Dragon Run Special Area Management Plan FY 2007 Final Report

Grant Number NA07NOS4190178, Task 95

Middle Peninsula Planning District Commission

Submitted by: Sara Stamp, Dragon Run SAMP Director

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Virginia Coastal Zone MANAGEMENT PROGRAM

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

Middle Peninsula Planning District Commission

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OVERVIEW

Task 1: Report on Technical Assistance for Adoption and Implementation of Comprehensive Plan and/or Zoning Amendments

Description: The Dragon Run Steering Committee has identified land-use planning (through comprehensive plan and zoning amendment changes) as a significant need for long-term protection of the Dragon Run watershed and the way of life it supports. Building upon draft language for comprehensive plan and/or zoning amendment developed in partnership with each watershed county, Middle Peninsula Planning District Commission (MPPDC) staff has been working with county Planning Commissioners, Boards of Supervisors, and county staff to provide technical support for the formal adoption of the amendments as county amendment cycles deem necessary. After amendment adoption, MPPDC staff will work to enable the successful implementation of these changes. MPPDC staff will provide a blend of training opportunities for local planning staff and citizens (through public and/or planning division workshop series, onsite training, visioning sessions, or other techniques tailored to the needs of each watershed county) in an effort to ensure widespread understanding and full implementation of the adopted changes and implementation assistance. MPPDC staff will develop and provide the appropriate training opportunities. Additionally, some funding incentives will be provided to the participating localities to counterbalance the costs (such as for hours of staff time spent in training) of incorporating the new land use policy and regulation recommendations (e.g. preservation district, drainage area conservation zone, stream buffer zone, conservation subdivision option). This counterbalancing incentive is estimated at $5,000 for each of the three watershed counties that adopted the WMP.

Narrative Report: MPPDC staff has continued to provide assistance with the adoption of the recommendation through dialog with planning staff, a presentation to the Essex Board of Supervisors/Planning Commission, provision of spatial watershed data for Gloucester County and the creation of a map product to include in a revised comprehensive plan of Essex County. Language was previously developed to reflect the input of county planning officials. The language was also developed in such a way as to be consistent with current comprehensive plan and zoning ordinance formats so that as the localities are updating their plans and ordinances, the recommendations can be inserted seamlessly. Note: The Dragon Run Steering Committee and county planning staff officials advised that the county Boards of Supervisors and Planning Commission would likely be more receptive to the recommendations if they were considered as a part of the regular update schedule vs as a stand alone change.

Each of the four watershed counties is at a different point with regard to adopting these enforceable policies. Only one, King and Queen County, has taken action to revise language in its zoning ordinance during this grant cycle, reaffirming its commitment to designate the Dragon Run as a place deserving extra consideration. Currently, two (Middlesex and Gloucester) of the four counties are well underway with comprehensive plan updates. One county (Essex) is just beginning its comprehensive plan updates. The fourth county recently completed its comprehensive plan update prior to the recommendations'

development. With regard to zoning ordinance revisions, Gloucester and Middlesex counties are going to wait until their comprehensive plan is approved before initiating zoning changes. Essex County intends on changing its zoning ordinance in concert with its comprehensive plan update.

King and Queen revised Article 11: Dragon Run Conservation District

The King and Queen County Planning Commission and Board of Supervisors received the Dragon Run land-use recommendations and MPPDC staff provided presentations to the Planning Commission and the Board of Supervisors in the previous grant cycle. Upon receipt of the draft recommended language, Planning Commission representatives revised it to meet the County's current vision. Specifically, the Board of Supervisor took action to amend their previous Dragon Run Conservation District to be more easily enforced district – 100 feet from the Dragon Run. Because almost one quarter of the County is in the watershed, there were concerns over the impact of the originally recommended ordinance changes, therefore, the scope and scale of the revised ordinance is less than recommended. This enforceable policy (one the next page) does, however, reaffirm the County's commitment to providing extra consideration to this unique resource. The ordinance provides a requirement for forest and farm Best Management Practices within the District. Documentation of Board action to the revise the ordinance can be found in Appendix 1.

Because the County recently completed updates to its Comprehensive Plan, it is envisioned that the recommended comprehensive plan language will be revisited again at its next update cycle.

ARTICLE 11 DRAGON RUN CONSERVATION DISTRICT

3-250 Intent of District

The purpose of the Dragon Run Conservation District (DRCD) is to protect and conserve fragile resource areas which perform valuable functions in their natural state and which are unsuitable for development and intense use. Areas to be designated as the "DRCD" primarily include wetlands and swamps and prescribed buffer areas adjacent thereto, but may include other areas deemed to be important for flood plain management, aquifer recharge, water storage, critical wildlife habitat, or similar functions.

3-251 Permitted Uses

The following uses, activities and structures are permitted within the "DRCD". Whenever these permitted uses are at variance with the requirements of any other lawfully adopted rules, regulations, ordinances, or resolutions, the most restrictive or one imposing the higher standards shall govern.

(1) The construction and maintenance of non-commercial catwalks, piers, fences and duck blinds, provided that such structures are so constructed on pilings as to permit the reasonably unobstructed flow of water courses and do not alter the natural contour of marshes, swamps and water courses.

(2) The cultivation and harvesting of shell fish and worms for bait.

(3) Non-commercial outdoor recreational activities, including hiking, boating, trapping, hunting, fishing, shell fishing, horseback riding, swimming and skeet and trap shooting; provided that no structure shall be constructed except as permitted in item (1) of this section.

(4) Conservation, repletion, education and research activities of the Virginia Marine Resources Commission, the Virginia Institute of Marine Science, the Commission of Game and Inland Fisheries, and other conservation agencies or organizations.

(5) The normal maintenance, repair, or addition to existing roads, highways, or the facilities of any person, firm, corporation, utility, or government abutting or crossing wetlands or swamps, provided that no waterway is altered and no additional wetlands or swamps are covered or drained.

(6) The normal maintenance of existing man-made drainage ditches, provided that no additional wetlands or swamps are covered or drained and provided further that this paragraph shall not be deemed to authorize construction of any drainage ditch.

(7) Agricultural activities which incorporate the application of Best Management Practices (BMPs) in a plan approved by the local Soil and Water Conservation District.

(8) Forestry activities which incorporate the application of Best Management Practices in a plan approved by the Virginia Department of Forestry.

3-252 Area of Applicability

The DRCD shall include, for the purposes of this ordinance: (1) Wetlands and swamps within the King & Queen County portion of the Dragon Run and its tributaries, and (2) The Resource Protection Area within the King & Queen County portion of the Dragon Run and its tributaries, which is a 100 foot vegetated buffer prescribed by Article 12 of this ordinance.

3-253 Official District Map

The official map showing the "DRCD" District is to be made part of and used as provided by Article 3 of this Zoning Ordinance.

---through 3-259 Reserved

Gloucester County Draft Comprehensive Plan

Middle Peninsula Planning District Commission staff has been collaborating with Gloucester County planning staff to encourage the inclusion of the Dragon Run recommendations in the county's Comprehensive Plan. The county is currently undergoing its Comprehensive Plan update and formed a Steering Committee to guide its development. MPPDC staff has provided information about the Dragon Run Watershed and the land-use recommendations to the Steering Committee.

To date, the county planning staff and the Comprehensive Plan Steering Committee have shown considerable motivation in including the recommendations. The language (starting on the next page) is the section of the Land Use Planning Chapter that specifically addresses the Dragon Run from the draft Gloucester County Comprehensive Plan. Rural character and tradition uses, qualities that the Dragon Run Steering Committee and SAMP have conveyed to be of significant importance, have been woven throughout the entire chapter, which is included in this report as Appendix 2.

The language included in the Comprehensive Plan draft goes above and beyond the basic recommendations provided to the county originally in terms of detail and scope. Feedback from the Comprehensive Plan Steering Committee and planning staff do not indicate any concerns with the language in the draft.

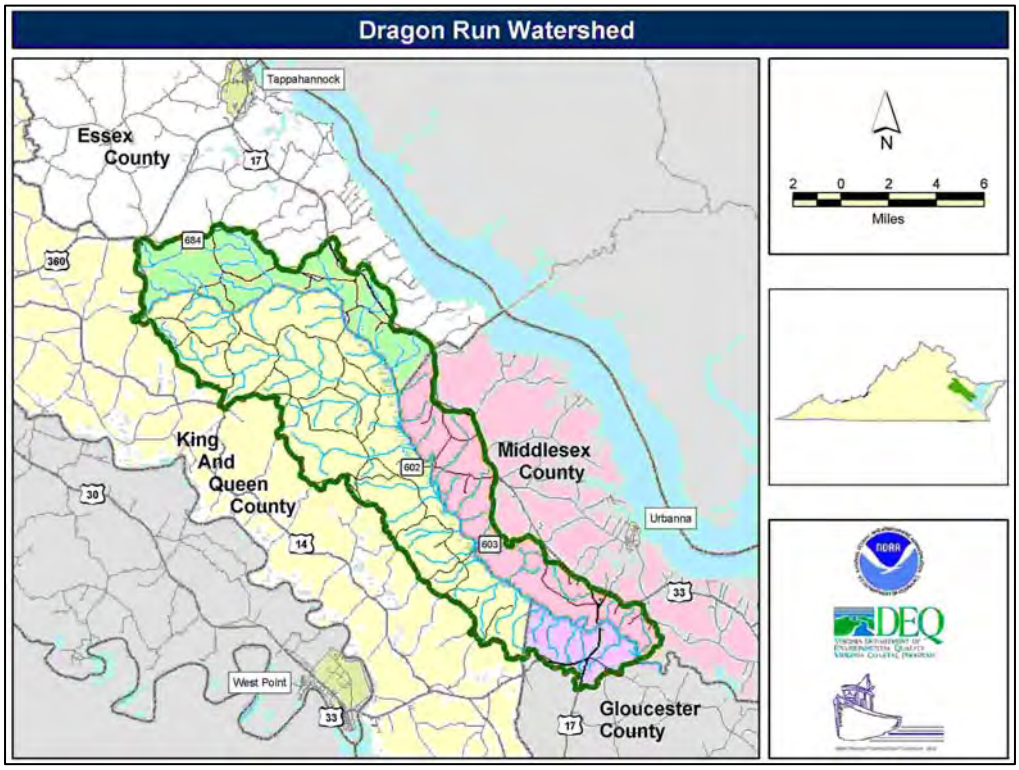
Upon adoption of the Comprehensive Plan (projected in Spring 2009), the county will be considering updates to its zoning ordinances. The Dragon Run land-use zoning ordinance recommendations will be presented again at that point in time.

(From the Gloucester County Draft Comprehensive Plan, Land Use Chapter)

Dragon Run Special Planning Area

As one of the Chesapeake Bay watershed's most pristine waterways, the Dragon Run "encompasses some of the most extensive and unspoiled swamp forest and woodland communities in Virginia"[1]. Effectively bisecting Virginia's Middle Peninsula located between the York and Rappahannock Rivers, this fresh and brackish water stream (Figure ___) meanders forty miles along and through nontidal and tidal cypress swamp. The watershed is mainly undeveloped, almost entirely privately owned, and encompasses approximately 140 square miles (90,000 acres) of rural landscape – mostly forests, farms, and wetlands. The spring-fed Dragon Run flows through portions of Essex, King and Queen, Middlesex, and Gloucester Counties, emptying into the estuarine Piankatank River and ultimately the Chesapeake Bay.

Figure ___. The Dragon Run Watershed



[1] Belden, A. Jr., A.C. Chazal, G.P. Fleming, C.S. Hobson, and K.M. McCoy. 2001. A Natural Heritage Inventory of the Dragon Run Watershed. Second edition. Natural Heritage Technical Report 01-03. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA.

The Dragon Run plays a central role in the Middle Peninsula's culture and identity. Its intriguing name is frequently borrowed by local enterprises and establishments. Since European settlement in the early 1600's and Native American inhabitation up to 10,000 years before that, natural resources have been the bedrock of the watershed's economy. For older generations, forestry, farming, hunting, trapping and fishing were the primary ventures. Today, forestry and farming continue to generate wealth and drive the watershed's economy. Hunters, many involved in organized hunt clubs continue to uphold this ancient tradition throughout land in the watershed. More than 46 percent of the land is leased by hunt clubs and it is estimated that $300,000 is generated due to hunt club activity and over $1.6 million in fishing activity[2]. These land uses, together with extensive swamps, are the main reasons that the Dragon Run remains wild and secluded.

The watershed's wilderness is both expansive and unique. The Dragon Run contains the northernmost example of the Bald cypress-Tupelo Swamp natural community in Virginia and the best example north of the James River. [3] Moreover, 14 rare species and 5 rare natural communities are found here. Based on his investigations of the watershed's aquatic communities, one researcher observes that the Dragon Run is a "100 year old time capsule," resembling coastal plain streams in the Chesapeake Bay region at the turn of the 20th century[4].

The Dragon Run's unique character evokes strong feelings to protect the pristine watershed in both long-time residents and first-time visitors alike. Although development pressure in the watershed is currently low, the potential for significant land ownership changes (>25% in 10 years due to aging and absentee corporate landowners) threatens to disrupt the rural character and fragment productive farm and forest land. Likewise, habitat fragmentation jeopardizes the Dragon Run's unique natural communities. Landowner opinions about how to address these threats vary widely, ranging from the belief that "the Dragon takes care of itself" by its wild nature and voluntary landowner stewardship to enacting and enforcing regulations with "teeth."

The difference in point of view between property rights advocates and conservationists centers on how to maintain a pristine watershed into the future.

The Dragon Run Watershed Special Area Management Plan (SAMP), a partnership between the Virginia Coastal Program and the Dragon Run Steering Committee of the Middle Peninsula Planning District Commission, is a project designed to address both the differing viewpoints and the common ground that exist concerning the future of the watershed. The project began in January 2002 with a grant from the Virginia Coastal Program under authority of the National Oceanic and Atmospheric Administration (NOAA). Enabled by the federal Coastal Zone Management Act of 1972 as amended, SAMPs aim to protect significant coastal resources through a collaborative, multi-level planning process to develop and implement new enforceable policies.

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[2] Dragon Run Watershed Plan, November 2003, Dragon Run Steering Committee, Middle Peninsula Planning District Commission

[3] Belden, Jr. et al., 2001

[4] Garman, G. C. 2003. Aquatic Living Resources Inventories in the Dragon System: Virginia Commonwealth University on-going Activities. Dragon Run natural Resources Symposium, February 11, 2003, Virginia Institute of Marine Science, Gloucester Point, VA.

One of the fundamental elements of a SAMP is that a strong regional entity must exist that is willing to sponsor the planning program. In the Dragon Run watershed's case, that regional entity is the Middle Peninsula Planning District Commission through its Dragon Run Steering Committee. Formed in 1985, the Dragon Run Steering Committee consists of landowners and local elected officials and is the key vehicle for cooperation and coordination among the four counties concerning watershed issues. The Steering Committee's approach to the SAMP is to stimulate and coordinate community involvement in the proactive development and implementation of goals, objectives, and action plans for a watershed management plan.

Another major element of a SAMP is that conflict exists concerning the area's proposed uses. The Steering Committee believed that the best approach is to proactively head off conflict before it grows by enabling stakeholders to openly discuss the issues. Potential conflicts in the Dragon Run watershed are: 1) the differences between conservation and property rights advocates; and 2) the private use of land versus the public use of the water. The Steering Committee felt that the watershed approach was the most effective way to manage natural resources and traditional land uses.

The Dragon Run Watershed SAMP began with public planning forums in December 2001 and January 2002. These planning forums led to two primary outcomes: 1) the development and confirmation of common themes for watershed issues; and 2) the establishment of a SAMP Advisory Group representing a broad cross-section of the community. Building upon the foundation established by the planning forums, the SAMP Advisory Group developed a mission statement and developed a list of three goals, each with several objectives. With minor modifications, the Steering Committee approved the goals and objectives, which were incorporated into a Memorandum of Agreement. Each county – Essex, Gloucester, King and Queen, and Middlesex - and the Middle Peninsula Planning District Commission signed the Agreement during the late summer and fall of 2002 to consider the actions recommended by the Steering Committee.

Mission Statement for the SAMP

To support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed.

- **Goal 1 - Establish a high level of cooperation and communication among the four counties within the Dragon Run Watershed to achieve consistency across county boundaries.**
- **Goal 2 - Foster educational partnerships and opportunities to establish the communities' connection to and respect for the land and water in the Dragon Run.**
- **Goal 3 - Promote the concept of landowner stewardship that has served to preserve the Dragon Run Watershed as a regional treasure.**

With the help of staff, consultants and the Advisory Committee, the Steering Committee completed the "Dragon Run Watershed Management Plan" in November 2003 and recommended that each of the

localities adopt the plan as an addendum to their comprehensive plan until specific language could be added to each of the communities' Comprehensive Plan. Gloucester County adopted the Watershed Management Plan as an addendum to its Comprehensive Plan on November 3, 2003.

Only 6% of the Dragon Run Watershed is within Gloucester County and it represents only 3% of the County's land areas. However, as "one of the Chesapeake Bay watershed's most pristine waterways" the Dragon Run is well worthy of individual attention, both from the County's perspective and from a regional perspective. The purpose of adopting the Watershed Management Plan was to formally acknowledge that the Dragon Run Watershed deserves distinctive treatment.

The uniqueness of the SAMP is that it goes beyond the County's borders. It represents regional collaboration and cooperation in managing this resource. The SAMP process, and its implementation, represents, and requires, partnerships with other localities on the Middle Peninsula, other governmental agencies and non-profit groups as well as with the property owners along the Dragon Run and the hunters, fishermen, boaters, nature lovers and others who enjoy its beauty and abundance. It also sets the stage for regional cooperation in future planning and implementation. By adopting the Watershed Management Plan as part of their Comprehensive Plan, the county adopted the following policies:

- Recognize the overall value of maintaining the traditional rural character and forested and farmed landscape of the Dragon Run watershed.
- Preserve the ecological integrity of the Dragon Run Watershed.
- Acknowledge the community and economic benefits of the Dragon Run watershed: for the production of agricultural and forest products; as a valued natural resource; for wildlife habitat; for maintaining water quality; and for scenic and aesthetic values.
- Continue to fully enforce existing regulations and policies.
- Protect forested and farmed land from fragmentation due to conversion to more intensive development.
- Encourage low-density, clustered pattern of development for new residential development in the watershed to protect open space and natural resources.
- Seek techniques to protect open space in the watershed without infringing upon landowner rights to maintain an economic return from their property.
- Identify land uses that are incompatible or competitive with traditional resource-based land uses (e.g. forestry, farming, hunting, fishing) and consider limiting them within the watershed.
- Limit or deny future rezoning approvals from existing zoning (i.e. *Agricultural or Rural Business zoning)* to more intensive uses in order to protect the rural character and integrity of farming and forestry resources in the watershed.
- Limit the extension of public utilities and central water and sewer in the watershed.
- Explore the feasibility of limiting major residential development in the watershed by aligning the Comprehensive Plan and Zoning Ordinance with provisions in the Subdivision Ordinance that limit major subdivisions.

- Publish citizen stewardship materials that explain pertinent ordinances, policies, and regulations in easy-to-understand language.

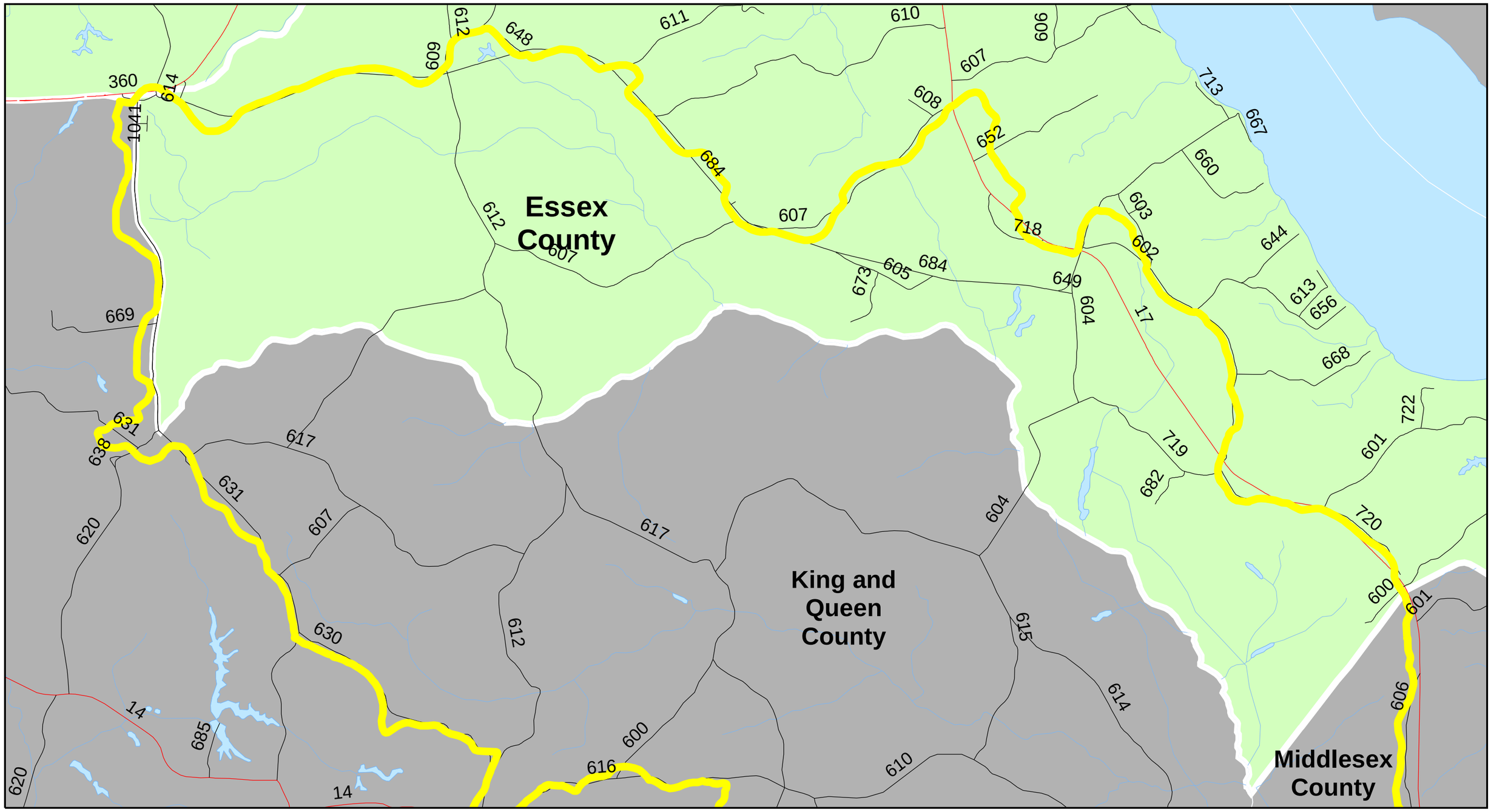
Many of these policies are similar to those established to protect the rural areas and character of the County. The Watershed Plan further recommends that Gloucester Planning Commission and Board of Supervisors amend their Comprehensive Plan include a "Dragon Run Planning Area." Once the Comprehensive Plan has been updated to include recommendations for the Dragon Run Planning Areas, the plan recommends implementation of Comprehensive Plan by changes to the Zoning Map and Ordinances to incorporate "Dragon Run Protection Zone." Through the SAMP funding, the MPPDC hired a consultant to work with staff and commissioners from each of the four affected Counties to develop draft language to consider in the Comprehensive Plan and subsequent zoning ordinances.

In addition to land use recommendations, the Watershed Management Plan includes tools to preserve forest, farm and natural resources, recommendations to address concerns regarding public access, and suggestions for controlling invasive species in the watershed. Additional recommendations involve education and landowner stewardship, ideas to encourage and support sustainable economic development, and recommendations to monitor the implementation of the Watershed Management Plan. Many of these recommendations are meant to be carried out by other agencies or entities and therefore will not likely be incorporated into the Comprehensive Plan update. Adoption of the plan shows support for the other recommended actions that may not be in the purview of local government, but will help to achieve the goals and objectives agreed to by all the Counties.

Map for Essex County Comprehensive Plan

Essex County is initiating their Comprehensive Plan update currently. The County has indicated that it is interested in incorporating the Dragon Run recommendations for their Comprehensive Plan. They requested the following map of the Essex County portion of the Dragon Run Watershed to include in the Comprehensive Plan as well. Additionally, the County will be conducting its zoning ordinance update simultaneously, in which the County has indicated that it is interested in rezoning the Dragon Run watershed as per the land use recommendations. Specifically, the County is interested in rezoning the area within the watershed from A-2 to A-1, which will increase the minimum lot size to 20 acres.

Dragon Run Watershed, Essex County



Legend

17 Dragon Run Watershed

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This map production is a product of the MPPDC's Dragon Run SAMP Technical Assistance Program and was funded by the Virginia Department of Environmental Quality's Coastal Program through Grant #NA07NOS4190178, Task 95 of the National Oceanic and Atmospheric Administration, Office of Ocean and Management Act of 1972, as amended.

Dragon Run WATERSHED

Virginia Coastal Zone MANAGEMENT PROGRAM

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

1 Miles

Middlesex County Comprehensive Plan

Due to staff changes in the Planning Director position with the County (two changes in the past year and a half), MPPDC staff time has been spent updating and informing the person in this position. The County is currently undergoing its Comprehensive Plan update and had previously received recommended language. According to the current Planning Director, the recommended language has been included in the draft Comprehensive Plan. Upon adoption of the Comprehensive Plan (projected in Spring 2009), the county will be considering updates to its zoning ordinances. The Dragon Run land-use zoning ordinance recommendations will be presented again at that point in time.

Task 2: Report on Technical Assistance and Education Programs

Overview

Task 2: Report on Technical Assistance and Education Programs

Description: In order to facilitate the implementation of the products of this scope of work, MPPDC staff continued to administer the Dragon Run SAMP Technical Assistance Program. MPPDC staff provided logistical and technical support to the citizen-based Dragon Run Steering Committee (and related subcommittees), which serves as the advisory council for the Dragon Run. MPPDC staff provided information about tools to preserve forest, farm, and natural resources to support the mission of the Dragon Run Watershed Management Plan, which is "to support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed." Tools included primarily land use assessment, and conservation easements. MPPDC staff provided technical support to assist the Dragon Run Day Subcommittee to plan for the community-oriented Dragon Run Day to celebrate the natural, cultural, and historic heritage of the Dragon Run. The festival served as an opportunity to increase citizen awareness of watershed issues and will feature results of projects undertaken during the course of the Dragon Run SAMP. Passive educational tools available at Dragon Run Day and in the interim included educational materials (e.g. brochures, fact sheets), the Dragon Run Watershed DVD and a web site that serves as a clearinghouse of information about the watershed.

Narrative Report: MPPDC staff has continued to support the implementation of the Dragon Run Watershed Management Plan and provided support to the Dragon Run Steering Committee. Four quarterly meetings (Appendix 3) of the Dragon Run Steering Committee were held, as well as monthly meetings (February – September) of the Dragon Run Day Planning Committee. Also, due to turnover in local politics, MPPDC staff has also provided an overview of the SAMP and the Steering Committee to four new representatives, equivalent to one quarter of the Steering Committee. As staff support for the Steering Committee, MPPDC staff drafted a position statement (Appendix 4) in opposition to the potential Naval outlying landing field site in the Dragon Run watershed.

During this year, MPPDC staff has represented the Steering Committee and the SAMP at many events/meetings, including: on Rob Wittman's 1st Congressional District Environmental Advisory Committee, Environment Virginia 2008, Middle Peninsula Chesapeake Bay Public Access Authority meetings, Chesapeake Watershed Forum, and a Virginia Invasive Species Advisory Committee meeting.

MPPDC staff provided educational opportunities to increase the awareness of the Dragon Run watershed and land-use planning tools available to protect the watershed. For example, Dragon Run Day is an annual event celebrating the natural, cultural and historic aspects of the Dragon Run watershed, while increasing watershed awareness. Dragon Run Day 2008 (Appendix 5) was attended by about 1,450 people. MPPDC staff, in partnership with the Chesapeake Bay National Estuarine Research Reserve in Virginia and Friends of Dragon Run, has also been involved with seeking inclusion of the Dragon Run Watershed in the four counties' middle schools' Standards of Learning programs. Additionally, MPPDC assisted in the coordination or a Dragon Run Discovery Lab to provide a hands-on overview of the Dragon Run Watershed and participated in the planning of the 2008 Down on the Farm

event hosted by Tidewater RC&D and provided the map in their brochure. MPPDC staff also continued to create and distribute Dragon Run DVDs with over 250 going out during this grant cycle. The DVD, in addition to the Dragon Run website, www.mppdc.com/dragon, provided a substantial amount of public education opportunity.

MPPDC staff also provided information to local government officials regarding purchase of development rights programs and conservation subdivisions. Additionally, to provide a direct, hands-on knowledge to local government elected officials and staff, MPPDC staff offered the opportunity to experience the Dragon Run first hand on two separate kayak trips.

Dragon Run Steering Committee

The Dragon Run Steering Committee, which has been a policy recommendation body to the Middle Peninsula Planning District Commission and the four Dragon Run watershed counties for over 23 years, is perhaps the best example of an active watershed group inside of the York and Small Coastal Basins Watershed. The Dragon Run Steering Committee meets quarterly to support the mission of the Dragon Run Watershed Management Plan (Agendas and minutes from their meetings can be found in Appendix 3).

The Dragon Run Steering Committee is the mechanism for stakeholders to develop policy recommendations for local decision makers to use in order to plan for the natural, cultural and historic aspects of the Dragon Run watershed. The composition of the Dragon Run Steering Committee contributes significantly to its success. Specifically, two landowners, one Planning Commission member and one Board of Supervisor member from each county on the Dragon Run comprise the Dragon Run Steering Committee. These members of the Steering Committee include representatives from such varied groups as farming, conservation, recreation and education.

The recommendations of the Dragon Run Steering Committee and the process by which recommendations are transferred to municipal government bodies impact land-use develop patterns and thereby water quality. One such example of the effectiveness of this process was the Dragon Run Steering Committee's efforts to discourage the siting of a Naval Outlying Land Field (OLF) within the watershed. A 20,318-acre site located in the Dragon Run Watershed was included in the initial list of potential locations for the OLF. The Dragon Run Steering Committee discussed this item and prepared a position statement. It also recommended that the Middle Peninsula Planning District Commission also submit a similar statement (Position statements can be found in Appendix 4). The PDC followed this recommendation and submitted one as well. Additionally, at least two of the four watershed counties passed resolutions opposing the OLF in the Dragon Run Watershed. The site did not appear on the final proposed sites list. One of the primary reasons that the Dragon Run Steering Committee opposed the OLF was that it was inconsistent and incompatible with the Dragon Run Watershed Management Plan.

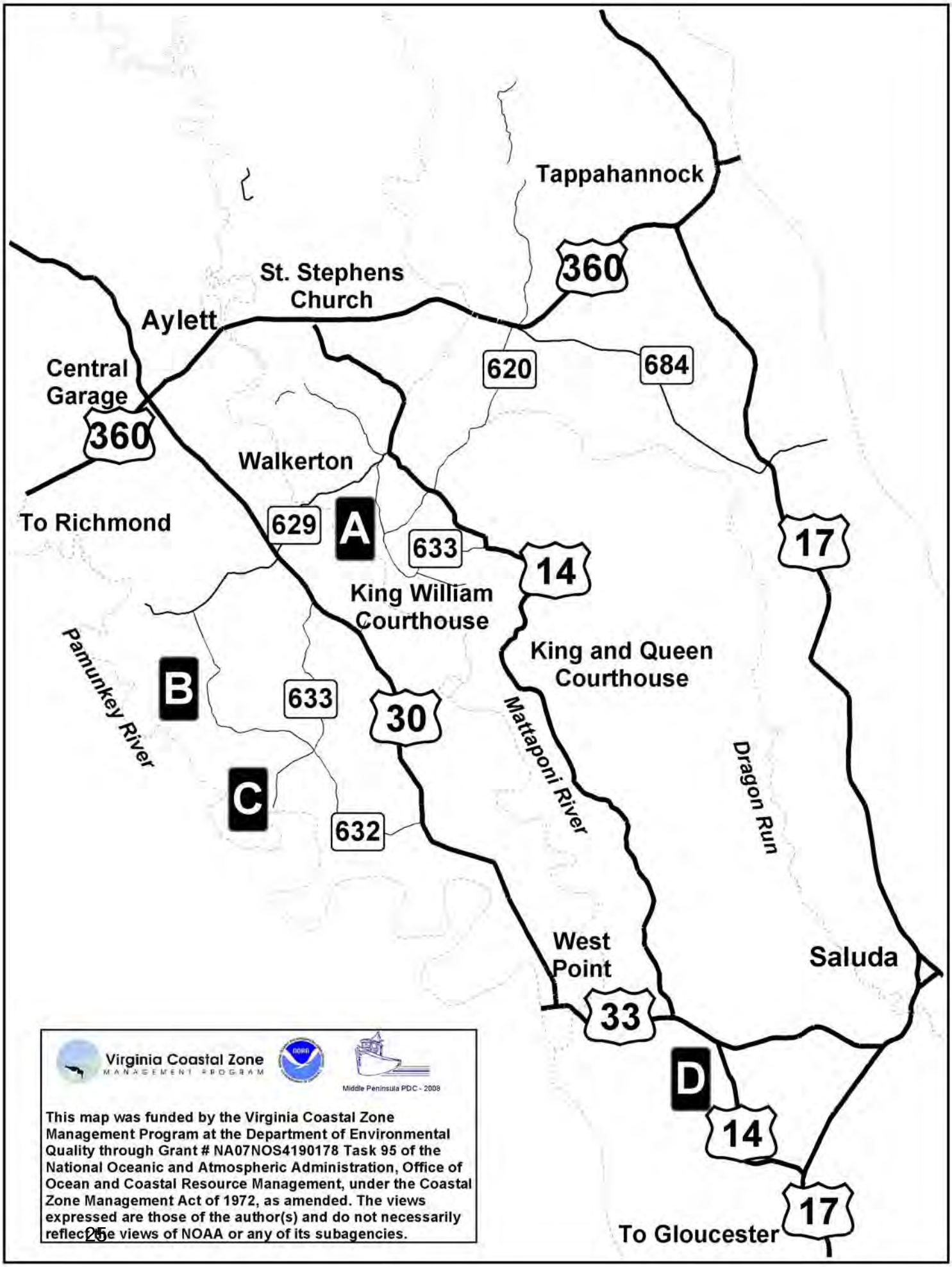
The mission of the Dragon Run Watershed Management Plan, a comprehensive document adopted by three of the four watershed counties, is to "support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed." The goal to balance the need for planned development and the need to protect our natural resource bases, and thereby the traditional uses that rely on it, is the primary driver of the Steering Committee's efforts. The Dragon Run Steering Committee captures the benefits of planning at a regional, watershed level, including land-use consistency across county lines and a landscape approach to natural resource protection.

Dragon Run Day 2008

Dragon Run Day, an annual education festival celebrating the natural, cultural and historic characteristics of the Dragon Run Watershed, provides an opportunity for the watershed community and the general public to come together to learn more about this unique place. (A full presentation on Dragon Run Day 2008 can be found in Appendix 5.) Most of the exhibits at Dragon Run Day focus on these characteristics and provide a hands-on approach to learning. 2008 was a very successful event. There were an estimated 1,450 people in attendance, making this the biggest Dragon Run Day yet. The Dragon Run Steering Committee co-hosts the event with Friends of Dragon Run and Thousand Trails Camp Resort. Dragon Run Day 2009 is already in its planning stages and is scheduled for October 10, 2009.

Dragon Run Technical Assistance

MPPDC staff also provides technical assistance to efforts that support the mission of the Dragon Run Watershed Management Plan. One such example during this grant cycle was assistance for the Down of the Farm event, which included a biodiesel highlight this year. In addition to coordinating the biodiesel exhibit, MPPDC staff created the following map to include in the Down on the Farm brochure identifying the locations of farms participating in the event.


Tappahannock
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King William Courthouse
King and Queen Courthouse
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Mattaponi River
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To Gloucester
Virginia Coastal Zone
MANAGEMENT PROGRAM
Middle Peninsula PDC - 2008
This map was funded by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant # NA07NOS4190178 Task 95 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended. The views expressed are those of the author(s) and do not necessarily reflect the views of NOAA or any of its subagencies.

Task 3: Report on Management Plan Development and Adoption for Public and Non-governmental Organization (NGO) Holdings Acquired for Conservation

Overview

Task 3: Report on Management Plan Development and Adoption for Public and Non-governmental Organization (NGO) Holdings Acquired for Conservation

Description: To facilitate local-state and state-state communication and coordination, MPPDC staff developed a report with recommendations of goals and policies consistent with the SAMP for managing public and NGO holdings acquired for conservation within the Dragon Run watershed (FY 05). Intended to communicate Dragon Run Steering Committee and Virginia Coastal Zone Management Program expectations for conservation management of public and NGO holdings in the Dragon Run watershed, the report targeted those entities that do or could manage land for conservation within the watershed, such as Department of Forestry, Department of Game and Inland Fisheries, Department of Conservation and Recreation, Middle Peninsula Chesapeake Bay Public Access Authority, The Nature Conservancy, Friends of Dragon Run, Rappahannock Community College, CBNERR-VA, and Virginia Outdoors Foundation. Implementation of the recommended guidelines for management of public or non-governmental organization holdings acquired for conservation in the Dragon occurred through the creation and adoption of management plans for a variety of agencies in the watershed. These management plans incorporated recommendations for land conservation management, such as wildlife and water quality protection and compatible recreational uses. MPPDC staff coordinated with public and NGO partners to develop and facilitate the adoption of an additional 4 (one remains to be formally adopted) recommendation-consistent management plans for public and/or NGO holdings acquired for conservation purposes in the Dragon Run watershed.

Narrative Report: During the last year's grant cycle, two management plans were drafted (for Chesapeake Bay National Estuarine Research Reserve in Virginia and The Nature Conservancy). During this grant cycle, MPPDC staff received and incorporated final input and letters adopting those plans as enforceable policies. MPPDC staff also drafted management plans for Friends of Dragon Run and participated in the development of a management plan for the Middle Peninsula Chesapeake Bay Public Access Authority. An adoption letter for the Friends of Dragon Run plan was received in early October, 2008. The adoption of the Middle Peninsula Chesapeake Bay Public Access Authority plan is expected in December. All plans and adoption letters are attached.

Friends of Dragon Run

MPPDC staff coordinated with Friends of Dragon Run, a local non-governmental organization, to produce management guidance to apply generally to all of their current and future conservation holdings. Friends of Dragon Run currently owns 9 tracts, totaling almost 600 acres, fee simple along the main stem of the Dragon Run. MPPDC staff collected input from representatives of the Friends of Dragon Run Board regarding the organization's goals and priorities for its holding and prepared a management plan reflective of this vision. This management plan was adopted by the Friends of Dragon Run Board to serve as an enforceable policy in early October. Both the adoption letter and the management guidance can be found in Appendix 6.

The Nature Conservancy

The Nature Conservancy (TNC), a non-governmental organization that operates worldwide, has a strong focus in the Dragon Run Watershed. The organization's primary interest in the area focuses on preserving the watershed's forest lands. TNC has been an instrumental component of the protection of land throughout the entire Dragon Run Watershed. Although typically operating through purchased easements, TNC owns (fee simple) a holding along the main stem – Dragon Flats. MPPDC staff coordinated with TNC staff to identify and priority goals and objectives for the management of the Dragon Flat Tract and a draft plan was submitted to the organization in the previous grant cycle. Final input was collected and incorporated at the beginning of this grant cycle. TNC adopted the finalized management plan as an enforceable policy in the early summer of 2008. The adoption letter and Dragon Flats Management Plan are included in Appendix 7.

Virginia Estuarine and Coastal Research Reserve

The Dragon Bridge Tract is part of the Virginia Estuarine and Coastal Research Reserve (VECRR) system, which is managed by the Chesapeake Bay National Estuarine Research Reserve of Virginia (CBNERR) staff at the Virginia Institute of Marine Science. This is an academic institution, which lends to one of the primary purposes of the site being education/research. CBNERR staff have been an integral part of the SAMP process. Additionally, Dr. Willy Reay serves on the Dragon Run Steering Committee as a landowner from Gloucester County.

MPPDC staff coordinated with VECRR staff to identify and priority goals and objectives for the management of the Dragon Bridge Tract and a draft plan was submitted to the organization in the previous grant cycle. Final input was collected and incorporated at the beginning of this grant cycle. VECRR adopted the finalized management plan as an enforceable policy in the summer of 2008. The adoption letter and Dragon Bridge Management Plan are included in Appendix 8.

Middle Peninsula Chesapeake Bay Public Access Authority

Enabled by legislation passed during the 2002 Virginia General Assembly session, the Middle Peninsula Chesapeake Bay Public Access Authority (MPCBPAA or PAA) officially began on June 13, 2003, upon the signing of the Operating Agreement by the member jurisdictions: the Counties of Essex, Gloucester, King and Queen, King William, and Mathews and the Towns of Tappahannock, Urbanna, and West Point. The PAA, a political subdivision, was established to identify, acquire, and manage public water access opportunities in the region that can be used by the general public for passive and active activities. The PAA currently holds approximately 1000 acres fee simple in the Dragon Run Watershed.

MPPDC staff consulted with PAA staff regarding the development of a management plan for a PAA holding that was reflective of Dragon Run Steering Committee recommendations for management of conservation acquisitions in the watershed. While PAA staff initiated work on the management plan, MPPDC Dragon Run staff served on the Thurston Haworth Recreation Area Steering Committee. Later, MPPPDC Dragon Run staff reworked the semi-final draft of the Thurston Haworth Recreation Area Management Plan as per PAA request. Action is required on the part of the PAA to provide policy direction to finalize the report. PAA staff will complete the final incorporation of input and policy direction. It is anticipated that the PAA will make some action to adopt this enforceable policy at either its December or February meeting. The final working draft submitted by MPPDC Dragon Run staff to PAA staff can be found in Appendix 9.

Task 4: Report on Sustainable Economic Development Biodiesel Pilot Program

Overview

Task 4: Report on Sustainable Economic Development Biodiesel Pilot Program

Description: The Biodiesel Pilot Program addresses one of the key WMP action recommendations, which is to further the implementation of sustainable economic development practices recommended in the FY03 Dragon Run economic development study, *Opportunities for Sustainable Natural Resource-Based Development in the Dragon Run Watershed* by Yellow Wood Associates, Inc. During FY 06, MPPDC staff and a consultant conducted a feasibility study in which an active partnership was developed to strengthen the local biodiesel crop market (such as soybeans) through increased local use of biodiesel, both at the local government and private community levels. As an enforceable outcome of the pilot study, the Dragon Run Steering Committee, MPPDC staff and the Consultant pursued a signed resolution from a watershed County and a signed MOU/MOA/Work Plan, etc from the partnership that was developed during the feasibility study/pilot program framework, indicating that they would use biodiesel fuel resulting from this pilot program partnership to support the watershed agricultural economic base. Promoting the adoption of biodiesel for sustainability purposes is a particularly good fit in the Middle Peninsula, as the enterprise meets the overall goal of sustainable natural resource-based economic development of the Watershed, offers a stronger market for local farmers, opens new fuel opportunities for the private sector as well as a contributes to a cleaner environment. MPPDC staff worked with the partnership and local government to implement the Dragon Run biodiesel school bus pilot program.

Narrative Report: At the beginning of this grant cycle, each of the four watershed counties adopted the biodiesel resolution as an enforceable policy. These resolutions can be found in Appendix 10. This enforceable policy states that the school boards will support and encourage the use of biodiesel in its buses, adopt a voluntary schedule for conversion to B5 and then to B20, and educate and promote biodiesel as a tool to support the local farming industry.

MPPDC staff also continued to work with the various biodiesel partners, including the watershed counties' school bus fleets, the local biodiesel refinery, the agricultural community and the fuel distributors to implement the Dragon Run biodiesel pilot program. In partnership with Virginia Clean Cities, MPPDC staff has been assisting in the implementation of the biodiesel pilot program. Currently, one county, Gloucester, has 100% of their school bus fleet using B5 (a 5% blend of biodiesel to regular diesel). King and Queen County has also just started using a B5 blend of biodiesel as well. Middlesex County's school board has suffered significant budget cuts, such that they are unable to afford the additional filters that will be required upon start up, even though the cost differential for the biodiesel would be covered through an US Environmental Protection Agency grant (Clean School Bus program). Essex County is relying on a single retailer who, according to the owner, is currently not able to convert to biodiesel due to issues with his brand. Work is underway to identify funding in assisting another retailer to convert tanks to biodiesel to serve Essex County.

Working with Virginia Clean Cities, MPPDC staff recommended three individuals that have been an integral part of the biodiesel pilot program to receive an "I Saved a Dragon Award" from Virginia Clean

Cities. Those individuals include Roger Kelly, Gloucester County School Bus Fleet Manager, Denny Sulik, VABiodiesel, and John Phillips, Phillips Oil and Gas. 98th District Delegate, Harvey Morgan, presented the awards at Dragon Run Day 2008.

While the school bus portion of the project has been very successful at increasing the general market for biodiesel and thereby soybeans in the area, project partners have still been seeking a more direct economic benefit to watershed farmers from biodiesel. Along these lines, MPPDC and Tidewater RC&D partnered to invite a group of stakeholders representing the agriculture community to discuss the potential of using Canola-based (or soybean-based) biodiesel to meet these goals. Three models were discussed:

1) acquiring a fuel seed crusher and biodiesel processor for farmers to use on a regional basis to fuel their farm vehicles (and thereby reduce their direct cost); there would also be potential here to use or sell the meal created from the crushing process

2) exploring incorporating Canola in the crop rotation and partnering with Red Birch in the western part of the state to sell their product;

3) considering the feasibility of having a one stop facility in the region where the farmer drops off its seed or beans, it is crushed and processed on-site and sold at a pump on-site as well.

It is anticipated that MPPDC staff will help to coordinate continued communication between interested parties in this process under the Technical Assistance portion of its FY09 SAMP grant.

Task 5: Report on Dragon Run Estate Planning Network Initiative

Overview

Task 5: Report on Dragon Run Estate Planning Network Initiative

Description: Because estate planning includes a barrage of flexible tools, such as conservation easements, life instruments, right of first refusal, community foundations, conservation registries, purchase of development rights, and transfer of development rights, many watershed landowners may be willing to participate in order to keep their lands in their current use. The Dragon Run Conservation Estate Planning Network was convened to target landowners in the Dragon Run Watershed, secure the land base for long term natural resource management and use, and direct local wealth to support sustainable local development. Additionally, in the second year of the project, the network will provide training and informational opportunities to family attorneys and accountants who may be in a position to advise landowners. MPPDC staff identified key estate planning partner entities, as well as key large tract land owners in and around the watershed. The aim of this task is to implement a formal network that would result in the official formation of a Dragon Run conservation hub.

Narrative Report: During the current grant cycle, MPPDC staff hosted two forums (Agendas and minutes from these meetings can be found in Appendix 11) to provide a roundtable for the various partners in the conservation estate planning process to discuss needs, gaps and coordination of efforts. Partners in this network include representatives from local land trusts, non-governmental organizations, local CPAs, attorneys, and real estate agents amongst others.

MPPDC staff updated its Conservation Estate Planning Brochure (Appendix 12) to include current Dragon Run Conservation Estate Planning Initiative partners. MPPDC staff also developed a list of targeted landowners throughout the Dragon Run Watershed (Appendix 13) based on a map (Appendix 14) created of high priority lands and currently protected lands. These lands are parcels characterized by their proximity to the Dragon Run, their land cover, and their larger sizes. They are considered to be the highest priority lands for conservation in the watershed for these reasons.

MPPDC staff also attended three Essex County Countryside Alliance and one Middle Peninsula Land Trust landowner meetings to participate in outreach for the conservation planning in the Dragon Run Watershed. To help increase the focus on the importance of conservation easements and conservation estate planning in the Dragon Run Watershed, MPPDC staff provided an article (Appendix 15) on the Dragon Run SAMP and the watershed to the Essex County Countryside Alliance for inclusion in their newsletter.

Appendix 1: King and Queen Amendment Supporting Documentation

DRAGON RUN REGULATIONS UPDATE

County Administrator Ron Hachey stated that this issue was tabled at the last Board meeting in order to see what the neighboring counties that share the Dragon Run Watershed were enacting in terms of a stream buffer. The discussion focused on whether or not we should have 75 feet of buffer on either side of the Dragon in addition to the 100 feet that is being recommended by the Planning Commission.

Since the last meeting, Mr. Hachey has sent a request to Lewie Lawrence, Director of Regional Planning at the Middle Peninsula Planning District Commission, asking that the buffer issue be discussed at the next scheduled meeting of the Dragon Run Steering Committee for their thoughts on the Board's proposed buffer depths.

Mr. Lawrence has advised Mr. Hachey that the steering committee will not be meeting until after the first of the year. Therefore, this item will need to be tabled until after the committee meets, unless the Board wants to take action without their recommendation.

Mr. Haden commented that he felt that the 100 foot buffer restriction was enough and could not see the County putting on new restrictions when a new Board is coming on.

It was once again noted that the Planning Commission recommended a 100 foot buffer on each side of the Dragon.

A motion was made by Mr. Haden and seconded by Mr. Busick to accept the Planning Commission's recommendation of a buffer of 100 feet on each side of the Dragon Run.

AYES: D. H. MORRIS, S. C. ALSOP, H. L. BUSICK, H. L. BUSICK
NAYS: J. L. SIMPKINS

Dec. 10, 2007

Appendix 2: Gloucester Draft Land-Use Chapter (Dragon Run Section at End)

~~LAND USE~~
EXISTING CONDITIONS

INTRODUCTION

Gloucester County, consisting of 225 square miles of land area, makes up the southernmost tip of the Middle Peninsula and is located adjacent to Middlesex, King and Queen, and Matthews Counties. Gloucester is surrounded by over 296 miles of shoreline; bounded on the south by the York River; on the east by the Severn, Ware and North Rivers, and on the north by the Piankatank River. The County is distinguished by a great deal of natural beauty, rural character, shoreline scenery and natural resources.

Gloucester County officially procured its status as a County in 1651. Up until the Civil War, the County was primarily plantation oriented, with tobacco farming as the main industry. The time period following the Civil War was one of the poorest in the County's history. Large plantations and farms were gradually sold off into smaller parcels of land; a trend that continued until the 1930s. In the 1700s, the average size farm was 395 acres; by 1930, 75% of all farms were less than 50 acres, and 95% of County residents owned their own property. The County's economy continued to be based on agriculture. Tobacco production gradually declined while production of corn, soybeans and flower bulbs—especially daffodils—increased.

During the first half of the 1900s Gloucester was generally prospering, although the population was declining. Because the County had no railroad or other major transportation, it remained isolated, rural and sparsely populated; with few outsiders moving to the area. Up until the 1950s, the County was characterized by scattered houses in the countryside, spread over a landscape of farmlands, waterways, shoreline and extensive undisturbed natural areas, with a few small, compact rural settlements.

Then in 1952, the George P. Coleman Bridge was opened—a critical factor in the transformation of the Gloucester. Prior to its construction, the York River was a physical barrier to the County, accessed only by the limited capacity of the river ferry service. However, when the two-lane toll bridge opened in 1952, Gloucester's population began to increase. At that post–war time, there was a trend in America of people moving to rural settings that were close enough to large metropolitan areas for employment, and Gloucester was attractive to those working in the urban areas of Newport News, Hampton and Williamsburg which were within an hour's drive. The tolls of the Coleman Bridge served as somewhat of an economic barrier for growth until 1976 when they were removed, resulting in more substantial growth in the County. Most of this growth was concentrated in the Gloucester Point area, from Bena up to Ordinary. In 1996,

the bridge was expanded to four lanes due to increased traffic and congestion, and tolls were added back to finance the expansion. However, the added tolls no longer had the effect of curbing growth in the County as they once did.
The continuous rapid population growth of the County since the 1970s is illustrated in Table __ and Figure __ below. Gloucester's population in 1970 was 14,509; by 1980, it had increased by 43% to 20,107. Between 1980 and 1990, the rate of increase climbed by 50% to 30,131 people. During this time, Gloucester was one of the fastest growing counties in the state of Virginia with an average annual growth rate of 6.4% from 1980 to June 1989. [1]

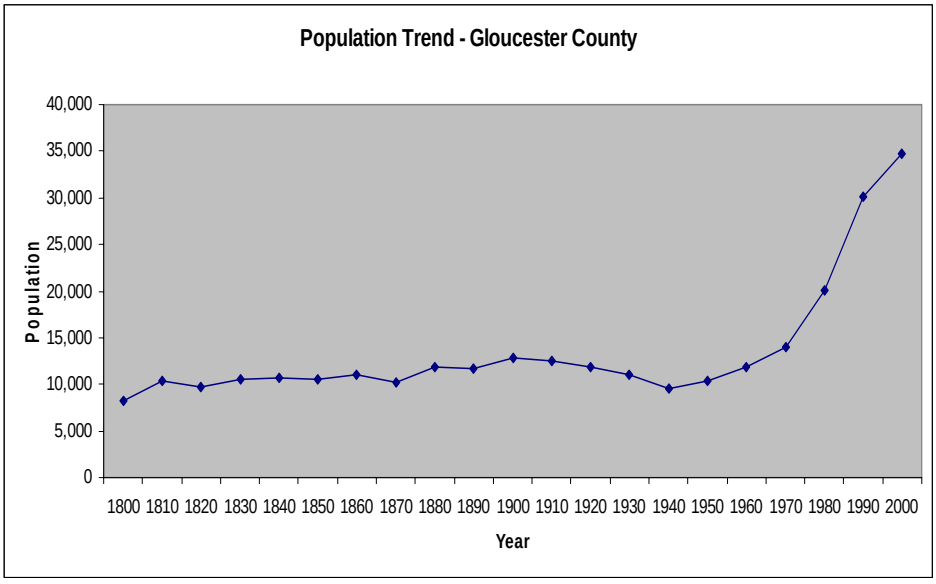
DEMOGRAPHIC TRENDS AND CONDITIONS

The latest census count in 2000 indicates a population of 34,780, which has increased 145% since 1970. However, the rate of growth has been significantly slower, but is steadily increasing. Based on Weldon Cooper's population estimates, Gloucester County had an average annual growth rate of 0.52% from 2000 to 2005. The percent increase in population was estimated to be 0.35% between 2000 and 2001 but increased to 0.85% between 2004 and 2005.[2]

[1] Gloucester County Comprehensive Plan 1991
[2] Weldon Cooper Center for Public Service, Demographics and Workforce Section, University of Virginia

Table 1
Population (1800-2000)
Gloucester County

Year	Population	% Change	Year	Population	% Change
1800	8,181		1910	12,477	-3%
1810	10,427	27%	1920	11,894	-5%
1820	9,678	-7%	1930	11,019	-7%
1830	10,607	10%	1940	9,548	-13%
1840	10,715	1%	1950	10,343	8%
1850	10,527	-2%	1960	11,919	15%
1860	10,956	4%	1970	14,059	18%
1870	10,211	-7%	1980	20,107	43%
1880	11,876	16%	1990	30,131	50%
1890	11,653	-2%	2000	34,780	15%
1900	12,832	1%			



Regional Context

Similar growth trends can be found throughout the state and region. As the population grows in adjacent population centers, development pressure will increase for the surrounding rural counties. The following chart (Figure ____) was taken from the Hampton Roads Planning District Commission's Hampton Roads Data Book (June 2006) and compares the population and population density within the Hampton Roads Area. Compared to our neighbors to the south, Gloucester has a pretty low overall density.

Figure ____

LAND AREA, POPULATION, AND POPULATION DENSITY

Cities and Counties	Land Area in Square Miles	1980 Population	2005 Population*	Persons Per Square Mile - 1980	Persons Per Square Mile - 2005
Hampton Roads	2,907	1,214,390	1,633,200	418	562
Southeastern Virginia	2,278	849,947	1,125,800	373	494
Chesapeake	340	114,486	213,400	337	628
Norfolk	54	266,979	235,500	4,944	4,361
Portsmouth	33	104,577	98,800	3,169	2,994
Suffolk	400	47,621	77,100	119	193
Virginia Beach	248	262,199	435,600	1,057	1,756
Metro	1,075	795,862	1,060,400	740	986
Franklin	8	7,723	8,400	965	1,050
Isle of Wight County	316	22,000	32,200	70	102
Southampton County	600	18,316	17,900	31	30
Surry County	279	6,046	6,900	22	25
Nonmetro	1,203	54,085	65,400	45	54
Peninsula	629	364,443	507,400	579	807
Gloucester County	225	20,101	35,700	89	159
Hampton	52	122,617	145,500	2,358	2,798
James City County	153	22,339	56,600	146	370
Newport News	68	144,903	182,200	2,131	2,679
Poquoson	16	8,726	11,900	545	744
Williamsburg	9	10,294	13,400	1,144	1,489
York County	106	35,463	62,100	335	586

*July 2005 Provisional

In comparison to our neighbors on the Middle Peninsula, however, Gloucester's population is much greater than the other localities (Table ___).

Table ____

Middle Peninsula County Population Comparisons
by Year: 1960 - 2010 (Including Town)

	1960	1970	1980	1990	2000	2010**
Essex	6,690	7,099	8,864	8,689	9,989	10,608
Gloucester	11,919	14,059	20,107	30,131	34,780	41,495
King and Queen	5,889	5,491	5,968	6,289	6,630	7,102
King William	7,563	7,497	9,334	10,913	13,146	16,003
Mathews	7,121	7,168	7,995	8,348	9,207	10,689
Middlesex	6,319	6,295	7,719	8,653	9,932	11,498
Middle Peninsula	45,477	47,633	59,987	73,023	83,684	97,395

Source: United States Census Data for 1960, 1970, 1980, and 1990;
**2010 projections from the Virginia Employment Commission State Data Center.

Age Distribution

As shown in Table ___, statistics from the U.S. Census revealed that the proportion of working-aged people has remained the same from 1990 to 2000, at 62%. The age cohort of 65 + years experienced a very slight increase during the same time period, from 11% to 12%, while the age cohort of 0-17 years showed a very slight decrease, from 27% to 26%. Figure 1 illustrates the County's age composition in 2000.

Table ___
Population by Age
Gloucester County

Age	1990	Percent	2000	Percent
0-17	8,224	27%	9,116	26%
18-64	18,552	62%	21,556	62%
65+	3,355	11%	4,108	12%
Total	30,131		34,780	

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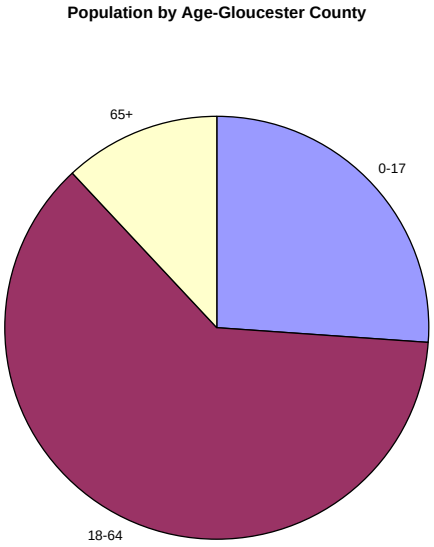
Figure
2000



Racial Composition

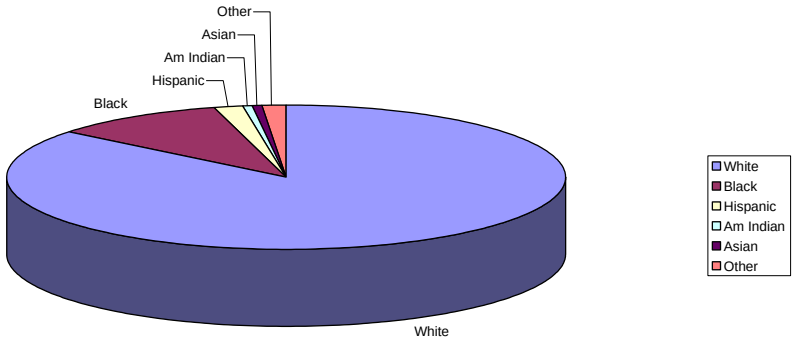
As shown in Table , the County's racial composition has been fairly stable from 1990 to 2000. It should be noted that in the 2000 Census, for the first time, people had the option of identifying themselves in multiple racial categories, so direct comparisons with racial data from the 1990 census are not exact. Figure 2 illustrates the County's racial composition in 2000.

Table
Population by Race
Gloucester County

Race	1990	Percent	2000	Percent
White	26,239	87%	29,805	86%
Black	3,343	11%	3,562	10%
Hispanic	287	1%	560	2%
Am. Indian	67	.2%	139	.4%
Asian	190	1%	232	1%
Other	5	.02%	482	1%
Total	30,131		34,780	

Figure 2
2000

Racial Composition-Gloucester County



Income

Median income is defined as the income value where 50% of a particular group has an income above a specific value, while 50% of the same group has an income below that value. As shown in Table ___, Gloucester County's median household income in 2000 was $45,421. This was slightly lower than that of Virginia. Per capita income is defined as the total income received by all persons divided by the total population. Gloucester's per capita income in 2000 was $23,975, which was also slightly lower than that of the State.

Table ____
Income Characteristics
Gloucester County

2000

	Gloucester	Virginia
Median Household Income	$45,421	$46,677
Per Capita Income	$19,990	$23,975

1990

	Gloucester	Virginia
Median Household Income	$31,591	$33,328
Per Capita Income	$13,122	$15,713

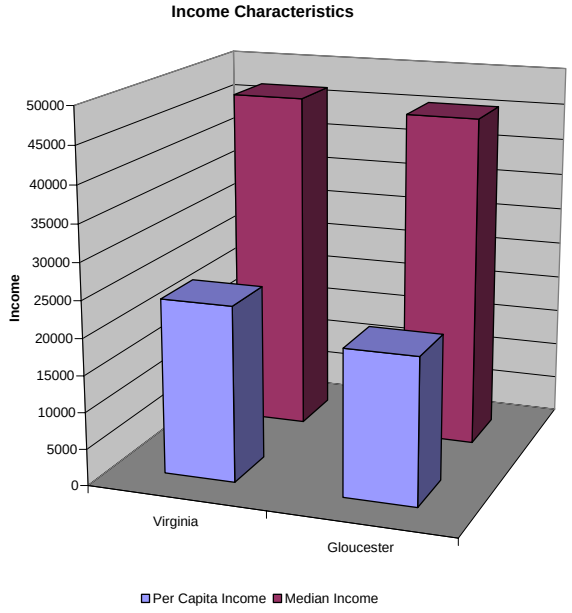


Table __ and Figure __ below illustrate the growth trend of housing units in the County, from 1940 through 2000. The U.S. Census indicates that approximately 64% of the County's housing units were built since 1970. The number of housing units accelerated substantially between 1970 and 2000, when approximately 9,200 units were added to the County.

Table 2
Housing Units
Gloucester County

Year	Housing Units	Increase	% Change
1940	2,993		
1950	3,524	531	18%
1960	4,338	814	23%
1970	5,294	956	22%
1980	8,312	3,018	57%
1990	12,451	4,139	50%
2000	14,494	2,043	16%

Source: U.S. Census

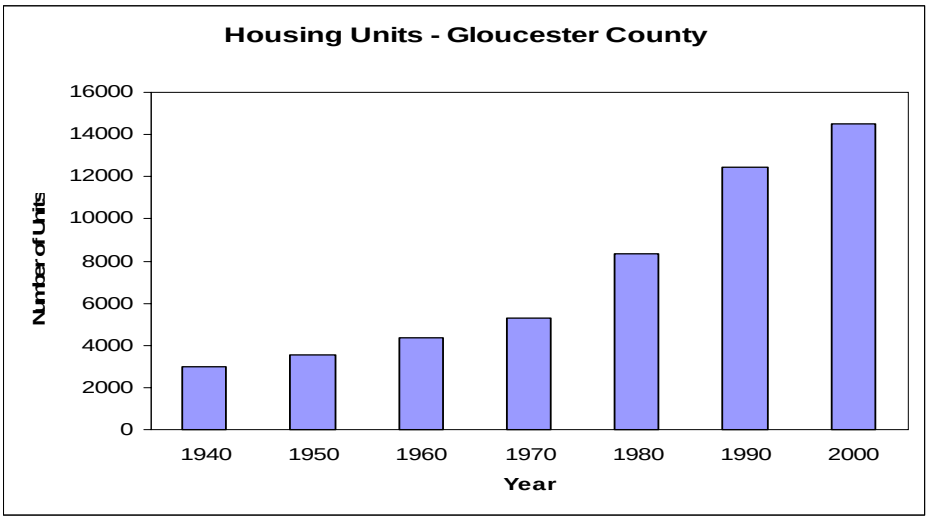


Figure __ below illustrates the number of building permits issued each year for new housing units. The highest growth years shown on the chart for building permits were from 1984-1988. Since that time, the numbers of units per year have become more level; however, the housing unit growth in recent years is still substantial.

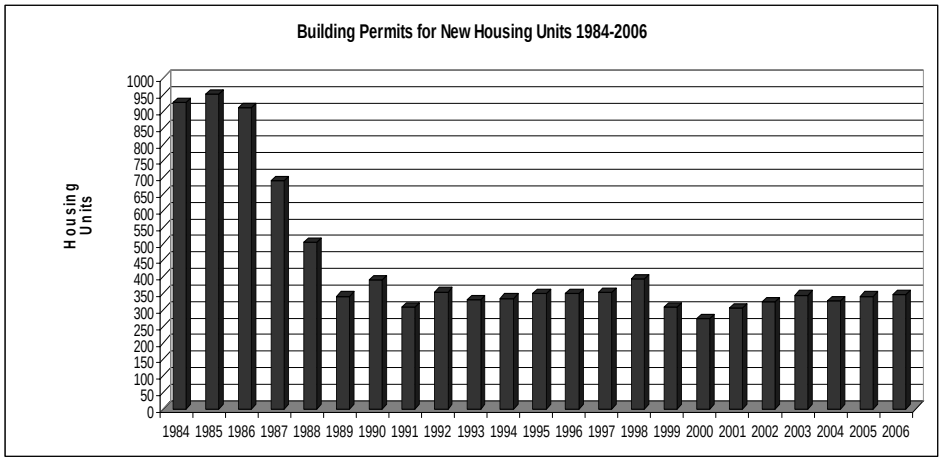


Table 3
Building Permits for New Housing Units
Gloucester County

Year	Units	Year	Units	Year	Units
1984	926	1992	353	2000	272
1985	951	1993	329	2001	304
1986	910	1994	335	2002	324
1987	690	1995	349	2003	344
1988	504	1996	349	2004	327
1989	340	1997	352	2005	341
1990	389	1998	393	2006	346
1991	307	1999	307		

Source: Department of Codes Compliance
Notes: Building Permits include single family, multifamily and mobile home units

Gloucester is increasingly becoming a bedroom community for other surrounding counties, which can have implications for public costs and revenues. As shown in Table __ below, the majority of the workers in Gloucester commute to jobs located outside the County. In 1960, 35% of County workers were commuters; by 2000, that percentage had increased to 59% of workers employed outside of

Gloucester. Approximately 80% of these commuters travel south to Hampton Roads, and about 10% travel to the Middle Peninsula and Northern Neck. Only about 4% travel to Richmond and the surrounding areas.

Table 4
Workers in Gloucester County

Year	Noncommuters	Commuters
1960	65%	35%
1970	53%	46%
1980	49%	51%
1990	40%	60%
2000	41%	59%

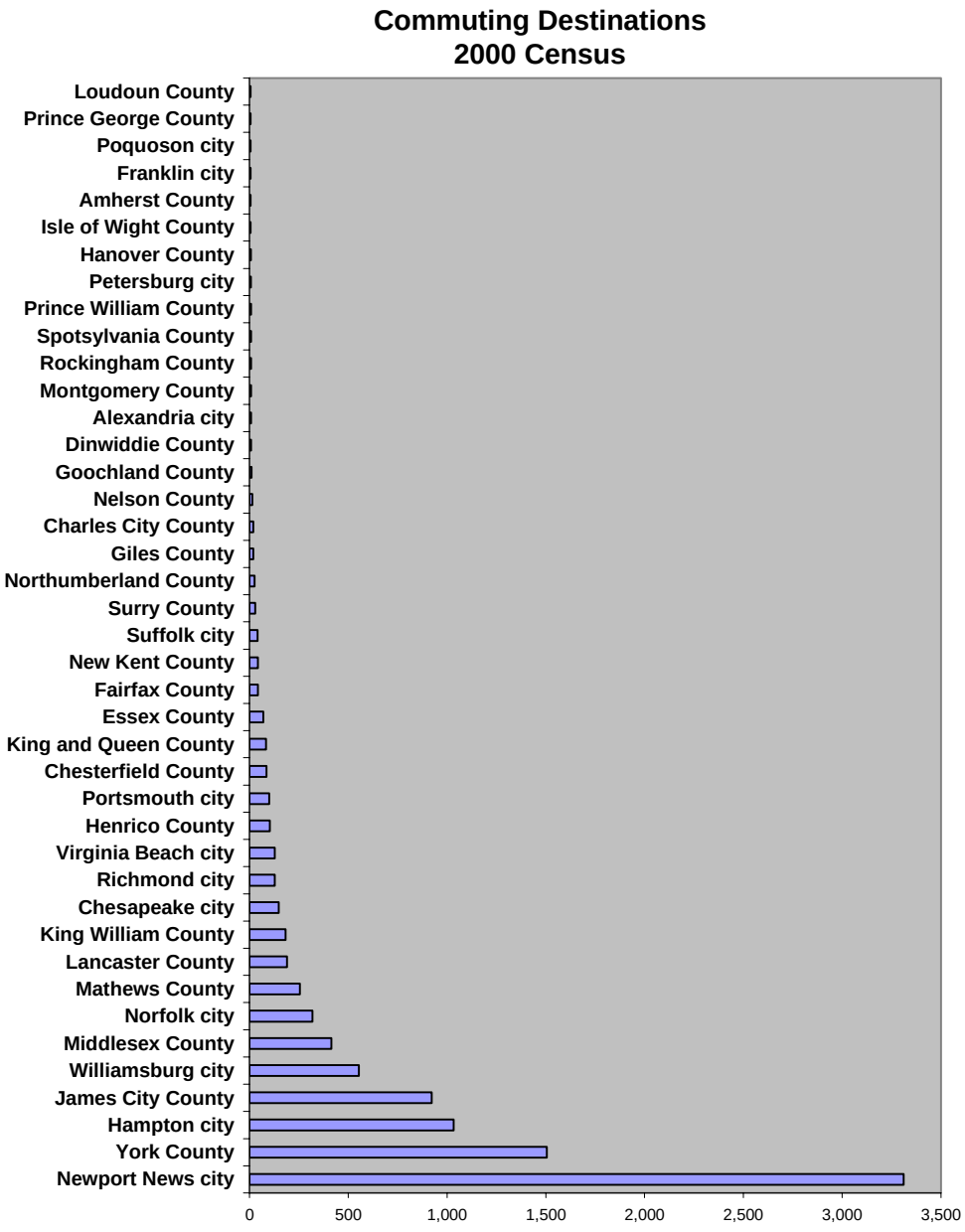
Sources: U.S. Census; Gloucester Co. Comp. Plan, 1980

Residents are lured to Gloucester by lower taxes, lower housing costs, better school systems, less crime, waterfront property, rural character and less congestion; however, their exodus into Gloucester has threatened the County's renowned quality of life assets that have attracted people—rural image, undisturbed pristine natural areas—and has increased traffic volumes on roadways not designed to serve the higher volumes.

Responses from citizen survey have indicated that there are a number of quality of life assets that are important to the citizens of Gloucester—including rural character and image, extensive shoreline and proximity to the water, natural beauty and wildlife, undisturbed natural areas, good schools, lower taxes and housing costs, and less traffic congestion than neighboring suburban localities. However, surveys also indicated a number of issues that citizens were concerned about, including too much residential development, increased traffic congestion, commercialization of Route 17, tax increases, and a need for improving schools.

As a result of the rapid growth and change, many of the County's quality of life assets have been threatened. Immense changes in land use have taken place, with much of the land along and adjacent to the County's primary transportation artery being lost to a pattern of sprawling development characterized by residential subdivisions, shopping centers and commercial strip development. Many of the rural areas of the County are also being subjected to this pattern of

Figure ___


Commuting Destinations
2000 Census
Loudoun County
Prince George County
Poquoson city
Franklin city
Amherst County
Isle of Wight County
Hanover County
Petersburg city
Prince William County
Spotsylvania County
Rockingham County
Montgomery County
Alexandria city
Dinwiddie County
Goochland County
Nelson County
Charles City County
Giles County
Northumberland County
Surry County
Suffolk city
New Kent County
Fairfax County
Essex County
King and Queen County
Chesterfield County
Portsmouth city
Henrico County
Virginia Beach city
Richmond city
Chesapeake city
King William County
Lancaster County
Mathews County
Norfolk city
Middlesex County
Williamsburg city
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sprawl, with existing and proposed subdivisions extending further out to the more sparsely developed portions of the County. As Gloucester continues to grow, so does public concern over this transformation of the traditional rural landscape. Threats to the quality of life have heightened the interest given to growth and development issues by the County's citizens and elected officials.

The 1991 Comprehensive Plan recommended a contained growth strategy for managing the rate, location, quality, and costs of future growth in the County. The Future Land Use Plan and the designation of a Development District were recommended to implement this strategy. The plan was further updated in 1995 for implementation strategies, in 2001 to address the Chesapeake Bay Act and in 2003 to address the Dragon Run Watershed.

In 1998 the County adopted a revised Zoning Ordinance to implement the recommendations in the Comprehensive Plan. In January 2000 the County adopted a revised Subdivision Ordinance which was another tool to implement the growth management strategy outlined in the Comprehensive Plan. There are several inconsistencies between the Comprehensive Plan and the implementation ordinances which will need to be evaluated as the County enters its next planning phase. Several of these ordinances have gone through subsequent revisions to further refine their abilities to meet the goals and objectives set forth in these previous planning efforts. The current growth management plan for the County will be evaluated in the context of existing trends, and implantation successes and failures to create a strategy to guide the community for the next 20 years and beyond.

EXISTING LAND USE

In order to create a vision for the future, it is important to analyze existing conditions of land use in the County. Map __ is the 2007 Existing Land Use Map, showing the distribution of current land uses in the County. The existing land uses in Gloucester County are discussed in this section, and classified into the general categories of residential, agricultural/forestal, commercial, industrial, and public/institutional.

RESIDENTIAL

Residential land use comprises the largest use of developed land within the County. The highest concentrations of residential uses are located in the Gloucester Courthouse and Gloucester Point areas, which are discussed in more detail later in this section. Public water and public sewer serve much of the Gloucester Point/Gloucester Courthouse corridor area along Route 17. The areas in and adjacent to the Route 17 corridor and the Courthouse Village area have been identified in the County's 1991 Comprehensive Plan as the areas most suitable for new population growth due to the proximity to, and availability to provide existing services, utilities and employment opportunities. This area has been designated as the Development District in the Comprehensive Plan.

Outside of these areas, concentrations of residential development have historically occurred in a linear pattern along major roadways. In addition to the concentrations of residential development, there are many scattered residential lots, as well as many residential subdivisions, dispersed throughout the rural areas of the County. These patterns of existing residential land use and subdivision activities are shown on the maps of Existing Land Use (Map ___) and Subdivisions (Map __).

Residential Development Trends

Land use trends are significant in that they provide insight into growth management planning factors, including what types of development should or should not be favored in future land use decisions. Recent development trends in Gloucester indicate an increase of residential uses, often associated with subdivision development, in the more rural areas of the County.

Although specific housing issues will be addressed in a housing study being conducted separately, the following discussion regarding housing types describes development trends in the County relative to residential development and density. The majority of housing in Gloucester County is single family

detached housing. According to the 2000 Census, 76% of all existing housing units are single family detached, and another 15% are mobile homes. The remaining 9% are multifamily units, most with fewer than 10 units per structure.

Single Family Development

The majority of recent major subdivisions (more than three lots) are located outside of the development district. Since 2000, 15 major subdivisions outside of the development district have received preliminary approval; these subdivisions contain 708 residential lots, and comprise 2,005 acres of land. During this same time period, inside of the development district, 650 lots from 14 major subdivisions have received preliminary approval; totaling 481 acres of land. The most recent trends show the market demand for major subdivisions outside of the development district growing. Since 2006, eight major subdivisions outside of the development district have been preliminarily approved, while two have been approved inside the development district. These subdivisions are listed in Appendix A.

Areas facing the greatest development pressure include the Suburban Countryside (SC-1) zoning district, a 2-acre lot size residential district comprising approximately 1/3 of the County's land area, and encompassing a substantial amount of rural lands. All of the recent major subdivisions (since 2000) outside of the development district are located in this zoning district. If current trends continue, the majority of the County's future residential growth will locate in areas of the County characterized by forests and agricultural fields, where no public sewer or water expansions are planned. This is inconsistent with the "contained growth" philosophy of the 1991 Comprehensive Plan which designated the development district to manage the location of the majority of future population growth, in order to prevent outward sprawl of residential development into rural areas.

The 1991 Plan stated that this "contained growth" philosophy would manage growth by providing specific areas in the southern and central portions of the County for containment of the majority of expected development. These areas were designated on the future land use map as Village Centers, located within a defined Development District designated to manage the location of the majority of projected future County growth. The Plan further states that containment of the majority of County growth in southern and central portions of the County requires less land to be consumed Countywide by future land uses and, therefore, permits retention or rural character and continued agricultural uses and activity in other currently rural areas of the County. In general, the plan was working fairly well, with most growth concentrating within the development district.

However, the 1991 future land use map also designates a significant portion of land outside of the "contained growth" areas as a residential district, identified on the future land use map as Suburban Countryside District. The majority of land

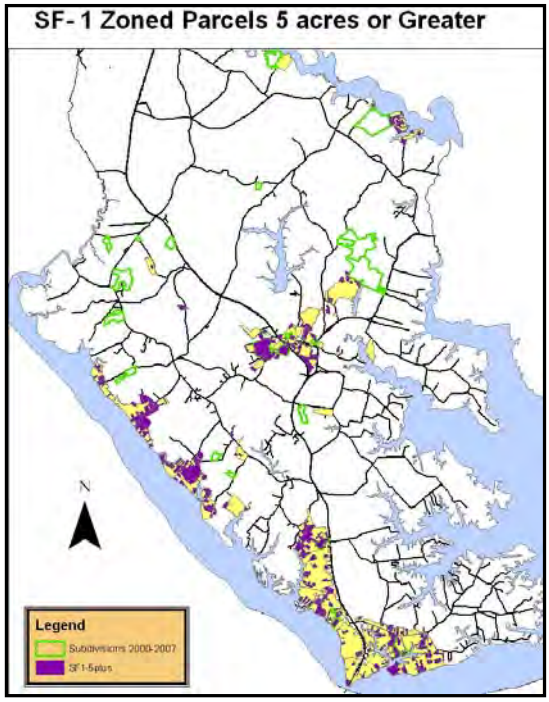
in the Suburban Countryside District is rural—characterized by open space in the form of forests and farms. The Comprehensive Plan calls for low density suburban development transitioning between farmlands and more urban areas. It is in these areas where a substantial amount of residential growth from major subdivisions is occurring as development pressure and cost of land increases.

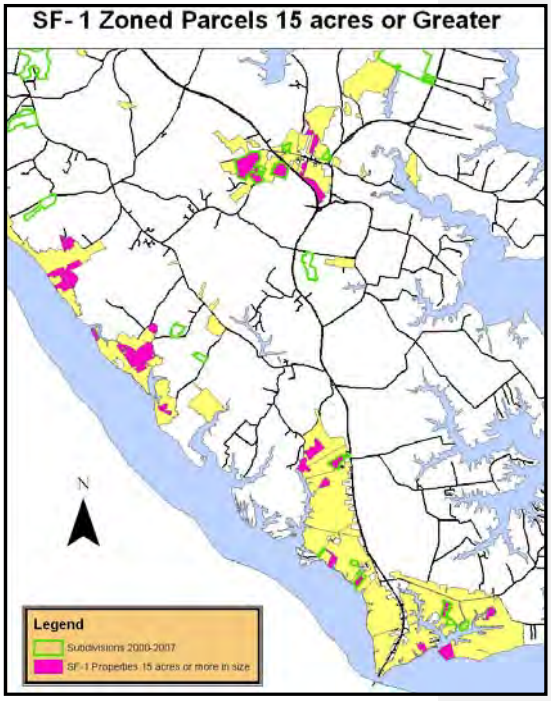
One contributing factor to this trend is that new technology has outpaced pre-2000 land use policies and regulations. Anticipated development densities shown on the Future Land Use Plan depended heavily on the environmental constraints of the land as a limiting factor in growth. The advanced technology of alternate septic systems, which only recently became a private sewage disposal option, has been a catalyst for development on land that was previously unbuildable due to poor soils unsuitable for conventional septic systems. The emergence of this new alternative technology has the potential to greatly impact the location and form of future County development by making vast tracts of previously unbuildable land open to development. A concern for the future is the potential impact on the capital and fiscal needs of the County if this new technology experiences failures mechanically.

Cost of development improvements is another factor fueling the residential growth trend in Gloucester. The improvements required by the developer in residential subdivisions outside of the development district are generally less costly. Typically the only improvements required are construction of state roads and drainage ditches; whereas inside the development district, much of the higher density residential zoning requires curb and gutter, sidewalks, street trees, stormwater management facilities, fire hydrants, streetlights and other amenities, as well as construction of public water and sewer facilities within the availability area, which is necessary for higher density. The higher cost of development inside the development district contributes to the trend of residential development in the rural areas.

In addition, much of the land within the Single Family (SF-1) zoning district with access to public water and sewer has been developed. Based on the data in the County's GIS, there area 296 parcels of five or more acres that are zoned SF-1 representing 3,126 acres (See Figure). There is potential that some of these parcels can be combined to create opportunities for new development or redevelopment. Only 32 parcels SF-1 parcels consisting of 15 acres or more are currently zoned SF-1 and several of them are currently in the process of being developed. In contrast there are over 632 parcels of 15 acres or more in the SC-1 zoning district.

Figure ___





Many of the large tracts of land remaining within this zoning district will require the developer to extend water and sewer in order to get the higher density allowed under the SF-1 zoning. Often the density of 2 units per net acre is insufficient to make the development costs feasible from the developer's point of view. As more development occurs and increases the availability of public sewer, these development options will increase.

The increased sophistication of the real estate market also contributes to development pressure. Advancements in information technology make it easier and faster for prospective developers to find vacant tracts of land within the County. The emergence of internet technology may also increase the demand for housing in the County; development is market responsive and internet marketing of real estate makes it easier, faster and more convenient for people who live out of town or out of state to find out about Gloucester.

The residential development trends that Gloucester is experiencing are not unique to the County, but are felt throughout the State. In fact, 25% of all development in Virginia's 400 year history has taken place within the last 15 years. The term "exurbs" has been coined to describe the growth of suburbs at the fringes of metropolitan areas. "Selective decentralization" is another term

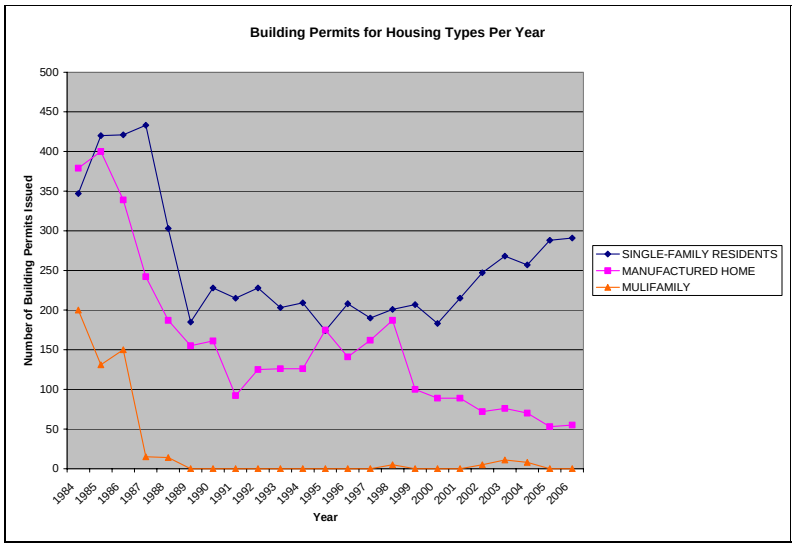
referring to people moving way from the cities, such as Newport News, Hampton, Williamsburg and Richmond, and relocating to the surrounding suburbs and exurbs. It is a trend throughout Virginia and has result in more places being defined as metropolitan.

The number of Virginia counties and cities that are considered metropolitan areas by the Census Bureau increased from 52 in 1980 to 80 in 2000.[3] In addition, this pattern has resulted in a scarcity of vacant land in the surrounding urban and suburban counties; as the supply of vacant land becomes limited, more rural lands on the fringes of suburbia are being developed. Ramifications associated with these residential growth trends are discussed below.

Multifamily

As indicated above, 9% of the County's residential housing is considered multifamily.[4] Much of the existing multifamily development in the County occurred prior to 1990. During the 1990s there was little development of multifamily housing (See Figure __). The County saw a slight increase in developers seeking to develop multifamily housing in the early 2000's; however, it was primarily limited to expansion of existing developments (such as the Points Condominiums and Village Woods Town homes) since there are no undeveloped parcels zoned for multifamily. Recently, there has been an increase in rezoning requests to allow for multifamily development either as stand-alone development projects or part of a mixed use development proposal.
Figure __

[3] "Demographic Profile of Virginia", presented to the Council on Virginia's Future, October 20, 2006, by the Demographics and Workforce Section of the Weldon Cooper Center for Public Service.
[4] 2000 Census



The 1991 Comprehensive Plan addresses multifamily development as part of what is described as mixed development in the two Village Areas—Gloucester Courthouse and Gloucester Point—and in Planned Unit Developments (PUD's). PUD's are floating zones and are not mapped on the 1991 Future Land Use Plan. The Gloucester Point Sub-Area plan specifically recommends multifamily development, but at a density of no greater than two units per acre.

The zoning ordinance adopted in 1998 describes the multifamily zoning (MF-1) district as "Medium density multifamily residential district" and indicates the intent of the district is "to provide for a variety of cluster and attached housing accommodations in suitable residential areas, at moderate and high densities allowing for efficient delivery of utility service. To this end, permitted uses are limited to two and multi-unit dwellings and public and semi-public facilities to serve the residents." The MF-1 district has a maximum density of eight (8) units per acre with public water and sewer, and the PUD district allows multifamily at a maximum density of 10 units per acre.

It is clear that from previous planning efforts, the County has not strongly encouraged multifamily housing, particularly at any great density. Only approximately 0.1% of the County is zoned for multifamily, and that consists of land that is already developed as multifamily. Attempts to allow for multifamily development through rezoning applications have often been opposed by existing residents. This opposition may be in part due to the type and quality of multifamily development that the County experienced during its rapid growth in the 1980s. Prior to 1984, the County did not have a zoning ordinance to regulate

the location or type of residential development. Site development standards for landscaping, storm water management setbacks and buffers were not in place.

Also, many residents have the perception that multifamily development generates a disproportionate number of school children as compared to single family development. While this is not necessarily true, any higher density development has the potential to provide more homes on fewer acres, and the impacts to all County services could potentially be greater. Finally, multifamily is typically considered an urban form of development and the citizens of Gloucester still consider this a rural county. Multifamily development is not typically compatible with the rural character that the community is striving to preserve.

This perception may also be shared by those looking to relocate to Gloucester County. A market analysis done in 2006 by a large scale developer considering a potential multifamily development near the Courthouse concluded that Gloucester is a rural market where people relocate to find a bigger house on a larger lot for less money than the area from which they moved.

With the approval of two Planned Unit Developments that include a multifamily component targeted at older adults, and the approval of several multifamily rezonings for age restricted housing, Gloucester's current housing make-up may be changing to some extent. Increasing land and development costs, particular for public water and sewer, will result in developers seeking higher densities in order to make their developments profitable. Also, lower maintenance developments are becoming increasingly popular to the County's aging population.

The housing study should shed additional light on the existing and future housing needs in the community. Multifamily development may provide an alternative to single family homes, particularly within the development district, not only for seniors and empty nesters, but also for recent graduates and young couples. Design and performance standards for higher density development should be developed to insure that if this type of residential development is needed in the County, it is adequately located to existing or developer-provided infrastructure and is compatible with the County's rural and suburban character.

Residential Growth and Development Issues

Public services and facilities costs

Rapid growth is followed by a rise in public costs associated with the increased population. These costs include schools, public safety, recreation, roads and other government services. However, the property tax resulting from residential development is typically insufficient to meet the costs of public services and facilities needed for the increased population. This results in a burden to the County as the growing population demands more services and facilities.

Studies comparing the fiscal impacts of development indicate that as a general rule, residential development costs more than the revenue it generates. Studies of 17 local governments in Georgia, North Carolina and Florida indicated that all 17 local governments lose money on their residential development. These studies concluded that when a rural community with a large base of farm and forestland begins to convert that land into residential development, either as a planned growth strategy or due to market forces and a lack of growth control measures, property tax rates within the local government increase and financial stability decreases.[5]

In Virginia, based on an average of Cost of Community Services Studies[6], residential development costs localities $1.18 in services for every $1.00 generated in revenues. Conversely, open space, including agricultural and forested lands, cost $0.35 for every $1.00 generated in revenues. The Cost of Community Services Studies are conducted through the comparison of a locality's annual revenues and to expenditures, calculating revenue-to-expenditure ratios for each land use category; and providing costs versus revenues for each land use type.

These studies negate a commonly held assumption in communities facing growth pressures that residential development will lower property taxes by increasing the tax base. Residential land is generally the most expensive for local government to support, costing the public more money than it pays in taxes and charges, while open space yields fiscal benefits to the local governments. The core reasoning behind this assessment is that agricultural or undeveloped land demands fewer services, and even with the customary low tax rates, generates more than enough to pay its way.[7]

Transportation cost

Another concern associated with residential growth is the demands upon the County's transportation system of roads. The transportation infrastructure may not be adequate to support the extent of land currently designated for residential development. Most secondary roads have limited capacity to support substantial increases in traffic volumes. Also, since over 59% the County's work force commutes to work outside of the County, the existing excess primary highway capacities will be rapidly depleted by future growth. This trend is expected to continue as with the continued decentralization of the Hampton Roads

[5] Dorfman, Jeffrey H. 2006. "The Fiscal Impacts of Land Uses on Local Government," The University of Georgia.
[6] Cost of Community Services Study, August 2006, The Farmland Information Center, a public/private partnership between USDA's Natural Resources Conservation Service and American Farmland Trust
[7] Government Finance Group, Inc. September 1993. "Economic Benefits of Open Space." Public Finance Digest.

metropolitan area into adjoining rural areas. The large commuter traffic also results in heavy peak hour traffic volumes on Route 17. Transportation issues are discussed in more detail in the Transportation element of the Comprehensive Plan.

Cost to the Natural Environment

Gloucester contains vast expanses of natural features which are considered assets to the County; most notably the extensive rivers, streams and shorelines; forested areas; and scenic vistas of natural beauty. Consumption of land by development can frequently diminish the environmental quality and aesthetic appeal of the natural environment, resulting in loss of forest cover, agricultural lands, loss of wetlands, erosion, stormwater runoff pollution from increased impervious surfaces, and loss of wildlife habitat. The breaking up of forests and stream corridors into progressively smaller, unconnected pieces leaves fewer areas that are large enough to support many species of wildlife and ecosystems. Conversion of forests into residential development has noticeably reduced the amount of woodlands in the County and current development trends are expected to reduce it even more so.

Groundwater pollution is another critical factor to be considered as residential development expands into rural areas. Most soils in the County are characterized as hydric and highly permeable; in fact, the majority of County soils (approximately 52%) are unsuitable for conventional septic systems, and an additional 26% of County soils are only marginally suitable[8]. Septic systems on poor soils increase the potential of groundwater pollution, and also surface water pollution as groundwater eventually makes it way into streams and rivers. Alternative sewage disposal systems, which have been in use in the County for less than five years, have enabled development on poor soils that cannot support traditional septic systems. The technology for the alternative systems is so new that there is not enough time-tested history to demonstrate how well they will work without causing major problems, and most homeowners are unaware of their need for frequent maintenance and inspection.

The County is considering regulating the maintenance of these systems; however, issues with the costs and environmental impact resulting from failure of these systems is difficult to determine. Many of these systems are not being installed by choice but because a conventional system will not work. If they fail, these systems involve costly repairs, and how these repairs will be mandated under limited financial resources is a concern for the community. Multiple system failures may impact neighboring residents and the environment. Potential risks to groundwater, drinking water, and shellfish waters are critical concerns, as these systems are allowed on soils with as little as 6" depth-to groundwater.

[8] Gloucester County Comprehensive Plan 1980 and 1991

Rural Character

Another consequence of residential development is the loss of the rural character that the County wants to retain. As development continues to spread into the rural areas, it consumes farms, forests, and wildlife habitat which are associated with the rural landscape. The 1991 Comprehensive Plan, and 2006 Citizen Survey for the Comprehensive Plan, indicate that maintaining the rural nature and quality of the County is important to its residents. In many areas, the rural character of the County has eroded and been supplanted by suburban features. However, there are still vast amounts of woodlands, fields and open space which are defining features of the County's character. There is a need for development standards on rural lands which effectively maintain rural character; this is especially critical in areas facing the greatest development pressures.

One example of protecting rural character through development standards is designating certain roads as "greenways" or green corridors. This concept is described in the 1991 Comprehensive Plan, but has not yet been implemented. Such a designation would provide for the preservation of the existing rural streetscapes through increased setbacks or buffers on existing rural roads. This concept would be similar to the Highway Corridor Overlay District in that the underlying zoning would apply, but additional standards for development would be required based on protecting rural character or scenic views. Different areas may have different requirements depending upon the features the community is striving to preserve or protect.

In addition to development standards for specific projects, the County should protect the areas it wants to preserve through the implementation of a green infrastructure plan. Green Infrastructure is a concept that includes open space, parks and natural areas as part of a community's other infrastructure components such as roads, utilities, schools. Green Infrastructure is defined as an interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations[9] . Green infrastructure provides a framework that promotes the conservation and future viability of those parts of the landscape and built environment that make our communities attractive and livable. These can include scenic, historic and cultural resources as well as agricultural lands and natural resources. Through a green infrastructure plan, the County can identify the rural features and important aspects of the landscape it wishes to preserve, while still allowing development to occur where appropriate.

The Comprehensive Plan's strategy for preserving rural character through residential cluster subdivisions—a design technique where houses are clustered together on smaller lot sizes in return for preserving open space—prompted the Creative Rural Development Program study, funded by a Virginia Coastal

[9] Benedict, Mark A. and Edward T. McMahon, Green Infrastructure: Smart Conservation for the 21st Century, Renewable Resources Journal, Autumn, 2002

Resources Grant, resulting in the establishment of a cluster ordinance in 1998. However, when put into practice it became apparent that the ordinance did not adequately preserve rural character and environmental resources. Concerns included density bonuses that were too liberal; the emergence of alternative sewage disposal systems and their potential to be problematic especially on smaller lot sizes; and no minimum requirement for preserved open space. These concerns resulted in a stop-gap ordinance amendment mandating a 2-acre minimum lot size for new lots not connected to public sewer, which prohibited the cluster subdivision in the majority of the Suburban Countryside zoning district. However, the County will be undertaking planning efforts to craft a more beneficial cluster ordinance incorporating more effective standards for preservation of rural character and environmental resources, as an alternative to conventional subdivision design. The cluster concept or conservation subdivisions can be an integral tool for implementing a green infrastructure plan. Those areas that have been identified in the plan as special resources for the community can be protected through the conservation subdivision design process.

In order to develop a plan that incorporates green infrastructure into the overall framework for the County, the community needs to inventory the existing resources that are protected (parkland, conservation easements, historic easements) as well as those areas that the community would like to see protected in the future (woodlands, productive farmland, significant wildlife habitat, scenic roads and bypasses). This will provide a working map that will be available to all parties to use when designing individual development projects. The idea is to preserve rural character by protecting open space across numerous tracts by creating an interconnected network of protected open space.

Conclusion

Development, especially outside of public water and sewer areas, should ideally be based upon the carrying capacity of the land; carrying capacity refers to the number of people who can be supported in a given area within natural resource limits, and without degrading the natural, social, cultural and economic environment for present and future generations.

Current residential zoning districts have a significant capacity for future development, and allow for a very large future increase in residential population. In the face of increasing development pressures, changing conditions, and emerging new technologies, land use policies and controls of the past may not have the capacity to deal effectively with managing future residential growth.

APPENDIX A

Major Subdivisions **Outside Development District** that have received Preliminary Approval since Jan. 1, 2000

	OUTSIDE DEV. DISTRICT Subdivision & Date of Preliminary Approval (year) (alphabetical order)	**Type of Approval**	**Zone**	**# Lots**	**Acreage of Lots & r/w**	**Acreage of Open Space**	**% of Open Space**	**Total Acreage**
1	Blakes Corner 2007	Preliminary	SC	4 lots	10 ac	n/a	n/a	10 ac
2	Canton Phase II 2000 All private roads Rear portion of 15 lots zoned C-1	Final	SC & C-1	21 lots	125 ac	3 ac (private park lot & Cemetery lot)	2%	128 ac
3	Christopher Crossing 2006	Preliminary	SC	12 lots	46 ac	n/a	n/a	46 ac
4	Churchill (Cluster Ordinance) 2005	Preliminary	SC	30 lots	30 ac	27 ac	48%	58 ac
5	Dove Field Farms 2006	Preliminary	SC	16 lots	37 ac	n/a	n/a	37 ac
6	The Meadows (Cluster Ordinance) 2006	Preliminary Dev Plan Phase 1	SC	170 lots	287 ac	86 ac	23%	372 ac
7	Pine Mill Sections 4-7 2002 (Sec. 1-3 done in 1987)	Final-Sec. 5 & 6 Dev Plan-Sec 4 Preliminary-Sec. 7	SC	62 lots	187 ac	n/a	n/a	187 ac
8	Patriots Walk 2006 (formerly The Villages at Cow Creek) (Cluster Ordinance)	Preliminary	SC	182 lots	186 ac	337 ac	65%	522 ac
9	The Ponds 2007	Preliminary	SC	21 lots	57 ac	n/a	n/a	57 ac
10	The Reserve (1st Cluster Ordinance) 2005	Dev Plan	SC	50 lots	48 ac	43 ac	47%	92 ac
11	Riverwatch, all sections (1-4) 2002 Conventional subdivision with open space proffered	Final	SC	94 lots	286 ac	91 ac	24%	378 ac
12	Robin's Woods 2005	Final	SC	10 lots	24 ac	n/a	n/a	24 ac
13	Yorkshire Woods 2006	Preliminary	SC	9 lots	24 ac	n/a	n/a	24 ac
14	Woodville Estates 2005	Dev Plan	SC	11 lots	27 ac	n/a	n/a	27 ac
15	Woods of Ark 2006	Preliminary	SC	16 lots	43 ac	n/a	n/a	43 ac
	Totals			708 lots	1,417 ac	493 (Cluster Ord) 94 (Riverwatch, Canton) 587 ac Total		2,005 ac

Major Subdivisions **Inside Development District** that have received Preliminary Approval since Jan. 1, 2000

	INSIDE DEV DISTRICT Subdivision & Date of Preliminary Approval	**Type of Approval**	**Zone**	**# Lots**	**Acreage of Lots & r/w**	**Acreage of Open Space**	**% of Open Space**	**Total Acreage**
1	Beckwith Farms 2003	Final	SF	76 lots	27 ac	4 ac	13%	31 ac
2	Bray Woods (formerly Twin Island) 2002	Final	SF	15 lots	9 ac	2 ac	18%	11 ac
3	Courthouse Spring 2005 conventional subdivision w/open space	Final	SF	32 lots	13 ac	20 ac	60%	33 ac
4	Courthouse Square 2005 Conventional subdivision w/open space	Final	SF	85 lots	39 ac	14 ac	26%	53 ac
5	Dunstan Hall/Airville Court Order 2006	Final-Phase I-30 lots Dev Plan.-Phase 2&3	SF	90 lots	53 ac	20 ac	36%	73 ac
6	Fiddler's Green 2007 Conventional subdivision w/open space	Preliminary	SF Conditional	88 lots	53 ac	80 ac	60%	133 ac
7	Gloucester Town Commons 2003 conventional subdivision w/open space	Final	SF	35 lots	13 ac	1 ac	7%	14 ac
8	Hawthorne Green 2005 conventional subdivision w/open space	Dev Plan	SF	17 lots	7 ac	4 ac	36%	11ac
9	Hutch Creek 2003	Final	SF	15 lots	15 ac	n/a	n/a	15 ac
10	River Club at Twin Islands 2005 PUD; Doesn't include the 54 condo units, they aren't considered major subdivision	Final for 62 lots	PUD	62 lots	16 ac includes all land except open space area	13 ac	45%	29 ac
11	Rivers Edge 2004	Final	SF	8 lots	9 ac	n/a	n/a	9 ac
12	Robinson's Pond 2003 conventional subdivision w/open space including two separate parcels (7 ac) to County	Final	SF	21 lots	7 ac	9 ac	56%	17 ac
13	Seawells Trace Sec. 3 2003 Conventional subdivision w/open space	Dev Plan	SF	95 lots	33 ac	8 ac	20%	41 ac
14	Yonder 2005 11 new lots; numbers don't include parent parcel w/existing house;	Preliminary	SF	11 lots	10 ac	1 ac	1%	11 ac
	Totals:			650 lots	304 ac	176 ac		481 ac

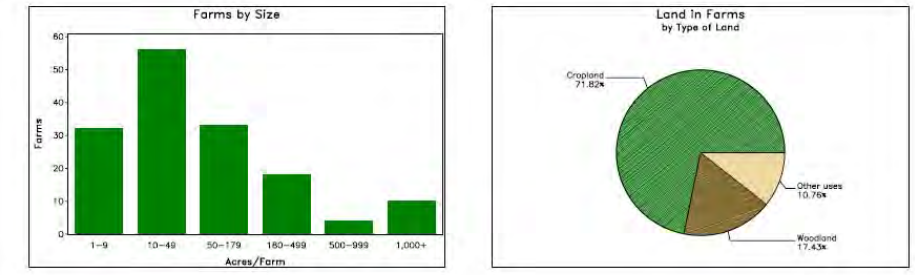
TOTAL from BOTH TABLES		1,358 lots	1,721ac	763 ac		2,486 ac

AGRICULTURAL/FORESTAL

A large percentage of land cover (approximately 88%) in the County can be classified as agricultural or forestal. This land use category also encompasses undeveloped shorelines, meadows, marshes, and similar lands associated with the natural environment. The vision for this rural landscape is important. As indicated in the previous section, while much of the land in the County is currently undeveloped, a substantial portion is either recommended or zoned for residential development. Results from the 2006 Citizen Survey for the Comprehensive indicate that preserving rural lands, including agriculture, forestry and wildlife habitat, is important to the citizens of Gloucester. As seen in the Land Cover/Existing Land Use Map, these rural areas are widespread and substantial throughout Gloucester.

Data from the U.S. Forest Service and Virginia Department of Forestry indicate that Gloucester contains 99,128 acres of forest land, which represents 70% of the County's land area. Approximately 61% of Gloucester forests are hardwoods, 21% are pine, and mixed pine and hardwood comprise 18%. This breakdown has remained relatively unchanged in the last 10 years.

Data from the 2002 Agricultural Census indicate that the County contains 25,699 acres of farmland, comprising 18% of the total land area in the County. The primary crops were corn, soybeans, wheat and barley.



Source: 2002 Census of Agriculture, County Profile, United States Department of Agriculture, Virginia Agricultural Statistical Service

As shown in the Table below, the general long term trend has been a decline in the amount of farmland in Gloucester County. Since 1940, the acreage of land in farms has decreased by 60%. From 1982 to 2002, the acreage of land in farms decreased from 32,895 acres to 25,699 acres—a 22% decrease. The number of farms and acreage of farmland increased slightly from 1997 to 2002, most likely due to an increase in hobby farmers. According to the Farm Service Agency,

there is an increase in people keeping horses in this region, and many timbered tracks of land have been converted into pastures. However, long term trends in the decline of farmland, coupled with more recent development trends of increased residential development in more rural areas of the County, indicate that the acreage of land in farms will continue to decline if current development trends continue.

Table ___
Farm Data & Land Use
Gloucester County of Gloucester

Year	Land in Farms[10] (Acres)	Cropland[11] (Acres)	Number of Farms
1940	64,175	30,494	1,253
1945	61,091	23,009	1,078
1950	57,468	21,333	842
1954	52,458	20,130	596
1959	49,355	21,668	455
1064	44,963	19,167	314
1969	35,206	18,249	201
1974	30,736	18,521	179
1978	30,459	19,003	157
1982	32,895	20,982	162
1987	25,831	18,315	130
1992	24,478	17,925	111
1997	24,697	17,451	136
2002	25,699	18,456	153

Source: U.S. Census of Agriculture, Virginia Agricultural Statistics Service

The average market value of production per farm in Gloucester County has decreased from $38,242 in 1997 to $30,056 in 2002, a 21 percent decrease. Most farmers say that the best way to protect farmland is to keep farming profitable. As land is converted from agricultural uses to non-farming impacts to the agricultural industry can be significant. An increase in the level of residential

[10] "Land in Farms" is defined by the U.S. Census of Agriculture as primarily agricultural land used for crops, pasture or grazing. It also includes small areas of woodland and wasteland, provided it was part of the farm's total operation. Large acreages of woodland or wasteland are not included in this category.
[11] "Cropland" is categorized by the U.S. Census of Agriculture as cropland harvested, cropland used for pasture or grazing, cropland idle or used for cover crops but not harvested, cropland where crops failed or were abandoned, and cropland in cultivated summer fallow.

and commercial development in a community nearly always means that the agricultural industry in is decline within that community.[12]

Increased residential development also represents a loss of timber lands which provide not only opportunities for economic benefits from forestry but also environmental benefits for the community. Large tracts of forest provide higher quality wildlife habitat, water quality benefits by filtering run-off and groundwater and scenic and recreational opportunities.

Economic Benefits

A significant presence of agricultural and other rural-based economic activities exist on these lands, including forestry, traditional and specialty crop cultivation, equestrian facilities, aquaculture, and other similar uses. Agriculture is a huge economic generator for the County, with an annual market value of **$4,599,000** for agricultural products according to the 2002 Agricultural Census. When considering indirect and induced economic impacts of agriculture, such as agricultural support businesses and spending, the total economic impact to the County is much higher. Unfortunately specific data on indirect and induced impacts of the agricultural industry in Gloucester is not currently available.

Virginia Department of Forestry prepared an Economic Study of the Forests in Virginia. As shown in Table ___ below, forestry is a significant economic generator in the County, with a total economic impact of almost $27 million[13]. Forestry is Virginia's number one manufacturing industry, and contributes $25.5 billion annually to the State's economy and accounts for 183,898 jobs[14].

[12] Dickinson, Keith, "Selling the Farm to Save the Business?", Farm Business Management Update, April/May 2006.
[13] Based on 1999 Implan data
[14] Becker, Charles III, 2006, Virginia Department of Forestry, "Virginia's Forests, Our Common Wealth, 2006: An Economic Study of the Forests in Virginia"

Table ___
Forest Economic Impact
Gloucester County

Direct Economic impact: Primary/secondary manufacturing & production	**$15,451,996**
Indirect economic impact: Services to Industry, i.e. trucking, supplies, maintenance, construction, etc.	**$4,530,643**
Induced economic impact: Employee spending	**$6,939,030**
Total Annual Economic Impact:	**$26,921,669**

Source: Virginia Department of Forestry

Tourism and outdoor recreation are other economic generators closely tied to rural land uses. Historic and natural resources are two leading factors for tourism, and rural lands in Gloucester encompass vast areas of exceptional environmental and historic resources. The varied topography and interesting patterns created by open farmland and rural landscapes creates a valuable aesthetic quality appealing to both tourists and residents alike. In respect to outdoor recreation, data from the U.S. Fish & Wildlife Service indicates that hunting, freshwater fishing and wildlife watching have an annual economic impact of almost $93 million in this 10-county region of the Middle Peninsula and Northern Neck.

~~Loss of farm and forest land to development decreases the economic vitality of the County.~~ Rural lands generate more in taxes than they require in services. As stated in an earlier section, based on an average of Cost of Community Services Studies done in Virginia[15], every dollar of tax revenue generated for forest, agricultural and open space lands requires only $.35 in services, while every dollar of tax revenue generated from residential development costs $1.18 in services. These studies are performed by the American Farmland Trust for individual counties to determine the fiscal contribution of existing local land for long term planning, land use and policy decisions.

[15] Cost of Community Services Study, August 2006, The Farmland Information Center, a public/private partnership between USDA's Natural Resources Conservation Service and American Farmland Trust

The economic benefits of agriculture and forestry are significant from a state perspective as well as locally. Agriculture and forestry combined make up the #1 industry in Virginia. However, the rate of loss for these working lands has accelerated rapidly, with an average rate of 70,000 acres of rural land converted to development annually; the impact is compounded by the trend throughout Virginia toward larger lot sizes for homes. This rapid loss is causing concern for the changing dynamics of land use in the State and the huge losses of Virginia's valuable economic and environmental resources. Economists at Virginia Tech expect that more than 70% of Virginia farmland, and a significant percentage of farm businesses, will be transitioned over the next 10 years. The State recognizes the significance of the loss of agricultural land and forests, and has established the Office of Farmland Preservation within the Department of Agriculture and Consumer Services, and recently set aside funding, for the goal of preserving rural lands. However, these funding resources are limited, so the importance of planning locally for the future of agricultural and forest resources is critical.

Fragmentation

In order to support rural lands as practical resource-based industries, it is important that the tracts of lands remain large enough so that they can function as working landscapes. Fragmentation and subdivision of the land into smaller pieces can result in parcels which are too small to manage agriculture and forestry as profitable industries, resulting in a loss of valuable rural economic resources.

Historically, a significant amount of the forested land in the region was owned by the Chesapeake Corporation for timbering; however, in the last five years, the majority of that land was sold to John Hancock Life Insurance for investment purposes, and some of that land is again being sold and fragmented. A recent example is The Meadows—a 372-acre land area which was sold by John Hancock Life Insurance to a developer for a proposed 180-lot subdivision. The Villages of Cow Creek is another recent example, where 522 acres of land previously owned by Ashley Logging Company was sold to a developer for a proposed 182-lot subdivision. Poor soils in the County and the emergence of alternative septic systems impact a high percentage of these mentioned timber tracts. Divestment of these large tracts of land by corporations provides opportunities for developers to develop in areas previously used by hunt clubs and managed for timber productions. Conversion of these properties to residential lands not only changes the landscape but also changes aspects of the rural lifestyle that many residents desire to protect.

Large areas of forested and agricultural land cover in Gloucester have been lost to development over the past several decades, and recent trends indicate development pressure will continue to increase. A substantial amount of these rural lands are located in zoning districts which allow major subdivisions as by-

right development. As discussed in the previous section, the areas facing the strongest market pressures for development are in the SC-1 zoning district—a by-right, 2-acre lot size residential district which encompasses approximately 1/3 of the County's land area. Because traditional farming and forestry activities are no longer as profitable as selling farms and woodlands to developers, the rural land cover is rapidly being converted into residential land uses, permanently taking substantial amounts of land out of forestry and agricultural uses. Since such vast amounts of agricultural and forestry resources exist in this residential district, a vision for the future of this area is important. Of particular importance is a future land use goal for preserving forestry and farming, and preserving rural character, coupled with the County's growth management strategy of a development district with public water and sewer.

Approximately 43% of the land in the County is zoned RC-1 and RC-2, both of which are 5-acre minimum lot size agricultural zones which do not allow major subdivisions (more than 3 lots). The majority of this agriculturally zoned land is located in the northern part of the County.

A portion of this undeveloped area north of Route 33 is part of in the Dragon Run Watershed. The Dragon Run is a stream that flows through the Middle Peninsula and empties into the Piankatank River. The Dragon Run has been identified as a unique and ecologically significant resource because of its pristine, largely undeveloped state and because it's tidal and non-tidal cypress swamps support numerous habitats for rare and endangered plant and animal species. The Smithsonian Institute ranked the Dragon Run the second (out of 232) most ecologically significant area in the Chesapeake Bay region. The Dragon Run Watershed was part of a regional planning process to address issues in the watershed. The Dragon Run Watershed Plan was adopted by three of the four counties as an addendum to the Comprehensive Plan. Many of the issues and opportunities facing the Dragon Run Watershed may also be applied to other rural areas of the County where the community desires to maintain the current rural land uses and characteristics.

The northern portion of the County may face increased development pressure in the future due to its close proximity to Interstate 64 and to Richmond—a one-hour commute. Upon completion of the new four-lane bridge in the town of West Point, which is replacing the existing two-lane bridge, the potential for a more convenient commute to Richmond may increase the demand for residential development in the northern reaches of the County.

Recent land use trends have shown that the greatest competitive threat to farming and forestry uses in rural areas is from residential development. Gloucester County permits limited residential development in its agricultural districts with a minimum lot size of five acres. However, major subdivisions, (3 acres or more) are prohibited in these agricultural districts; therefore the effective density in the agricultural districts is much lower than one unit per five acres.

This has been relatively effective in protecting farms and forest lands in areas where development pressures are low; however, it may not be sufficient in the future when market forces make rezoning to a higher density worth the additional costs.

The 5-acre minimum lot size requirement in the RC-1 and RC-2 agricultural zones may not be the optimal size for maintaining agriculture and forestry as viable industries. This size has generally not been effective historically for preserving forest and agricultural working lands, especially the type of agricultural commodities most prevalent in Gloucester where the majority of farm acreage produces soybeans and corn. The 5-acre minimum size tends to contribute to large house lots being created, consuming more land than is reasonably considered necessary for residential use. This results in large lawns that are no longer suitable for farming or forestry, thereby accelerating the amount of working lands being converted to residential use. It also creates a pattern of sprawl in which the remaining rural landholdings become carved up incrementally into minor subdivisions and residential lots.

The 5-acre minimum lot size is more a function of a low density residential district that has a more rural appearance than other suburban scale development. On land characterized by poor soils, it also spreads out residences on lands that cannot support higher densities. This 5-acre lot size may also serve as a transition area in rural areas with sub areas of existing suburban scale development zoned SC-1, and poor soils. Transition areas are areas located between viable farming/forestry and suburban/urban scale development, often characterized by larger lots of 5 to 10 acres or more, and private country lanes. These areas can still promote limited agricultural/forestry production and a rural farmland atmosphere and character.

It is important to point out that agricultural zoning districts tend to function as holding areas until a future time when the land may be rezoned for more intensive development, subject to politics. The agriculture zone designation is not absolute, but sometimes acts as “land in the bank” which can be chipped away and converted into other uses over time. Therefore, it is important to have land use preservation tools in addition to agricultural protection zoning to ensure the preservation of rural lands.

~~Explicit density policies or zoning standards should be adopted that are consistent with the intent of~~ Agricultural protection zoning (APZ) is a zoning technique intended to ~~preserving~~ preserve agricultural and forestal land uses~~.~~ By designating areas where farming and forestry are the primary land use, and other land uses are discouraged through maximum densities. APZ zoning may result in the reduction of permitted residential densities previously allowed, resulting in less land taken out of agricultural use and converted to residential use. Counties throughout Virginia have adopted a variety of density policies in their agricultural

districts in an attempt to preserve open space for farming, ranging from one unit per ten acres to up to one unit per 50 acres.

It is difficult to determine an absolute standard for densities that will protect sufficient open space to maintain a viable farming use. The average size of a farm in Gloucester is 168 acres[16] however most working farm operators lease or own a patchwork of land that adds up to a great deal more. Rules of thumb for grain farming suggest land assemblages of 750 to 3000 acres are needed to support a family by farming alone. However, specialty farms, such as fruit and vegetable farms, located close to appropriate markets, can support a family farming operation on 20-25 acres or less.

Generally, 20 acres is considered the minimum area necessary for agricultural protection zoning, according to the Farmland Information Center, a public/private partnership between American Farmland Trust and the USDA Natural Resources Conservation Service that provides technical information about farmland protection. This size is large enough to maintain a critical mass of agricultural land to be managed effectively, while limiting land speculation, keeping land affordable to farmers, and avoiding the trend of farms becoming isolated islands in residential areas. This will work toward ensuring that there will be enough farms to support local agricultural service businesses, which are needed for local farming to remain competitive.

Similarly, parcel sizes for forestry practices are also variable. In times of poor timber markets, larger tracts are more economically viable. However, in poor timber markets, tracts as small as five acres can provide good return if they have valuable timber and are next to larger tracts. In either case, contiguous tracts of forest land improves their ability to be managed for timber production.[17]

It is as important to plan for agricultural and forestry land uses as it is to plan for future development. Planning for these uses provides a framework for economically and environmentally sustainable industries. Productive agricultural and timber land are finite and irreplaceable natural resources. Agricultural land is desirable for building because it tends to be flat, well drained and generally more affordable to developers than land within the development district with County provided services. Once this land is converted to other uses, it is no longer available for farming. It is also important to identify and preserve the *productive* farmland since you cannot preserve everything and not all open space is good for agriculture or timber production.

Prepare soils map – identify production soils for farming and poor soils for septic.

[16] 2002 USDA Census of Agriculture
[17] Dragon Run Land Use Policy Audit, 2003, Paradigm Design,

An incentive that the County utilizes for preserving working farms and forests is the land use-value taxation program—a tax assessment program authorized by the State which enables the County to assess agricultural, forested and horticultural land at its current use value instead of its fair market value. This is an important tool for preserving rural lands because the current use value is generally lower than the fair market value, which lowers property taxes for rural property owners and shifts the tax burden to those who use more services. Land ownership becomes more affordable for future generations, and the economic pressure to sell off farms and forests for development is reduced. Also, the land use exemption encourages land to stay in agricultural, horticultural or forestry since roll back taxes apply when land changes from a qualifying use to a non-qualifying use.

Minimum land areas are a requirement of this program; 20 acres is the minimum requirement for forestry, and 5 acres is the minimum for agricultural and horticultural uses. These minimum areas are exclusive of other uses; if a house exists on a 5-acre tract of farmland, it wouldn't qualify because it would fall below the minimum 5-acre area requirement. Therefore, It is important to consider these minimum area requirements so that they work in concert with other land preservation policies and incentives, such as agricultural protection zoning, and the Purchase of Development Rights program discussed below.

The Purchase of Development Rights (PDR) program is an incentive program that the County may want to utilize for preserving working farms and forest lands. This program allows landowners to voluntarily sell the development rights of their property to the County. The landowner is paid the difference between the fair market value and the agricultural value while still owning the land, and a conservation easement is applied to the property. The State has recently funded, for the first time, $4.25 million to provide PDR matching funds to localities with certified local PDR programs. Factors that the State considers for certification include consistency with the comprehensive plan, as well as other locally implemented preservation techniques such as protective agricultural zoning and land use-value taxation.

Smaller tract sizes and subdivision of rural lands into smaller parcels can have a disabling effect on the rural economics of the County. Therefore, when devising long term planning policies it is important to realize the need for a minimum core size of land area in order to utilize incentive programs such as those described above, and to maintain forestry and agricultural as viable industries.

Rural lands provide many other benefits besides economic value; including wildlife habitat, scenic landscapes and aesthetic value, recreation, and environmental quality protection. It is difficult to put dollar amounts on these benefits; however, they have immeasurable intrinsic value as quality of life factors and the attraction of the County as a place to live, work and visit.

The ability of forests to remove carbon dioxide from the atmosphere is especially critical in relation to global climate change. Scientific consensus on global warming as a genuine threat heightens the importance of the critical role that forests perform in absorbing greenhouse gases. The conversion of rural lands into other uses also results in tremendous loss of prime wildlife habitat. A current example of this is the decline of prime bald eagle habitat in the Chesapeake Bay region. Biologists are concerned that the eagle population is threatened by rapid development. Approximately 80% of eagles nest on private property, consisting of rural areas near large creeks. Unprecedented increases in the real estate value of waterfront property are leading to dramatic losses in prime eagle habitat. Since less than 4% of eagles nest near developed areas, biologists predict that their numbers will plummet over the next several decades if development trends continue.

Conclusion

Given these factors, it is logical to conclude that preservation of agricultural and forestal lands is an important economic and land use issue. Rural planning principles and effective economic strategies are needed if forestal and agricultural uses are to continue. A vision for the rural lands in the County is important in order to protect and maintain valuable environmental, scenic and agricultural/forestal resources against inappropriate activities and intense growth pressures. Sound planning policy can ideally balance the need for reasonable rural growth against its impact on the surrounding natural environment, and maintain a reasonable overall level of rural development potential.

Tools for Protecting and Maintaining Forestal and Agricultural Lands

This section isn't intended to be included as text of the Comprehensive Plan, but is inserted at this point for discussion of alternative scenarios for preserving rural areas; as a step in determining goals, objectives and strategies

The **Comprehensive Plan** can influence forest and farmland preservation by:

- Designating land uses, densities, standards and characteristics—identify areas of the County to be protected for agricultural/forest use; areas where growth will be encouraged, and areas of transitions of land uses, between urban, suburban, and rural/agricultural, forestry.

- Defining the location of future water and sewer service (urban growth boundaries) i.e. Gloucester's Development District, which can lower or limit development pressure; adopt agricultural protection zoning outside of growth boundaries

- Defining rezoning standards and criteria for increased densities; it is important to balance land conservation with private market demand; regulatory powers can balance and limit the market

- Define changes to be made to development regulations

- Define where roads are built and improved

Subdivision Ordinance--a tool for implementing the Comprehensive Plan, but shouldn't be the main conservation tool because does not control land use or density; rather it is for managing orderly subdivision and insuring basic onsite infrastructure

Downzoning-to reduce the permitted residential densities

Agricultural Zone – The intent is to maintain open and rural character
Large lot zoning is good at preserving rural character but not always effective for preserving working farms and forests; frequently takes land out of agricultural use and converts to residential use; land is consumed by rural development at a faster rate—for example:
700 homes x 1 acre lots = 700 acres
700 homes x 5 acre lots = 3,500 acres

Agricultural zone frequently functions as a holding zone until later rezonings to increased density

Agricultural Protection Zoning (APZ)—designates areas where farming/forestry are primary land use and discourages other land uses in those areas through maximum densities ranging from 1 house per 20 acres in the east to 1 house per 640 acres in the western United States

APZ zoning usually results in the reduction of permitted residential densities previously allowed (downzoning);

Cluster zoning
Grouping houses close together on small lots to protect open land. The open space parcel may be restricted by a conservation easement. Generally not designed to support commercial agriculture, but owned by homeowners association. More successful at preserving open space/providing transition areas between residential and farm uses, than at protecting farmland.
Reasons why it doesn't support agriculture use:
- open space parcel may not be large enough to farm efficiently
- access to open space may be difficult
- homeowners object to noise, dust, odor from farming the open space

Randall Arendt's 6 step process for open space/conservation subdivision design—a zoning technique that can be implemented in subdivision process:

1. Identify primary conservation areas
2. Identify secondary conservation areas (steep slopes, etc.)
3. Identify potential development areas
4. Locate potential house sites
5. Design road alignments
6. Draw lot lines

Areas of Rural Character - Transition areas between viable farming/forestry and suburban/urban scale development, often characterized by larger lots and private country lanes. These areas can still promote limited agricultural/forestry production and a rural farmland atmosphere and character.

Zoning is in control of politics; it is important that conservation of rural lands is not in complete control of politics; so the following tools/strategies are important to have conservation tools other than zoning:

Land Use-Value tax assessment- In use by the County; local program doesn't include classification of "open space"; consider this category as an added incentive

[As an incentive to preserving agricultural and forested lands, the County utilizes land use-value taxation—a tax assessment program authorized by the State which enables the County to assess agricultural, forested and horticultural land at its current use value, instead of its fair market value. This program is beneficial for preserving rural lands because the current use value is generally lower than

the fair market value, which lowers property taxes for rural property owners and shifts the tax burden to those who use more services. Land ownership becomes more affordable for future generations, and the economic pressure to sell off farms and forests for development is reduced which helps to keep resource based industries viable. The minimum acreage required is 5 acres for agricultural and horticultural uses, and 20 acres for forestry. Excludes houses, so a 20-acre tract with a house on it wouldn't qualify.]

Conservation easements: permanent agreement between landowner and holder which is usually a land trust of government agency

PDR-Purchase of Development Rights
-development rights are purchased; conservation easements applied to land
-landowner is paid difference between fair market value and agricultural value
-the landowner still owns the land, but the easement stays with the property
-money may become available by the State for localities to use for PDR-localities can fund a PDR program in a variety of ways, including additional tax on real estate transfers, bonds, or other methods
-If locality has model PDR program approved, then it will be ready to implement when state money becomes available (the governor has goal of conserving 400,000 acres statewide; has 4.25 million for PDR matching funds program) -Fauquier County has 50-acre minimum;

TDR-Transfer of Development Rights
-enabled by Virginia in 2006
-no localities are using it
-transfers the development potential from one area to another
-sending areas and receiving areas; credits purchased from land owners in sending areas and developers apply credits for higher density in receiving areas
-it is hard to sell the concept of receiving areas-the residents of these areas may not want the higher density

Economic Viability - **measures to keep farming profitable**
-Agricultural Economic Development programs
-Build relationships with non-agricultural stakeholders
-Broker Farmlands for lease
-Agricultural Tourism
-Specialty, niche marketing
-Direct marketing to schools, hospitals, farmers markets
-Sustainable development is good for business, good for the environment and community

Sliding Scale Zoning
- As parcel size increases, the number of homes allowed decreases. The intent is to preserve larger parcels of land for farming and forestry and develop smaller parcels of land which can not be used for agriculture at a higher rate.

COMMERCIAL/INDUSTRIAL

The majority of the County's commercial and industrial land uses are located along the southern portion of Route 17 between Gloucester Point and Gloucester Courthouse, in and around the Gloucester Courthouse area, and in Glenns. Commercial land uses within Gloucester serve as a destination and trade center for surrounding counties; such uses include retail and service centers, medical care, and commercial recreation and entertainment.

Also scattered throughout the County are various small and medium-sized establishments located on secondary roads and crossroads. These commercial nodes include neighborhood-oriented businesses that serve the daily needs of nearby residents. Generally these commercial uses are considered convenience activities because they are more dependent on the convenience to the shopper rather than a comparative advantage over similar establishments. These activities are generally located in the rural areas and to a lesser extent in well-established residential areas. The 1991 Future Land Use Plan designated these areas as Rural Service Centers; however, many of the designated locations no longer contain viable businesses. This may be indicative of the shift in the community from Rural to Suburban. It is just as convenient to shop at the larger commercial centers since they are in relatively close proximity to the more rural areas of the county and many people frequent these larger shopping centers as part of their daily commute.

Business development in general has continued in a linear pattern along Route 17, the County's major roadway, within the Gloucester Point/Gloucester Courthouse Corridor. This corridor has experienced a shift in emphasis from residential to commercial uses since the 1950s, due to the construction of the Coleman Bridge and Route 17. Newer convenience-oriented shopping centers, retail, service, and fast food establishments were built along Route 17, resulting in a decrease of commercial activity in the Courthouse village. As indicated in a 2005 draft study for the EDA, "An onslaught of chain retailers in the Route 17 corridor provided overwhelming competition that gradually caused the downfall of Main Street as a regional shopping destination. Across the country, malls and chains have caused independent local retailers to become an endangered species."[18]

The commercial zoning pattern reflects the existing development pattern, but also reveals some threats to orderly growth, including the substantial amounts of strip commercial zoning that exist along the southern portion of Route 17. Large amounts of vacant land and residentially developed parcels along Route 17, between Gloucester Point and Gloucester Courthouse, are zoned commercial.

[18] H. Blout Hunter Retail & Real Estate Research, October 2005, "Market Analysis and Retail Strategy for Main Street, Gloucester, Virginia, prepared for the Gloucester County Economic Development Authority.

This is inconsistent with the County's future land use plan, which designates commercial land uses to the Gloucester Point and Gloucester Courthouse village areas, in order to discourage commercial strip development along the Route 17 corridor.

Strip development is a common suburban land use pattern along highways. Highway oriented, auto-dependent commercial development use large amounts of land spread out in a linear form over long distances with high volume traffic generating uses, separate vehicular entrances and exits for each use on the street, insufficient space onsite for parking and loading activities; and, visually, a cluttered appearance from an abundance of signs. No defined pedestrian path system adds to, or creates, potential conflicts between pedestrian and vehicular movements. The spread-out linear land use pattern makes it inconvenient to move among businesses without driving from one establishment, or a small group of establishments, to another. This generates significant traffic and traffic congestion, creating the need for new and wider roads, such as bypasses.

Although this pattern of development provides public exposure along the County's major roadway, commercial stripping of Route 17 results in an image of the community that is unbalanced, eroding its rural character and aesthetics. Even if the developments are attractively designed, the rural qualities and natural features of the landscape are hidden by a continuous narrow strip of businesses.

Over time, this type of development pattern negatively impacts the aesthetics of the community and quality of life through traffic congestion, visual chaos, and generally unattractive and inconvenient character. Strip development reduces the traffic-carrying capacity of the roadway. Also, strip development does not allow the public to take advantage of the convenience of centralized commercial activity and may deter shoppers from businesses in the smaller strip developments and stand-alone establishments. Opportunities for alternative transportation modes that promote connectivity for community/village scale development are more difficult to achieve.

Concentrating commercial development in designated areas as recommended in the 1991 Future Land Use Plan would prevent the extension of businesses along the full length of the County's major roadways. This will reduce traffic impacts, preserve rural character of undeveloped areas, and provide opportunities for well-defined groupings of commercial activities with consistent design standards. Recent concentrations of commercial land uses, including Gloucester Business Park, and the Foxmill Centre retail area, have developed as more designated centralized areas. Gloucester Business Park was opened in 1996, expanding the land use base for commercial and limited industrial uses in the County.

Industrial Land Use

Industrial land uses are much less prevalent in Gloucester than commercial uses, and are scattered throughout the County at various sites. Some of the heavier

industrial uses include a landfill, several sand and gravel operations, wood product processing, three concrete manufacturing plants, and an asphalt plant. Light industrial uses, which are defined as those that generate no nuisances, are located throughout the County, and in many cases are located in commercially oriented areas (see examples below).

Survey of Industrial Uses

These existing industrial uses have been grouped these into categories based on nuisances generated (noise, odor, dust, traffic generation, cleanliness, appearance, etc.)

Light Industrial Uses

- Industrial Resource Technologies (IRT/Canon) in Business Park
- Coastal Bioanalysts, Inc. (lab testing) in Business Park
- Marine Sonic Technology (manufacturer of underwater sonar equipment)
- Sea Technology Ltd. (manufacturer of marine power hookups)
- Mini-warehouse storage facilities-at least 10

Medium Industrial uses

- Mid-County center—warehousing, trucking
- Several building contractor storage areas
- Hunt Brothers-equipment/tools/trailers/recycling?/warehousing?
- Philips LP gas and oil

Heavy Industrial Uses

- 2 sand and gravel operations
- 3 concrete manufacturing operations (Rappahannock has two; Branscomb has one on shared property with CW Davis near Glenns, across from RCC college)
- Asphalt manufacturing (CW Davis' in Glenns on same property as Branscomb); granted Special Exception by BZA years ago, use limited to just concrete and asphalt)
  - Wood Products has VPDES permit on Piankatank for pressure treated lumber
  - Middle Peninsula Landfill and Recycling Facility

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Industrial zoning in Gloucester (I-1 Limited Industrial) is generally located on existing industrial land uses; and not on vacant land where industrial operations may be planned or encouraged. In addition, several uses are permitted only in the I-1 district and therefore would require a rezoning to establish such a use in the County. While the zoning ordinance defines light and extractive manufacturing, there is no definition for medium or heavy manufacturing. Extractive manufacturing (excavating, processing, etc of natural resources i.e.

wood, stone, etc.) can only be done by special exception in industrial zone. Heavy or medium intensity Industrial uses typically need access to major roadways while being located away from other uses and environmentally sensitive areas. The 1991 Comprehensive Plan contemplates industrial uses to be more of an industrial park complex and does not give much direction as to where to locate more intensive industrial uses. The combination of these factors makes it difficult to establish new industrial facilities within the County.

Since Gloucester County is a bedroom community with more of a service based economy, it needs to provide areas for service industries to be established. Contractor storage yards, lumber yards, wood recycling facilities and other industries associated with the construction and building industries as well as landscaping and nursery operations for residential and commercial development are land uses that will increase in demand as the County continues to grow. These industries are typically smaller operations that cannot afford to locate in more costly real estate areas nor do they necessarily need to be in more highly visible areas. Currently, these types of businesses are having difficulty finding viable locations within the County due to the lack of affordable and appropriately zoned land.

In order to provide for industrial development in the County, areas which meet minimum performance standards for these more intensive uses should be established. These areas could be designated on the future land use map, or performance criteria established to determine appropriate locations as market conditions allow. Designation of future locations for industrial uses should consider the potential impacts of the uses and possibly provide for additional categories of light, medium and heavy industrial uses based on these impacts. More intense industrial uses should be located where potential impacts on adjoining properties are minimized; heavy uses that will likely have an adverse impact should not be located near residential areas, and areas of public activity such as schools, parks, etc. In addition to location of uses, various design criteria, screening of structures and outside storage, setbacks, and other criteria may be used to allow more intensive uses to be located in higher visibility areas (such as the Route 17 corridor) without adversely impacting the County's limited available highway frontage.

An example of a land use that was formerly only permitted in the I-1 zoning district is mini-warehouse storage. Due to the many rezoning requests and approvals to rezone from Business District to Industrial to allow for mini-storage, the County revised is zoning ordinance to allow mini-storage as a special exception in the B-1 Business district. This use requires specific performance criteria including a 250' front yard setback. There is a substantial amount of mini-warehouse storage in the County, likely because of the military population. This use does not typically generate noise, traffic or other nuisances; however, ~~they~~ mini-warehouses are not generally attractive, consume a lot of land, and do not generate much tax revenue. Based on their popularity, there is an apparent

market for them in the community. The County's ordinance allows this use but discourages mini-warehouses from fronting directly on major roads in the B-1 district which are ~~be~~ better suited for more high profile commercial businesses. Consequently, industrial and other business uses should be discouraged as strip development along existing roads and should be permitted in planned industrial and commercial park districts.

Working Waterfront and Water-oriented Commercial Land Use

This category includes various water-related activities that have historically held a very important position in the County's commercial base. Included under this category are marinas, boatyards, seafood businesses and several small boat building and repair operations. Because of the waterfront locations of such uses, in many cases they are located within or near residential land uses or areas with limited vehicular access. Six marinas are located within the County, with the majority (five of the six) located in the southeastern part of the County. Two marinas have closed in Gloucester since 2003, with one of these marinas being converted into residential land use. Numerous seafood businesses are disbursed throughout the County, including wholesale, retail, processing plants and landing facilities. These facilities are mostly concentrated in Guinea, and also scattered throughout the County.

Conversion of these working waterfront lands into other uses, such as residential development, is a noticeable trend in coastal communities across the East Coast, due to growth and development pressure. In many cases, the conversion is so slow and gradual that it is not noticeable; however, the cumulative impact of converting working waterfronts into other uses is detrimental to the local seafood economy and culture. The table below illustrates the dockside value of seafood landed in Gloucester. As shown in the table, the local seafood industry has been a significant economic generator in the County. Between 1994 and 2004, the dockside value has declined significantly, by 444%. While the causes of this decline are beyond the scope of this land use analysis, it is important to note that the trend of working waterfront lands being converted into non-waterfront – dependent development is unfavorable for Gloucester's local seafood economy.

Table ___
Dockside Value of Commercial Fish
Landed in Gloucester County

Year	Value
1974	$1,409,121
1980	$3,006,614
1985	$2,191,581
1994	$4,853,196
2004	$ 893,000

Source: Virginia Marine Resources Commission

This trend of land conversion poses a threat to the continuance of working waterfront lands in Gloucester, as to commercial fishermen due to lack of access. As more working waterfront land is being converted to residential development, there are fewer and fewer places for local watermen to land or dock their boats. Many recreational marinas and yacht clubs do not allow working watermen access to their facilities; for those that do allow workboats, the slip fee for dock space is not affordable for most working watermen. In Gloucester, only eight workboats are docked at private marinas; and the monthly slip rate for 30' boats ranges from $85 to $210 at the three marinas where these workboats are docked. The Commissioner of Revenue Department indicates that 94 commercial boats were registered in the County in 2007.

Also, State regulations no longer allow overnight docking at State docks; just loading and unloading. The exception to this is State commercial docks, which require certain provisions such as restroom facilities; however, none of the State docks in Gloucester fall into the category of commercial piers.

In Gloucester, the majority of these working waterfront lands are located in residential zoning districts, where they are either legally nonconforming uses, or allowed by special exception. Seafood Processing plants are allowed by special exception in all agricultural zones, and in all residential zones except for SC-1. Marinas and boat yards are allowed by special exception in the RC-2 agricultural zone, and in the C-2 and SC-1 residential zones. As waterfront real estate values increase, the commercial fishing industry diminishes since these uses are typically not compatible and the residential real estate market has the competitive advantage. If the County wants to retain its working waterfront and fishing industry, strategies need to be in place to protect both the seafood industry and residential waterfront properties.

Another land use scenario taking place on the waterfront is the modernization of older marinas. Today, the expansion of marinas adjusting to a more urban/suburban client base is creating a change on the commercial waterfront. In the more urban waterfront, the C-2, Bayside Conservation designation which permits commercial marinas by special exception, is not synonymous with a low density conservation zone. The change taking place on the more urban waterfront areas is one of restaurants, shops and ship stores, boat slips and public places and possibly mixed use residential. The new era of the working waterfront is changing as Gloucester grows. It is possible that a new commercial waterfront district could have a new zoning classification that better reflects to the more modern waterfront uses in urban areas with public water and sewer.

Due to increasing conflicts between water dependent activities in Gloucester, the Middle Peninsula Planning District, through funding from the Virginia Coastal Resources Management Program Grant, has established a York River Land Use Conflict Committee to study these conflicts and the regulations that pertain to the waterside and waterfront. This committee may provide strategies to help the

County better understand these conflicts and trends associated with the change in waterfront uses and make recommendations for strategies to deal with them.

CHARACTER AND APPEARANCE OF THE BUILT ENVIRONMENT

In addition to retaining the character-defining features of the rural areas of the County, it is equally important to preserve the character and appearance of the non-rural areas to ensure the viability of Gloucester as a pleasant and attractive community in which to live, work and play. Development has altered much of the County's natural landscape, especially in the Gloucester Point and Gloucester Courthouse areas, and the highway corridor connecting these two areas. The character and appearance of the County in the future will depend largely on the design of new development, including infill, redevelopment, new neighborhoods, and new commercial centers.

Transportation Corridors

Streets and corridors are an important element of the community's character and appearance, as they are major public spaces and the conduits through which most residents experience the County. Their visual character and relationship to adjoining uses has a big impact on the County's image. Corridor design standards along streets can help to ensure that new or redevelopment projects are compatible with their surroundings and enhance the character and appearance of the community. Landscaping standards provide aesthetic counterpoints to the man-made built environment, and provide buffers, screens against noise and softens the visual clutter.

Although the County adopted a subdivision ordinance in 1965, land use policies and regulations were practically nonexistent prior to 1984, when the County adopted its first zoning ordinance. Policies and regulations put in place since then have contributed to what the built environment looks like today. More recent regulations impacting character-defining features include the adoption of the Highway Corridor Overlay District (HCOD) as part of the Zoning Ordinance. The provisions in this district address appearance issues with the objective of enhancing the visual quality of development along the County's primary corridors (US Route 17 and US Route 3/14), without altering the uses allowed by the underlying zoning classification.

While the HCOD has helped minimize certain character-altering impacts of development, there is room for improvement in land use controls along the County's major corridors. HCOD setbacks are one feature that should be re-examined in regards to their effectiveness in preserving character and enhancing appearance. The minimum setback in the HCOD along road frontages is 50' to 70', based on the landscaping option selected. The setback may be reduced even further if certain architectural features are used and the parking is behind

the building. This is the area that is intended to protect and preserve existing trees, or require supplemental landscape plantings if no vegetation exists. For the side and rear perimeter of a site, this setback is reduced to a minimum of 10' to 20', respectively. These setbacks have proved not large enough to effectively preserve the natural landscape along primary road corridors and create a pleasant vista.

In practice, it has been recognized that commercial site design and development usually results in considerable disturbance within the front 10 to 20' of the setback, causing existing mature trees or signature trees to be damaged or destroyed and thus altering significantly the views and vistas along the corridor. In the case of the side and rear setbacks, this sometimes results in the destruction of all existing trees within these setbacks. Also, in many instances, utilities such as water, sewer, and electric lines need to be located within the setback, which leads to further encroachment in the landscape preservation area. This undermines the effectiveness of the HCOD setback as a tool for preserving existing trees and vegetation.

Location of storm water management facilities also impact the design of commercial sites. During the early implementation of the HCOD regulations, many developers attempted to use the buffers to locate storm water management facilities such as bio-retention ponds and other structural best management practices (BMP's) for reducing storm water impacts. However, these structural BMP's, like other structures are not permitted in the setbacks because they do not meet the intent of these setbacks for preserving existing landscaping, buffers and supplemental landscaping.

Some have argued that tall, spindly trees should be removed and replaced with new landscaping, but it is those same tall trees that create the pleasant vistas along the primary road corridors and that can be supplemented (rather than replaced) with new landscaping to create an even more attractive highway corridor.

Other than residential subdivisions, there has not been much development pressure on other County collectors and secondary roads. However, there are currently no requirements for buffering or tree preservation on roads other than those within the HCOD. The Comprehensive Plan recommends identifying certain roads in the County as greenways with increased setbacks to protect the scenic quality with increased setbacks and buffers. This recommendation has yet to be implemented, but has been discussed for use particularly on roads that serve historic landmarks or represent the rural character that the County is striving to preserve.

Based on past experience, it has been determined that there is a need to increase the landscape areas along the primary corridors, and to expand the

landscape buffer provisions to certain additional residential and commercial corridors. To minimize character-altering impacts of development, and effectively preserve the natural landscape along roadways, 100' to 150' landscape buffer areas are the accepted standard in many communities. This is the minimum buffer width needed to effectively protect the natural views along the corridor and enhance the visual view shed. This can be done through a variety of techniques, including an increase in the minimum setback distances in the HCOD; designating greenbelts along certain transportation corridors, or creating a separate stand-alone corridor management overlay district.

Additionally, it has been recognized that existing trees that were protected within the HCOD setbacks have been subsequently cut down at the direction of the property owner. In some cases these trees were significant in size and species, and resulted in an irreplaceable loss to the County. When such a tree is cut down, the only recourse the County has is tree replacement with new trees of 2 ½" trunk diameter; this is insufficient as a deterrent and does not mitigate the loss of a 50- to 100-year old tree. There is a need for strict penalties and fines to prevent the loss of mature trees within these protected setbacks. In some cases, the property owner and tree removal companies are unaware that the trees are protected; so it is important to educate all parties that could potentially remove trees. It also may be appropriate to consider levying civil penalties directly against the parties which cut down the trees.

Specimen trees

Another landscape preservation issue that needs to be examined is the preservation of specimen trees. A specimen tree is any tree which qualifies for special consideration for preservation due to its size, species or historic relevance. Specimen trees are a resource worth protecting and maintaining in the County, and serve as character defining features as well as providing visual buffering and beautification. Currently there are no land use controls in the HCOD to protect such trees unless they are located within the setback area, and there is a need for standards to preserve specimen trees as part of the land development process.

Development Appearance Standards for Buildings

The appearance of the built environment can also be influenced by standards of development which promote development that is complementary to community character and results in enhancing the visual appearance of the built environment. In regards to the appearance of buildings, these standards can include criteria for such factors as architectural design, relationship of building to the site and adjoining areas, and maintenance. Development along the County's primary corridors is subject to standards for architectural treatment through the provisions of the HCOD. However, these standards are minimal, and have a negligible impact on such factors as architectural styles, color, scale, and compatibility with adjacent buildings.

Essentially, the HCOD standards adopted in 1998 prohibit the placement of unadorned concrete block buildings and metal buildings which are visible from the right of way. The HCOD standards encourage higher architectural design standards by allowing buildings with certain architectural features to have reduced setbacks (up to a minimum of 40 feet) however if these incentives are used, the parking must be to the rear of the building. Most commercial establishments, particularly along major highways, prefer parking in the front of the building to attract customers. As a result, this architectural incentive has only been used on one commercial development since the ordinance was adopted.

The County may want to reexamine these standards, and consider implementing additional development appearance standards; these standards can also be considered for certain types of development outside of the HCOD. Typically, such standards are applied to multi-family, commercial, and industrial development, but not to single-family residential development. The intent of these standards is to ensure that new or redevelopment projects are compatible with their surroundings and influence development aesthetics in a positive manner. The design speed of the road may also be a factor in the type of incentives used. For example, in a village setting, reduced setbacks and parking in the rear of the building may be more acceptable than on a major thoroughfare.

Use of the Natural Environment to Shape the County's Form

Another important consideration in relation to character and appearance of a locality is the use of the natural environment to shape the form of the community. This includes the use of natural features, greenways, blueways and other aspects of an open space network to shape the form of the built environment and maintain a desirable character and sense of place. Natural features are important in spatially defining and separating developed areas, and connecting them with open space corridors. They also provide access between built areas and the natural environment.

There are still significant amounts of woodlands, fields and open space in the developed and developing areas of the County which are defining features of the County's character. The County also includes numerous historic and cultural resources and landmarks which add to the uniqueness and sense of place. By defining and protecting these features, the unique character of the community is maintained. This can be accomplished through a master plan of greenways and open space, known as a green infrastructure plan. Such a plan would identify open space and features to preserve, while allowing development to occur.

As discussed earlier, cluster development is a residential development practice that preserves more character-enhancing open space and woodland than a typical conventional subdivision development. Cluster subdivisions can be used in integration with a green infrastructure plan and as an implementation technique for the plan. The County currently has a cluster ordinance and will be

undertaking efforts to craft a more beneficial cluster ordinance with more effective standards for protecting character-enhancing features to achieve the objectives outlined in the Comprehensive Plan. Cluster subdivisions are discussed in more detail in the Residential Land Use section.

Conclusion
The County's character and appearance in the future will be influenced by the design of new development and redevelopment, including new commercial centers, infill development, new subdivisions, and mixed used development. Responses from citizen surveys showed that Gloucester County residents have a desire for preserving and enhancing the character and appearance of the County, and indicated that preserving and protecting character-defining features of the County was very important. Sound land use policies can help to ensure that the inevitable growth and development that occurs has a positive defining effect on the character and appearance of the County.

PUBLIC/SEMI-PUBLIC

Public uses in the County include schools, fire stations, libraries, County office buildings, U.S. Post Offices, churches, the Riverside Walter Reed Hospital, the County's Water Treatment Plant, and the Virginia Institute of Marine Science. Lands in this category occupy a small percentage of the County's land area. However, this category is important in regards to future land use because of public infrastructure factors and the proximity of these facilities to the residents they serve.

Figure ___. Map of Public Places

SPECIAL AREAS PLANNING

Gloucester Courthouse Area

The Gloucester Courthouse area, located in the center of the County, has been a population center during most of the County's existence. This area houses the County seat, as well as a mix of land uses, historic structures, a public square and settlement patterns; the combination of which form a cohesive development pattern. Most residents would consider the Gloucester Courthouse area as characteristic of a village, due to its courthouse green and traditional grid street system adjacent to the historic downtown Main Street area. A combination of land uses have developed here, including all types of residential, commercial, and public uses.

The original courthouse complex was built between 1679 and 1684, and included a jail, Clerk's office and lawyers' offices. The current courthouse was rebuilt in 1766 after the original was destroyed, probably by a fire. Historically, courthouses in Virginia were usually located near the geographic center of the County and tended to be isolated due the rural character of the region; Gloucester's courthouse was no exception. During its early history, two ordinaries, or taverns (Botetourt Hotel and Edgehill Ordinary, now called Long Bridge), were established in the vicinity to provide food and shelter on court days, which were generally the only time people came to the County seat.

Up until the late 1800s, growth in the area was limited to just a few establishments, although the area periodically served as a gathering center for various social activities. After the Civil War, the County's population increased gradually until the turn of the century. Public building activity increased, as did private establishments. The lands surrounding the public green were divided into half acre lots with a linear Main Street and grid pattern of intersecting streets, establishing the basic village settlement pattern still evident today. Main Street was developed on the highest ground along a ridge which sloped down on either side to wetland areas associated with tributaries of the Ware River.

After the turn of the century the population began to gradually decline; development in the village continued to grow at a slow pace, due to the emergence of the automobile and road paving in the 1920s. Travel into the village from surrounding farms became faster, more convenient and therefore more frequent. Commercial establishments increased along Main Street, extending southward, while residences were built to the north of the courthouse as well as along streets perpendicular to Main Street. In the 1950s, building activity in the village decreased due to the construction of the Coleman Bridge and Route 17. New construction along Route 17 provided convenience-oriented shopping centers, parking lots and fast food establishments which detracted from activity in the village.

Current Land Use

In more recent decades, development in the village area has consisted of two convenience oriented shopping centers, a hospital, elementary school, and County office buildings and mixed residential development. The area has the potential for growth in the future, especially due to its direct access to Route 17 and concentration of public services. The village still retains its historic character and continues to retain small retail and service oriented businesses. Development in the immediate village area is somewhat limited due to the physical constraints of tributaries of the Ware River tributaries and their associated wetlands.

Commercial

Commercial land uses that exist in the village area today are concentrated along Main Street. The businesses located between the historic Courthouse circle and Clements Avenue, just west of the Main Street/Route 14 intersection, have an established historic character and pedestrian-oriented development pattern. The older buildings located close to the sidewalk, and on-street parking, are indicative of a pedestrian scale and traditional small town character.

An interesting stock of architectural styles contributes an historic style and authenticity however only the Court Circle and the surrounding buildings are designated by the County in the Historic Overlay District. Over the years some of the existing business owners have covered the original building facades, resulting in a variety of exposed materials; the resulting mixture of facades can leave the area looking confused and disjointed as well as lacking in a cohesive community character. Over the past decade, the County has invested in substantial improvements to the downtown commercial area, including the removal of overhead wires and poles, and the addition of landscaping, street lamps and sidewalks through federal and state transportation enhancement grants. It is important that the village's historic character be protected, not only for its intrinsic value, but also to continue to attract and expand businesses and visitors to this area.

Beginning at the Route 14 intersection and continuing southward, the commercial buildings on Main Street were built more recently, in the 1970s and early 1980s, including two shopping centers and a number of detached buildings. *[Sears 1970; Vashti's part 1980; Main Street Center 1970]* The Main Street Center shopping center was refurbished in 2004. The Library and the Post Office relocated to these new facilities which also include medical offices, restaurants, a drug store and a retail store. The County has the option to lease space in the Main Street Center and has recently decided to re-locate the Health Department offices to that location.

The Main street Center was the vision of the late Edwin Joseph, a local philanthropist. This unique redevelopment project in the Courthouse area will play a significant role in the future of "Main Street". A foundation has been

established to oversee that the profits of the commercial and community center will be reinvested to enhance the business environment and Village Community. These proceeds are estimated to amount to $500,000 by 2009 and will have significant positive impact on village improvements for the Courthouse area.

Other commercial establishments on Main Street include professional offices, concentrated at the southerly end Main Street near its intersection with Route 17. The Riverside regional health complex, which includes a hospital, a variety of doctors' offices, a cancer center, dialysis center, a wellness center and associated convalescent facilities, is a major destination point.

Public/semi-public
The Courthouse village area is also the location of the County's local government offices and services, as well as a number of other public and semi-public uses including an elementary school, fire and rescue, the library, and several churches. Because the village serves as the location for most of the County's administrative offices and services, increased population in the County means the village may have to accommodate larger County facilities; resulting in more traffic coming into area.

Residential
Residential land uses that exist in the village area are generally of a higher density. The older residential structures in the village area were built to the north of the courthouse as well as along streets perpendicular to Main Street, forming a loose grid pattern of development. The majority of residential housing units are detached single-family; however, a number of multi-family units are also interspersed, including duplexes as well as apartments and town-homes. Since the 1970s, a substantial number of new residential subdivision lots have been created. The earliest of these subdivisions had ½ acre to ¾ acres lot sizes. More recently, four new major subdivisions have been developed in the village and immediate vicinity, with a relatively higher density of ¼ acre to ½ acre lot sizes.

[Chart below of larger subdivisions since 1970s-for analysis; not for final draft]

Name	*Year*	*# Lots*	*Lot area/ zoning*
Beaver Dam	*1977-78*	*65*	*½ to ¾ acre*
Fox Mill Run	*1979*	*31*	*½ to ¾ ac*
Forbes	*1979*	*26*	*½ to ¾ ac*
Holly Springs	*1984*	*250*	*½ to ¾ ac*
Wildlife Meadows	*1990*	*22*	*½ to ¾ ac*
Glo. Town Comm.	*2005*	*35*	*10-15,000 sq. ft.*
Robinson's Pond	*2005*	*21*	*10-15,000 sq. ft.*
Courthouse Square	*2006*	*85*	*12-23,000 sq. ft.*
Courthouse Spring	*2007*	*34*	*10-20,000 sq. ft.*

Current Land Use Management Regulations

1991 Comprehensive Plan
The current Comprehensive Plan designates the Gloucester Courthouse area as a Village Center for focusing future County growth. The Village Center is further defined as a mixed-use regional center for residential, office, retail and service development. The Village Center is designated as an area to direct future growth and at the same time establish a recognizable center of development with its own unique sense of place. The Plan specifies that higher density residential development should be concentrated here, and that future development should build upon the established traditional village development form and reflect the characteristics and qualities of the settlement as represented in the historic structures. Development standards should be framed to establish a clear sense of identity and distinct character, based upon the historic community theme.

Currently no detailed land use policies exist specifically for the Courthouse Village area. Most of the newer residential development is suburban in character, and does not necessarily manifest a development theme or "village" image. The Plan specifies that a more specific sub-area plan for the village center should be prepared by the County focusing on how the qualities and form of development may best be managed through detailed land use policies.

[No goals, objectives or implementation recommendations in 1991 Plan are specific to the Gloucester courthouse village area; may need to be established as part of a more detailed village sub-area plan.]

The future land use plan depicts the general area of the Gloucester Courthouse Village Center. The northernmost boundaries of the Village Center coincide those of the Development District, and the southern boundaries coincide with Burleigh Road, Short Lane and T.C. Walker Road. The Village Center boundaries differ from the 1990 Gloucester Courthouse CDP (census designated place) boundaries, which encompass a smaller land area. The Plan does not specify the criteria upon which the Village Center boundaries were established; however, once a detailed sub-area plan of the Gloucester Courthouse area is undertaken, the boundaries of the study area can be refined if appropriate, based upon such factors as pedestrian scale, distinct sense of place and historic character. Census CDP boundaries may also be considered for opportunities of statistical detail.

Zoning
The majority of the land located in the immediate Gloucester Courthouse area is zoned SF-1 (single family residential), which allows for a higher density of residential land use. A few small areas are zoned MF-1 (multi-family), primarily

over areas of existing multi-family housing. The periphery is predominantly zoned SC-1 (suburban countryside)—a lower density residential use.
The majority of land fronting on Main Street is zoned as B-2 (Village Business), encompassing commercial land uses, and a small number of vacant parcels; this district was designed to promote village scale commercial development. The hospital medical complex, and commercial areas across from Route 17 are zoned B-1 (Business)—designed for general business which requires direct and frequent access.

Economic Development Authority (EDA)
The Economic Development Authority (EDA) had a Market Analysis and Retail Strategy prepared for Main Street. The Study was conducted by H. Blount Hunter Retail and Real Estate Research Company and completed in October 2005. The general objective of the study was to generate recommendations to guide the on-going retail revitalization of Historic Courthouse. The author summarized the analysis as follows: "*Historic Gloucester's competitive market position and its drawing power are predicated upon maintaining its role as a unique specialty shopping and dining destination. In recent years, Gloucester Courthouse has offered a supportive environment that has enabled many entrepreneurs to survive and prosper. However, Main Street's continued retail evolution is hindered by the marginal quality of much of the vacant commercial space as well as competing sites in the heavily traveled Route 17 corridor. Future efforts to concentrate economic activity such as new offices and the proposed Riverside senior living center can bolster Main Street's Prospects for revitalization.*"[19]

The EDA is also working with Hampton University to preserve and restore the T.C. Walker House. This house has historic significance not only for Gloucester County, but from as part of our national heritage as well. As stated on the County's Web site, *"The Thomas Walker House was the home of Thomas Calhoun Walker and his family following his marriage and establishment as a lawyer. Built in the 1920's, it includes his law office. Located on Main Street in Gloucester Court House, it was bequeathed to his beloved alma mater, Hampton University. Abandoned for many years and only recognized by a roadside historical sign, it now sits boarded up as a silent witness to the legacy of Thomas C. Walker. The Walker House is a wood frame building of balloon construction typical of the times and sits atop the ridge that runs down the spine of most of Gloucester Court House. No dependencies still stand. The kitchen is internal to the building and is not a connected separate structure. The windmill driven water well pump still exists, however and is one of only a handful still remaining in the County. The T. C. Walker House's mission is to preserve and interpret the*

[19] Hunter, Blout, H. Blout Hunter Retail & Real Estate Research Co., October 2005, "Market Analysis and Retail Strategy for Main Street, Gloucester, Virginia" prepared for Gloucester County Economic Development Authority, page 1.

legacy of the African-American leader Thomas Calhoun Walker on the American experience. From slavery to educator, lawyer, businessman, and community leader, T. C. Walker's story epitomizes the American dream of education, equality, and leadership." The T.C. Walker house restoration project will be an integral part of future plans for Gloucester Courthouse.[20]

Nonprofit Organizations
Several organizations exist in the County that can play a role in revitalizing the village, including the Chamber of Commerce and the Gloucester Main Street Association—a nonprofit group created to promote the Route 17 business corridor. The association was developed by Edwin A. Joseph, and focuses on Main Street activities and events, as well as attracting people and businesses to Main Street.

The following issues may need to be addressed at this time rather than waiting for sub-area plan:

- *Identify need for greenway open space system—designate areas on future land use map*
- *Identify need for protecting/improving aesthetics of downtown area for continued economic revival, and to protect historic buildings from demolition or renovation which would damage their historical integrity*

Gloucester Point Area

The Gloucester Point area, located at the southernmost end of the County, is a major population center and also the most densely developed area of the County, encompassing approximately 27% of the total population within 3% of the County's land area. Rapid growth in this area began when the Coleman Bridge opened in 1952, resulting in metropolitan growth from Hampton, Newport News and Williamsburg spreading to the area. The urbanization of Gloucester Point has resulted in an enclave of concentrated development including a combination of land uses, with residential use being the most prevalent. Although the Gloucester Point area is designated in the Comprehensive Plan as a Village Center, it does not currently manifest a village image; there is no community center, development patterns are less cohesive and commercial land uses are mostly strip development along Route 17. The area can best be characterized as a bedroom community for the Hampton Roads Metropolitan Area.

Because of the concentrated urbanization of the area, Gloucester Point was recognized as an area worthy of more in-depth planning consideration. This resulted in the creation of the Gloucester Point Plan, adopted in 1995 and included as a component of the 1991 County's Comprehensive Plan. The

[20] http://www.gloucesterva.info/tcwalker/home.htm

geographic boundaries of the study area conform to those of the United States Census Bureau, which established Gloucester Point as a Census Designated Place (CDP) due to its concentrated population density. This sub-area plan is located in Appendix A of the Comprehensive Plan.

Other Planning initiatives for Gloucester Point include the Gloucester Point Gateway Plan which was instigated in part by plans to widen Route 17 to six lanes from the Coleman Bridge to Farm Wood Road. The plan was completed in 2002 and provides direction for future planning and implementation efforts for the southern tip of the County. The widening of Route 17 and the transportation improvements associated with this project may provide other planning opportunities to improve the aesthetic and transportation safety aspects at the Point.

Issues to consider when the Gloucester Point Plan is updated:

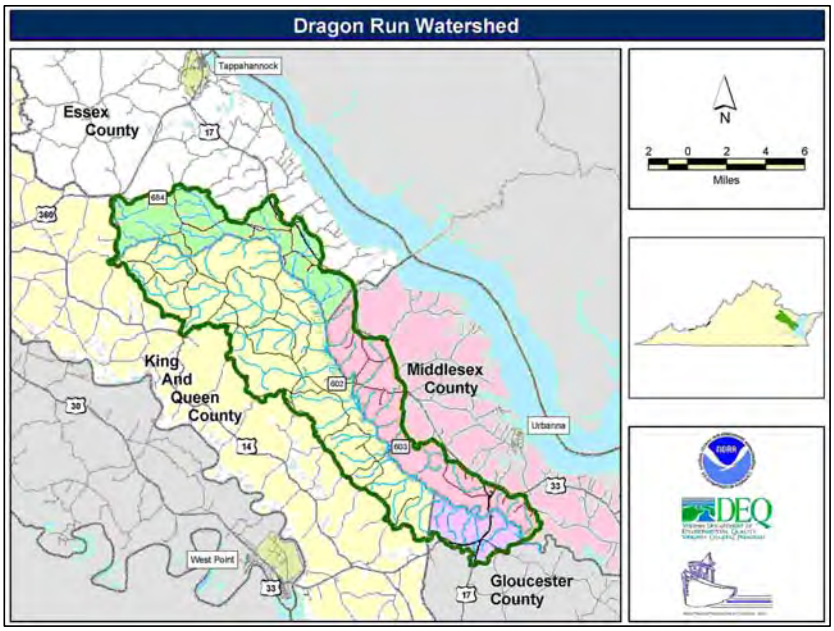
Identify need for two separate village scale sub-area plans in Gloucester Point: one for the areas adjacent to Hayes Road; the other for areas adjacent to Greate Road (both roads run parallel to Rt. 17).

Dragon Run Special Planning Area

As one of the Chesapeake Bay watershed's most pristine waterways, the Dragon Run "encompasses some of the most extensive and unspoiled swamp forest and woodland communities in Virginia"[21]. Effectively bisecting Virginia's Middle Peninsula located between the York and Rappahannock Rivers, this fresh and brackish water stream (Figure ___) meanders forty miles along and through nontidal and tidal cypress swamp. The watershed is mainly undeveloped, almost entirely privately owned, and encompasses approximately 140 square miles (90,000 acres) of rural landscape – mostly forests, farms, and wetlands. The spring-fed Dragon Run flows through portions of Essex, King and Queen, Middlesex, and Gloucester Counties, emptying into the estuarine Piankatank River and ultimately the Chesapeake Bay.

[21] Belden, A. Jr., A.C. Chazal, G.P. Fleming, C.S. Hobson, and K.M. McCoy. 2001. A Natural Heritage Inventory of the Dragon Run Watershed. Second edition. Natural Heritage Technical Report 01-03. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA.

Figure ___. The Dragon Run Watershed



The Dragon Run plays a central role in the Middle Peninsula's culture and identity. Its intriguing name is frequently borrowed by local enterprises and establishments. Since European settlement in the early 1600's and Native American inhabitation up to 10,000 years before that, natural resources have been the bedrock of the watershed's economy. For older generations, forestry, farming, hunting, trapping and fishing were the primary ventures. Today, forestry and farming continue to generate wealth and drive the watershed's economy. Hunters, many involved in organized hunt clubs continue to uphold this ancient tradition throughout land in the watershed. More than 46 percent of the land is leased by hunt clubs and it is estimated that $300,000 is generated due to hunt club activity and over $1.6 million in fishing activity[22]. These land uses, together with extensive swamps, are the main reasons that the Dragon Run remains wild and secluded.

The watershed's wilderness is both expansive and unique. The Dragon Run contains the northernmost example of the Bald cypress-Tupelo Swamp natural community in Virginia and the best example north of the James River. [23] Moreover, 14 rare species and 5 rare natural communities are found here. Based

[22] Dragon Run Watershed Plan, November 2003, Dragon Run Steering Committee, Middle Peninsula Planning District Commission
[23] Belden, Jr. et al., 2001

on his investigations of the watershed's aquatic communities, one researcher observes that the Dragon Run is a "100 year old time capsule," resembling coastal plain streams in the Chesapeake Bay region at the turn of the 20th century[24].

The Dragon Run's unique character evokes strong feelings to protect the pristine watershed in both long-time residents and first-time visitors alike. Although development pressure in the watershed is currently low, the potential for significant land ownership changes (>25% in 10 years due to aging and absentee corporate landowners) threatens to disrupt the rural character and fragment productive farm and forest land. Likewise, habitat fragmentation jeopardizes the Dragon Run's unique natural communities. Landowner opinions about how to address these threats vary widely, ranging from the belief that "the Dragon takes care of itself" by its wild nature and voluntary landowner stewardship to enacting and enforcing regulations with "teeth."

The difference in point of view between property rights advocates and conservationists centers on how to maintain a pristine watershed into the future. The Dragon Run Watershed Special Area Management Plan (SAMP), a partnership between the Virginia Coastal Program and the Dragon Run Steering Committee of the Middle Peninsula Planning District Commission, is a project designed to address both the differing viewpoints and the common ground that exist concerning the future of the watershed. The project began in January 2002 with a grant from the Virginia Coastal Program under authority of the National Oceanic and Atmospheric Administration (NOAA). Enabled by the federal Coastal Zone Management Act of 1972 as amended, SAMPs aim to protect significant coastal resources through a collaborative, multi-level planning process to develop and implement new enforceable policies.

One of the fundamental elements of a SAMP is that a strong regional entity must exist that is willing to sponsor the planning program. In the Dragon Run watershed's case, that regional entity is the Middle Peninsula Planning District Commission through its Dragon Run Steering Committee. Formed in 1985, the Dragon Run Steering Committee consists of landowners and local elected officials and is the key vehicle for cooperation and coordination among the four counties concerning watershed issues. The Steering Committee's approach to the SAMP is to stimulate and coordinate community involvement in the proactive development and implementation of goals, objectives, and action plans for a watershed management plan.

Another major element of a SAMP is that conflict exists concerning the area's proposed uses. The Steering Committee believed that the best approach is to

[24] Garman, G. C. 2003. Aquatic Living Resources Inventories in the Dragon System: Virginia Commonwealth University on-going Activities. Dragon Run natural Resources Symposium, February 11, 2003, Virginia Institute of Marine Science, Gloucester Point, VA.

proactively head off conflict before it grows by enabling stakeholders to openly discuss the issues. Potential conflicts in the Dragon Run watershed are: 1) the differences between conservation and property rights advocates; and 2) the private use of land versus the public use of the water. The Steering Committee felt that the watershed approach was the most effective way to manage natural resources and traditional land uses.

The Dragon Run Watershed SAMP began with public planning forums in December 2001 and January 2002. These planning forums led to two primary outcomes: 1) the development and confirmation of common themes for watershed issues; and 2) the establishment of a SAMP Advisory Group representing a broad cross-section of the community. Building upon the foundation established by the planning forums, the SAMP Advisory Group developed a mission statement and developed a list of three goals, each with several objectives. With minor modifications, the Steering Committee approved the goals and objectives, which were incorporated into a Memorandum of Agreement. Each county – Essex, Gloucester, King and Queen, and Middlesex - and the Middle Peninsula Planning District Commission signed the Agreement during the late summer and fall of 2002 to consider the actions recommended by the Steering Committee.

Mission Statement for the SAMP

To support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed.

- **Goal 1 - Establish a high level of cooperation and communication among the four counties within the Dragon Run Watershed to achieve consistency across county boundaries.**
- **Goal 2 - Foster educational partnerships and opportunities to establish the communities' connection to and respect for the land and water in the Dragon Run.**
- **Goal 3 - Promote the concept of landowner stewardship that has served to preserve the Dragon Run Watershed as a regional treasure.**

With the help of staff, consultants and the Advisory Committee, the Steering Committee completed the "Dragon Run Watershed Management Plan" in November 2003 and recommended that each of the localities adopt the plan as an addendum to their comprehensive plan until specific language could be added to each of the communities' Comprehensive Plan. Gloucester County adopted the Watershed Management Plan as an addendum to its Comprehensive Plan on November 3, 2003.

Only 6% of the Dragon Run Watershed is within Gloucester County and it represents only 3% of the County's land areas. However, as "one of the Chesapeake Bay watershed's most pristine waterways" the Dragon Run is well worthy of individual attention, both from the County's perspective and from a

regional perspective. The purpose of adopting the Watershed Management Plan was to formally acknowledge that the Dragon Run Watershed deserves distinctive treatment.

The uniqueness of the SAMP is that it goes beyond the County's borders. It represents regional collaboration and cooperation in managing this resource. The SAMP process, and its implementation, represents, and requires, partnerships with other localities on the Middle Peninsula, other governmental agencies and non-profit groups as well as with the property owners along the Dragon Run and the hunters, fishermen, boaters, nature lovers and others who enjoy its beauty and abundance. It also sets the stage for regional cooperation in future planning and implementation. By adopting the Watershed Management Plan as part of their Comprehensive Plan, the county adopted the following policies:

- Recognize the overall value of maintaining the traditional rural character and forested and farmed landscape of the Dragon Run watershed.
- Preserve the ecological integrity of the Dragon Run Watershed.
- Acknowledge the community and economic benefits of the Dragon Run watershed: for the production of agricultural and forest products; as a valued natural resource; for wildlife habitat; for maintaining water quality; and for scenic and aesthetic values.
- Continue to fully enforce existing regulations and policies.
- Protect forested and farmed land from fragmentation due to conversion to more intensive development.
- Encourage low-density, clustered pattern of development for new residential development in the watershed to protect open space and natural resources.
- Seek techniques to protect open space in the watershed without infringing upon landowner rights to maintain an economic return from their property.
- Identify land uses that are incompatible or competitive with traditional resource-based land uses (e.g. forestry, farming, hunting, fishing) and consider limiting them within the watershed.
- Limit or deny future rezoning approvals from existing zoning (i.e. *Agricultural or Rural Business zoning)* to more intensive uses in order to protect the rural character and integrity of farming and forestry resources in the watershed.
- Limit the extension of public utilities and central water and sewer in the watershed.
- Explore the feasibility of limiting major residential development in the watershed by aligning the Comprehensive Plan and Zoning Ordinance with provisions in the Subdivision Ordinance that limit major subdivisions.
- Publish citizen stewardship materials that explain pertinent ordinances, policies, and regulations in easy-to-understand language.

Many of these policies are similar to those established to protect the rural areas and character of the County. The Watershed Plan further recommends that Gloucester Planning Commission and Board of Supervisors amend their Comprehensive Plan include a "Dragon Run Planning Area." Once the Comprehensive Plan has been updated to include recommendations for the Dragon Run Planning Areas, the plan recommends implementation of Comprehensive Plan by changes to the Zoning Map and Ordinances to incorporate "Dragon Run Protection Zone." Through the SAMP funding, the MPPDC hired a consultant to work with staff and commissioners from each of the four affected Counties to develop draft language to consider in the Comprehensive Plan and subsequent zoning ordinances.

In addition to land use recommendations, the Watershed Management Plan includes tools to preserve forest, farm and natural resources, recommendations to address concerns regarding public access, and suggestions for controlling invasive species in the watershed. Additional recommendations involve education and landowner stewardship, ideas to encourage and support sustainable economic development, and recommendations to monitor the implementation of the Watershed Management Plan. Many of these recommendations are meant to be carried out by other agencies or entities and therefore will not likely be incorporated into the Comprehensive Plan update. Adoption of the plan shows support for the other recommended actions that may not be in the purview of local government, but will help to achieve the goals and objectives agreed to by all the Counties.

Appendix 3: Agenda and Minutes for February, May and August 2008 Meetings

Dragon Run Steering Committee
Winter Quarterly Meeting
February 27, 2008

Regional Boardroom – Middle Peninsula PDC
Saluda
4:00 PM

AGENDA

1. Welcome, Introductions and new Appointees
2. Officer Elections
3. Naval Outlying Landing Field Update
4. Biodiesel Program Update by Al Christopher
5. Dragon Run Estate Planning Network Initiative: A discussion of local needs
6. Land Use Policy Recommendations Update
7. Discussion of 2008 DRSC Action Items: Revisiting the Goals of the Watershed Management Plan
8. Other Business
9. Adjourn

Dragon Run Steering Committee
Middle Peninsula Planning District Commission
Steering Committee Meeting Minutes
February 27, 2008 4:00pm
Saluda, Virginia

Agenda

1. Welcome and Introductions
2. Officer Elections
3. Naval Outlying Landing Field Update
4. Biodiesel Program Update by Al Christopher
5. Dragon Run Estate Planning Network Initiative: A discussion of local needs
6. Land Use Policy Recommendations Update
7. Discussion of 2008 DRSC Action Items: Revisiting Goals of the Watershed Management Plan
8. Other Business
9. Adjourn

Attendance

Steering Committee: Prue Davis (Essex County), Dorothy Miller (Essex County), Fred Hutson (Essex County), Frank Herrin (King and Queen County), RD Johnson (Middlesex County), and Michelle Ressler (Gloucester County).

Others: Sara Stamp and Al Christopher

Welcome and Introductions

Chair Prue Davis called the meeting to order and began introductions.

Officer Elections

The chair called for the election of officers. Fred Hutson made a motion to keep officer positions the same. Michelle Ressler seconded. Motion carried. (Prue Davis – chair, Frank Herrin – vice chair)

Naval Outlying Landing Field Update

Sara Stamp reported that the Dragon Run site was not included in the revised list of potential OLF sites.

Biodiesel Program Update

Mr. Christopher supplied the Steering Committee with an update on the biodiesel partnership, EPA clean school bus grant and school board participation through resolutions. Mr. Christopher let the DRSC know about a school bus biodiesel stakeholder meeting that took place and about an idle reduction meeting coming up in March. The DRSC discussed the need for press releases connecting these efforts with the DRSC, SAMP, MPPDC and CZMP. Ms. Ressler noted that a press release would be good in the Beehive.

Dragon Run Estate Planning Initiative

Ms. Stamp provided an overview of the Dragon Run Estate Planning Initiative and the various likely project partners, including Friends of Dragon Run, Essex County Countryside Alliance, Middle Peninsula Land Trust, The Nature Conservancy and Chesapeake Bay Foundation. She reported that the Dragon Run may try a strategy similar to that of the ECCA, involving getting landowners talking to other landowners about the value of conservation easements and the process and cost of establishing one. Depending on feedback at the upcoming ECCA landowner meeting at Prue's house, the Dragon Run Initiative will choose a strategy to reflect the needs and interest of the Dragon Run landowners.

Land Use Policy Recommendation Update

Ms. Stamp reported that King and Queen County adopted a Dragon Run ordinance and thereby reconfirmed their commitment to protecting this resource. She also reported that she made a presentation at the Essex County joint Board of Supervisors/Planning Commission meeting regarding adding the Dragon Run to the comprehensive plan and recommended that the A-1 district purpose was more appropriate for the Dragon Run watershed than its current A-2

designation. She reported that she had provided an overview of the recommendations for Gloucester County at their Comprehensive Plan Steering Committee meeting. She noted that the current proposed language developed by county planning staff is very thorough and goes beyond the minimum language recommendations.

Discussion of 2008 Action Items

The Steering Committee members discussed their priorities for the coming year, including:

1. The need to increase partnerships and stakeholders with complimentary interests

2. Work to increase the participation from the local government representatives on the Steering Committee

3. Encourage and invite press coverage of meetings and/or send recaps to press

4. Invite groups to educate Steering Committee members, such as the Virginia Department of Forestry, Tidewater RC&D, etc

5. Work to involve more landowners through: extended interested parties email list; rotation of the location of the meetings to garner more interest; add a public comment session to agenda; educate the public that the Steering Committee looks at more than just the mainstem; conduct press releases on radio spots

6. Continue to distribute DVDs, including to Chambers

Other Business

Ms. Stamp showed the ribbon received for participating in the NAMEE Film Contest. She reported that the film, The Dragon Run: A Step into the Past, A Strategy for the Future, went to the finals.

Ms. Stamp also reported that she is submitting a proposal for continued Dragon Run work to the National Fish and Wildlife Foundation.

Adjourn

The next meeting is the annual picnic and is scheduled for May 21st at 6pm at The Majors' house in Stormont. The Steering Committee would like to have Becky McCoy be the speaker if she is available.

The Dragon Run Steering Committee
cordially invites you to attend their
Annual Picnic

Wednesday, May 21, 2008 at 6:00 pm
at
Stormont

Come on out to eat, drink, mingle and discuss the happenings of the Dragon Run Watershed! The main topic of the evening will be a discussion on conservation estate planning, featuring a presentation by Ms. Cornelia Christian from Conservation Partners.

Family and friends are welcome!

Please RSVP to Sara Stamp by May 20th
(804) 758-2311

Directions

From Saluda: Route 33 East toward Deltaville <1.5 miles; turn right on Stormont Road; travel just over .25 miles and turn right on Old Courthouse Rd; home is at the end of the road.

Dragon Run Steering Committee
Middle Peninsula Planning District Commission
Steering Committee Meeting Minutes
May 21, 2008 6:00pm
Saluda, Virginia

Agenda

1. Welcome and Introductions
2. Networking and dinner
3. An Overview of Conservation Estate Planning Tools and Resources by Cornelia Christian, Conservation Partners

Attendance

Steering Committee: Prue Davis (Essex County), Dorothy Miller (Essex County), Frank Herrin (King and Queen County), Terry DuRose (Gloucester County). Annie Pollard (King and Queen County), John England (Middlesex County), Robert Gibson (King and Queen County), and Willy Reay (Gloucester County).

Others: Sara Stamp, Vera England, Robert and Caroline Major, Jacquie Shapo, Bud and Carol Smith, Mr. and Mrs Croxall and Del. Harvey Morgan.

Welcome and Introductions

Chair Prue Davis called the meeting to order and began introductions.

Conservation Estate Planning Presentation

Cornelia Christian, representing Conservation Partners in Lexington, VA, provided an overview of conservation estate planning and tools, such as conservation easements, that are available to landowners. Ms. Christian led a discussion on tax benefits that are available to landowners and farmers and answered questions from Dragon Run Steering Committee members and their guests. Ms. Christian also provided information on the services that Conservation Partners provides, including covering the up front costs on doing an easement, such as the appraisal, and providing brokerage services for the sale of tax credits.

Adjourn

The next meeting is scheduled for August 13th (this was later changed to August 27th) at 7pm at the Regional Boardroom at the Middle Peninsula Planning District Commission office in Saluda.

Dragon Run Steering Committee
Summer Quarterly Meeting
August 27, 2008

Regional Boardroom – Middle Peninsula PDC
Saluda
7:00 PM

AGENDA

1. Welcome, Introductions and New Appointees
2. The Dragon Run Steering Committee: A review of why it exists and what it has accomplished
3. The Dragon Run Special Area Management Plan: What we are doing
4. Where We Are Going: Steering Committee goals, priorities and strategies
5. Other Business
6. Adjourn

Dragon Run Steering Committee
Middle Peninsula Planning District Commission
Steering Committee Meeting Minutes
August 27, 2008 7:00pm
Saluda, Virginia

Agenda

1. Welcome, Introductions and New Appointees
2. The Dragon Run Steering Committee: A review of why it exists and what it has accomplished
3. The Dragon Run Special Area Management Plan: What we are doing
4. Where We Are Going: Steering Committee goals, priorities and strategies
5. Other Business
6. Adjourn

Attendance

Steering Committee: Prue Davis (Essex County), Frank Herrin (King and Queen County), Terry DuRose (Gloucester County), John England (Middlesex County), Robert Gibson (King and Queen County), Michelle Ressler (Gloucester County), RD Johnson (Middlesex County), Pete McDuff(King and Queen County), Kenny Richardson (Gloucester County), Fred Hutson (Essex County), and Willy Reay (Gloucester County).

Others: Sara Stamp, Al Christopher and Teta Kain

Welcome and Introductions

Chair Prue Davis called the meeting to order and began introductions.

The Dragon Run Steering Committee: A review of why it exists and what it has accomplished

Sara Stamp provided a brief overview of the Dragon Run Steering Committee's history and evolution.

The Dragon Run Special Area Management Plan: What we are doing

Sara Stamp provided an overview of the Dragon Run Special Area Management Program and related its connection to the recommendations developed by the DRSC. Specifically, Ms Stamp provided information on the following projects:

Land-use planning

Biodiesel

Management plans

Conservation estate planning

Dragon Run Day and other educational events

Where We Are Going: Steering Committee goals, priorities and strategies

John England – education is extremely important; one place we can do more to educate the community on what is going on in the Dragon and the rest of the counties as well

Dragon Run Day advertising – potentially at Guinea Jubilee

School age education is important. The Dragon Run should be part of the SOLs for the watershed counties – Ms. Stamp will coordinate with Dr. Reay to develop and submit a Chesapeake Bay Restoration Fund grant.

Education opportunities potentially at the raceway – owner may be conducive

4H, FFA, BS, GS maybe be good partners

Education for elected officials

RD – limited accessibility leads to limited connection

Other Business

VDOT issue with ditches and destroying swales - DRSC wants to send letter to VDOT regarding swale destruction; motion to draft and send letter to VDOT Frank and Terry; coordinate with Dr. Reay for pictures, send to committee to review and have Prue sign

Education for planning commissions/BOS on low impact development – Ms. Stamp will get copies of Raining in the Storm; and Friends of the Rappahannock and send to PC and BOS

The DRSC members and Virginia Clean Cities representative, Al Christopher discussed offering an award at Dragon Run Day. The DRSC decided that it was too late to do something this year, but that VCC could give awards at the event. VCC showed interest in recognizing John Phillips, Roger Kelly and Denny Sulik. . Dr. Reay made a motion that DRSC will give awards each year for good stewardship; Kenny seconded; motion carried. Nominating committee give report on first quarter of each year – this group will try to have a recipient each year (whether DRD or not). Nominating committee will be appointed at next meeting

Adjourn

November 12th next meeting

Michelle made a motion to adjourn, Fred seconded; motion carried.

Appendix 4: Naval Outlying Landing Field Position Statement

DRAGON RUN STEERING COMMITTEE

Saluda Professional Center
125 Bowden Street
P.O. Box 286
Saluda, Virginia 23149-0286
Phone: (804) 758-2311
FAX: (804) 758-3221
Toll Free : 1-888-699-1733
Email : sstamp@mppdc.com
Website : www.mppdc.com/dragon/

Project Director
Mrs. Sara Stamp

MEMBERS

Essex County
Hon. Margaret H. Davis (Chairman)
Ms. Dorothy Miller
Mr. M. Scott Owen
Mr. Fred Hudson

King and Queen County
Hon. Keith Haden
Mr. Robert E. Gibson
Mr. Kempton Shields
Mr. William F. Herrin (Vice Chairman)

Gloucester County
Hon. Charles R.Allen, Jr.
Ms. Terry DuRose
Dr. William Reay
Dr. Eric Weisel

Middlesex County
Hon. John D. Miller
Mr. R.D. Johnson
Mr. William Bagby
Mr. John England

October 2, 2007

Rear Admiral David O. Anderson, USN
Vice Commander, U.S. Fleet Forces Command
1562 Mitscher Ave., Suite 250
Norfolk, VA 23551-2487

Dear Admiral Anderson:

The purpose of the Dragon Run Steering Committee, an advisory committee of the Middle Peninsula Planning District Commission is to promote the orderly and efficient planning and management of the environmental, social, and economic resources within the Dragon Run watershed. Its mission is to support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses (agriculture, silviculture, outdoor recreation, etc) within the watershed. The Dragon Run Steering Committee has taken the position over the past twenty years that uses, such as a Naval Outlying Landing Field, are not a consistent or compatible use in the Dragon Run Watershed.

During the past two decades, the federal, state and watershed local governments have invested many resources and funds into studying the Dragon Run and identifying ways to plan for the future of this unique resource and the way of life it supports. Some of the results of this effort have had far reaching implications. For example, the current Chesapeake Bay Resource Protection Area is based on the original Dragon Run Conservation District. Federal and state partners involved with the development and implementation of Dragon Run projects include the National Oceanic and Atmospheric Administration – National Ocean Service, the Virginia Department of Environmental Quality – Coastal Zone Management Program, the Virginia Department of Conservation and Recreation, the Chesapeake Bay Local Assistance Division (now Division of Chesapeake Bay Local Assistance at the Virginia Department of Conservation and Recreation), Virginia Department of Forestry, and Chesapeake National Estuarine Research Reserve of Virginia. Other organizations involved in these efforts include The Nature Conservancy, the Tidewater Resource Conservation and Development Council and Friends of Dragon Run. This investment in planning has a strong potential to be negatively impacted by the introduction of an Outlying Landing Field.

While the Dragon Run Steering Committee considers traditional, natural resource-based industries, such as farming and forestry, to be compatible with the long-term

conservation of the Dragon Run character, it does not consider an Outlying Landing Field to be an appropriate use of land in the watershed and in direct conflict with the land-use recommendations put forth by the Dragon Run Steering Committee through the Dragon Run Special Area Management Plan.

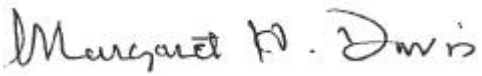
The ecological resources found within the Dragon Run are considered to be some of the most pristine and unique resources in the Chesapeake Bay Watershed. Many Natural Heritage Resources are located in the Dragon Run. Landowners in the surrounding region have provided excellent stewardship of these resources for generations. In fact, many of the landowners rely on the quality of the watershed's environment to support their traditional industries. Degradation caused by an Outlying Landing Field could impact not only the pristine ecosystem, but also the traditional natural resource-based industries of the Dragon Run. The negative impacts of the constant noise and pollution associated with such a use outweighs the limited economic benefit to the surrounding area.

The Dragon Run Steering Committee has been operating for over twenty years. The planning process involved with fulfilling its mission revolves around finding consensus between varying viewpoints among residents of the Dragon Run watershed. On the matter of a potential Outlying Landing Field in the watershed, however, watershed residents appear to be unified in their opposition. Not only is an Outlying Landing Field not consistent with the ecological or economic aspects of the Dragon Run, it is ultimately not consistent with the rural character found throughout the watershed and will diminish the quality of life for those who live here.

The Dragon Run Steering Committee is strongly opposed to the placement of a Naval Outlying Landing Field site inside the Dragon Run watershed. Such a placement would jeopardize a long-term investment by federal, state, and local agencies; does not support the traditional natural resource-based industries of the watershed; has the potential to significant degrade the pristine natural environment; and will ultimately conflict with the rural character and quality of life of the Dragon Run.

Please do not hesitate to contact me if you have any questions or would like further information about the Dragon Run watershed and its value to the region in its current state.

Sincerely,



Prue Davis
Dragon Run Steering Committee Chair

Copy:
Senator Warner

Senator Webb
Senator McDougal
Del Morgan
Del Peace
Gov Kaine
King and Queen BOS Chairman
National Oceanic and Atmospheric Administration
Laura McKay, Virginia Coastal Zone Management Program
Virginia Department of Conservation and Recreation
Virginia Department of Forestry
William Reay, Chesapeake National Estuarine Research Reserve
Nancy Miller, Division of Chesapeake Bay Local Assistance
Andy Lacatell, The Nature Conservancy
Pat Tyrell, Tidewater Resource Conservation and Development Council
Tom Gregory, Friends of Dragon Run

Appendix 5: Complete Dragon Run Day PowerPoint Presentation


DRAGON RUN DAY
2008
Welcome to
Dragon Run Day
Delta Welding
Rivah Golf

Dragon Run Day:
Celebrating the natural, cultural and historic heritage of the Dragon Run Watershed, while increasing watershed awareness!!!

Dragon Run Day Hosts

The Dragon Run Steering Committee

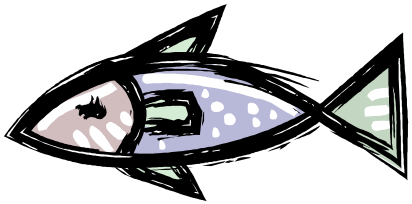
Friends of Dragon Run, Inc.

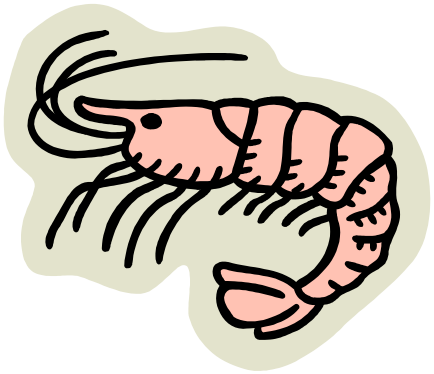
Thousand Trails

America's Finest Family Camping

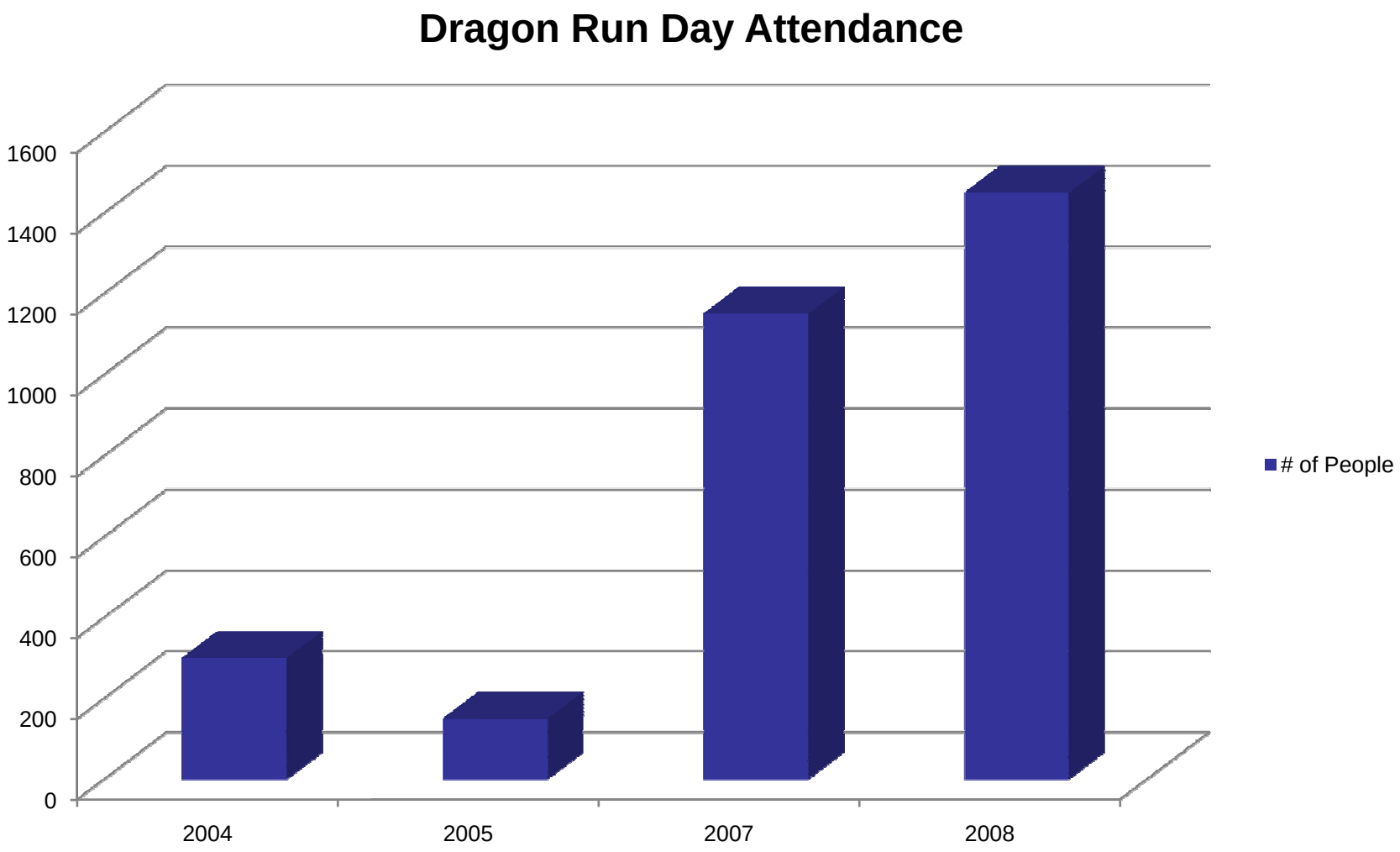
A little background…

- 4th Annual Dragon Run Day
- 2nd year at Thousand Trails Camp Resort with the Seafood Festival - An event without a cause





THIS IS A GROWING EVENT!!

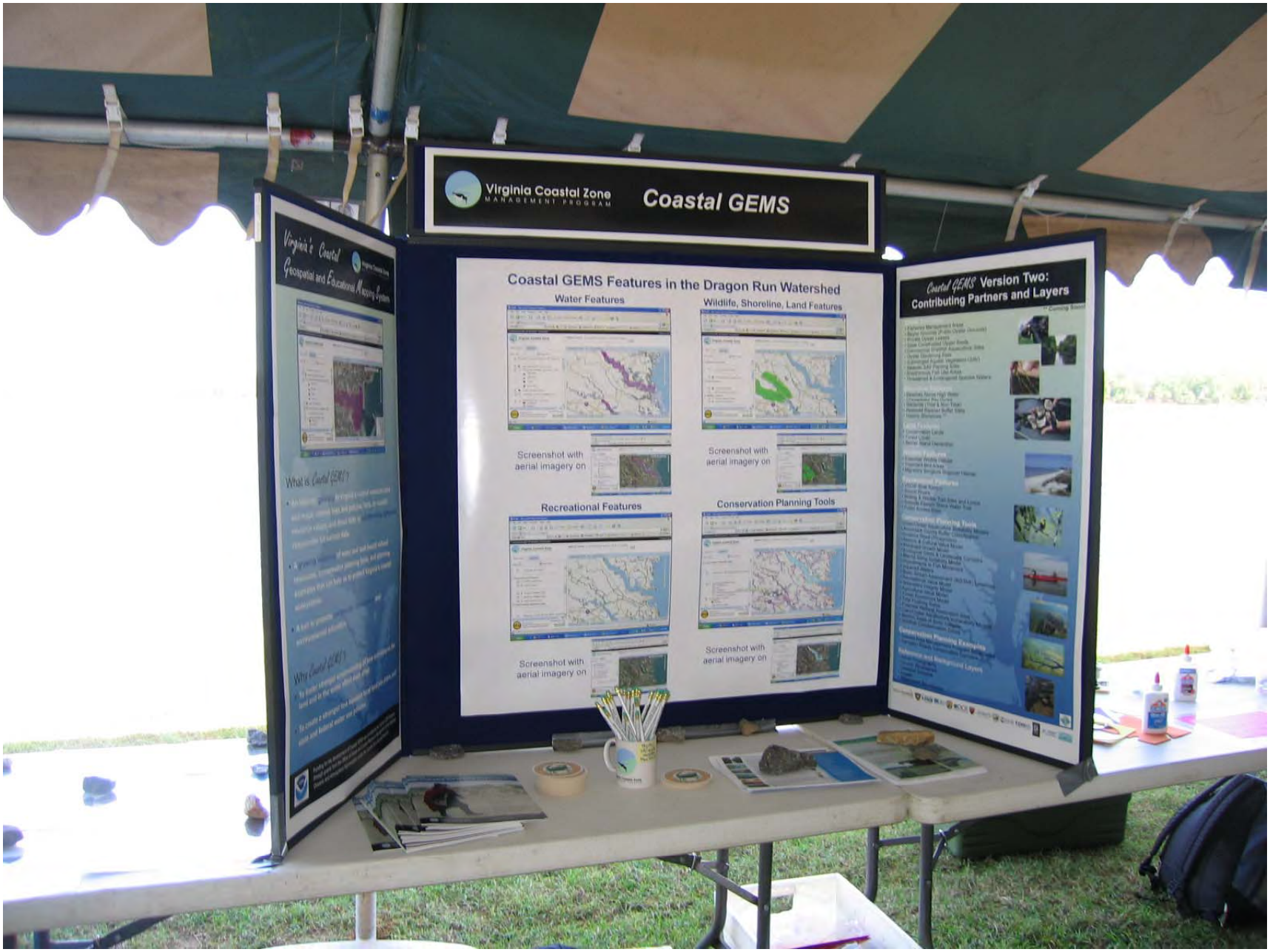


Fun for the Whole Family

- 20 exhibitors
- 2 presenters (Native American Storytelling & History of the Dragon Run)
- 2 Marsh Tours
- 2 Tree Walks
- Crafters
- Great Food!!

SAMP Exhibit

Virginia Coastal Zone Management Program



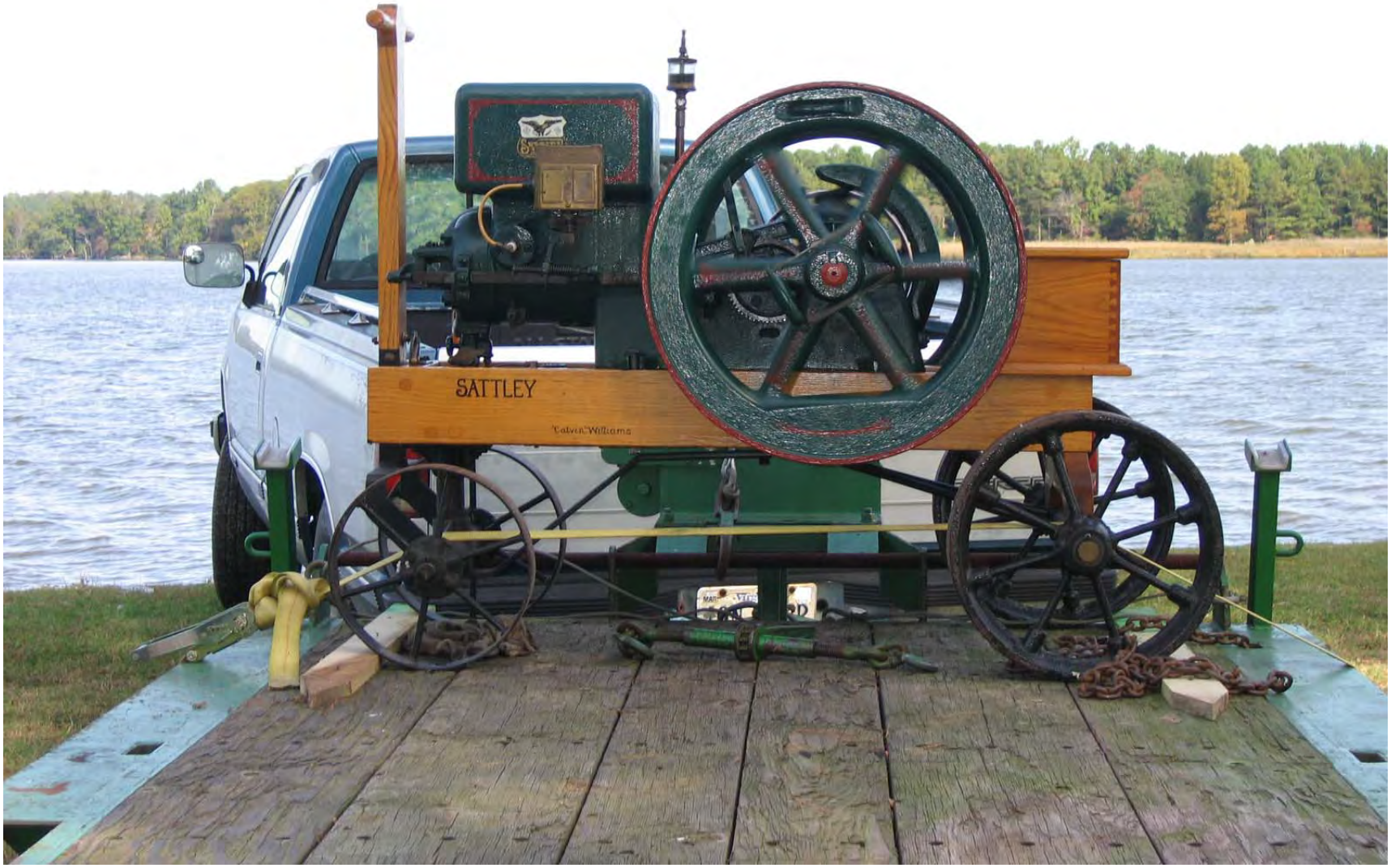
Chesapeake Bay National Estuarine Research Reserve of Virginia

Chesapeake Bay National Estuarine Research Reserve of Virginia

Resource International

Sam Motley's Portable Saw Mill

Northern Neck Farm Museum Antique Farm Equipment



Northern Neck Farm Museum Antique Tractor

Gloucester-Mathews Farm Bureau

History of the Dragon Run Presentation

Rona Sullivan’s Papermaking Demonstration

How to turn your junk mail into paper…

Be the Bay

Virginia Clean Cities

VABioDiesel Refinery

Kid's ID Station

Gloria Digg's Gourds and Naturals

Gloria Digg's Minerals

Gloria Digg’s Corn Husk Rugs

Lorna Wass's Children's Education


RESOURCE
INTERNATIONAL, LTD.

The Enviroscape Exhibit

Charlie Ivins - USDA

Bee Keepers

Friends of Dragon Run

“I SAVED A DRAGON” AWARDS

Dragon Power Biodiesel Partners

THANK YOU TO ALL OF OUR SPONSORS AND VOLUNTEERS!!

Virginia Coastal Zone MANAGEMENT PROGRAM

NOAA National Oceanic and Atmospheric Administration U.S. Department of Commerce

Thousand Trails
America's Finest Family Camping

FARM BUREAU VIRGINIA

Clean Cities
U. S. Department of Energy

Rivah Golf

Chesapeake Bay National Estuarine Research Reserve in Virginia

Delta Welding

SEE YA'LL ON OCTOBER 10TH, 2009!!!!

Appendix 6: Friends of Dragon Run Adoption Letter and Management Plan

Friends of Dragon Run, Inc.

October 7, 2008

Ms. Sara Stamp
Dragon Run SAMP Director
Middle Peninsula Planning District Commission
125 Bowden St.
PO Box 286
Saluda, Virginia 23149

Dear Ms. Stamp:

I am in receipt of the "Management Guidance for Friends of Dragon Run Conservation Acquisitions," prepared by the Middle Peninsula Planning District Commission under the Dragon Run Special Area Management Plan. The plan is comprehensive and extremely useful for The Friends of Dragon Run's purpose of managing its holdings to maintain or enhance the health of the forest wetland, riparian buffers, soil and water quality, and wildlife habitat, while promoting research, educational and limited recreational uses of the Dragon Run, for the purpose of increasing appreciation and knowledge of the habitat and natural systems.

Thank you for providing this important service to The Friends of Dragon Run. At it October meeting, the Friends of Dragon Run Board voted to incorporate the recommendations of the plan into our overall conservation acquisition management and will implement those recommendations as capacity allows.

We continue to appreciate and benefit from our partnership with the MPPDC and Dragon Run SAMP. We are fortunate to have great partners in the watershed that complement our work. I look forward to what our future endeavors will produce.

Sincerely,

Frank Herrin
President
Friends of Dragon Run

Management Guidance for Friends of Dragon Run Conservation Acquisitions

Prepared by:
Middle Peninsula Planning District Commission
Dragon Run Special Area Management Plan

This work was funded by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant # NA07NOS4190178 Task 95 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended. The views expressed are those of the author(s) and do not necessarily reflect the views of NOAA or any of its subagencies.

Friends of Dragon Run Conservation Acquisition Guidance Plan

Overview

Friends of Dragon Run (FODR), a non-profit corporation with status under Section 501(C)(3), acquires and receives land donation for conservation purposes along the mainstem of the Dragon Run. Concerned with the future of the entire Dragon wilderness area, FODR, as an organization, seeks to promote the preservation and protection of the watershed through the example it gives the community by its actions; foremost being the concern it shows for the land it owns or manages.

This document has been prepared in partnership with the Dragon Run Special Area Management Plan (SAMP) utilizing the Dragon Run Steering Committee recommendations for management of conservation acquisitions in the Dragon Run Watershed. The purpose of this document is to provide an overarching management approach including priorities and objectives to apply to all current and future Friends of Dragon Run conservation acquisitions.

Dragon Run Ecological Importance

As one of the Chesapeake Bay's most pristine watersheds, the Dragon Run meanders approximately 40 miles through vast, untouched swamp forest and woodland communities (Belden et al. 2001). At 89,771 acres, it envelops remote portions of four Eastern Virginia counties – Essex, King and Queen, Middlesex, and Gloucester and is connected, by its creation of the Piankatank River, to the Chesapeake Bay (Dragon Run Steering Committee 2003a). The watershed is mainly undeveloped and composed almost entirely of expansive, privately-owned floodplains, baldcypress swamps, upland forest systems, and open agricultural fields. Approximately 80% of the watershed is forested, compared to a statewide average of less than 70% (Middle Peninsula Planning District Commission 2002; Dragon Run Steering Committee 2003b; Virginia Department of Conservation and Recreation 2003). Only about 15% of the watershed is open to agricultural uses; however, the majority of the Dragon Run is zoned for agriculture, with varying restrictions and allowances across county boundaries. Additionally, about 4% of the watershed is open water, and only 1% is urbanized (Middle Peninsula Planning District Commission 2002; Dragon Run Steering Committee 2003b; Virginia Department of Conservation and Recreation 2003).

The Dragon Run watershed plays an important ecological role as part of a 225,000 acre forested block between the Pamunkey and Rappahannock Rivers (The Nature Conservancy 2003). This block represents the largest relatively non-fragmented forest in the lower Chesapeake Bay (Belden et al. 2001). The Dragon supports five rare, natural communities, including the non-tidal baldcypress-tupelo swamp, tidal baldcypress-tupelo swamp, tidal baldcypress woodland, fluvial terrace woodland, and the tidal freshwater marsh (Belden et al. 2001; Fleming et al. 2001; Belden et al. 2003; Dragon Run Steering Committee 2003a, b; Fleming et al. 2006). The baldcypress-tupelo swamp represents the northernmost non-tidal and tidal occurrence of the natural community along the eastern coast of the United States (Belden et al. 2001; The Nature Conservancy 2001; Dragon Run Steering Committee 2003a, b). While harvest of mature baldcypress trees occurred historically, it is no longer active. As a result, many trees in the Dragon Run watershed range from 150 to more than 400 years of age. A number of the Dragon's majestic bald cypress trees are 8 to 9 feet in diameter and 20 to 25 feet in circumference at the base.

Bald eagles nest at the top and resurrection ferns live on the trunks of many of these large cypress trees.

The Dragon's habitat has been estimated to support between 14 and 25 state and globally rare plants and animals (Belden et al. 2001; Belden et al. 2003; Dragon Run Steering Committee 2003a, b). Rare plants include the cuckoo flower, cypress-knee sedge, yellow water buttercup, pinebarren ticktrefoil, red turtlehead, and river bulrush (Belden et al. 2001; Fleming et al. 2001; The Nature Conservancy 2001; Belden et al. 2003; Dragon Run Steering Committee 2003a, b; Fleming et al. 2006). The piebald white tail deer, masked bobwhite, tiger salamander, great purple hairstreak (butterfly), southern pitcher-plant mosquito, cypress sphinx, Selys' sundragon, blackwater bluet, fine-lined emerald, and robust baskettail are just some of the rare animals that have been observed in Dragon Run (Belden et al. 2001; The Nature Conservancy 2001; Belden et al. 2003; Dragon Run Steering Committee 2003a, b). A study of invertebrates found rare insects and named a stonefly new to science in 2003. The heavily-protected bald eagle, which was delisted from the Federal List of Endangered and Threatened Wildlife and Plants on June 28, 2007, also has been sited frequently throughout the watershed.

In addition to rare natural communities, plants, and animals, the Dragon Run supports a diversity of freshwater and estuarine fishes, aquatic macroinvertebrates, and freshwater bivalves (McIninch et al. 2003). At least 45 fish species and 6 macroinvertebrate species have been recorded to-date. Based on his investigations of the watershed's aquatic communities, one researcher observed that the Dragon Run is a "100 year-old time capsule" similar to coastal plain streams of the Chesapeake Bay in the early 1900's (Garman 2003). If permanently protected as a non-fragmented ecosystem, the watershed will continue to support numerous plant and wildlife populations. Additional acquisitions by FODR and similar entities are necessary to further conservation efforts by linking a network of currently-protected forest and swamp lands with acreage adjacent to them.

The importance of the Dragon Run watershed is supported by its identification as a high priority site for protection efforts in several comprehensive conservation plans. In "Natural Areas of the Chesapeake Bay Region: Ecological Priorities" (Jenkins 1974), a comprehensive report published by the Smithsonian Institute that ranked 232 areas in the Chesapeake Bay watershed based on their ecological value, the Dragon Run watershed was ranked second overall and first in Virginia due to its swamp forests, hardwoods, and organismal diversity. The Nature Conservancy, which at any point in time owns and manages between 500 and 4,000 acres in the watershed, designated the Dragon Run an "Aquatic Portfolio", a "10-Year Action Site", and a "Significant Conservation Area" with an abundance of native fish species and excellent water quality in "The Chesapeake Rivers Site Conservation Plan" (2001) and its "Chesapeake Bay Lowlands Ecoregional Plan" (2003). Additionally, the Virginia Conservation Lands Needs Assessment developed by the Virginia Department of Conservation and Recreation, Division of Natural Heritage, which identifies priority cores, corridors, and stream conservation units in Virginia, ranked 58% of the watershed as a priority area for habitat conservation. The Virginia Natural Heritage Program and NatureServe have classified Dragon Run as a high priority area for acquisition and protection. The "Virginia Outdoors Plan" also identifies Dragon Run as an exceptional area for outdoor recreation, particularly for its kayaking and canoeing opportunities and its abundance of natural heritage resources (Virginia Department of Conservation and Recreation 2007).

Recognizing the importance of the Dragon Run watershed locally and regionally, the Virginia Coastal Zone Management Program, the Dragon Run Steering Committee, and the Middle Peninsula Planning District Commission entered into a partnership to address the future of the watershed. From this collaboration, the Dragon Run Watershed Special Area Management Plan (SAMP) was developed in 2001. The Dragon Run SAMP advocates for a comprehensive approach to addressing the future of the watershed that balances land use regulations, voluntary agriculture and forestry program participation, education, outreach, and land conservation. Three of the four counties in the watershed have adopted the Dragon Run SAMP as an amendment to their comprehensive plans. Special zoning overlays are currently being developed for each county that will strengthen natural resource protection in the watershed.

Conservation Acquisitions Priorities and Objectives

PRIORITY I

The highest priority identified by FODR is to manage all acquisitions to protect the natural resource conservation value of the lands adjacent to the Dragon Run

Objective A

Maintain the health of the forested wetland by protecting wetlands, riparian buffers, endangered species and wildlife habitat value

Objective B

Conserve soil and water through water quality protection practices

PRIORITY II

If resources permit, FODR aims to provide enhanced natural value to the acquisition site

Objective A

Provide wildlife habitat (for songbirds, water fowl and non-game wildlife)

Objective B

Maintain or enhance the health of the forest by creating a high quality upland habitat (ie conversion from pine plantation to hardwood/mixed hardwood forest) or managing upland habitat (ie managing pine plantations for harvest)

Objective C

Maintain a scenic forest

PRIORITY III

When it does not conflict with Priorities I and II, FODR aims to offer opportunities to foster and enhance appreciation of Dragon Run in FODR membership and public

Objective A

Provide opportunities for limited recreational access to acquisition sites as deemed appropriate by the FODR Board

Objective B

Provide opportunities for research and education on acquisition sites

Management Strategy

FODR's management strategy emphasizes maximizing the conservation of natural resources on its holdings, providing wildlife habitat enhancements where feasible, and maintaining recreational/educational opportunities where appropriate.

Natural Resource Protection

Objectives:

The objectives for this strategy give natural resource considerations priority over uses. Resource management practices will attempt to preserve the natural character of the area and restore/enhance land health and habitats, while allowing for limited low-impact recreational/educational opportunities.

To fulfill the goal of natural resource conservation, FODR will take measures to protect key terrestrial and aquatic habitats, prevent fragmentation, preserve riparian buffers, prevent run-off and conserve both soil and water. By protecting the land and water resources, associated habitats and communities should be protected as well. Friends of Dragon Run will monitor for invasive species on its holdings and take action to remove invasives that threaten the natural resource health.

In order to protect the natural resources of a holding, FODR will work with appropriate natural resource experts (Virginia Department of Game and Inland Fisheries or Virginia Department of Conservation and Recreation) to identify the key habitat and resources on each holding.

Monitoring of environmental indicators will be needed to determine if resource management activities are improving wildlife habitat, preserving and enhancing water quality, and restoring the health of land impacted by development. Monitoring will also determine the extent to which traditional activities such as timber harvesting, hunting, and fishing affect biological diversity and wildlife populations, as well as the nature of those impacts.

Implementation items:

1. Identifying areas that contain important riparian, wildlife, archeological, paleontological, or soil resources and prohibiting or minimizing impacts (recreational, timber, etc) in these areas;

2. Establishing "resource protection zones" and "special management areas" throughout the holding to demonstrate best management practices for maintaining and/or restoring land health in these areas;

3. Using native tree and plant species to restore areas impacted by disturbance;

4. Managing wildlife and improving wildlife habitat to the maximum extent possible by creating corridors and open areas for movement;

5. Protecting or establishing native shrubs, trees or other vegetation along streams (distance depends on surrounding land use) to help prevent bank erosion, trap sediment and filter other pollutants;

6. Planning forestry activities and other land disturbing activities to protect riparian zones and water quality by conducting these activities outside of the riparian buffer and by taking steps to reduce run-off;

7. Planning forestry and other land disturbing activities to reduce habitat fragmentation by developing a forestry plan that is consistent with providing quality habitat; and

8. Monitoring for and managing invasive species on site that threaten natural resource conservation value.

9. Monitoring natural resource management and user impacts

Natural Resource Enhancement

Objectives:
The second highest priority of FODR is to go beyond habitat protection and enhance the land and aquatic health of its holdings. By managing its uplands and by creating additional habitat, FODR hopes to attract and maintain a higher biodiversity of species, including songbirds, waterfowl and nongame species. An additional objective of habitat enhancement is the creation of a scenic forest.

Land health management practices, such as forestry, are important natural resource value conservation enhancement activities. Much of the land around the Dragon Run is in pine plantation. Either conversion of these lands to hardwood forest or harvesting of these pine stands at the appropriate interval or would be beneficial to enhancing the habitat value of the holding. FODR will take steps to develop plans in concert with the Virginia Department of Forestry (VDOF) or other resource experts to design a forest management plan for each site where habitat enhancement is necessary, feasible and practicable.

Enhancement to provide habitat for key species, such as songbirds, waterfowl and non-game species, is also a priority of FODR. Many species rely on a specific type of habitat for some or all of their life cycles. For example, loss of habitat (feeding, stopover or wintering) is a significant threat to migratory songbirds. By working with natural resource specialists, FODR can increase the amount of these key habitats or features on their holdings. The United States Department of Agriculture's Natural Resource Conservation Service also offers cost-share programs, such as Wildlife Habitat Incentive Program (WHIP) that may assist in fulfilling this objective. Many waterfowl are limited by a lack of nesting habitat. A typical solution to draw more waterfowl to an area is to construct wood duck boxes. County Extension agents can provide construction plans and details for building and managing wood duck nest boxes.

Additionally, the implementation of forestry management plans and habitat enhancement practices will both improve the scenic value of a conservation holding.

Implementation items:
1. Preparing a forestry management plan in concert with VDOF for each site where appropriate to design a strategy to convert to a hardwood forest or to maintain pine plantations at appropriate intervals;

2. Planning timing of forestry and other land disturbing activities to limit impact on key nesting bird species;

3. Establishing “resource protection zones” and “special management areas” throughout the holding to demonstrate best management practices for restoring land health in these areas;

4. Constructing, mounting and maintaining wood duck boxes to attract waterfowl; and

5. Planting native vegetation to enhance habitat value and provide foodstock to waterfowl and other species.

Recreation and Education/Research

Objectives:
When it does not conflict with the protection and enhancement of natural resources objectives, using the holdings for recreation and education/research is another primary objective of FODR acquisitions. The purpose of this objective is to foster an understanding and appreciation for the Dragon Run, its uniqueness and the value of open space.

Traditional recreation such as hunting, fishing, kayaking and hiking will be preserved but limited to areas where these activities are compatible with resource management strategies. Recreational usage of environmentally sensitive areas or areas where significant ecological resources exist will be restricted or prohibited. Educational and interpretive opportunities will be expanded to expose visitors to the unique natural and cultural characteristics of the holding and as well as to efforts to preserve the area for the enjoyment of future generations. A limited number of opportunities for recreation enhancement (such as trails or water access points) may be created if evidence suggests that developing these new facilities will not significantly impact environmental resources or natural resource management.

This strategy will seek to educate visitors about resource management activities taking place in “special management” areas, environmentally sensitive areas, and places where land managers are re-establishing native, natural communities.

Implementation items:
1. Maintaining trails and facilities to minimize erosion;

2. Confining recreational activities to appropriate areas and restricting or prohibiting recreational access to environmentally sensitive areas by creating “recreation buffer zones”.

3. If the holding is to be used to access the waterway, establishing one or limited water access sites to minimize user impact on riparian buffer; and

4. Providing education information on the conservation value of the holding through FODR kayak trips, newsletter and other instruments.

Appendix 7: Dragon Flats Adoption Letter and Management Plan

The Nature Conservancy
Protecting nature. Preserving life.™

JUL 23 2008

July 22, 2008

Ms. Sara Stamp
Regional Planner II
Middle Peninsula Planning District Commission
125 Bowden Street
PO Box 286
Saluda, Virginia 23149

Dear Ms. Stamp:

I am in receipt of the "Management Plan for Dragon Flats: The Nature Conservancy," prepared by the Middle Peninsula Planning District Commission under the Dragon Run Special Area Management Plan. The plan is comprehensive and extremely useful for The Nature Conservancy's purpose of managing the Dragon Flats preserve for a mixed pine and hardwood forest indicative of the Coastal Plain while protecting the Bald cypress swamps and in the integrity of the aquatic system in the Dragon.

Thank you for providing this important service to The Nature Conservancy. We will incorporate the recommendations of the plan into our overall preserve management and will implement those recommendations per our preserve management policies and as capacity allows.

We continue to appreciate and benefit from our partnership with the PDC and Dragon Run SAMP. We are fortunate to have great partners in the watershed that complement our work. I look forward to what our future endeavors will produce.

Sincerely,

Andrew D. Lacatell
Director, Chesapeake Rivers Program
The Nature Conservancy

cc: Mark Romagosa, TNC
Gwynn Crichton, TNC

Management Plan for Dragon Flats: The Nature Conservancy

Prepared by:
Middle Peninsula Planning District Commission
Dragon Run Special Area Management Plan

Modeled after:
Stamp, S.E. 2007. Management Plan for Dragon Run Tract: Virginia Estuarine and Coastal Research Reserve. Dragon Run Special Area Management Plan #07-01. Middle Peninsula Planning District Commission. Dragon Run Special Area Management Plan. Saluda, Virginia. 33 pp. plus appendices.

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Management Plan for Dragon Flats The Nature Conservancy

2007

Dragon Run Special Area Management Plan Technical Report 07-02

Middle Peninsula Planning District Commission
Dragon Run Special Area Management Plan
125 Bowden Street
PO Box 286
Saluda, Virginia 23149
(804) 758-2311

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We'd like to acknowledge the Management Plan for Goodwin Islands: Chesapeake Bay National Estuarine Research Reserve -Virginia. Natural Heritage Technical Report #05-03 by Virginia Department of Conservation and Recreation, Division of Natural Heritage from which we borrowed heavily and/or copied outright in some instances.

This Management Plan for the Dragon Flats was compiled, developed, and completed with the combined expertise of individuals from Department of Game and Inland Fisheries, The Nature Conservancy and the Middle Peninsula Planning District Commission.

SECTION 1: Management Framework

MANAGING ENTITY

Dragon Flats is owned (fee simple) by The Nature Conservancy (TNC). The primary point of contact for this site is Andy Lacatell, Director, Chesapeake Rivers Program, (804) 644-6800, extension 18, Alacatell@tnc.org, 530 East Main St, Suite 800, Richmond, VA 23219.

MANAGEMENT STRATEGY FOR DRAGON FLATS

Program Overview

The Chesapeake Rivers project area, identified in the Chesapeake Rivers Plan (Appendix A), totaling roughly 1,800 square miles, encompasses the tidal freshwater portions of the Mattaponi, Pamunkey, and lower Rappahannock river systems as well as the non-tidal blackwater river, Dragon Run . The project area, settled by Europeans 400 years ago, is predominately rural and agricultural, dissected by extensive, unaltered rivers and tributaries that flow into the Chesapeake Bay. These rivers systems are home to some of the most pristine and extensive tidal freshwater marsh and swamp communities remaining in the coastal plain of the Chesapeake Bay, providing unique habitat for the federally listed, globally rare *Aeschynomene virginica* (sensitive joint vetch). The marshes also provide critical nursery habitat for native anadromous fishes like shad and herring and nesting grounds for bald eagles, black ducks, king rails and other resident and migratory waterfowl.

The Chesapeake Rivers area has been a focal area for The Nature Conservancy of Virginia (TNC-VA) since 1986. Past efforts have been focused on land protection for rare species such as the sensitive joint vetch. While the landscape of the Chesapeake Rivers appears to maintain its rural and natural character, its future is precarious as the human populations in Newport News/Hampton Roads, Richmond and Fredericksburg continue to grow and sprawl into the project area, with a high demand for open space and freshwater resources. To fulfill TNC's mission to conserve all biodiversity in this area given the impending threats, broader, more holistic strategies are necessary to address freshwater conservation, restoration of degraded ecological systems, and land protection *at the landscape scale*.

As an example of a site best capturing the biodiversity and ecological processes in the Chesapeake Rivers project area, Dragon Flats represents the high quality Bald cypress forests found exclusively on the Dragon Run.

Site Purpose

The primary purpose of Dragon Flats is conservation. Natural resources on this site that make it representative of the ecosystems of the coastal plain include its uniquely pristine swamp habitat and its upland component with significant ecological value. In this context, Dragon Flats is part of one of Virginia's most extensive and relatively unimpacted swamp forest communities, was selected as a site representing one of the Chesapeake Bay's most pristine waterways (Figure 1).

The site priorities at Dragon Flats include: 1) the protection of water quality and the Bald cypress community;; 2) managing the property for compatible human uses; and 3) serving as a demonstration site for forest management.

Policy and Management Approach

The purpose of this management plan is to guide an adaptive resource management process that protects key natural resources on Dragon Flats, utilizes forestry management for habitat development, yet allows for use by traditional groups, such as private hunt clubs.

SECTION 2: Site Background and Resources

INTRODUCTION

Description and Location
Dragon Flats is located east of the New Dragon Bridge on Route 603 (Figure 2). The site is 495.804 acres and includes primarily mixed hardwoods, quality riparian buffer forest and pristine swamp habitat.

The Dragon Run, headwaters to the Piankatank River, is one of the Chesapeake Bay's most pristine waterways. The Dragon Run watershed remains largely undeveloped and represents one of Virginia's most extensive and relatively unimpacted swamp forest communities. The Dragon Run contains the northernmost example of Bald cypress-Tupelo Swamp community in Virginia and four other natural communities (e.g. Fluvial terrace woodland, Tidal Bald cypress-Tupelo Swamp, Tidal Bald cypress-Woodland/Savanna, and Tidal freshwater marsh) and up to fourteen state rare species (Belden, Jr. et al., 2001; Belden, Jr. et al., 2003).

Climate
While detailed climatic data are not specifically available for Dragon Flats, data for nearby Urbanna, VA describe an average annual minimum temperature of (48.7° F) and an average annual maximum temperature of (68.5° F) from 1971 – 2000. Average monthly maximum temps for the same time period are in July (87.8° F) and the average minimum monthly temps are in January (29.8°F). Precipitation is generally well distributed throughout the year with slightly more than average rainfall in the summer and slightly less in the autumn.
Average total precipitation for the same period is (42.22 inches(Southeast Regional Climate Center, 2007). Soils tend to be wettest in winter and early spring due to reduced evaporation and evapotranspiration. Snow can be expected any time from November to April. The average growing season length is approximately 197 days, and although variable, first fall frosts usually occur in late October and the last spring frosts are often in early to mid-April.

As with most parts of Virginia's coastal plain, the Dragon Flats is vulnerable to hurricanes, tropical storms, ice storms and northeasters that affect the Chesapeake Bay and surrounding shores. Northeasters tend to occur in the autumn, winter, and spring. Hurricanes and tropical storms are less frequent, generally more severe, and usually occur in late summer through autumn. Some northeasters may reach the strength of a tropical storm. These storm events can cause drastic changes to the physiography of the site and surrounding area. Most recently, many coastal forests lost a considerable number of trees, many of which remain where they fell, during Hurricane Isabel in September 2003.

Geology, Landforms, Soils
As one of the Chesapeake Bay watershed's most pristine waterways, the Dragon Run "encompasses some of the most extensive and unspoiled swamp forest and woodland communities in Virginia" (Belden, Jr. et al, 2001). Effectively bisecting Virginia's Middle Peninsula located between the York and Rappahannock Rivers, this fresh and brackish water stream meanders forty miles along and through nontidal and tidal cypress swamp.

During the site survey, it was noted that much of the upland area consisted of primarily sandy soils. Richer soils were found in the riparian buffer area and the lands adjacent to the Run itself.

Geological features are described by the following excerpt from *A Natural Heritage Inventory of the Dragon Run Watershed* (Belden, Jr. et al., 2001):
Surficial deposits of riverine terraces bordering Dragon Run from the vicinity of the Essex-Middlesex county line to Meggs Bay belong to the Shirley Formation and the Sedgefield Member of the Tabb formation. The middle Pleistocene Shirley Formation consists of light- to dark-gray, bluish-gray and brown sand, gravel, silt, clay, and peat; the Sedgefield Member is of upper Pleistocene age and consists of pebbly to bouldery, clayey sand and fine to medium, shelly sand grading upward to sandy and clayey silt. Somewhat higher topography away from the waterway is underlain by the Chesapeake Group. This consists of fine to coarse quartzose sand, silt, and clay (variably shelly and diatomaceous) deposited in shallow waters of the upper Pliocene and lower Miocene periods. At still higher elevations, the Windsor Formation is found, consisting of gray and yellowish to reddish-brown sand, gravel, silt, and clay of lower Pleistocene or upper Pliocene age. At higher elevations southwest of Dragon Run, two other formations are prevalent, both of upper Pliocene age. The Bacons Castle Formation is characterized by gray, yellowish-orange, and reddish-brown sand, gravel, silt, and clay and the Moorings Unit by white, light gray, and grayish-yellow quartzose sand and clay to grayish-brown clayey silt and silty clay.

Watershed elevation ranges from 180 feet to near sea-level. Detailed soils information can be found in the Soil Survey for each county. Information about the soil surveys can also be found at the Natural Resources Conservation Service website: http://websoilsurvey.nrcs.usda.gov/app/. Many of the soils in the watershed are considered prime farmland and are suitable for silviculture.

Hydrologic Conditions, Water Quality and Water Quality Monitoring Hydrologic Conditions

Hydrologic Conditions. Watershed boundary hydrologic units CB06, CB07, CB08 and CB09 encompass the Dragon Run Watershed. Hydrologic units are drainage areas that are delineated so as to nest into a multi-level hierarchical drainage system. Aside from the surface waters that are collected within the boundary of a hydrologic unit, it may also accept water from one or more points outside of the unit's boundary. To uniquely identify National Watershed Boundary Database (NWBD) units in Virginia without requiring the use of 10 or 12 digits, the Virginia Department of Conservation and Recreation developed a new four-character internal coding scheme for the 5th and 6th order units of the NWBD. The first two characters of the new code are based on the major stream name in the basin, or portion of the basin, where the unit is located. The two digits that follow these codes are a sequential numbering scheme based on the drainage flow (headwaters to mouth).

The Dragon Run watershed is a fourth-order stream system that is nontidal freshwater above the U.S. Route 17 bridge and tidal freshwater from the U.S. 17 bridge to its mouth at Meggs Bay. There it forms the Piankatank River, where it becomes estuarine, and eventually drains into the Chesapeake Bay. Underground springs, feeder swamps, and surface waters support streamflow in the Dragon Run. Significant tributaries include Dragon Swamp, Yonkers Swamp, Exol

Swamp, Timber Branch Swamp, Briery Swamp, Holmes Swamp, White Marsh, Zion Branch, Carvers Creek, Mill Stream, and Meggs Bay (MPPDC, 2001).

According to the National Wetland Inventory, wetlands (Figure 7) along the Dragon Run are Palustrine, mostly Forested Wetlands except for Emergent Wetlands in Meggs Bay. U.S. Route 17 is the approximate demarcation between tidal wetlands and nontidal wetlands. The hydrologic regime of most Dragon Run wetlands is Seasonally Flooded, Seasonally Flooded-Saturated, or Temporarily Flooded (Belden, Jr. et al., 2001).

The U.S. Geological Survey (USGS) maintained a streamflow gaging station at Church View (Route 602) from 1943 to 1981 that received drainage from 60% of the watershed (84 square miles) and has maintained a streamflow gaging station at Mascot (Route 603) since 1981 that receives drainage from 75% of the watershed (105 square miles). Median daily streamflow at Mascot from 1981 to 1999 was 79 ft3/sec and varied between 0.01-6050 ft3/sec. Median daily streamflow at Church View from 1943 to 1981 was 57 ft3/sec and varied from 0-3790 ft3/sec. Compared to other coastal plain stream systems such as the Chickahominy River (New Kent County), the Mattaponi River (King William County), and Cat Point Creek (Richmond County), the Dragon Run exhibits lower median daily streamflow per square mile of drainage area. Base flow, fed primarily by groundwater discharge, accounts for two-thirds of the Dragon Run's total streamflow, with the remaining third attributable to surface water runoff. Of the annual precipitation, only one-third becomes streamflow, with two-thirds lost to evapotranspiration. Seasonally, streamflow is highest in the spring and lowest in the fall (MPPDC, 2001).

Water Quality. The primary water contaminant sources in the Dragon Run are point source discharges and nonpoint source pollution from precipitation (atmospheric deposition), residential land use, agricultural land use, and forested lands (MPPDC, 2002). According to the Virginia Department of Environmental Quality (DEQ), the Dragon Run generally exhibits medium nutrient levels and is listed as "impaired" for pH, fecal coliform bacteria, mercury, and lead (DEQ, 2002). Based on agricultural, urban, and forested pollution loadings potential determined by DCR, however, the overall nonpoint source pollution potential rating is low for the Dragon Run (DCR, 2002).

Point source discharges, which are permitted and monitored by the Virginia Department of Environmental Quality, are relatively easy to quantify and, in turn, control or track. Point source discharges to the Dragon Run include: stormwater runoff from a wood treatment facility (arsenic, chromium, copper) at Pitts Lumber Company, Inc. to an intermittent stream adjacent to U.S. Route 17 in Middlesex County (Permit #VA0083011); discharge from a sewage treatment plant (biological oxygen demand, total suspended solids, ammonia nitrogen, total residual chlorine, pH, fecal coliform) at Rappahannock Community College to an intermittent stream near Glenns in Gloucester County (Permit #VA0028461); and discharge from a wellwater treatment plant (pH, total suspended solids) at the Miller's Square Subdivision to an intermittent stream near Miller's Tavern in Essex County (Permit #VA0075302). According to the Shoreline Sanitary Survey (Smither et al., 2003), there are 9 other indirect sources of pollution, including five animal pollution sources (Middlesex County near Saluda and Stormont and Gloucester County near Glenns); a solid waste dumpsite in Middlesex County near Stormont; and a potential pollution source in Middlesex County in Saluda. Furthermore, a network of water quality

monitoring wells is maintained at the Browning-Ferris Industries landfill in King and Queen County.

Throughout the Chesapeake Bay, atmospheric deposition (e.g. precipitation) contributes a significant amount of the total nutrient loadings in coastal waters (MPPDC, 2001). Wet deposition is measured in the watershed. Air quality is not currently monitored in the watershed, although the Virginia Department of Environmental Quality does take some air quality measurements in West Point in close proximity to the watershed boundary

More than 90% of residents in Gloucester, King and Queen, and Middlesex Counties use on-site wastewater treatment systems, commonly known as septic systems (MPPDC, 2001). When operated properly, conventional septic systems remove nutrients and fecal coliform. Conventional septic systems can pose potential environmental and health risks due to inappropriate design, poor maintenance, poor soils, or inefficient nitrogen removal. Driven by changes to Department of Health regulations for on-site wastewater treatment systems (12 VAC 5-610-10 et seq. effective July 2000), the popularity of non-conventional on-site wastewater treatment systems is increasing. These alternative systems, when properly maintained, can be effective at removing nutrients and fecal coliform in areas where conventional septic systems are ineffective. Regardless of the type, however, improperly maintained or failing septic systems pose significant environmental and health risks by contributing nutrients, pathogenic bacteria, and viruses to groundwater.

Forested lands, representing a significant land area, yield low nutrient input to streams relative to other land uses in the watershed. Best Management Practices (BMPs) are designed to minimize these inputs. For example, forested riparian buffers provide effective protection for water quality. The watershed currently exhibits intact riparian buffers. By contrast, agricultural land use in rural and semirural areas in Virginia can be the source of significant sediments, fecal coliform bacteria, and nutrients such as nitrogen and phosphorus. Nitrogen is transported through the groundwater, whereas phosphorus is generally transported on soil particles in surface water. BMPs such as fencing cattle out of streams, conservation tillage, and expanded riparian buffers are designed to minimize these inputs.

Residential and commercial land uses typically contribute less nutrients and sediments than agriculture, but more than forestry. These residential and commercial contributions are mainly attributable to reduced or no riparian buffers, chemical application for landscaping, and stormwater runoff.

Water Quality Monitoring. Water quality data sets in the watershed are sparse in quantity, duration, and parameters measured. Existing data sets include: STORET, a database managed by the Virginia Department of Environmental Quality (DEQ); data collections during fish surveys by the Virginia Department of Game and Inland Fisheries (DGIF) and Virginia Commonwealth University (VCU); data collections by the Chesapeake Bay National Estuarine Research Reserve in Virginia at the Virginia Institute of Marine Science (VIMS); and a short-term volunteer water quality monitoring program in the watershed (MPPDC, 2001). CBNERRVA established and maintained a continuous (15 minute) water quality station at the Route 603 bridge near Mascot during 2003 through 2005. Measured parameters included depth, temperature, specific

conductance, dissolved oxygen, turbidity and pH; data are available through the Virginia Estuarine and Coastal Observing System web portal.

Two stations are currently sampled regularly by the DEQ. Station DRN003.40 is located at the U.S. Route 17 bridge and Station DRN010.48 is located at the Route 603 bridge near Mascot. Data are available from DRN003.40 for the period 1968-1974 and 1992- present and from DRN010.48 for the period 1992-present. Samples are evaluated bimonthly for nutrients, fecal coliform, suspended solids, dissolved oxygen, pH, salinity, and temperature and are occasionally evaluated for pesticides, toxic metals, and other harmful compounds (MPPDC, 2001). Data sets collected at these sampling stations were used by the DEQ to list the Dragon Run as "impaired" for pH and fecal coliform bacteria. The DEQ attributes the pH impairment to natural causes, citing the acidic nature of water in swamps. The DEQ lists the cause of the fecal coliform and mercury and lead impairments as unknown. Potential sources of fecal coliform bacteria include: wildlife; failing septic systems; and livestock. Potential sources of metals include: atmospheric deposition; automobile and roadway deposits; and industrial operations. Fish tissue samples were also used by the DEQ to list the Dragon Run as "impaired" for mercury and lead. The Virginia Department of Health issued a health advisory for the Dragon Run for mercury contamination in largemouth bass (DOH, 2003).

Data collected by the DGIF in 1995-1996 and 1998 includes temperature, Secchi depth, pH, dissolved oxygen, conductivity, salinity, alkalinity, hardness, and total dissolved solids. Nutrient data are very limited and were frequently below detection limits. Dissolved oxygen at sampling stations with no or low flow frequently violated daily minimum standards to support aquatic life (MPPDC, 2001).

VIMS data from 2000-2001 measured temperature, salinity, total dissolved solids, pH, dissolved inorganic nitrogen, and fecal coliform bacteria. Of specific note, samples from Briery Swamp exhibited high nitrate and fecal coliform levels, indicating the presence of subsurface agricultural or wastewater drainage (MPPDC, 2001).

Site History

The Dragon Run plays a central role in the Middle Peninsula's culture and identity. Its intriguing name is frequently borrowed by local enterprises and establishments and is often overheard in community conversations. Since European settlement in the early 1600's and Native American inhabitation up to 10,000 years before that, natural resources have been the bedrock of the watershed's economy. For older generations, forestry, farming, hunting, trapping and fishing were the primary ventures. Today, forestry and farming continue to generate wealth and drive the watershed's economy. Upholding an ancient tradition, hunters range over prime hunting grounds stalking prized game. These land uses, together with extensive swamps, are the main reasons that the Dragon Run remains wild and secluded.

While no archeological artifacts have been found for the site according to the Virginia Department of Historic Resources, the New Dragon Bridge is considered to be a point of navigational significance. In the late mid 1800s, the Dragon Swamp Navigation Company attempted to construct a navigational channel to allow for transportation (primarily of timber) from the Dragon Run to the Piankatank and on to the Chesapeake Bay. This channel was not

utilized and considered to be a failure. The channel has since returned to its natural state and is virtually undistinguishable from the surrounding landscape.

Surrounding Land Use
The watershed is mainly undeveloped, almost entirely privately-owned, and encompasses approximately 140 square miles (90,000 acres) of rural landscape – mostly forests, farms, and wetlands. The spring-fed Dragon Run flows through portions of Essex, King and Queen, Middlesex, and Gloucester Counties, emptying into the estuarine Piankatank River and ultimately the Chesapeake Bay.

Land cover data (Figure 5) indicate that the watershed is 80.3-83.9% forested and wetlands, 15.1-18.4% agricultural, and 1.0-1.3 % commercial and residential (MPPDC, 2002; DCR, 2003). The Dragon Run watershed lies within the transitional Oak-Pine vegetation region where dominant oaks share the forest with Virginia pine, shortleaf pine, and loblolly pine. Although loblolly pine originally appeared in the forest as scattered associates of oaks and other hardwoods, loblolly pine plantations are increasingly common.

In recent years, several public and non-governmental organizations have been actively acquiring land in the Dragon Run watershed for conservation or conservation-compatible purposes. These entities include the Middle Peninsula Chesapeake Bay Public Access Authority, the Friends of Dragon Run, the Nature Conservancy and VIMS. Other conservation holdings in the vicinity of the Dragon Bridge Tract can be seen on Figure 6.

Associated Natural Resources
The watershed's wilderness is both expansive and unique. The Dragon Run contains the northernmost example of the Bald cypress-Tupelo Swamp natural community in Virginia and the best example north of the James River (Belden, Jr. et al., 2001). Natural Heritage Areas are numerous throughout the Dragon Run. Moreover, 14 rare species and 5 rare natural communities are found here (Appendix B). Based on his investigations of the watershed's aquatic communities, one researcher observes that the Dragon Run is a "100 year old time capsule," resembling coastal plain streams in the Chesapeake Bay region at the turn of the 20th century (Garman, 2003).

NATURAL HERITAGE RESOURCES

Overview
Natural heritage resources are defined in the Virginia Natural Area Preserves Act (Section 10.1-209 through 217, Code of Virginia), as "the habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest benefiting the welfare of the citizens of the Commonwealth." Natural heritage resources are the most likely natural resources to be lost without conservation action in the near future. DCR-DNH inventories and compiles lists of the natural heritage resources of the state.

Since the watershed is relatively intact, it contains many unique resources. Natural heritage resources are abundant in the Dragon Run. Several rare natural communities occur in the Dragon

Run, including Bald cypress-Tupelo Swamp, Tidal Bald cypress-Tupelo Swamp, Tidal Bald cypress Woodland/Savanna, Fluvial Terrace Woodland, and Tidal Freshwater Marsh.

Biodiversity Significance
A variety of rarity patterns exist based on the geographic range, habitat specificity and local abundance of species (Rabinowitz, 1981). Standard Natural Heritage methodology ranks plants, animals, and natural communities on two scales of rarity. The global rank (G-rank) and state rank (S-rank) are based on the number of occurrences of a species at a global scale and state scale, respectively (see Appendix C). G- and S-ranks help direct conservation actions to the rarest species and communities since these are usually the most vulnerable to extinction.

Natural Communities
The inventory and classification of natural communities constitute an important "coarsefilter" approach to biological conservation that ensures the protection of diverse organisms. The identification and protection of excellent examples of all natural community types facilitates the protection of the majority of component native plant and animal species, including a host of taxa too cryptic, poorly known, or numerous to receive individual management strategies.

At present DCR-DNH classifies communities principally at the level of *ecological community group*, which represents a broadly defined unit based on combinations of topographic, edaphic, physiognomic, and gross floristic similarities (Fleming et al., 2004).

Given below are brief descriptions of the primary ecological community groups and their respective ecological community type(s) occurring in the Dragon Run.

Bald cypress-Tupelo Swamp. Forests in this group occupy seasonally to semipermanently flooded backswamps, sloughs, and first bottoms of Coastal Plain rivers and streams. These swamp forests occur throughout the Coastal Plain from Delaware south to Florida and west to eastern Texas, and in the Mississippi River alluvial basin north to Kentucky. They are distributed throughout southeastern Virginia, north to Dragon Swamp (Gloucester, King and Queen, and Middlesex Counties). Habitats are deeply flooded (up to 1.3 m) for part of the year; many retain at least some standing water throughout the growing season. Microtopography is often pronounced with small channels, swales, tree-base hummocks, and numerous Bald cypress "knees." Overstory composition varies from mixed stands of Bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), and/or swamp tupelo (*Nyssa biflora*) to nearly pure stands of one species or another. The three dominants have complex competitive and successional relationships. As a rule, the two tupelos are less shade-tolerant than Bald cypress and regenerate more readily by sprouting in cut-over stands. Thus, tupelos tend to become dominant when Bald cypress stands are heavily logged. In addition, swamp tupelo appears to be most abundant in organic swamp soils, while water tupelo appears to prefer mineral soils with high silt content.

Green ash (*Fraxinus pennsylvanica*), overcup oak (*Quercus lyrata*), American elm (*Ulmus americana*), and red maple (*Acer rubrum*) are occasional overstory associates and frequent understory trees; swamp cottonwood (*Populus heterophylla*) is also an occasional overstory associate and often abundant in disturbed or cut-over stands. Carolina ash (*Fraxinus caroliniana*)

is often dominant in the small tree and shrub layers, while vines of climbing hydrangea (*Decumaria barbara*) and red-berried greenbrier (*Smilax walteri*) are often abundant.

Herb layers vary from sparse to seasonally lush. Most herbaceous plants of Bald cypress-tupelo swamps are tolerant of muck soils and fluctuating water levels, or are capable of becoming established on tree hummocks, stumps, and logs. A few of the typical herbs are lizard's-tail (*Saururus cernuus*), false nettle (*Boehmeria cylindrica*), Walter's St. John's-wort (*Triadenum walteri*), swamp beggar-ticks (*Bidens discoidea*), weak stellate sedge (*Carex seorsa*), giant sedge (*Carex gigantea*), taperleaf bugleweed (*Lycopus rubellus*), catchfly cutgrass (*Leersia lenticularis*), and pale mannagrass (*Torreyochloa pallida*). Draw-down zones may support large populations of false pimpernel (*Lindernia dubia* var. *dubia*), marsh fleabane (*Pluchea camphorata*), horse-tail paspalum (*Paspalum fluitans*), Carolina boltonia (*Boltonia caroliniana*), and other fast-growing herbs. This group differs from Coastal Plain / Piedmont Swamp Forests in the clear dominance or co-dominance of Bald cypress and tupelos (vs. dominance of mixed hardwoods) and apparently by longer hydroperiods and more deeply flooded habitats. It is distinguished from Non-Riverine Swamp Forests, which are also dominated by Bald cypress and tupelos, by habitat (floodplains vs. non-riverine peatlands) and lower-strata floristics.

Although community types in this group are relatively common, high-quality examples are scarce and all stands provide valuable wildlife habitat and resources. Mature, hollow specimens of the dominant trees are known to provide nesting habitats for the globally uncommon, state-rare eastern big-eared bat (*Corynorhinus rafinesquii macrotis*) and southeastern myotis (*Myotis austroriparius*). Old-growth stands of Bald cypress-dominated swamp with trees up to 800 years old occur along the Blackwater River in Surry and Isle of Wight Counties. However, the largest individuals of both Bald cypress and water tupelo occur in swamps along the Nottoway River in Southampton County.

References: Fleming and Moorhead (1998), Parker and Wyatt (1975), Plunkett and Hall (1995).

Tidal Bald cypress Woodland. Coniferous or mixed swamp forests and woodlands dominated by Bald cypress (*Taxodium distichum*) are known only from the upper tidal reaches of rivers in Maryland, southeastern Virginia and North Carolina. Examples are documented in Virginia from the lunar-tidal Dragon Swamp / Piankatank River (Gloucester, King and Queen, and Middlesex Counties), Chickahominy River (Charles City, James City, and New Kent Counties), and James River (Isle of Wight and Surry Counties); and the wind-tidal Northwest and North Landing Rivers (City of Chesapeake and Virginia Beach). At some sites, these communities occur in ecotones between tidal marshes and non-tidal backswamps or uplands.

In lunar-tidal stands, Bald cypress (*Taxodium distichum*) dominates an open to very open overstory, with or without hardwood associates such as swamp tupelo (*Nyssa biflora*), water tupelo (*Nyssa aquatica*), and green ash (*Fraxinus pennsylvanica*). Stand structure and canopy cover range from closed forest to very open woodland. Shrub and herb layers are variable but generally contain a mixture of species characteristic of both marshes and swamps. Some well-developed tidal Bald cypress forests appear floristically similar to palustrine Bald cypress-Tupelo Swamps. Other stands have a nearly monospecific herb dominance by shoreline sedge

(*Carex hyalinolepis*). In a unique, possibly fire-influenced, savanna-like stand on the Northwest River, the herbaceous dominants, in rough seasonal order, are silvery sedge (*Carex canescens* ssp. *disjuncta*), spikerushes (*Eleocharis fallax and Eleocharis rostellata*), marsh rattlesnake-master (*Eryngium aquaticum* var. *aquaticum*), and wild rice (*Zizania aquatica* var. *aquatica*).

A distinctive, mixed tidal swamp forest in extreme southeastern Virginia is subject to irregular wind-tidal flooding. As currently defined, this community type appears to be a globally rare endemic of the Embayed Region of southeastern Virginia and northeastern North Carolina; similar communities, however, may also occur in Maryland and Delaware. In Virginia, stands are confined to the North Landing and Northwest Rivers (Cities of Virginia Beach and Chesapeake), estuarine tributaries of Currituck Sound. Although these systems are no longer influenced by lunar tides because of inlet closures, they are subject to wind-driven currents that produce as much as 1 m (3 ft) of variation in water levels and contribute to a salinity regime that fluctuates between completely fresh and about 5 ppt. This forest borders the wind-tidal marshes along the lower portions of the two rivers, extending well upstream of the limit of marshes in narrowing channel-side belts. It appears to represent a long-term seral stage in succession from marsh to swamp forest. Habitats have a pronounced hummock-and-hollow microtopography, with an average flooding depth 40 cm (16 in) above the hollow bottoms. Soils are coarse, fibric peats that appear indistinguishable from adjacent marsh peats. Bald cypress (*Taxodium distichum*), swamp tupelo (*Nyssa biflora*), and loblolly pine (*Pinus taeda*) are the dominant overstory trees in variable combinations. Spanish moss (*Tillandsia usneoides*) is locally abundant, festooning the trees in some stands. Sweetbay (*Magnolia virginiana*) and red bay (*Persea palustris*) are scattered understory trees, while southern bayberry (*Myrica cerifera* var. *cerifera*) dominates the shrub layer. The herb layer is diverse, containing species characteristic of both marshes and swamps, but royal fern (*Osmunda regalis* var. *spectabilis*) often dominates. This type differs from vegetation of the Maritime Wet Pine Forests group, which also contains loblolly pine, southern bayberry, and royal fern, in its tidally flooded hydrologic regime (vs. non-tidal saturated hydrology, the co-dominance of Bald cypress,) and the prevalence of numerous, flood-tolerant swamp species.

The environmental dynamics, compositional variation, and state-wide distribution of Tidal Bald cypress Forests and Woodlands are not well known and need intensive study.

Reference: Fleming and Moorhead (1998).

Fluvial Terrace Woodland. This is a somewhat enigmatic group of communities occurring on flat, sandy terraces and islands along Coastal Plain rivers in eastern Virginia. These habitats are elevated well above the level of adjacent swamps and are characterized by xeric, sandy soils and open forest or woodland vegetation. Single occurrences have been documented along the Nottoway River (Sussex County), Chickahominy River (New Kent County), Dragon Swamp (Middlesex County), and Mattaponi River (Caroline County). At all four sites, hickories (*Carya pallida* and *Carya alba*) are the dominant trees, with drought-tolerant oaks (*Quercus falcata*, *Quercus nigra*, *Quercus marilandica*, *Quercus alba*) and pines (*Pinus taeda*, *Pinus virginiana*) present in smaller numbers. Shrubs occurring at all or most sites include sand post oak (*Quercus margarettiae*), sweetleaf (*Symplocos tinctoria*), American holly (*Ilex opaca* var. *opaca*), and eastern red cedar (*Juniperus virginiana* var. *virginiana*). Typical herbs include sedges (*Carex*

albicans var. *australis* , *Carex pensylvanica* , and *Carex tonsa*), Canada frostweed (*Helianthemum canadense*), butterfly-pea (*Clitoria mariana*), late goldenrod (*Solidago tarda*), and prickly-pear (*Opuntia humifusa* var. *humifusa*). The Dragon Run site is anomalous in the presence (despite low soil pH and base status) of several calciphiles such as eastern redbud (*Cercis canadensis* var. *canadensis*), wild columbine (*Aquilegia canadensis*), smooth rock-cress (*Arabis laevigata* var. *laevigata*), robin's-plantain (*Erigeron pulchellus* var. *pulchellus*), and elm-leaved goldenrod (*Solidago ulmifolia* var. *ulmifolia*). A full understanding of the status and compositional relationships of this group will require additional inventory and assessment.

Tidal Freshwater Marsh. This is a diverse group of herbaceous wetlands subject to regular diurnal flooding along the upper tidal reaches of inner Coastal Plain rivers and tributaries. Ranging from New York to North Carolina, freshwater marshes occur in the uppermost portion of the estuarine zone, where the inflow of saltwater from tidal influence is diluted by a much larger volume of freshwater from upstream. In Virginia, tidal freshwater marshes are best developed on sediments deposited by large meanders of the Pamunkey and Mattaponi Rivers, although outstanding examples also occur along the Potomac, Rappahannock, Chickahominy, and James Rivers. Strictly speaking, freshwater conditions have salt concentrations < 0.5 ppt, but pulses of higher salinity may occur during spring tides or periods of unusually low river discharge.

The most common species are arrow-arum (*Peltandra virginica*) dotted smartweed (*Polygonum punctatum* var. *punctatum*), wild rice (*Zizania aquatica* var. *aquatica*), pickerelweed (*Pontederia cordata*), rice cutgrass (*Leersia oryzoides*), tearthumbs (*Polygonum arifolium* and *Polygonum sagittatum*), and beggar-ticks (especially *Bidens laevis* and *Bidens coronata*). Locally, sweetflag (*Acorus calamus*), waterhemp pigweed (*Amaranthus cannabinus*), marsh senna (*Chamaecrista fasciculata* var. *macrosperma*), and southern wild rice (*Zizaniopsis miliacea*) may form dominance patches. Species diversity and vegetation stature vary with salinity, duration of inundation, and disturbance; the most diverse marshes occupy more elevated surfaces in strictly freshwater regimes. Mud flats that are fully exposed only at low tide support nearly monospecific stands of spatterdock (*Nuphar advena*), although cryptic submerged aquatic species may also be present.

Tidal freshwater marshes provide the principal habitat for the globally rare plant sensitive joint-vetch (*Aeschynomene virginica*) and are important breeding habitats for a number of birds, *e.g.*, the least bittern (*Ixobrychus exilis*) . Chronic sea-level rise is advancing the salinity gradient upstream in rivers on the Atlantic Coast, leading to shifts in vegetation composition and the conversion of some tidal freshwater marshes into oligohaline marshes. Tidal Freshwater Marshes are also threatened by the introduced invasive plant marsh dewflower (*Murdannia keisak*). Several communities in this group are chiefly restricted to the Chesapeake Bay drainage basin and are likely globally rare or uncommon.

References: Ahnert (1960), Coulling (2002), McCoy and Fleming (2000), Megonigal and Darke (2001), Parker and Wyatt (1975), Perry and Atkinson (1997), Perry and Hershner (1999).

Rare Plant and Animal Species. The Bald cypress-Tupelo Swamp community also harbors a number of rare plant and animal species. Rare animals include the bald eagle, great purple

hairstreak, blackwater bluet, robust baskettail, cypress sphinx, Selys' sunfly, fine-lined emerald and Southern pitcher-plant mosquito. Rare plants include cuckooflower, red turtlehead, Parker's pipewort, pineland tick-trefoil, river bulrush, Northern purple pitcher-plant, and cypress-knee sedge (Belden, Jr. et al., 2001; Belden, Jr. et al., 2003). The Dragon Run also harbors a number of rookeries for colonial water birds, such as egrets and herons. Other natural communities that occur in the Dragon Run include: Coastal Plain/Piedmont Bottomland Forest; Coastal Plain/Piedmont Acidic Seepage Swamp; and Coastal Plain Semipermanent Impoundment (Belden, Jr. et al., 2003).

In addition to natural heritage resources, the Dragon Run supports a diversity of freshwater and estuarine fishes, aquatic macroinvertebrates, freshwater bivalves (primarily unionid mussels), and herptefauna (amphibians and reptiles) (McIninch et al., 2003). At least forty-five fish species from nineteen families have been collected in the Dragon Run, representing a mixed assemblage of mostly lowland freshwater forms that is highly dynamic spatially and temporally. At least sixty-five macroinvertebrate species from fourteen orders and forty-seven families have been recorded from the Dragon Run.

SECTION 3: Management Guidance

RESOURCE STEWARDSHIP

Goals and Objectives

The primary goal of management at Dragon Flats is to maintain a pristine ecosystem with a matrix of communities native to the site that will provide for high biodiversity, water quality and habitat protection, and a high quality forest block. The philosophy and policy direction for management of Dragon Flats is supported by goals and objectives found in the Chesapeake Rivers Site Conservation Plan in Appendix A. Management and monitoring actions, as well as cooperative management initiatives and protection strategies, are planned based on the best current information and available resources.

Management objectives for Dragon Flats include:

- Maintain and protect key pristine swamp habitat, primarily the Bald cypress communities.
- Protect water quality by maintaining quality functioning riparian buffers.
- Manage site to provide for a high quality forest block.
- Manage the site for future compatible human uses.
- Manage habitat and uses to ensure long-term quality of environment.
- Prevent invasive species from taking hold.
- Manage habitat to benefit the array of natural resources, scenic resources, and historic resources.
- Monitor and evaluate effects of management on plants, animals, and natural communities.
- Maintain populations of rare or uncommon plants and animals.
- Foster consistency with surrounding parcel land uses.
- Ensure site-security and visitor safety.

SITE MANAGEMENT GUIDE

Aquatic and Wildlife Habitat Management Issues

Biological resource management actions shall be taken to preserve and maintain the pristine nature of the swamp community and to utilize the upland area of the site as quality riparian buffer habitat. Due to the current pristine state of the ecosystem of the swamp community on the site, preventing ecosystem degradation is more applicable than ecosystem restoration. Regarding the upland portion of the site, the primary goal is to manage the area to remain a high quality habitat that provides superior buffer qualities to protect the swamp portion of the site. Figure 3 displays the current composition of Dragon Flats.

Major threats to biodiversity generally include: habitat degradation/loss, invasive non-native species, pollution, overexploitation, disease, land conversion to development, water development (e.g., dams, drainage projects), some agricultural practices, livestock grazing, some outdoor recreation (e.g. off-road vehicles), pollutants, infrastructure development (e.g. roads), disruption of fire regimes, logging, and mining activities (Wilcove et al., 1998). After habitat loss, invasive

non-native species are the greatest threat to terrestrial species. For aquatic species, water pollution is the most significant threat after habitat loss (Richter et al., 1997). Because of these threats to biodiversity, active management is often needed to restore and maintain natural resources (Wilcove and Chen, 1998).

Biological issues of greatest concern and most likely to cause negative impacts to natural resources at Dragon Flats are potential invasive species introduction/expansion, use and development pressures outside the reserve, and native animal populations lacking natural abundance controls. Due to the permission-only use management schema of the site, habitat degradation by users should be relatively limited.

Upland/riparian buffer management. The establishment and maintenance of riparian buffers is recognized as a significant protection mechanism of both water quality and key swamp ecosystems. One of the principle components of the management goals includes the establishment of a riparian buffer along Dragon Run and associated riparian zones. The most obvious buffer line is the road on western edge of the property that parallels the creek. The Virginia Department of Game and Inland Fisheries (DGIF) site surveyor's recommendation to achieve this goal is to leave the mixed hardwood forest in the bottomland to serve as riparian buffer. This leaves the upland planted pines as the area for management activities. As the exact direction of management activities had not been fully scoped by The Nature Conservancy, several options are listed with an attempt at discussing the pros and cons of each.

The planted pines (Appendix G) appear to be in excellent condition and will need to be thinned at the appropriate time (approx. 5-10 yrs [is this age or in 5-10 years]), allowing a lot of understory growth that is excellent for early successional species. As the trees continue to mature, TNC will have a couple of options. Trees should reach a harvestable size (consultation with a certified forester is recommended) in the next 10-15 years. At that point, a decision to harvest the timber or allow the pine trees to continue growing past their prime and eventually die must be made. As the pines die off, the forest will change into a mixed pine hardwood forest (most likely with more of a pine component since oak, beech or hickory species in the understory were not found in high quantities; there were a few yellow poplar saplings in certain areas). If the goal is to eventually have an old growth forest, then the only option is to allow the forest to change over time.

The DGIF site surveyor recommendation is to manage the existing pine forest in similar fashion to neighboring pine forests on different properties. It appears that most of them are naturally regenerated pine forests that are harvested at different periods. If this option is chosen, then maintaining the log decks and planted food plots in an early successional state would fit with management goals. They can be planted in clover or a similar perennial species or allow them to revegetate naturally and mechanically set it back every three years or so. This method would also allow the harvest of different stands of timber for a monetary income that can be reinvested into conserving wetland habitat of performing management activities.

Prescribed fire. Burning can be an important tool for promoting early successional growth in a pine ecosystem, especially once the pines grow large enough to shade out the understory. The existing road network can serve as fire breaks for future management activities and can be

planted for wildlife food sources with just a few minor changes. In order to make effective fire breaks, the roads need to be widened slightly by clearing 10 ft from the center to each side of the road. The roads will also have to be extended to completely surround the upland forested acres. As they exist now, they will not work as fire breaks. Road sides can then be planted in a perennial clover to serve as erosion control and a wildlife food source. As part of a timber harvest plan, the loggers may be able to create roads for TNC while removing certain areas of timber as required. Once created, roads can be maintained as fire breaks very easily.

Key habitat and Natural Heritage Resource protection zones. Areas identified as key habitat, such as the swamp habitat and its riparian buffer should be prevented from being negatively impacted by site activities. Most, if not all, of the Natural Heritage Communities may be found in these zones. Therefore, protection of these zones (Figure 4) is equivalent to protection of the Natural Heritage Communities. Any activities that may damage these habitats should be prohibited and this guidance establishing this prohibition should be enforced.

Threat mitigation.

Invasive, non-native species. The watershed contains only limited examples of invasive, or non-native, species, again emphasizing a relatively intact natural system. Currently, blue catfish, common reed, Asiatic dayflower, Chinese Lespedeza and Japanese stiltgrass occur in the Dragon Run in limited quantities. Nationwide, however, invasive species have been identified as the second highest threat to biological diversity, second only to loss of species and habitat from development and urban sprawl (Stein et al., 2000). Control of invasive non-native plants is expensive, resources are limited, and management efforts must be prioritized (Hiebert and Stubbendieck, 1993). The goal of management at Dragon Flats is to prevent the worst invasive species from becoming established in its high-quality natural communities. While no invasive species were found during the site survey, the managing entity should continue to monitor for these species and prevent their occurrence.

At nearby Dragon Bridge Tract, owned by the Virginia Institute of Marine Science, the following invasive species was noted: Chinese Lespedeza (*Lespedeza cuneata* (sericea lespedeza)).

Chinese Lespedeza (*Lespedeza cuneata* (sericea lespedeza)). Chinese lespedeza, sometimes called sericea lespedeza, is primarily a threat to open areas such as meadows, prairies, open woodlands, wetland borders and fields. Once it gains a foothold, it can crowd out native plants and develop an extensive seed bank in the soil, ensuring its long residence at a site. Established dense stands of lespedeza suppress native flora and its high tannin content makes it unpalatable to native wildlife as well as livestock.

Native animal problem species. Due to overabundance, certain native species of animals have become problematic – from both ecological and economic perspectives. While these species are native to Virginia, recent population increases have resulted in negative effects on habitat. Overabundance of some species is often incompatible with a broad array of resource management objectives. For ecological and/or economic reasons, natural resource managers must sometimes control burgeoning populations of native animals. The primary native species of impact at the Dragon Flats is the white-tailed deer.

White-tailed deer (*Odocoileus virginianus*). A large body of research (Russell et al., 2001) presents evidence that dense populations of deer in many eastern U.S. ecosystems can negatively impact tree and herb regeneration, recruitment and composition (Alverson and Waller, 1997, Horsley et al., 2003), alter natural community composition (Rooney and Dress, 1997), eliminate certain plant species from areas (Augustine and Frelich, 1998), and disrupt bird populations (deCalesta, 1994; McShea and Rappole, 1997). Deer also avoid browsing on the invasive non-native plants, such as Japanese stilt grass (Tu, 2000) further exacerbating the nefarious effects of these weeds on native flora. Of particular concern for natural areas management are negative effects of high deer densities on herbaceous plants (Balgooyen and Waller, 1995; Augustine and Frelich, 1998) and rare plants (Miller et al., 1992). At the end of the 19th century, deer were over-hunted to the point of near extirpation from Virginia. Since then, implementation of strict game laws, elimination of natural predators, and the changing landscape (with more edge habitat) has given rise to a burgeoning deer population that today, in most areas of the state, exceeds estimated presettlement deer densities (Knox, 1997).

Monitoring programs can be designed to estimate and track deer population densities and deer impacts in order to guide management actions. Additional information on white-tailed deer monitoring and control can be found in Appendix E.

Urban interface factors. Increasing development in the Dragon Run watershed, and specifically along the mainstem itself, has immediate and long-term impacts on natural resource quality and thereby natural resource-based industries. In particular, both large scale development and the placement of sporadic single family homes negatively impact these watershed values.

The network of roads that accompanies larger scale new development creates negative ecological impacts beyond just the effect of construction of new buildings. Increased impervious surfaces alter surface water flow and aquifer recharge, in addition to increased soil loss and sedimentation, which contribute to water quality degradation. Even more distantly located emissions from motor vehicles, power plants, industry, and other fossil-fuel producers have negative air and water quality impacts in the Dragon Run.

While the development of single family homes along the Dragon Run may leave a smaller footprint with regard to impervious surfaces and infrastructure requirements, it contributes significantly to the fragmentation of key habitat. Most of the traditional uses, ie farming and forestry, which have been practiced in the Dragon Run for generations require large tracts of land to operate. These large holdings have been the key to keeping the watershed primarily intact. The patchy placement of new single family homes, especially close to the mainstem itself, reduces the cohesiveness of the ecosystem, as well as the capacity of the traditional industries to operate effectively in the future.

To help mitigate and plan for the impacts of the urban interface factors, TNC should continue to support the Dragon Run Steering Committee and the Dragon Run Special Area Management Plan in its efforts to work with the watershed counties to develop land-use planning recommendations that balance growth demands and the protection of traditional uses of the Dragon Run.

Fire management. Fire management is frequently an important facet of natural areas management in Virginia. Fire management activities include both prescribed fire implementation and wildfire management. While some wildfires are potentially destructive and should be suppressed, some situations – such as in the case of Dragon Flats - should be explored as an opportunity to realize the benefits of fire in a natural setting.

To prepare for and provide guidance in the event of a wildfire in the future, a wildfire contingency plan should be developed for Dragon Flats. Such a plan should explore the past role of fire on the site, clearly state the potential benefits and disadvantages of wildfire under current landowner and management contexts, outline management objectives, and provide a viable set of management options should a wildfire occur. Development of a wildfire contingency plan would best be accomplished by TNC staff working closely with agencies and organizations that frequently deal with fire management issues, including DCR, and Department of Forestry (DOF), DGIF.

Cultural/Historic Site Protection
A Virginia Department of Historic Resources review was conducted and there do not appear to be any applicable archeological or architectural artifacts located on the Dragon Flats site; however, a more thorough site assessment should be conducted in the future.

Use, Public Access, and Enforcement Plan
Operations management is a crucial aspect of natural area management, especially on lands where recreational uses by members of the public may conflict with the primary management objectives of water, habitat and biodiversity protection. Managers must design and maintain infrastructure such as signs to best protect resources from adverse human effects. Routine operations management activities include boundary line maintenance, permitted/prohibited activity posting, and law enforcement. Since TNC lacks its own law enforcement staff, it will be necessary to partner with other natural resource agencies such as VDGIF when law enforcement issues affecting natural resource protection arise.

Specific permitted uses discussed for Dragon Flats included leasing to hunt clubs, forestry/timbering and case-by-case passive recreation. Other activities may be permitted by TNC on a case-be-case basis, subject to approval by TNC managing staff.

Visitor management. All requests for access to and use of Dragon Flats must be submitted to the TNC for review, processing and permission. Any permitted access or usage must be consistent and compatible with the management strategies and goals outlined in this management plan. Failure to comply with approved visitation permission stipulations shall result in the cessation of all activities by that entity. Trespass or failure to request permission for an activity shall result in cessation of use by that entity until such time as the activity is approved by TNC.

Code of conduct. Upon receipt of permission to use the site, TNC will distribute a copy of the Public Use Guide (Appendix F) to users. This brochure provides information regarding the public and private rights associated with waterways in Virginia. It also provides an overview of the Public Trust Doctrine and how it is applied. This use of this document may help to reduce conflicts between individuals exercising their public trust rights and landowners, and vice versa.

Hunting.
Waterfowl Hunting. Virginia law provides that any appropriately licensed person can hunt waterfowl in public waters during established seasons and using legal methods so long as they are not within 457 meters (500 yards) of an existing licensed stationary waterfowl blind. Therefore, if TNC does not license, establish, and use (for the purpose of hunting) stationary waterfowl blinds on Dragon Flats, then members of the public may obtain a license and build a stationary hunting blind in public waters surrounding and adjacent to the site. Where stationary blinds are not established, hunters could also legally hunt from licensed floating blinds in the waters adjacent to the site.

Wildlife hunting. Traditional activities, such as wildlife hunting, are recognized as valuable uses in the Dragon Run watershed. In addition to providing recreational opportunities, hunts can be conducted to control species populations. Any hunt clubs leasing the site should be registered in the DMap system. DMAP is a site-specific deer management program that increases a landowner's or hunt club's management options by allowing a more liberal kill of antlerless deer than could be obtained under the current system of county either-sex deer hunting day regulations. DMAP is an open-ended goal oriented deer management program offered by the Virginia Department of Game and Inland Fisheries. It is a cooperative effort. Landowners and hunt clubs set their own deer management goals and collect biological data on the deer they kill. In turn, a wildlife biologist from the Department will analyze the data and provide the cooperator with the information necessary to make informed decisions about deer management issues. This one-on-one relationship, stressing communication and cooperation, makes DMAP a flexible and effective deer management program. Both parties can benefit. The Department receives important biological data on deer herds across the Commonwealth, while the cooperator learns more about their deer herd and deer management issues. Additional deer hunting guidance can be found in Appendix E.

Plan for Consistency with Surrounding Properties and Participation with Regional Conservation Area Coordination Efforts
TNC representatives have been active participants on the Dragon Run Steering Committee and the Dragon Run Special Area Management Plan (SAMP). TNC representatives have also been key stakeholders in the development of the Dragon Run Watershed Management Plan (Appendix D). Action items identified in this plan shall be conducted in a method that consistent with the goals of the SAMP and the objectives identified in the Dragon Run Watershed Management Plan.

There are several sites in the vicinity of Dragon Flats that also are conservation acquisitions held by public and non-governmental organizations, yet have varying goals and management schema than Dragon Flats. It is recommended that the site managers communicate as needed to maximize opportunities that become available and to ensure consistency and compatibility across the watershed. The Dragon Run SAMP is currently working to coordinate the development of a public and NGO conservation acquisition managers group. It is expected that this group will communicate via meetings, group email or listserve, based on user preference.

Establishment of Conservation Easements

It is recommended that a conservation easement be placed on the property, primarily the swamp habitat and its riparian buffer to permanently protect the key natural habitats of this property.

Plan for Management Sustainability and Funding
TNC aims to utilize on-site earning, such as those from timber harvests and hunt club leases to fund future conservation management needs. As time and capacity are a limiting factor for site management, TNC also aims to use these leases and agreements to conduct much of the site maintenance, such as road maintenance, culvert installation and trail clearing.

IN SUMMARY
Summarized below are Action Items identified by this management plan to fulfill the Management Objectives listed in Section 3:

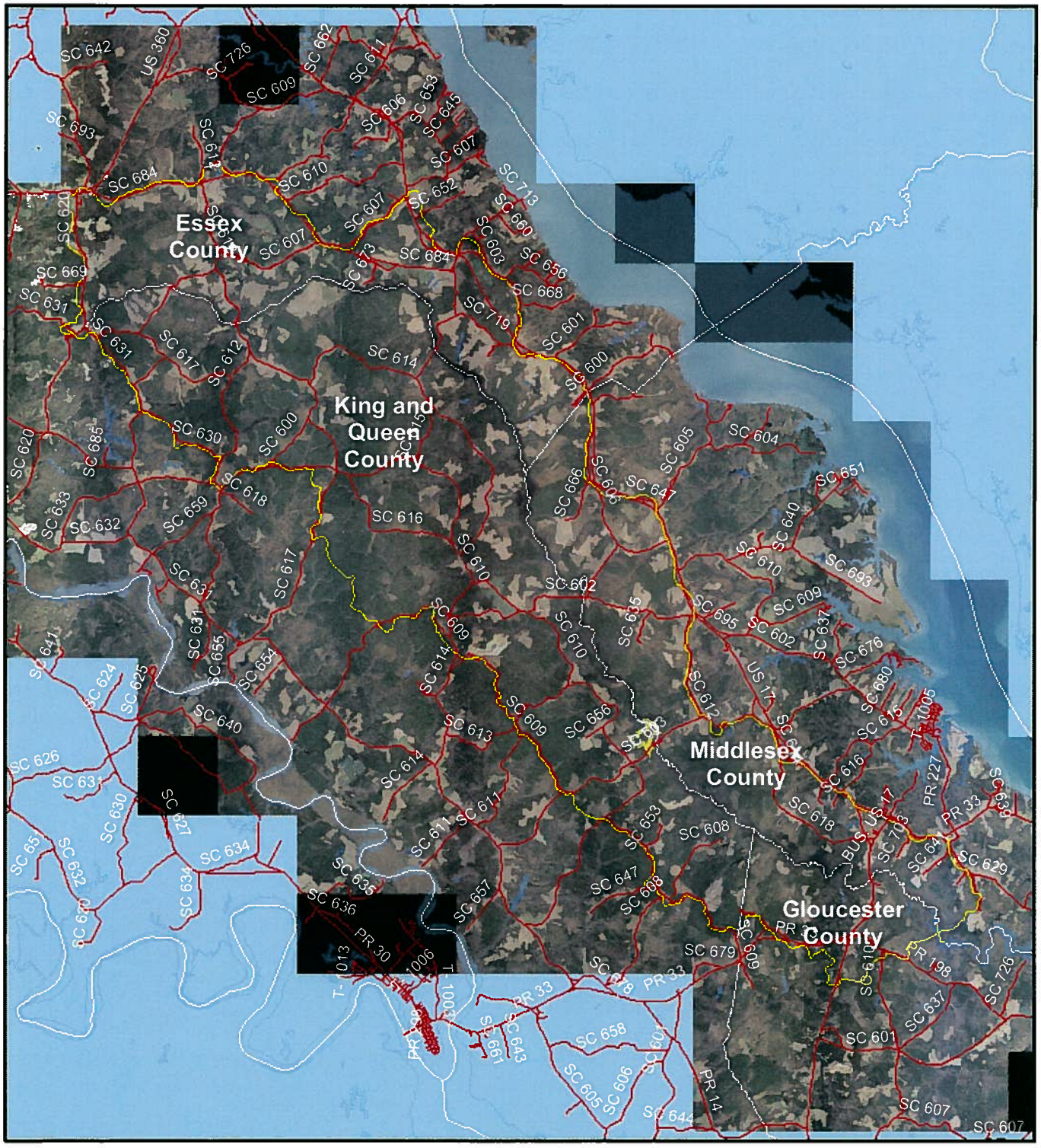
Action Items

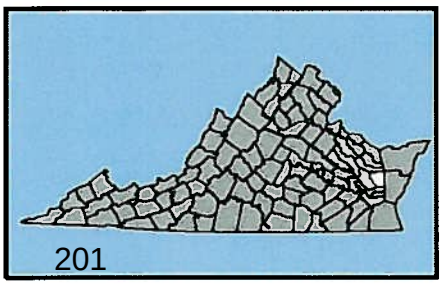
- Adopt "preventive maintenance" approach to management of riparian buffers/swamp/Natural Heritage Communities
- Install culvert to keep roadway accessible
- Select forest management approach from discussed options and consult with Virginia Department of Forestry to implement
- Take prescribed measures to prevent invasive species, such as Chinese Lespedeza; monitor for other invasive species that may move into the area on an on-going basis
- Require DMap registration for all hunt clubs leasing the property
- Continue with Dragon Run Steering Committee participation and input, especially regarding land-use planning in King and Queen and the surrounding counties
- Adopt Public Use Guide and distribute all users
- Erect signage internal to the site with management contact information, use restrictions and guidance and other information, such as the Public Use Guide.
- Post boundary markers to differentiate the site from surrounding lands
- Continue with permission-based management approach for site use
- Coordinate with surrounding public and non-governmental entities regarding conservation site management goals and opportunities

CONCLUSION
Contrary to the management of many conservation sites in more populated areas, the isolation and relatively undisturbed key habitats of the Dragon Flats Tract require minimal active management. Because the swamp and primary riparian buffer of the site currently reflects the "natural" landscape of pre-industrial/pre-urban expansion America 500 years ago, a management strategy based on protection, maintenance and continued monitoring will go a long way to conserve natural resources. By addressing several key management issues, including road corridor maintenance, removal of invasive species, management of the upland forest, and by controlling activities and enforcing the prohibition of incompatible uses, it is likely that successful stewardship of natural resources will be attained.

LIST OF FIGURES

Figure 1: Dragon Run Watershed





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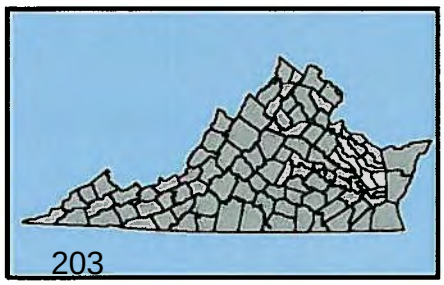
NOAA

Dragon Run WATERWAYS

Figure 2: Dragon Flats - TNC



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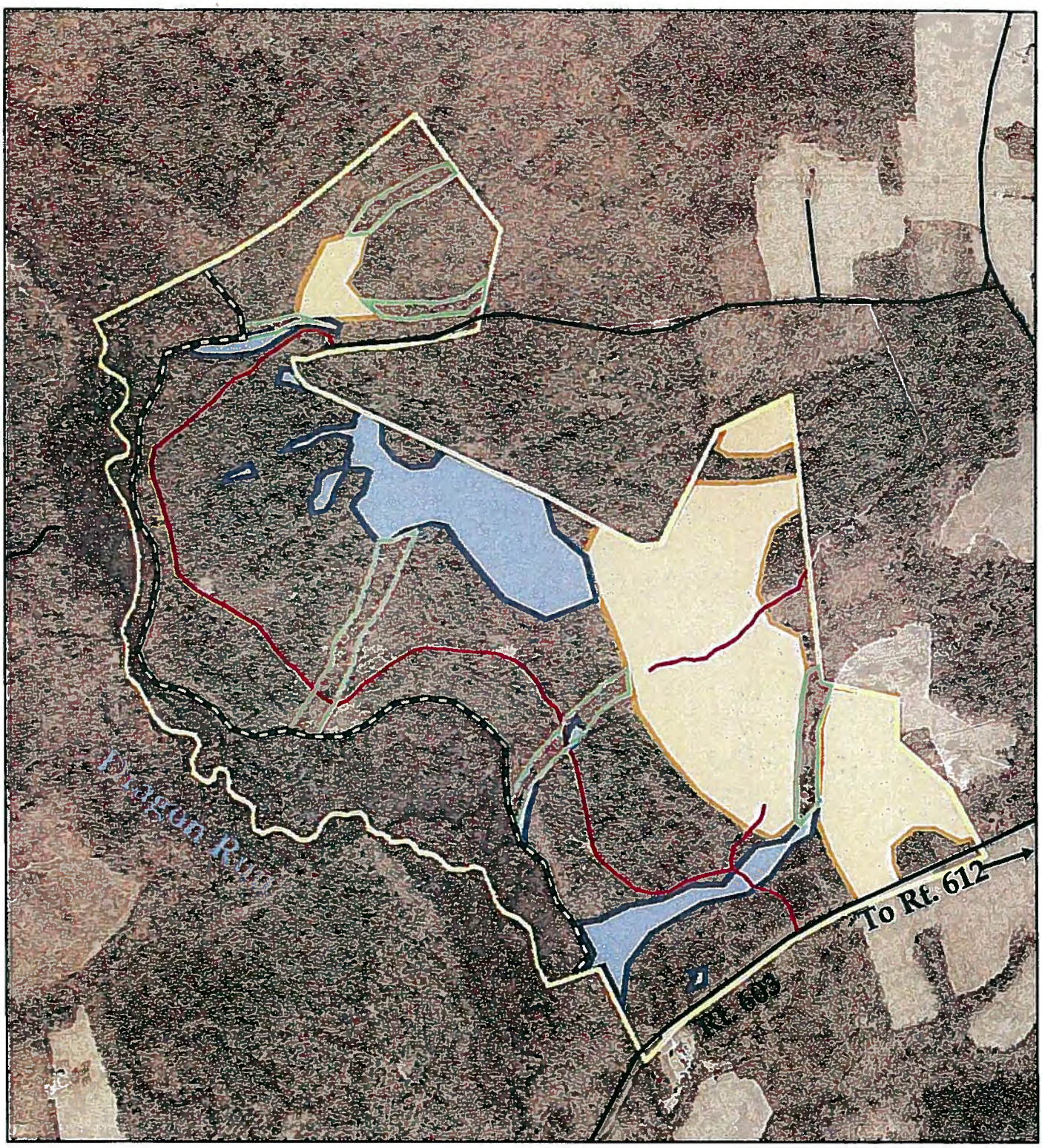

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Dragon Run Block Combination Management

- Dragon Run High Water Line
- Wetlands
- Hardwood Stands
- Travel Corridor

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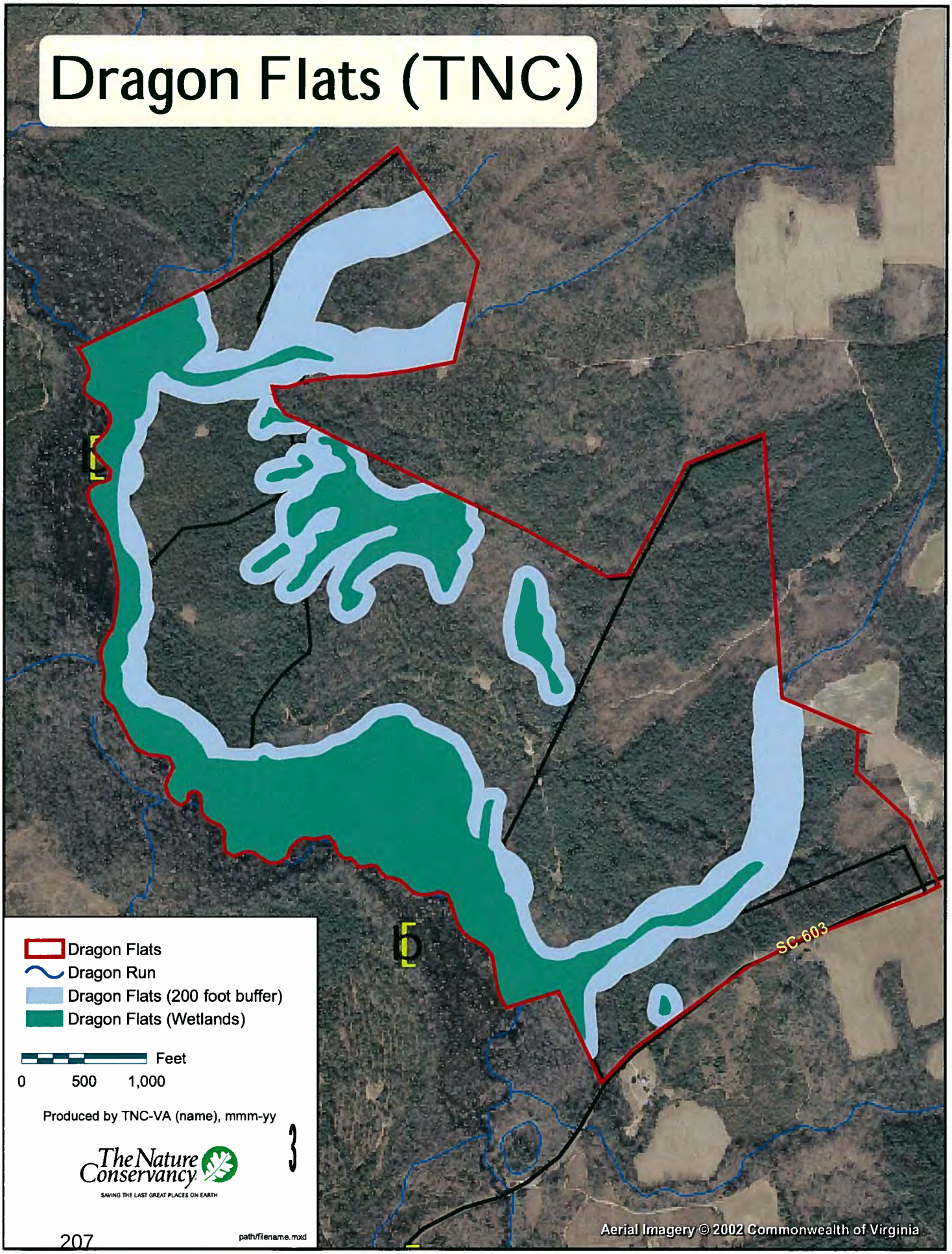
Dragon Flats (TNC)
Dragon Flats
Dragon Run
Dragon Flats (200 foot buffer)
Dragon Flats (Wetlands)
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SAVING THE LAST GREAT PLACES ON EARTH
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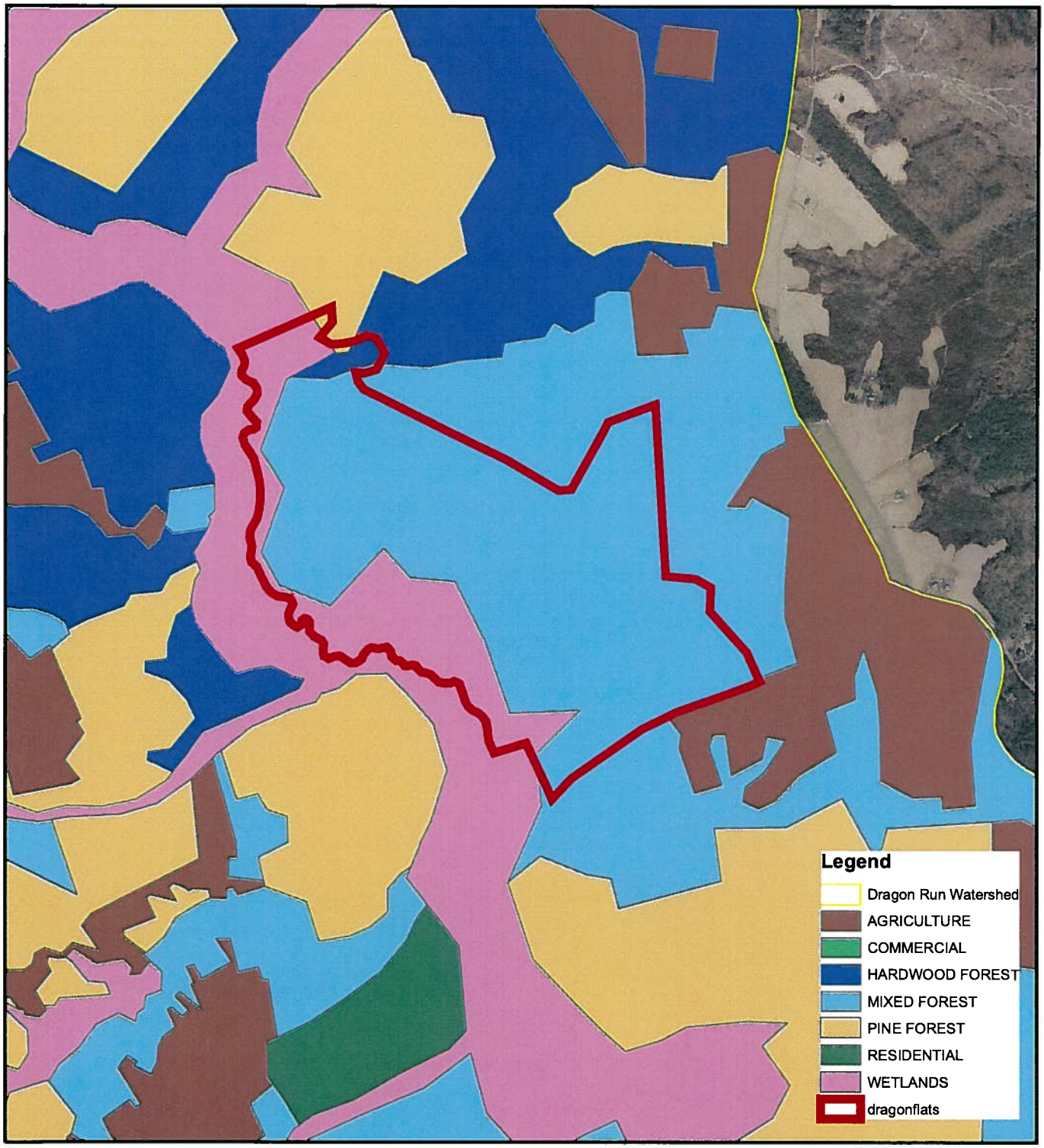
Aerial Imagery © 2002 Commonwealth of Virginia

Figure 5: Dragon Bridge Tract - Surrounding Landcover



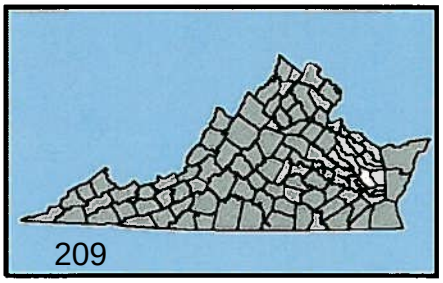


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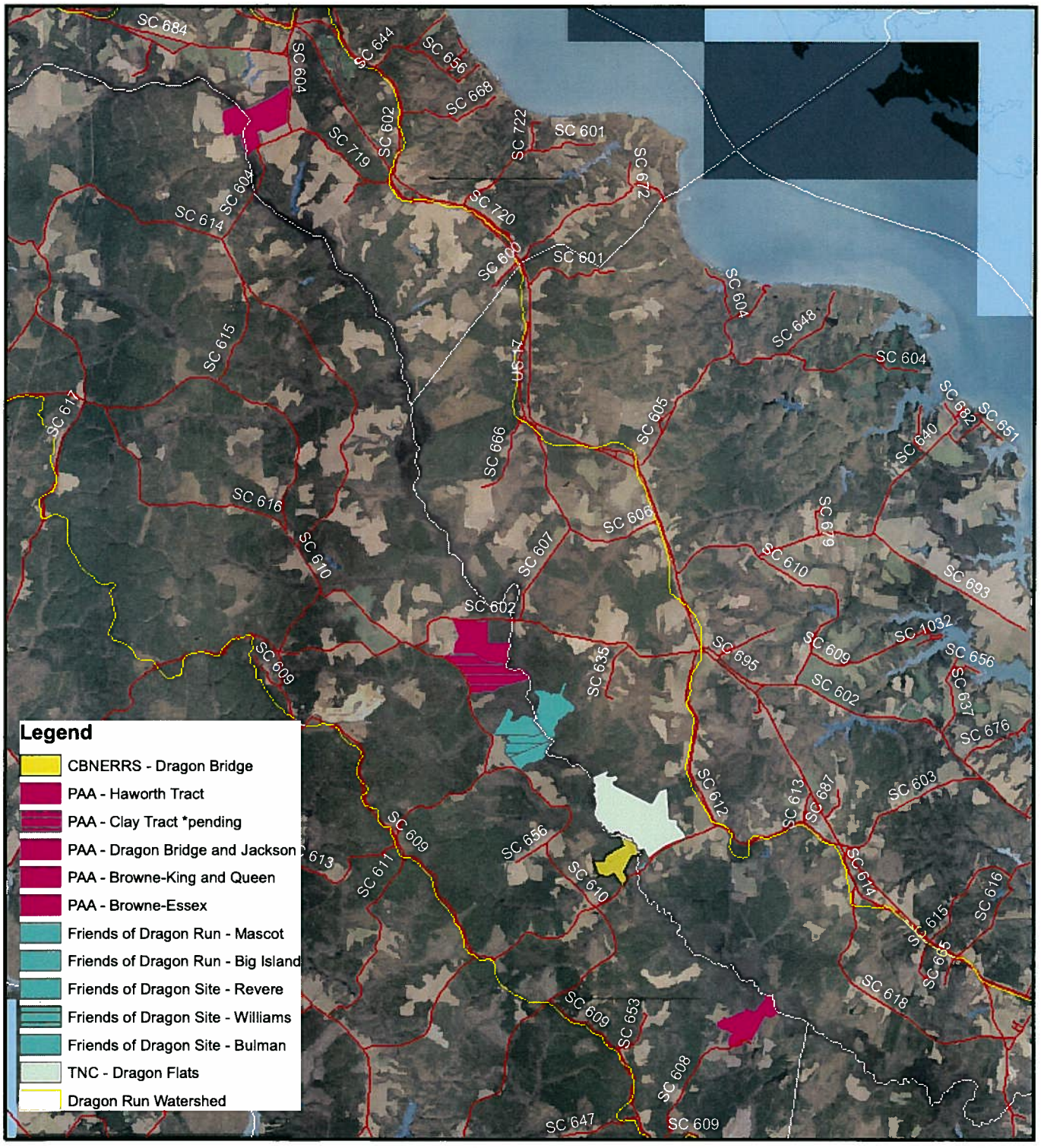
Figure 6: Dragon Flats - Surrounding Conservation Holdings



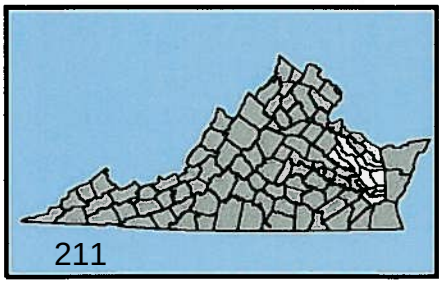


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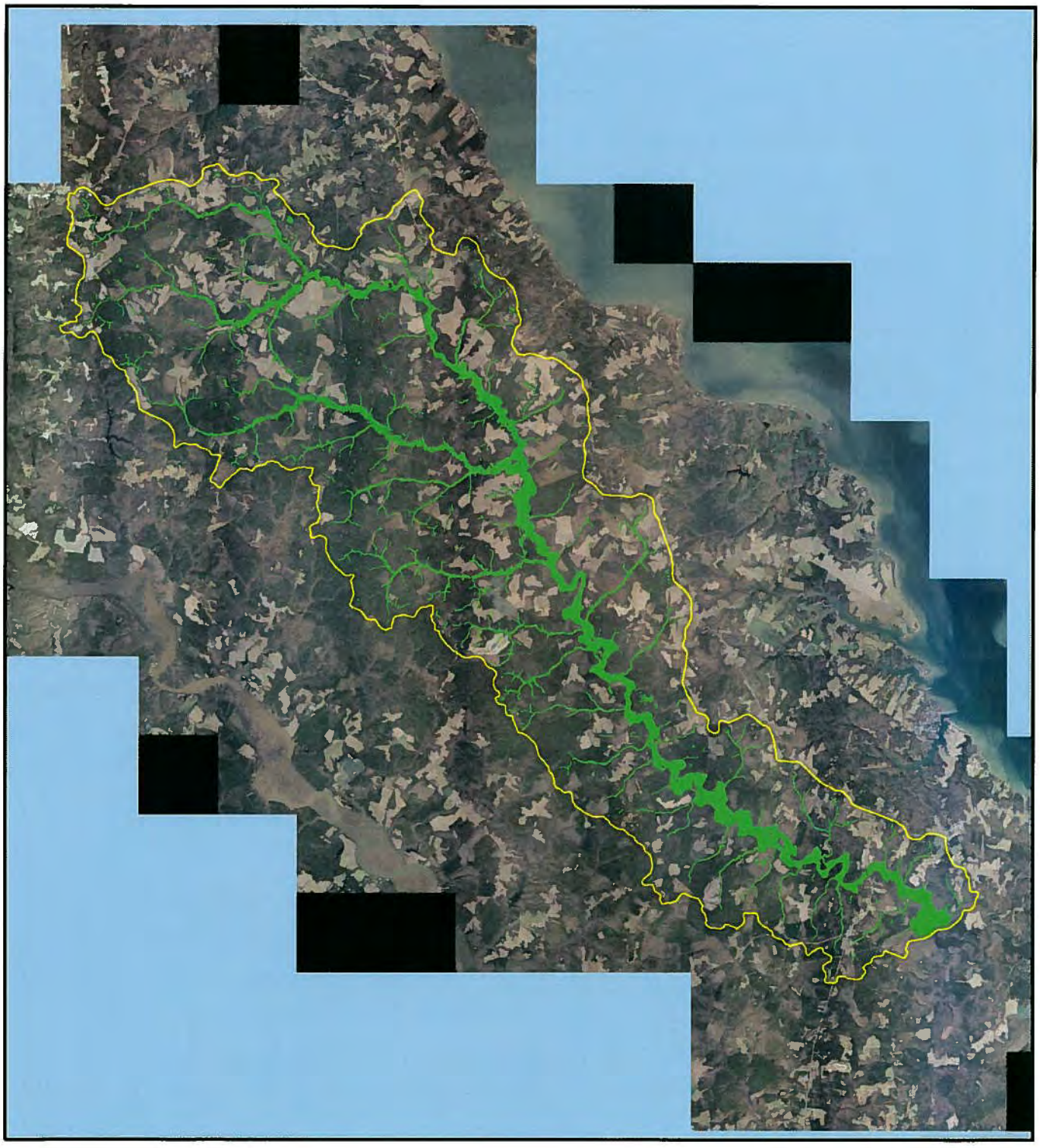
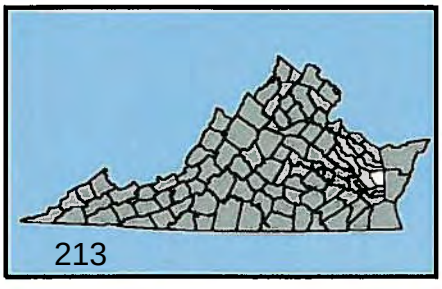
Figure 7: Dragon Run Wetlands





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Dragon Run

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APPENDICES

A. Chesapeake Rivers Plan
B. Rare Species and Community List
C. Natural Heritage Rarity Ranks and Status Explanation
D. Dragon Run Watershed Management Plan
E. Deer Hunting Plan Samples and Sample Lease
F. Public Use Guide
G. Dragon Flats Forestry Management Plan

APPENDIX A: Chesapeake Rivers Plan

The Chesapeake Rivers Site Conservation Plan

August 2001

The Nature Conservancy of Virginia

Executive Summary

The Chesapeake Rivers project area, totaling roughly 1,800 square miles, encompasses the tidal freshwater portions of the Mattaponi, Pamunkey, and lower Rappahannock river systems as well as the non-tidal blackwater river, Dragon Run . The project area, settled by Europeans 400 years ago, is predominately rural and agricultural, dissected by extensive, unaltered rivers and tributaries that flow into the Chesapeake Bay. These rivers systems are home to some of the most pristine and extensive tidal freshwater marsh and swamp communities remaining in the coastal plain of the Chesapeake Bay, providing unique habitat for the federally listed, globally rare *Aeschynomene virginica* (sensitive joint vetch). The marshes also provide critical nursery habitat for native anadromous fishes like shad and herring and nesting grounds for bald eagles, black ducks, king rails and other resident and migratory waterfowl.

The Chesapeake Rivers site has been a focal area for The Nature Conservancy of Virginia (TNC-VA) since 1986. Past efforts have been focused on land protection for rare species such as the sensitive joint vetch. While the landscape of the Chesapeake Rivers appears to maintain its rural and natural character, its future is precarious as the human populations in Newport News/Hampton Roads, Richmond and Fredricksburg continue to grow and sprawl into the project area, with a high demand for open space and freshwater resources. To fulfill TNC's mission to conserve all biodiversity in this area given the impending threats, broader, more holistic strategies are necessary to address freshwater conservation, restoration of degraded ecological systems, and land protection *at the landscape scale*. Therefore, TNC-VA has developed a strategic conservation plan, which re-defines and focuses the goals and plan of action over the next 5-10 years for the Chesapeake Rivers project area, as summarized below.

Seven focal conservation targets were selected to best capture the biodiversity and ecological processes in the Chesapeake Rivers project area (Table i.). The tidal freshwater system and upland terrestrial system capture the gamut of critical ecological functions and the characteristic native biota within the project area at multiple scales, for rivers and uplands. Other targets represent significant biological elements not captured explicitly by the tidal freshwater or upland terrestrial systems. These include high quality bald cypress forests found exclusively on the Dragon Run, the cryptic fluvial terrace woodland communities occurring in only 2 sites on elevated islands in river floodplains, calcareous forests found in coves and ravines on unique marine shell deposits, and seepage wetlands which occur in highly dissected headwater areas of the inner coastal plain within the project area. Anadromous shad and herring fish species were also singled out as conservation targets due to the unique co-occurrence of these species in the Chesapeake Rivers and potential for viability not possible elsewhere given the unaltered river runs necessary to their reproduction.

The overall biodiversity health or viability is ranked as "fair" for the project area (Table iii). This reflects the severe and widespread degradation, fragmentation and destruction of the upland forest communities. However, the tidal freshwater system is considered to be functional and viable given the lack of alteration to the naturally variable flow regimes of

the respective river systems. Significantly, the overall landscape context of the project area considered good due to its rural and agricultural setting, improving the likelihood of conservation success.

The top 5 threats to conservation targets identified in the Chesapeake Rivers project area are development, incompatible forestry practices (i.e. clearcutting, high grading, conversion to pine plantations), invasive and non-native plant and fish species, sea level rise and water management (i.e. water withdrawals, dam/reservoir construction, etc.) (Table iii). ***Residential development*** is a threat to almost all of the targets throughout the project area. Historically, the ***conversion of upland forest to agriculture*** in addition to the current ***silivicultural practices*** such as conversion to pine plantations, clear cutting and high-grading has had a severe and widespread effect on the functioning of these forest communities. ***Introduced, invasive non-native freshwater fish species*** such as blue catfish predate on native anadromous fishes, posing a serious threat to their population viability. ***Invasive plant species*** permeate tidal freshwater marshes, upland and calcareous forests, out-competing the native flora and altering the structure and composition of these communities. ***Sea level rise*** threatens to completely alter all vegetation in the freshwater rivers by increasing the amplitude of tides and moving the salt gradient further upstream, favoring halophytic species and communities. Finally, ***water management*** issues such as surface and ground water withdrawals, dam and reservoir construction are becoming more imminent as threats to the natural flow regimes of the Chesapeake Rivers which support a range ecological processes, species and communities. Demand for freshwater is ever-pressing with the growing populations surrounding the project area.

TNC-VA will implement several conservation strategies in the Chesapeake Rivers to abate the most severe threats to conservation targets and to improve their viability through out the project area (Table iv), grouped into the following five categories:

- **Land Use and Land Protection.** These strategies consist of working with partners (e.g. DCR, USFWS, river organizations) to protect viable occurrences of conservation targets through acquisition or conservation easements as well as working with priority localities to promote land use policies or incentive based land protection programs.
- **Upland Forest Restoration**. The conservation goal for the upland terrestrial forest system is to restore 3 contiguous mixed hardwood-pine forest patches of 10,000 acres or more (one between the Dragon Run and the Mattaponi, one along the mid Rapphannock, and one at Fort A.P. Hill). Strategies to accomplish this include working to promote sustainable and profitable forestry to private landowners through model forest sites which demonstrate the economic value of longer rotations, uneven age class structure, and hardwood regeneration for sawtimber procurement, quail hunting, etc.
- **Water Management**. To address water management issues, TNC-VA will work to develop and implement a regional and state water use policy that preserves the naturally variable flow regimes of the project area rivers. This may be one of the most bold and challenging conservation strategies ever undertaken by the TNC-VA, yet is the most promising means of ensuring conservation of freshwater targets.

- **Invasive Species.** TNC-VA will work with partners to promote policies to eliminate invasive species introductions and trades, for both fish and plants, while seeking to develop control methods for species which are currently established or anticipated in the project area.

The new TNC Chesapeake Rivers Program Director, Andy Lacatell, has recently been hired to work with the local community groups, landowners, and government agencies to implement conservation strategies set forth in the conservation plan. Doors to TNC's new Chesapeake Rivers office in Tappahannock opened the first of January 2001. With a comprehensive strategic plan and increased on-site capacity and leadership, the VAFO hopes to successfully work with partners toward the conservation and restoration of the unique and vast landscape of the Chesapeake Rivers.

Table i. Descriptions of Chesapeake Rivers conservation targets.

Conservation Target	**Description**
Tidal Freshwater System	Mosaic of inter-grading tidal freshwater emergent herbaceous marshes, mudflats, semi-open multi-strata hardwood swamp forest, and submerged aquatic vegetation, including sensitive joint vetch, (*Aeschynomene virginica* (G2)). Marshes at site are likely the most exemplary and extensive on the Atlantic coast.
Upland Terrestrial Forest System	Well-drained upland forests consisting of beech, oaks, hickories and other common hardwood species. Represents remnant occurrences of a formerly characteristic upland matrix forest of the coastal plain and will require significant restoration.
Bald Cypress Forests	Tidal and non-tidal/seasonally to semi-permenantly flooded bald cypress forests found exclusively along Dragon Run in project area. Non-tidal swamp on Dragon represents best and northernmost example of its kind in the eastern U.S.
Fluvial Terrace Woodlands	Small patch, open woodland communities composed of xeric hickories and oak species anomalous due to elevated topographic position and sandy substrate in floodplain--likely relicts of sandhill communities.
Calcareous Forest	Small patch, rich northeast-facing, mature oak-hickory-beech-poplar forests with paw-paw dominant in the shrub layer and a diverse herbaceous layer. Found in unique calcareous ravines.
Seepage Wetlands	A mosaic of intergrading fire-maintained shrub/ graminoid-dominated seepage bogs and forested seepage swamps that occur in areas of dissected topography and sandy/peaty soils, supporting rare plant species such as swamp pink and New Jersey Rush (*Helonias bullata* (G3, LT) and *Juncus caesariensis (G2))* as well as critical breeding habitat for odonates and amphibian species.
Anadromous Fishes	Reproductive habitat of blueback herring, alewife, hickory shad and American shad. Historically, these four species' distribution overlapped in the mainstem tributaries of the Chesapeake Bay; however, the Rappahannock, Mattaponi and Pamunkey watersheds (to Fall Line) maybe last places where all 4 species can still migrate/reproduce successfully without significant habitat impediments or alterations.

Table ii. Viability ranks for Chesapeake Rivers conservation targets.

Target	**Size**	**Condition**	**Context**	**Viability Rank**
Tidal Freshwater System	Very Good	**Good**	**Good**	**Good**
Upland Terrestrial Forest System	Poor	Poor	**Fair**	Poor
Bald Cypress Forests	Very Good	**Good**	**Good**	**Good**
Fluvial Terrace Woodland	Very Good	**Good**	**Good**	**Good**
Calcareous Forest	**Good**	Very Good	**Good**	**Good**
Seepage Wetlands	**Good**	**Fair**	**Fair**	**Fair**
Anadromous Fishes	**Fair**	**Fair**	**Good**	**Fair**
Site Biodiversity Health Rank				**Fair**

Table iii. Threat ranks for the Chesapeake Rivers conservation targets.

Active Threats across Conservation Targets	Tidal Fresh-water System	Bald Cypress Forests	Fluvial Terrace Woodland	Upland Terrestrial Forest System	Calcar-eous Forest	Seepage Wetlands	Anadro-mous Fishes	**Overall threat rank**
Development (residential homes, roads, other infrastructures)	Medium	-	Medium	Very High	Medium	High	Medium	**HIGH**
Incompatible forestry practices (silviculture)	-	Medium	-	Very High	Medium	-	-	**HIGH**
Invasive and/or non-native fish species	-	-	-	-	-	-	Very High	**HIGH**
Invasive and/or non-native plant species	High	-	-	Medium	High	-	-	**HIGH**
Sea level rise	High	Medium	-	-	-	-	Medium	**MEDIUM**
Water Management	High	-	-	-	-	-	Medium	**MEDIUM**
Lack of fire	-	-	-	High	-	Medium	-	**MEDIUM**
Fishing (includes boating)	Low	-	-	-	-	-	High	**MEDIUM**
Dam construction by beavers	-	-	-	-	-	High	-	**MEDIUM**
Incompatible crop and forestry practices (inadequate BMPs)	Medium	-	-	-	-	-	Low	LOW
Structural impediments to fish passage (dams, clogged culverts, etc.)	-	-	-	-	-	-	Medium	LOW
Conversion to agriculture (Active)	-	-	-	Medium	-	-	-	LOW
Threat Status for Targets and Site	High	Medium	Low	Very High	Medium	High	High	**HIGH**

Table iv. Profile of each conservation strategy, the targets benefited threats abated and conservation goals met by the strategy.

Strategy	**Targets benefited by strategy**	**Threats abated by strategy**	**Threat abatement goals to be met by strategy**
1. Identify tracts of land with the most viable occurrences of conservation targets and protect through acquisition or conservation easements.	➢ Tidal Freshwater System ➢ Upland Terrestrial Forest System ➢ Calcareous Forests ➢ Seepage Wetlands ➢ Bald Cypress Forests ➢ Fluvial Terrace Woodland	➢ Development (residential homes, roads, other infrastructures) ➢ Incompatible forestry practices (silviculture) ➢ Lack of fire ➢ Conversion to agriculture (Active)	➢ Protect key tracts with exemplary occurrences of conservation targets. ➢ Reduce the impacts of development on conservation targets. ➢ Restore at least one functional upland terrestrial forest (>10,000 acres) in each matrix block. ➢ Restore viable seepage wetlands
2. Develop/promote land use policies and compatible economic development initiatives that conserve land in matrix blocks and protect water quality/flow regimes.	➢ Tidal Freshwater System ➢ Upland Terrestrial Forest System ➢ Calcareous Forests ➢ Seepage Wetlands ➢ Anadromous Fishes	➢ Development (residential homes, roads, other infrastructures) ➢ Incompatible forestry practices (silviculture) ➢ Lack of fire ➢ Conversion to agriculture (Active)	➢ Protect key tracts with exemplary occurrences of conservation targets. ➢ Reduce the impacts of development on conservation targets. ➢ Restore at least one functional upland terrestrial forest (>10,000 acres) in each matrix block.
3. Develop region water use policy to determine the source of current and future water need and to affect the best method to meet the need.	➢ Tidal Freshwater System ➢ Anadromous Fishes	➢ Development (residential homes, roads, other infrastructures) ➢ Water Management ➢ Structural impediments to fish passage (dams, clogged culverts)	➢ Preserve natural range of variability of flow regimes of tidal freshwater system.
4. Restore connectivity of matrix forest through a shift in current pine management to longer-rotation mixed hardwood/pine forest.	➢ Upland Terrestrial Forest System	➢ Incompatible forestry practices (silviculture) ➢ Conversion to agriculture (Active)	➢ Restore at least one functional upland terrestrial forest (>10,000 acres) in each matrix block.
5. Restore connectivity of matrix forest through conversion of key agricultural lands to mixed hardwood/pine forest.	➢ Upland Terrestrial Forest System	➢ Conversion to agriculture (Historical)	➢ Restore at least one functional upland terrestrial forest (>10,000 acres) in each matrix block.
6. Determine invasive/ non-native fish species that contribute the greatest threats to conservation target.	➢ Anadromous Fishes	➢ Invasive and/or non-native fish species	➢ Reduce the threat of non-native, invasive predatory fishes on anadromous fish populations.
7. Develop policy to eliminate introduction and stocking of non-native fish species in the Coastal Plain and Piedmont.	➢ Anadromous Fishes	➢ Invasive and/or non-native fish species	➢ Reduce the threat of non-native, invasive predatory fishes on anadromous fish populations.

Strategy	Targets benefited by strategy	Threats abated by strategy	Threat abatement goals to be met by strategy
8. Work with local, state and federal agencies to develop policy to reduce and control non-native/invasive fish populations and to enforce existing laws.	➢ Anadromous Fishes	➢ Invasive and/or non-native fish species	Reduce the threat of non-native, invasive predatory fishes on anadromous fish populations.
9. Determine invasive/ non-native plant species that contribute the greatest threats to conservation targets.	➢ Tidal Freshwater System ➢ Upland Terrestrial Forest System ➢ Calcareous Forests	➢ Invasive and/or non-native plant species	Reduce the threat of non-native, invasive plant species in tidal freshwater and upland terrestrial systems.
10. Develop control strategies for priority invasive plant species in key conservation areas.	➢ Tidal Freshwater System ➢ Upland Terrestrial Forest System ➢ Calcareous Forests	➢ Invasive and/or non-native plant species ➢	Reduce the threat of non-native, invasive plant species in tidal freshwater and upland terrestrial systems.
11. Work with state/federal agencies and other conservation partners to prevent the introduction of new invasive plant species.	➢ Tidal Freshwater System ➢ Upland Terrestrial Forest System ➢ Calcareous Forests	➢ Invasive and/or non-native plant species	Reduce the threat of non-native, invasive plant species in tidal freshwater and upland terrestrial systems.
12. Evaluate current and future effects of sea level rise on species and communities in Coastal Plain to determine compensatory conservation actions to protect conservation targets.	➢ Tidal freshwater system ➢ Bald Cypress Forests	➢ Sea level rise	Assess long-term effects of sea level rise on project area and conservation targets.
13. Promote sound fisheries management policy to increase anadromous fish abundance.	➢ Tidal Freshwater System ➢ Anadromous Fishes	➢ Fishing (includes boating) ➢ Structural impediments to fish passage (dams, clogged culverts)	Reduce the threat of fishing to anadromous fish populations.
14. Support Fort A.P. Hill's Natural Resources Division to restore seepage wetlands.	➢ Seepage Wetlands	➢ Lack of fire ➢ Dam construction by beavers	Restore viable seepage wetlands

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Preface

As stated in *Conservation by Design*, The Nature Conservancy's conservation goal is "the long term survival of all viable native species and community types" within portfolios of sites by ecoregion. In order to accomplish the ambitious goal of conserving all native biodiversity, the Conservancy has developed many tools for conservation planning at the ecoregional and site-based scale. The Chesapeake Rivers project area has long been a priority for The Nature Conservancy based on its freshwater resources, rare species and critical ecological linkage to the incomparable Chesapeake Bay. The rivers and much of the terrestrial landscape found within the project have been identified as significant sites through the Chesapeake Bay Lowlands ecoregional planning process (to be completed by Fall 2001).

To address conservation strategies at the site scale for the Chesapeake Rivers, the TNC-VA Protection and Stewardship staff were invited in January 2001 to participate in a series of three Efroymson Workshops, led by Greg Low, Vice President and Managing Partner of U.S. Conservation Programs, and members of the Conservation Science Division. The goal of these workshops was to apply The Nature Conservancy's site conservation "5-S Framework" to the Chesapeake Rivers project area, thereby developing a conservation blueprint for action and a baseline from which to measure its success over time. The 5-S's are defined below:

- **Systems**: the conservation targets occurring at a site, and the natural processes that maintain them, that will be the focus of site-based planning.

- **Stresses**: the types of degradation and impairment afflicting the system(s) at a site.

- **Sources**: the agents generating the stresses.

- **Strategies**: the types of conservation activities deployed to abate sources of stress (threat abatement) and persistent stresses (restoration).

- **Success**: measures of biodiversity health and threat abatement at a site.

Through the guidance of the Efroymson workshops and supplemental staff meetings, the TNC-VA conservation planning team selected conservation targets (systems), analyzed and ranked stresses and sources of stress for each target, and identified conservation strategies to abate threats. A comprehensive conservation plan and strategy for implementation has been developed that will focus and direct the TNC-VA's new Chesapeake Rivers Program for the next 5 to 10 years. This report documents the results of these workshops and meetings.

Introduction

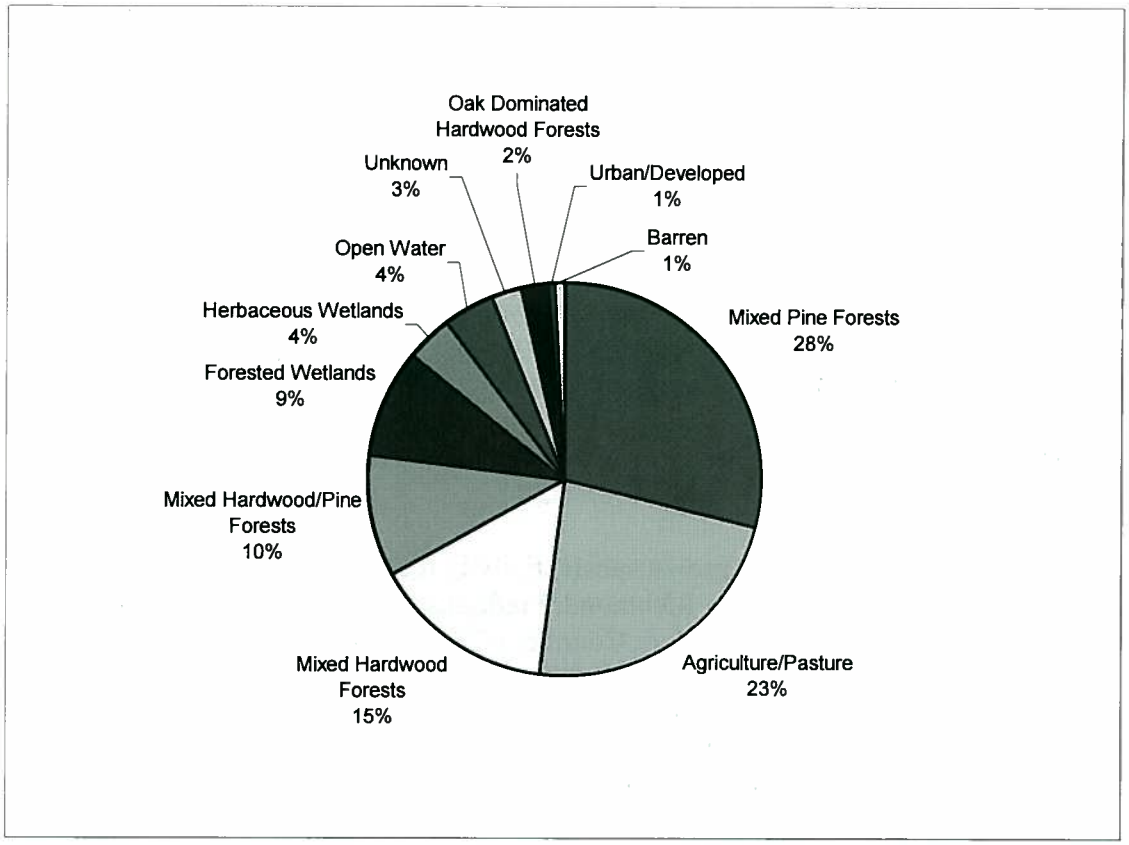
- ***Site description***

The Chesapeake Rivers site, part of the Chesapeake Bay Lowlands Ecoregion (CBY), is located in "tidewater" Virginia, roughly bounded by the Chesapeake Bay to the east, the Fall Line to the west, the James River to the south and the Potomac River to the north (Map 1). The site, totaling roughly 1,800 square miles, primarily encompasses the tidal freshwater portions of the Mattaponi, Pamunkey, lower Rappahannock rivers and watersheds as well as the non-tidal blackwater river, Dragon Run and its watershed (Map 2). The mighty Rappahannock is the largest and longest of the four, its headwaters found in at the foot of the Blue Ridge Mountains and draining into the Chesapeake Bay 184 miles later. The Mattaponi and Pamunkey are both part of the York River drainage, the Mattaponi forming in the coastal plain and the Pamunkey in the Piedmont. Dragon Run forms the headwaters of the Piankatank River and is the smallest and shortest of the rivers (<20 miles in length). For planning purposes, the site is defined as a "project area" containing multiple functional landscapes (i.e. the lower Rappahannock watershed, the Dragon watershed and the Mattaponi and Pamunkey watersheds).

Overall, the project area is characterized by flat to gently undulating alluvial and upland coastal plain topography dissected by slow-flowing meandering rivers and tributaries. Expansive tidal freshwater marshes and swamp forests populate the wide, sinuous flood plains and are surrounded by upland areas of wheat fields, pine plantations and residential areas interspersed with patches of native forests and wetlands. The area has experienced a long history of human settlement, starting with the presence of Native American inhabitants after the last ice age. Native Americans hunted the last of the large predatory mammals, causing mass extinctions and forever changing the ecology of the region. In addition, Native Americans used wildfire as a management tool to keep woodlands open for hunting while also inadvertently sustaining a biologically diverse landscape. European colonists arrived in Jamestown four hundred years ago and have been intensively cultivating the uplands since through agriculture, forestry and development ever since.

Today, 23% of the landscape is in agricultural production (including pastures and row crops), 30% is pine plantations, while 13% is wetlands and 27% remains as natural forest cover (VA GAP 2000). Less than 1% of the landscape is developed (urban or residential) (Figure 1). While the ecological integrity of upland areas has been greatly disturbed by this long history of human settlement, the predominantly rural, agricultural character of the site has helped to maintain its natural character, making effective conservation actions such as restoration possible. One of the unique features of this project area is that the rivers themselves have remained relatively pristine compared with other tidal rivers of the eastern seaboard. With the exception of Embrey Dam on the Rappahannock in Fredricksburg these rivers remain un-dammed with natural flow regimes intact and relatively high water quality. Moreover, Embrey Dam is scheduled to be removed by the Army Corps of Engineers in 2002.

Figure 1. Land use/land cover classification of the Cheasapeake Rivers project area (VA GAP 2000).



- ***Conservation value***

The Mattaponi, Pamunkey and Rappahannock river systems are home to some of the most pristine and extensive examples (some greater than 1000 acres) of functional tidal freshwater marsh communities remaining in the CBY ecoregion and the eastern seaboard of the United States. In addition, high quality, globally rare tidal hardwood forests communities of gum and ash are found along these rivers intermittent with the marshes. An outstanding occurrence of non-tidal cypress-gum swamp forest along the Dragon Run River represents the best and northernmost occurrence of this southern community type in the eastern U.S. Moreover, these largely unaltered marsh and swamp communities support occurrences of rare and endangered plant species, in particular the federally-listed sensitive joint vetch (*Aeschynomene virginica)* (G2), Parker's pipewort (*Eriocaulon parkeri)* (G3), and wild marsh senna (*Chamaechrista fasciculata var. macrosperma*) (G5T2). The marshes also provide critical nursery habitat for anadromous fishes like shad and herring and nesting grounds for bald eagles, black ducks, king rails and other resident and migratory waterfowl.

The upland portions of the project area were once characterized by matrix forming mesic to dry oak-hickory-beech and mixed pine-oak-ericad forest communities. Most of these forests have been cleared and cultivated over the course of four centuries for agricultural and silvicultural purposes, yet extant, secondary growth patches occur throughout the

area. Other more rare, small patch upland communities include mature mesophytic calcareous ravine forests found on slopes of exposed marine shell deposits. Fire-dependent seepage bogs and swamps are found in areas of dissected topography where plant rarities such as New Jersey rush (*Juncus caesariensis*) (G2) and federally-listed swamp bog rose (*Helonias bullata*) (G3) occur in addition to a host of breeding amphibians and odonates.

- ***Socio-Economic Characterization***

The economy of the area is dependent on agricultural production of wheat, corn and soybeans as well as pulp and timber production from both pine plantations and forestry. Aside from agriculture and silviculture, there is very little commercial or industrial use of the land within the project area. Yet conversion of upland forests to agriculture or pine plantations continues to be a local economic pressure. Moreover, increasing demand from outside markets for hardwood timber is placing new pressures on the remaining upland hardwood forest communities of the Chesapeake Rivers, one of the few reservoirs of mature salable hardwood timber in the southeast.

Overall, the human population has grown substantially in the corners of the project area as residential sprawl has spread from Richmond, Fredricksburg and the Hampton Roads area (e.g. Hanover, Spotsylvania and York Counties) (Table 1, Map 3). Growing human populations in surrounding urban areas are creating an increase in demand for residential housing and accompanying infrastructures as well as for the freshwater resources of these rivers (i.e. drinking water supply). The threat of population growth to freshwater resources is epitomized by the controversial and still unresolved application by the city of Newport News to the U.S. Army Corps of Engineers to provide water for its citizens by pumping it from the Mattaponi River and storing it in a reservoir to be constructed on a tributary of the Pamunkey in King William County.

Table 1. Population estimates for counties falling within (or partially within) the Chesapeake Rivers project area from the 1990 and 2000 census counts, with absolute and percent change over the decade (US Census Bureau 2001).

	Census Population		Change, 1990 to 2000	
County Name	**April 1, 1990**	**April 1, 2000**	**Number**	**Percent**
Caroline County	19,217	22,121	2,904	15.1
Essex County	8,689	9,989	1,300	15.0
Gloucester County	30,131	34,780	4,649	15.4
Hanover County	63,306	86,320	23,014	36.4
Henrico County	217,881	262,300	44,419	20.4
King and Queen County	6,289	6,630	341	5.4
King George County	13,527	16,803	3,276	24.2
King William County	10,913	13,146	2,233	20.5
Lancaster County	10,896	11,567	671	6.2
Mathews County	8,348	9,207	859	10.3
New Kent County	10,445	13,462	3,017	28.9
Northumberland County	10,524	12,259	1,735	16.5
Richmond County	7,273	8,809	1,536	21.1

	Census Population		Change, 1990 to 2000	
County Name	**April 1, 1990**	**April 1, 2000**	**Number**	**Percent**
Spotsylvania County	57,403	90,395	32,992	57.5
Westmoreland County	15,480	16,718	1,238	8.0
York County	42,422	56,297	13,875	32.7
Fredericksburg city	19,027	19,279	252	1.3
Richmond city	203,056	197,790	-5,266	-2.6
Newport News city	170,045	180,150	10,105	5.9

♦ ***Conservation Lands***

Only 1.5% of the Chesapeake Rivers project area can be considered under conservation management (Table 2, Map 4). 7% is publicly owned in the project area, most of which is comprised of the federal military base Fort A.P. Hill, totally approximately 75,000 acres in Caroline County. Second to Fort A.P., the Rappahannock Valley National Wildlife Refuge, established by the U.S. Fish and Wildlife Service in 1995, owns over 3,500 acres of wetland habitat along the Rappahannock River. The Nature Conservancy and other conservation groups such as the Trust for Public Land and The Conservation Fund work together as the Rappahannock Working Group to continue to acquire and transfer land to the refuge. A private corporate timber management group is the largest private land owner in the Chesapeake Rivers, owning almost 75,000 acres of land throughout the project area (equal to Fort A.P. Hill), most of which is managed as pine plantations for pulp wood.

Table 2. Ownership of conservation lands in the Chesapeake Rivers project area.

Owner/ Management Agency	**Acres**	**% of total project area**
Department of Defense (Fort A.P. Hill)	74,645.90	6.45%
The Nature Conservancy	4,935.11	0.43%
US Fish and Wildlife Service (Rappahannock Valley National Wildlife Refuge)	3,849.32	0.33%
Mattaponi and Pamunkey Tribal Governments	1,653.71	0.14%
National Park Service	1,624.15	0.14%
VA Dept. of Game & Inland Fisheries	1,384.85	0.12%
VA Dept. of Conservation and Recreation	1,337.07	0.12%
VA Dept. of Forestry	376.51	0.03%
Total	*89806.602*	7.76%

The Chesapeake Rivers site has been a focal area for The Nature Conservancy of Virginia (TNC-VA) since 1986. In the past, the TNC-VA has primarily focused on the protection of tidal freshwater marsh habitat and associated rare species, particularly sensitive joint vetch. TNC-VA has protected close to 5,800 acres of land in the area, including 4 preserves, 5 conservation easements and one transfer to the USFWS Rappahannock River Valley National Wildlife Refuge (NWR). Most notable among these are the 1,100 acre Cumberland Marsh Preserve along the Pamunkey River which conserves examples of high quality tidal freshwater marsh and swamp habitat and one of the best global

populations of the sensitive joint vetch, and Sandy Point, a 2,200 acre tract of similar habitat on the Mattaponi, also protecting the sensitive joint vetch. The Voorhees Nature Preserve protects 729 acres of tidal freshwater marsh and mesic mixed hardwood forest on the Rappahannock River. In addition to acquisition and easements, over 150 landowners have volunteered for a natural area registry and with this group, TNC-VA helped to form a new organization in 1988 called the Mattaponi and Pamunkey River Association.

- ***A Strategic Vision and Key Partners***

Overall, the Chesapeake Rivers is a very large and complex landscape and there is much that we still do not know or understand about its species, natural communities and ecological processes. To meet TNC's mission in the Chesapeake Rivers, we need a strategic vision and plan for conservation action at the landscape scale that includes protection, restoration and policies regarding freshwater use. Partnerships will be the key to success in such a large area. Partners include USFWS, DOD, VA-DGIF, VA-DOF, Chesapeake Bay Foundation (CBF), Rappahannock Working Group, planning district commissions and localities, and local groups (Friends of Dragon Run, Mattaponi and Paumunkey Rivers Association, Middle Pennisula Land Trust, etc.). The new TNC Chesapeake Rivers Program Director, Andy Lacatell, has recently been hired to work with the local community groups, landowners, and government agencies to implement conservation strategies set forth in the conservation plan from TNC's new Chesapeake Rivers office in Tappahannock as of the first of January 2001. With a comprehensive strategic plan and increased on-site capacity and leadership, the VAFO hopes to successfully work with the above-mentioned partners toward the conservation and restoration of the unique and irreplaceable landscape of the Chesapeake Rivers.

Conservation Targets

♦ ***Overview of Methods***

Clearly defining conservation targets is the first and most critical step in the site conservation planning process. Conservation targets are the basis for all subsequent steps in the planning process and ultimately determine what conservation actions will be taken. The goal of selecting targets is to represent the biodiversity of the site and capture its "functionality"—or the ecological processes that sustain diversity. Therefore, conservation targets should occur at multiple scales across all ecological systems such that the long term functionality or collective viability of the site is ensured if they are conserved (Richter and Poiani 2000). The list of "focal" targets is limited to eight in order to encourage a systematic approach towards developing a succinct list that is "indicative of threats and viability of the biodiversity of interest" at the site (TNC 2000).

The viability of each conservation target is then ascertained based on and evaluation of the ecological processes and attributes necessary for the target's long term persistence. This information is crucial to establish a viability baseline for each target by which to analyze stresses to the targets, set conservation goals, determine conservation strategies, and ultimately, to measure success of conservation actions over time. To accomplish this, specific viability attributes have been developed for each conservation target. Size, condition and landscape context are the factors used to indicate the viability of a target system, community, or species. They are defined as follows (TNC 2000):

- **Size**: A measure of the area or abundance of the conservation target's occurrence.
- **Condition**: An integrated measure of the composition, structure and biotic interactions that characterize an occurrence
- **Landscape context**: An integrated measure of two factors: the dominant environmental regimes and processes that establish and maintain the target occurrence and connectivity

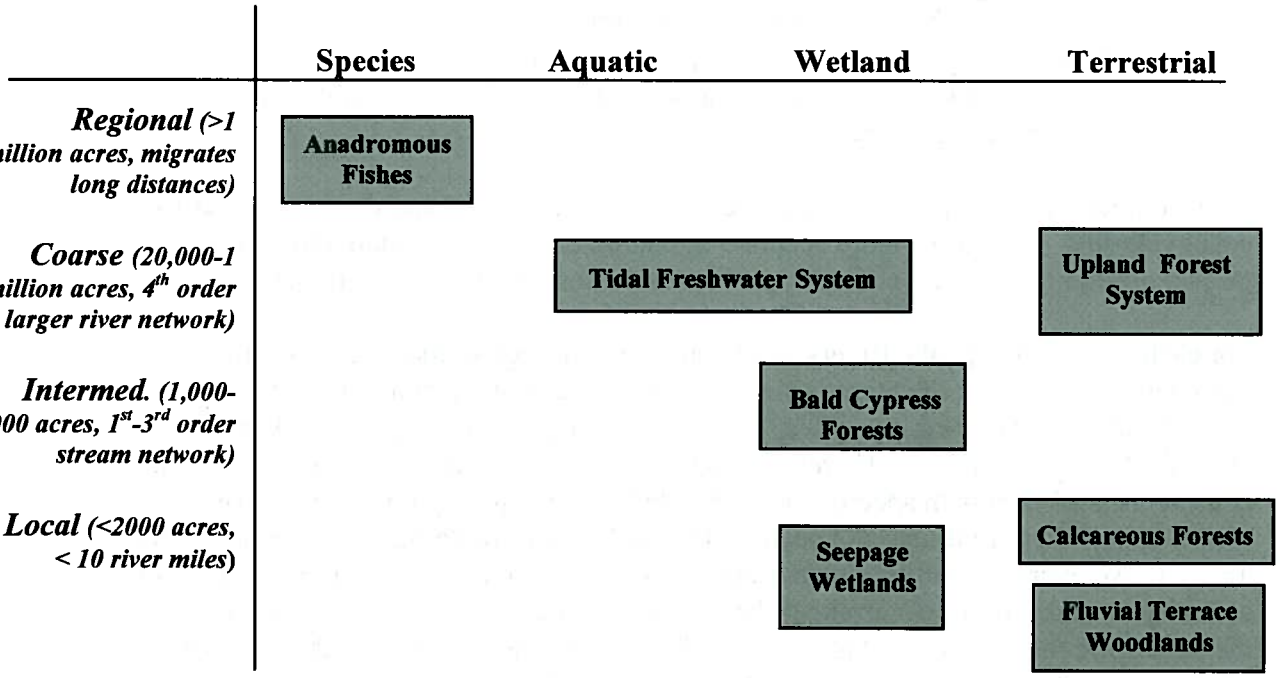
Size, condition and landscape context are indicators of viability but do not necessarily equal viability. They are a more accurate measurement of current status from which we project or infer the target's ability to persist and be resilient over the long term.

For each of the Chesapeake Rivers focal conservation targets, qualitative criteria have been developed to rank the target's size, condition and context, and in turn the target's overall viability. The ranking system consists of four general categories: "Very Good", "Good", "Fair" and "Poor". Therefore, each of the three variables (size, condition and context) is attributed with specifications that define the 4 quality ranks. The target viability attributes are found in Appendix B. Ranks based on these attributes are found in Table 3. An overall viability rank per target is derived from averaging the size, condition and context ranks for all occurrences throughout the site. Individual viability "scores" for the targets are then aggregated to develop a biodiversity health rank for the site as a whole, establishing a baseline from which to measure future success towards conserving the site (TNC 2000).

♦ ***Conservation Targets and Viability Assessments***

Seven conservation targets were selected to best capture the biodiversity and ecological processes in the Chesapeake Rivers project area (Figure 2, Map 5). The tidal freshwater system and upland terrestrial system capture the gamut of critical ecological functions and the characteristic native biota within the project area at multiple scales, for rivers and uplands. Other targets represent significant biological elements not captured explicitly by the tidal freshwater or upland terrestrial systems. These include high quality bald cypress forests found exclusively on the Dragon, the cryptic fluvial terrace woodland communities occurring in only 2 sites on elevated islands in river floodplains, calcareous forests found in coves and ravines on unique shell deposits, and seepage wetlands which occur in highly dissected headwater areas of the inner coastal plain within the project area. Anadromous shad and herring fish species were also singled out as conservation targets due to the unique co-occurrence of these species in the Chesapeake Rivers and potential for viability not possible elsewhere given the unaltered river runs necessary to their reproduction. Conservation target profiles and viability assessments are presented below for each target (Table 3). Information on conservation targets, except for anadromous fishes, is based on the descriptions found in the Virginia Division of Natural Heritage's First Approximation classification of ecological community groups of Viriginia (Fleming et al. 2001) and extensive personal communications with Natural Heritage ecologists Gary Fleming, Phil Coulling and Dean Walton. Information on anadromous fishes is based on extensive communications with Dr. Greg Garman and Dr. Steve McIninch of Virginia Commonwealth University and the work of McIninch and Garman (1999).

Figure 2. Chesapeake Rivers conservation targets represented across different levels of biological organization at multiple scales.



1. Tidal Freshwater System

Definition:

Mosaic of inter-grading tidal freshwater emergent herbaceous marshes, mudflats, semi-open multi-strata hardwood swamp forest, and submerged aquatic vegetation found in the uppermost portions of the estuarine zone along inner coastal plain rivers; marshes are likely the most exemplary and extensive on the Atlantic coast. Rare species include sensitive joint vetch (*Aeschynomene virginica* (G2)), wild marsh senna (*Chaemacrista fasiculata var macrosperma* (G5T2)), Parker's pipewort (*Eriocaulon parkerii* (G3)), and *Cardamine longii* (G3Q).

Key Ecological Processes/Conditions:

- Flooding from diurnal lunar tides up to 1.5 m.
- Maintenance of freshwater regime (<.5ppt).
- Natural variability of sedimentation/erosion cycle.
- Adequate light penetration in water column (for SAV).

Viability Ranking:

Size: VERY GOOD
Comments: Multiple 1000+ acre occurrences of marshes and swamps.
Condition: GOOD
Comments: Marshes are in excellent condition in terms of species composition and structure; however, *Murdannia* is rampant thoughout and its impacts are unknown. Swamp forests are in fair condition exhibiting increased crown stress, mortality, shrub and marsh species invasion w/ canopy cover < 25% in some cases. Mudflats are in good condition based on the persistence of historic rarities. SAV condition unknown.
Context: GOOD
Comments: Terrestrial context is agriculture, silviculture and natural forest—all relatively stable systems. Little hydrologic alteration to the rivers (except for the Rappahannock), allowing for natural flow regimes and sediment/erosion cycles to occur. Potential increase in salinity and changes in water levels from rising sea level.
Overall Rank: GOOD

2. Upland Terrestrial Forest System

Description:

Well-drained upland forests consisting of beech, oaks, hickories and other common hardwood species; drier, acidic variants consist of strong ericad shrub component, little herbaceous cover and overall low species diversity; richer, mesic variants have higher (almost double) species diversity with paw-paw, holly, spicebush, dogwood with ferns and other herbaceous species in understory, including *Isotria medeoloides* (G2G3). Represents remnant occurrences of a formerly characteristic upland matrix forest of the coastal plain that will require significant restoration.

Key Ecological Processes:

- Gap regeneration and seedling recruitment of characteristic species resulting in uneven, mature age structure.
- Occasional fire to regenerate oaks and heaths (every 30-50 years)—but not in mesic forest types.

Viability Ranking

Size: POOR
Comment: Most occurrences are small (~10 acres); occurrences of 200+ acres are rare.
Condition: POOR
Comments: Overall, stands are immature and weedy. In more mature stands, beech, tulip poplar and red maple are often dominant due to the selective harvest of oaks and hickories and fire suppression.
Context: FAIR
Comments: Forests are highly fragmented often found in isolated patches surrounded by agricultural, silvicultural or residential land uses. Fire frequency and extent have been reduced throughout landscape.
Overall Rank: POOR

3. Bald Cypress Forests

Definition:

Progression from tidal bald cypress forest/woodlands to non-tidal, seasonally to semi-permanently flooded cypress-gum found primarily along Dragon Run. Non-tidal swamp on Dragon represents the most significant northernmost example of its kind on the coastal plain. The tidal forest is of outstanding quality.

Key Ecological Processes:

- Seasonal and semi-permanent flooding and innundation during growing season.
- Periodic drawdowns for regeneration and seedling recruitment.

Viability Ranking:

Size: VERY GOOD

Comment: Combined occurrence of tidal cypress forest and non-tidal cypress-gum forest is over 2,000 acres on Dragon.

Condition: GOOD

Comments: Tidal and portions of non-tidal forests are outstanding occurrences of very mature forests (100+ years old), exemplary in structure and composition. Non-tidal forest show evidence of logging, with ash and red maple dominated patches in the midst of mature stands of cypress.

Context: GOOD

Comments: Surrounded primarily by upland pine plantations; subject to episodic siltation and pesticide run-off; beavers active.

Overall Rank: GOOD

4. Fluvial Terrace Woodlands

Description:

Small patch, open woodland communities composed of xeric hickory and oak species. Anomalous due to elevated topographic position and sandy substrate in floodplain--likely relicts of sandhill communities. Enigmatic distribution with only 2 known occurrences in study area (on Dragon Run and on Mattaponi), but likely that other occurrences exist between James and Potomac. Occurrence along Dragon Run is especially unusual due presence of calciphiles such as redbud and columbine intermixed with typical sandhill species that favor acidic, lower nutrient conditions.

Key Ecological Processes/Conditions:

- Edaphically limited; fire may play a role in oak regeneration.

Viability Ranking:

Size: VERY GOOD

Comment: Reedy Mill occurrence is roughly 25 acres, Dragon occurrence is 10 acres.

Condition: GOOD

Comments: Dragon occurrence excellent with anomalous assemblage of sandhill species and herbaceous calciphiles, trees mature (~100 year old) w/ no evidence of logging, no exotics. Reedy Mill EO shows more signs of disturbance due to selective cutting.

Context: GOOD

Comments: Dragon occurrence is an elevated island buffered by high quality tidal cypress forest with no access. Reedy Mill surrounded by agricultural fields, road and boat launch.

Overall Rank: GOOD

5. Calcareous Forest

Description:

Small patch, rich northeast-facing, mature oak-hickory-beech-poplar forests with paw-paw dominant in the shrub layer and a diverse herb layer consisting of rock ferns, columbine, and other mountain disjuncts. Found in unique calcareous ravines where erosion has cut through surficial non-calcareous soils into marine shell deposits from Pliocene epoch. Distinctive and unusual communities in the coastal plain because of geology, species composition and maturity relative to other upland hardwood communities. Note: A very rare calcareous forest type (G1) is found on dry south-facing convex slopes and is dominated by *Quercus muehlenbergii* and diverse, dry-site herbs; not known in site but is likely be present (occurrences documented in Stafford and Surry Counties).

Key Ecological Processes:

- Gap regeneration and seedling recruitment of characteristic species resulting in uneven, mature age structure.

Viability Ranking:

Size: GOOD
Comment: Gasch property and Fort A.P. occurrences < 50 acres each.
Condition: VERY GOOD
Comment: Mature to very mature (150+ years old) with evidence of selective oak removal 80 to 100 years ago.
Context: GOOD
Comment: Found in forested landscape surrounded by bottomland hardwoods in floodplain and mixed oak-heath forest or pine plantations on ridge tops, grading into mixed mesic hardwoods on slopes.
Overall Rank: GOOD

6. Seepage Wetlands

Description:

A mosaic of inter-grading fire-maintained shrub/graminoid-dominated seepage bogs and forested seepage swamps that occur in small patches in areas of dissected topography and sandy/peaty soils in braided seepage streams of small headwaters and toe slopes fed by groundwater. Support rare plant species (*Helonias bullata* (G3, LT) and *Juncus caesariensis (G2))* and critical breeding habitat for odonates and amphibian species. Groundwater supports globally rare interstitial gastropods and isopods. Seepage wetlands (particularly the fire-dependent open bogs) are mostly extirpated throughout site due to fire-suppression and hydrological degradation and are in need of significant restoration. Scattered throughout inner coastal plain and Piedmont (G3/G4?).

Key Ecological Processes/Conditions:

- Groundwater flow and recharge.
- Frequent fire return interval (bogs only).

Viability Ranking:

Size: GOOD
Comment: Most swamps < 10 acres and bogs are ~1-2 acres.
Condition: FAIR to GOOD
Comments: Swamps are in very good condition with mature canopy structure. Bogs mostly degraded by the succession of non-fire tolerant woody species throughout range except where artificially maintained in powerline right-of-ways.
Context: FAIR
Comments: Swamps generally secure, buffered by other forests. Fire suppression suppression/lack of ignition throughout landscape. Hydrologic alteration due to road building and beaver dams.
Overall Rank: FAIR

7. Anadromous Fishes

Description

Unique assemblage of herrings--includes *Alosa aestivalis* (blueback herring), *Alosa pseudoharengus* (alewife), *Alosa mediocris* (hickory shad), and *Alosa sapidissima* (American shad). Target is the reproductive habitat of these fishes in the site. Historically, these four species' distribution overlapped in the mainstem tributaries of the Chesapeake Bay; however, the Rappahannock, Mattaponi and Pamunkey watersheds (to Fall Line) maybe last places where all 4 species can still migrate/reproduce successfully . without significant habitat impediments or alterations. In these 3 river systems, the ranges of the target species are found from Chesapeake Bay to upper portions of Chesapeake River watersheds in Piedmont and Blue Ridge. Adult fishes found throughout the rivers of the Atlantic seaboard from Newfoundland to Florida.

Key Ecological Processes/Conditions:

- Long, largely unaltered natural passages for migration and spawning.
- Appropriate substrate for spawning; emergent vegetation for nurseries.
- Lack of predation.

Viability Ranking:

Size: FAIR

Comment: Blueback and alewife are doing OK; hickory is rebounding; American shad has very low populations.

Condition: FAIR

Comments: Condition unknown but experts suggest that the combination of naturally variable population fluctuations with impacts of predation by non-native invasive predatory fishes, over fishing and degraded reproductive habitat may adversely affect age class structure, reducing the number of juveniles and spawning adults.

Context: GOOD

Comment: Rivers and tributaries are largely unaltered and provide strong spawning runs (exception is Embrey Dam); marshes provide high quality nursery habitat. Sedimentation from upland run-off a threat to viability of eggs.

Overall Rank: FAIR

- ***Site Biodiversity Health Score***

The overall biodivesity health rank is ranked as "fair" (Table 3). This primarily is a reflection the severe degradation and loss of functionality of the upland matrix forest system. However, the tidal freshwater system is considered to be functional and viable given its lack of alteration and natural state. The non-system scale targets are all considered viable. Significantly, the overall landscape context of the project area is good due to its rural and agricultural setting, improving the likelihood of conservation success.

Table 3. Viability ranks for Chesapeake Rivers conservation targets. (Please refer to Appendix B. for definitions of ranks).

Target	Size	Condition	Context	Viability Rank
Tidal Freshwater System		Good	Good	Good
Upland Terrestrial Forest System			Fair	
Bald Cypress Forests		Good	Good	Good
Fluvial Terrace Woodland		Good	Good	Good
Calcareous Forest	Good		Good	Good
Seepage Wetlands	Good	Fair	Fair	Fair
Anadromous Fishes	Fair	Fair	Good	Fair
Site Biodiversity Health Rank				Fair

Stresses and Sources of Stress

♦ ***Overview of Methods***

A threat is defined as a combination of the stress on the target and the source(s) of stress. A stress is defined as an "impairment or degradation of the size, condition, and landscape context of a conservation target, and results in reduced viability of the target" (TNC 2000). Stresses are identified and ranked for each conservation target based on the severity of damage to the target and the scope or scale of damage over the next 10 years. Consideration of a given target's viability attributes and ranks informs the process of identifying and ranking stresses. For instance, a target with "fair viability" indicates that there are severe and widespread stresses to the target having deleterious effects on its size, condition and context.

Each stress is attributed to one or more source for a given target (Table 4). A source of stress is defined as "an extraneous factor, either human or biological, that infringes upon a conservation target in a way that results in stress" (TNC 2000). Sources may be cited as historical or active. A historical source is currently inactive, but its past impacts remain persistent today (e.g. historical clearing of upland terrestrial forest for conversion to agriculture). An active source contributes to the stresses on a target presently and into the future (e.g. development). Sources are ranked based on both their degree of contribution to the stresses and the irreversibility of impacts over the next 10 years.

Stresses and sources of stress are ranked as "very high", "high", "medium" or "low". The active and historical threats are ranked for all targets both individually (Appendix C) and collectively across the site (Table 6).

♦ ***Definition of Stresses***

The following stresses have been identified for the Chesapeake Rivers conservation targets:

- **Habitat destruction:** The elimination of physical habitat suitable for a given target.
- **Target destruction:** The physical elimination of the conservation target itself. The habitat or substrate of the target may still remain though the target is destroyed.
- **Altered composition and structure:** Changes the characteristic species diversity, structure and abundance of a given vegetation community due to disturbances such as logging, invasive and/or non-native species, and fire suppression.
- **Habitat fragmentation**
  1. Loss of connectivity, size and functionality of a given target's distribution due to a conversion or destruction event.
  2. Increased edge-to-area ratio that creates edge effects, disrupting the interior forest conditions. Edge effects change the light, temperature and moisture regimes of forest interiors in addition to increasing competition and predation by early successional and/or invasive species.
- **Extraordinary competition for resources**: The process by which invasive species out-compete native species and communities for resources such as light, nutrients, and water, thereby succeeding and displacing the native vegetation.

- **Alteration of natural fire regime.** Disruption of natural, historical fire return intervals, fire intensity, severity and extent in vegetation communities that changes the composition, structure and abundance of characteristic, fire-influenced species and communities.
- **Changes in water levels/alteration of natural flow regime:**
  1. A significant change to a river's flow regime that reduces the natural seasonal variability in baseflow (i.e. higher average minimum baseflows or lower average peak baseflows), affecting the persistence of wetland vegetation. Alterations of this sort are due to hydrologic alterations such as dams and reservoirs, water withdrawals or sea level rise.
  2. A change to groundwater or surface water flow, volume and period of inundation that affects the persistence of palustrine wetlands. Sources of this stress are disruption of water flow by development/ construction activities and beaver dams.
- **Alteration of sediment regime.** Changes to the naturally variable cycles of sediment accretion and erosion that create and maintain tidal wetland communities.
- **Sedimentation**: The addition of soil, sand, silt and other substrate to water bodies via overland flow during rain or flood events due to erosion/disturbance of upland habitat.
- **Salinity alteration:** Increased salinity levels in the tidal and non-tidal freshwater communities that favor brackish and salt marsh tolerant vegetation, thereby displacing and eliminating obligate freshwater species. Increases in salinity can be due to sea level rise, freshwater withdrawals (both surface and ground water) and periods of drought.
- **Erosion of substrate.** The loss of substrate due to disturbance or destruction of its rooting vegetation by logging or development activities. This stress is particular to calcareous forests that are distributed on ravines and steep northeasterly facing slopes on top of rich calcareous deposits of marine shells.
- **Nutrient loading**: Addition of excessive nutrients such as nitrogen and phosphorus to water bodies via overland flow during rain or flood events. Excess nutrients cause eutrophication of river and stream channels, leading to algae blooms that block available sunlight for photosynthesis of SAV.
- **Extraordinary predation.** The excessive mortality of an organism (in this case, the anadromous fishes) caused by an invasive predatory species or anthropogenic hunting/fishing activities.
- **Loss of access to reproductive habitat.** Inaccessibility of spawning and nursery habitat for anadromous fishes due to structural impediments and fishing practices that block fish passage.

Table 4. Stresses and sources of stress to conservation targets in the Chesapeake Rivers. The matrix below illustrates the various sources for a given stress to a conservation target in the project area.

	STRESSES												
SOURCES of Stress	***Habitat or target destruction***	***Altered composition and structure***	***Habitat fragmentation***	***Extraordinary competition for resources***	***Alteration of natural fire regime***	***Changes in water levels/alteration of natural flow regime***	***Alteration of sediment regime***	***Sedimentation***	***Alteration of salinity regime***	***Erosion of substrate***	***Nutrient loading***	***Extraordinary predation***	***Loss of access to reproductive habitat***
Invasive and/or non-native species		X		X								X	
Development (residential homes, roads, other infrastructures)	X		X			X	X	X		X	X		X
Incompatible forestry practices (silviculture)	X	X	X							X			
Lack of fire		X			X								
Fishing (includes boating)	X											X	X
Dam construction by beavers						X							
Conversion to agriculture	X		X										
Sea level rise						X	X		X				
Construction of dams and reservoirs						X	X	X	X				X
Ground water withdrawals						X			X				
Structural impediments to fish passage (dams, clogged culverts, etc.)						X		X				X	X
Surface water withdrawals (Agriculture)						X			X				
Incompatible crop and forestry practices (inadequate BMPs)							X	X			X		

♦ ***Sources of Stress***

A list of the conservation targets affected and descriptive information on each source of stress is presented below in order of its overall threat rank, from highest to lowest.

1. Development (residential homes, roads, other infrastructures)

- *Overall threat rank*: **High**
- *Total targets affected*: 6 (tidal freshwater system, fluvial terrace woodlands, upland terrestrial forest system, calcareous forests, seepage wetlands and anadromous fishes).

Comments: The Chesapeake Rivers project area is primarily threatened by residential home development and other infrastructures such as roads and powerlines. Residential sprawl is prevalent in the outskirts of northeastern Richmond on the south side of the upper Pamunkey River and in southeastern Fredricksburg on the upper Rappahannock. Warsaw and Tappahannock, flanking either side of the lower Rapphannock, are both predicted to experience accelerated residential sprawl over the next 10 years. Currently, 6% of the Rappahannock watershed that falls in the project area is residential. Development is ranked highly due to the permanent and irreversible damage to conservation targets.

2. Incompatible forestry practices (silviculture)

- *Overall threat rank*: **High**
- *Total targets affected*: 3 (bald cypress forests, upland terrestrial forest system and calcareous forests)

Comments: Native upland hardwood and mixed pine-hardwood forests have been extensively cleared and replaced with plantations of loblolly pine throughout the project area, most notably in King and Queen County. Estimates using classified landcover data show that roughly 334,000 acres, or 29%, of the Chesapeake Rivers project area are mixed pine forest, the majority of which is pine plantation (VA GAP 2000). Hardwood sawtimber is one of the most commercially valuable natural resources of the project area. Mature, prime sawtimber species such as oaks are found in rich, mesic calcareous ravine forests and mesic mixed hardwood forests of the dissected topography along tributaries of rivers. Due to the moratorium on logging in select areas of the national forests lands of Virginia, private logging companies have begun to expand their areas of sawtimber procurement to include the coastal plain. Moreover, in the next 10 years, it is expected that large operation logging companies from the western U.S. will begin to move into areas such as the Chesapeake Rivers to procure hardwood sawtimber as well. This is especially alarming as these larger companies will employ newer logging technology such as cable logging which will enable them to remove timber from areas previously considered inaccessible using conventional logging methods. Currently, there are 7 paper, 25 lumber and 11 forestry companies located within the project area (Map 6).

3. Invasive fish species

- *Overall threat rank*: **High**
- *Total targets affected*: 1 (anadromous fishes)

Comments: There are 18 confirmed introduced, invasive and mostly predatory fishes the Rappahannock and York drainages, representing roughly 30% of the fish species in these rivers (Table 5) (G. Garman and D. Fowler, *personal communication*). The life history

strategy of native anadromous clupeid fishes is to migrate upstream as a means of escaping predation in the Bay and ocean, ensuring the success of their offspring. Therefore, the introduction of invasive predatory fish into the spawning and nursery waters of these anadromous fishes poses a severe threat to the viability of their populations to which they have no natural defenses. Many of the fish species were introduced in the later 19th century by the U.S. Fish Commission and then between 1953 and 1972 by the Virginia Department of Game and Inland Fisheries (VDGIF) (Jenkins and Burkhead 1994). Limited stocking by VDGIF of a few species continues today (Table 5) (D. Fowler, *personal communication*). The blue catfish (stocked in the mid-1970's) is of particular concern as it is a newer introduction that has successfully thrived and naturalized in the rivers and is a voracious predator of native anadromous fishes such as alewife and blue back herrings (G. Garman, *personal communication*). The blue is on average 15-20 pounds and can grow as big as 100 pounds in comparison to the average 2-4 pound weight of an alewife or blueback herring.

Table 5. List of invasive non-native fishes of the Chesapeake Rivers project area. Information on the fishes status as a predator of native anadromous, clupeid fishes and on its stocking history is included. (Information compiled from personal communication with G. Garman, D. Fowler and Jenkins and Burkhead 1994.)

Invasive Fishes in Project Area	**Predator? (at all life stages unless otherwise indicated)**	**Currently Stocked?**
grass carp	Yes (on eggs only)	Unknown; since 1983, VDGIF has issued permits for importation of sterile triploids; stocked lakes in Orange Co. in mid-1980's
red shiner	No	No; never stocked but is sold commonly as a tropical fish for aquariums and often used as bait
flat-head catfish	Yes	No
thread-fin shad	Yes (on eggs and larvae only)	No
common carp	Yes (eggs during only demersal phase)	No; introduced in 1880 via commercial hatcheries
channel catfish	Yes	Yes (in impoundments by VDGIF and private landowners)
Largemouth bass	Yes	Yes (in new or renovated public impoundments by VDGIF)
Smallmouth bass	Yes	No; stocked by the VA Fisheries Commission in Rappahannock around 1880
spotted bass	Yes	No; stocked by VDGIF in Lake Anna in 1979
blue catfish	Yes	Unknown; stocked in Rappahannock in early 1970's
green sunfish	Yes (on eggs, larvae, and juveniles only)	No; introduced in Rapphannock in 1941 by aquarium trade.
bluegill	No	Yes (in new or renovated public impoundments by VDGIF)
redear sunfish	No	Yes (in new or renovated public impoundments by VDGIF)
black crappie	Yes	No; first records in York 1949, Rappahannock 1959, probably stocked by private sector
white crappie	Yes	No

Invasive Fishes in Project Area	Predator? (at all life stages unless otherwise indicated)	Currently Stocked?
warmouth	Yes (on eggs, larvae, and juveniles only)	No; first stocked in York in 1934 and in Rappahannock in 1968
northern pike	Yes (found almost exclusively in impoundments)	No (but stocked by DGIF in other drainages)
Muskellunge	Yes (found almost exclusively in impoundments)	No (but stocked by DGIF in other drainages)

4. Invasive and/or non-native plant species

- *Overall threat rank*: **High**
- *Total targets affected*: 3 (tidal freshwater system, upland terrestrial forest system, calcareous forests)

Comments: Invasive, non-native plant species pose a serious threat to the viability of natural communities by competitively displacing native species. In the tidal freshwater system, some of the most alarming invaders include *Murdannia keisak* (marsh dewflower), *Phragmites australis,* and *Hydrilla verticillata* (hydrilla). Invasive plants of the upland terrestrial system (including calcareous forests) include *Lonicera japonica* (Japanese honeysuckle), *Microstegium vimineum* (Japanese grass) and *Alliaria petiolata* (garlic mustard). Each of these plant species are well-established and naturalized in the eastern U.S. due to historical introductions for horticulture, erosion control or mishap. While each of these species is present within in the project area, the distribution, abundance and impact is unknown at this point in time.

5. Conversion to agriculture --(historical and active)

- *Overall historical threat rank:* **High**
- *active threat rank*: **Medium**
- *Total targets affected*: 1 (upland terrestrial forest system)

Comments: The majority of the upland areas of the Chesapeake Rivers project area has undergone repeated land clearings and cultivation over the last 400 years since Europeans first arrived. Currently, roughly 23% of the landscape is classified as agricultural (VA GAP 2000, Map 1). The land is farmed primarily for commercial crops such as wheat, corn, and soy in addition to limited row cropping. Very little livestock farming takes place in this part of Virginia. Today, clearing of upland secondary forests for agricultural uses continues though not as extensively as in the past.

6. Sea level rise

- *Overall threat rank*: **Medium**
- *Total targets affected*: 3 (tidal freshwater system, bald cypress forests and anadromous fishes)

Comments: Current thinking suggests that sea levels will rise at a rate of 5 cm per decade or 50 cm over the next century (Map 7). Over the next 10 years, there will be negligible effects on the project area in terms of increased water levels or salinity to the tidal freshwater and non-tidal systems of the rivers. However, over the next 50-100 years, it is

assumed that a gradual migration of vegetation inland will occur as the tidal zone and salinity gradients move upstream. Much is unknown regarding the future character and condition of marsh and swamp communities with accelerated rates of sea level rise. The persistence of tidal freshwater vegetation is in large part due to the fluvial geomorphologic processes of coastal plain rivers. How will fluvial geomorphology change in the Chesapeake rivers with rising sea level and how this will affect the dynamics, composition and structure of marsh and swamp communities as we know them today? Moreover, little information exists on the impacts of sea level rise on freshwater aquatic fauna. For example, how will rising sea levels affect the reproductive habitat of anadromous fishes, if at all? Given these many contingencies and uncertainies, sea level rise is ranked as a medium for the next 10 years.

7. Water Management

- *Overall threat rank*: **Medium**
- *Total targets affected*: 2 (tidal freshwater system, anadromous fishes)

Comments. Water management is a complicated threat consisting of several different sources, including surficial water withdrawal projects (reservoirs, dams), groundwater withdrawals (primarily for industrial uses), and headwater withdrawals for agricultural.

Overall, rivers in the project area are relatively free of hydrologic alterations such as dams and reservoirs. However, growing human populations in surrounding urban areas are creating an increasing demand for freshwater resources, particularly for drinking water supply. This threat is epitomized by the controversial and still unresolved application by the city of Newport News to the U.S. Army Corps of Engineers to provide water for its citizens by pumping it from the Mattaponi River and storing it in a reservoir to be constructed on Cohoke Creek, a tributary of the Pamunkey in King William County. It is anticipated that more applications such as this one will be submitted over the next 10 years, though it is improbable that more than 1 reservoir—if that--would be built during this time given the surrounding controversies and beauracratic maneuverings involved in such projects.

The contribution of groundwater to base freshwater flow needs to be understood to fully evaluate the impact groundwater withdrawal has on freshwater flow regimes of the rivers. Comprehensive information on groundwater withdrawals by paper, chemical or nuclear plants is not available, though it is available for local areas designated as groundwater management zones. A paper mill along the lower Pamunkey near West Point has been withdrawing significant amounts of groundwater from an underground aquifer which has in turn caused subsidence of the marshes, precluding the future full capacity recharge of the aquifer. Though this is a localized event, the same type of groundwater withdrawals could be occurring in multiple locations throughout the project area.

In addition, surface water withdrawals for agricultural purposes do commonly occur, especially in times of drought, and have the potential to contribute to an overall reduction in freshwater flow to these smaller streams. Farmers can withdraw unregulated volumes of water from headwater streams and other tributaries without permits. This makes it impossible to account for the total amount or rate at which these withdrawals take place

throughout the project area. At this time, this does not seem to be causing significant stress to the targets.

8. Lack of fire

- *Overall threat rank:* **Medium**
- *Total targets affected*: 2 (upland terrestrial forest system, seepage wetlands)

Comments: The lack of fire in the landscape is due to fire suppression, a lack of natural ignition sources and human infrastructures (roads, farmlands) that prevent its spread. Upland terrestrial and palustrine vegetation in the coastal plain have adapted to fire due to its consistent use by indigenous peoples since the retreat of the last ice age. European settlers used fire in a similar fashion as the native peoples to clear land for hunting, agriculture, and so forth. However, for most of the 20th century and continuing into the 21st, cultural attitudes towards fire have radically changed to exclude and actively suppress its use as a land management tool. The Virginia Department of Forestry has banned prescribed burning on privately owned lands in the spring (February 15th to May 1st until 4pm) to reduce risks and costs of fire problems.

9. Fishing (includes boating)

- *Overall threat rank*: **Medium**
- *Total targets affected*: 2 (tidal freshwater system, anadromous fishes)

Comments: Large scale commercial fishery operations in the Chesapeake Bay employ "intercept" methods such as pound and gill netting. While this type of fishing for American shad has been banned in the Virginia jurisdiction of the Bay, it still occurs in the Bay at large—though the Atlantic Fisheries Commission plans to impose regulations to protect shad throughout the Bay in the next 5 years. However, no regulations exist in the Bay to protect the blueback herring, alewife and hickory shad from intercept fishing practices, resulting in excessive mortality of these fishes as incidental by-catch.

Within the project area (i.e. along the rivers), most fishing is recreational and does not have a significant impact on fish populations. However, the boating activities associated with fishing have numerous impacts the vegetation of the tidal freshwater marshes. The propellers on motorized boats that are used to fish in the rivers and tributaries damage and disturb submerged and low tide emergent vegetation. Motorized boats also promote the spread hydrilla by carrying pieces of the plant in the propellers far distances, allowing the plant to disperse and colonize new habitat. There are a total of 6 designated recreational boating access points along the Mattaponi and Pamunkey Rivers and 11 along the Rappahannock River.

10. Dam construction by beavers

- *Overall threat rank*: **Medium**
- *Total targets affected*: 1 (seepage wetlands)

Comments: Since the re-introduction of beavers to the mid-Atlantic states in the first half 20th century, beaver populations have exploded in Virginia. In the project area, beavers are particularly attracted to slow moving seepage streams, the same habitat of seepage swamp forests and bogs. They down trees and build dams, flooding the habitat for emergent and forested wetland vegetation of the seepage communities. Beavers were

most likely a keystone species historically that shaped the wetland landscape. However, due to the degradation, destruction and fragmentation of the natural landscape in conjunction with the lack of natural predators, the overpopulation of beavers poses a serious threat to the sensitive hydrology of rare small patch vegetation communities such as seepage wetlands. While beavers are a very high contributor to the immediate destruction of these seeps, the damage can be remedied in a straightforward manner[1]. Therefore the overall threat rank is a medium.

11. Structural impediments to fish passage (dams, clogged culverts, etc.)

- *Overall threat rank*: **Low**
- *Total targets affected*: 1 (anadromous fishes)

Comments. The rivers and tributaries of the project area are without significant structural impediments to the migration of spawning anadromous fishes; hence the low ranking of this threat. Embrey Dam is the only mainstem dam in the project area, located on the upper Rappahannock at the Fall Line in Fredricksburg. This dam blocks the passage of migrating American and hickory shad and to a lesser extent the blueback herring and alewife. However, this dam is scheduled to be removed in 2002 by the Corps. Lake Anna, located on the border between Louisa and Spotsylvania counties in the Piedmont, is a reservoir on a main tributary (the North Anna River) of the Pamunkey; however, its role in blocking fish passage is insignificant as little evidence exists to suggests herrings and shads currently migrate above the Fall Line in the York drainage. Numerous smaller structural impediments exist on tributaries such as low head dams and culverts that clog easily with debris, preventing fish passage.

12. Incompatible crop and forestry practices (BMPs)

- *Overall threat rank*: **Low**
- *Total targets affected*: 2 (tidal freshwater system, anadromous fishes)

Comments. Incompatible crop and forestry practices primarily refer to increases in sedimentation and nutrient loading to the tidal freshwater system due to a lack of implementation of best management practices. The Chesapeake Bay Preservation Act stipulates the designation of resource management zones for implementation of BMPs to protect the bay only if ratified by the county. While all counties east of I-95 have ratified the act, compliance is still largely voluntary and unenforceable. The more recent Chesapeake 2000 Agreement developed by the Chesapeake Bay Commission (a coalition of state and federal agencies) stipulates that 20% of the Virginia portion of the Chesapeake Bay watershed must be protected by the year 2010. This is a low ranking threat because non-compliance with BMPs on the flat to gently rolling terrain of the coastal plain does not cause as severe sedimentation or nutrient loading in the Piedmont or mountains.

- ***Overall Site Threat Rank***

[1] Though a beaver dam can be unplugged easily, wetlands created by beavers have the same status as non-beaver created wetlands under the Clean Water Act. However, one does not neeed a license to trap and kill beavers in the state of Virginia.

Overall, the active threat rank for the Chesapeake Rivers landscape is "high" (Table 6). The high ranking reflects an increasingly populated area that is developing at a moderate pace and increasing the demand for land and freshwater resources, with a lucrative forestry and timber industry, while the remaining natural systems are plagued by numerous intractable and spreading invasive/non-native species.

Table 6. Threat ranks for the Chesapeake Rivers conservation targets.

Active Threats across Conservation Targets	Tidal Fresh-water System	Bald Cypress Forests	Fluvial Terrace Woodland	Upland Terrestrial Forest System	Calcar-eous Forest	Seepage Wetlands	Anadro-mous Fishes	**Overall threat rank**
Development (residential homes, roads, other infrastructures)	Medium	-	Medium	Very High	Medium	High	Medium	**HIGH**
Incompatible forestry practices (silviculture)	-	Medium	-	Very High	Medium	-	-	**HIGH**
Invasive and/or non-native fish species	-	-	-	-	-	-	Very High	**HIGH**
Invasive and/or non-native plant species	High	-	-	Medium	High	-	-	**HIGH**
Sea level rise	High	Medium	-	-	-	-	Medium	**MEDIUM**
Water Management	High	-	-	-	-	-	Medium	**MEDIUM**
Lack of fire	-	-	-	High	-	Medium	-	**MEDIUM**
Fishing (includes boating)	Low	-	-	-	-	-	High	**MEDIUM**
Dam construction by beavers	-	-	-	-	-	High	-	**MEDIUM**
Incompatible crop and forestry practices (inadequate BMPs)	Medium	-	-	-	-	-	Low	LOW
Structural impediments to fish passage (dams, clogged culverts, etc.)	-	-	-	-	-	-	Medium	LOW
Conversion to agriculture (Active)	-	-	-	Medium	-	-	-	LOW
Threat Status for Targets and Site	High	Medium	Low	Very High	Medium	High	High	**HIGH**

Conservation Strategies

- ***Overview of Methods***

The next step in the site conservation planning process is to decide how best to protect and conserve the conservation targets, given the analyses of their viability and threats. The general goals of the site conservation plan are to improve the viability and abate the threats to the conservation targets. Conservation strategies are means by which we meet these goals.

As a prelude to determining the most effective conservation strategies for the Chesapeake Rivers, the team set both conservation goals and threat abatement goals. A ***conservation goal*** is defined as the desired viability of a given conservation target. General conservation goals (Table 7) specify the aspect (i.e. size, condition or context) of viability to be maintained or improved and the intended degree (i.e. "fair" to good) of improvement. These goals are based on a consideration of the key attributes that are most vulnerable to threats in combination with the feasibility of taking effective conservation action (i.e. it may be possible to improve the condition of a given target but not the size or context). More specific and quantitative management goals will be determined as part of a monitoring program for the conservation targets to be completed in the next year. A ***threat abatement goal*** articulates the desired future reduction of a given threat or the restoration of a target that will in turn improve its viability. Threat abatement goals are based on the threats with medium to very high ranks only in order to concentrate energies on areas of immediate need.

Based on these conservation and threat abatement goals, the planning team developed 14 conservation strategies to fulfill conservation and threat abatement goals for the Chesapeake Rivers (Table 8). Conservation strategies are grouped by the following categories:

- Land Use/Land Protection
- Water Management
- Forest Restoration
- Invasive Fishes
- Invasive Plants
- Sea Level Rise
- Seep Restoration

For a each conservation strategy, a list of implementation or action steps are presented that will be incorporated in the TNC-VA annual strategic plan and staff goals and objectives. Lead staff members and time lines for implementation are noted for each step.

Strategies were also evaluated for their effectiveness in abating sources of stress to targets, improving viability, costs of implementation, and feasibility (Table 9). While the results of this evaluation are not used to assign priority to the conservation strategies, they are helpful in deciphering and taking into full consideration the realistic constraints involved with implementation.

Table 7. Conservation goals and threat abatement goals for Chesapeake Rivers conservation targets.

Conservation Targets	Viability Rank	Conservation Goal	Threat Rank	Threat Abatement Goals
Tidal Freshwater System	Good	To maintain "good" condition.	High	➢ Protect key tracts with exemplary occurrences of conservation target. ➢ Reduce the threat of non-native, invasive plant species. ➢ Assess long-term effects of sea level rise on project area and conservation target. ➢ Preserve natural range of variability of flow regimes of tidal freshwater system.
Bald Cypress Forests	Good	To maintain "very good" size and "good" condition. Target local occurrences for improvement from "fair" to "good" condition.	Medium	➢ Protect key tracts with exemplary occurrences of conservation target. ➢ Assess long-term effects of sea level rise on project area and conservation target.
Fluvial Terrace Woodland	Good	To maintain "very good" size and "good" condition.	Low	➢ Protect key tracts with exemplary occurrences of conservation target.
Upland Terrestrial Forest	Poor	To improve size and condition from "poor" to "good".	Very High	➢ Protect key tracts with exemplary occurrences of conservation targets. ➢ Reduce the impacts of development on conservation target. ➢ Restore at least one functional upland terrestrial forest (>10,000 acres) in each matrix block. ➢ Reduce the threat of non-native, invasive plant species
Calcareous Forest	Good	To maintain "good" size and condition.	Medium	➢ Protect key tracts with exemplary occurrences of conservation targets. ➢ Reduce the impacts of development on conservation target. ➢ Reduce the threat of non-native, invasive plant species
Seepage Wetlands	Fair	To improve condition from "fair" to "good".	High	➢ Protect key tracts with exemplary occurrences of conservation target. ➢ Restore viable seepage wetlands.
Anadromous Fishes	Fair	To increase "fair" population sizes to "good", improve populations' condition from "fair" to "good" and maintain "good" context.	High	➢ Protect key tracts with exemplary occurrences of conservation target. ➢ Reduce the threat of non-native, invasive predatory fishes ➢ Assess long-term effects of sea level rise on project area and conservation target. ➢ Preserve natural range of variability of flow regimes of tidal freshwater system. ➢ Reduce the threat of fishing.

♦ ***Conservation Strategies and Implementation Steps***

Each strategy category lists the appropriate conservation strategies followed by the initials of staff members responsible for implementation of the strategy. For each strategy, implementation or action steps are listed followed by a list of key partners critical to implementation success. All strategies are of equal priority.

I. Land Use/ Land Protection

➢ **Strategy 1.** *Identify tracts of land with the most viable occurrences of conservation targets and protect through acquisition or conservation easements* (**ADL, LLC**).

Action Steps:

1. Continue to work with the Rappahannock Working Group to add key tracts to the Rappahannock Valley NWR using funds from the LWCF.
2. Establish a cooperative agreement with Fort A.P. Hill to manage and protect exemplary occurrences of seepage wetlands on the military base.
3. Apply for NAWCA grants and other sources to support land acquisition.
4. Develop a protection priority map and promote at state and county levels to direct the fulfillment of Chesapeake Bay Agreement for Virginia within the project area.
5. Protect key tracts on the Dragon Run, Rappahannock, Pamunkey and Mattaponi through TNC and partner acquisition of legal interest and management.
6. Secure easements on high quality upland forest through Forest Legacy Program.
7. Identify potential reservoir sites and work to acquire or place restrictive covenants on them.
8. Enroll Wetland Restoration Trust Fund sites as appropriate for acquisition and restoration.

Key Partners:

DCR, RWG, USFS, USFWS, DOD, VAULT, Resource Management, ACE, VA-DOF

➢ **Strategy 2.** ***Develop/promote land use policies and compatible economic development initiatives with partners that conserve land in matrix blocks and protect water quality/flow regimes*** (**ADL**, NR).

Action Steps:

1. Identify the important conservation areas most vulnerable to residential sprawl and calculate the true benefit/cost of development; use information to assist county comprehensive planning processes to promote more compatible economic development.
2. Work with local citizens in designated areas to determine which types of economic development are consistent with the conservation goals and work to promote this type of development to key areas.
3. Become involved with county comprehensive planning process where necessary and work with localities to integrate TNC conservation goals into upcoming county comprehensive plans.
4. Develop a protection priority map and promote at state and county levels to direct the fulfillment of Chesapeake 2000 Agreement for Virginia within the project area.

5. Co-ordinate coalition of local environmental groups (include American Farmland Trust) to develop strategy for PDR open space programs in counties where appropriate (i.e. has sufficient tax base and where a PDR program would be most useful towards meeting conservation goals).
6. Work with the Farm Bureau, local organizations, land owners and localitites to create forestry and/or agricultural districts in matrix sites or enact land use taxation to maintain current land use over the short term.

Key Partners:
County governments, planning district commissions, local organizations (Friends of the Dragon Run, Friends of the Rappahannock, Mattaponi and Pamunkey Rivers Association, Middle Peninsula Land Trust, etc.),

II. Water Management

- **Strategy.** ***Develop regional water use policy[2] to determine the source of current and future water need and to effect the best method to meet the need.*** (**NMR**, MLL, JKD)

Action Steps:
1. Research past efforts to establish a water use policy in the east in addition to existing laws and regulations concerning water use in Virginia.
2. Hold TNC meeting on water policy, inviting TNC-HO experts, to determine policy content and best course of action for its implementation.
3. Start small coalition with CBF in support of proposed water use policy.
4. Solicit endorsement of policy by broader audience of partners.
5. Support partner agencies to seek sponsor for policy who will introduce to General Assembly for enactment.

Key Partners:
CBF, SELC, local organizations, county governments, PDCs

III. Forest Restoration (See Map 8 for locations of matrix sites chosen for forest restoration.)

- **Strategy 1.** ***Restore connectivity of matrix forest through a shift in current pine management to longer-rotation mixed hardwood/pine forest*** (**ADL**, LLC, JKD).

Action Steps:
1. Work with private forestry consulting agencies and public agencies (DOF) to encourage them to promote longer rotations and hardwood regeneration when working with private landowners. As part of this:
   - Work with consultants to conduct economic analysis to compare returns on clearcutting young pine plantations and selective harvest of hardwood over time and use results to educate landowners about different options for forest management and procurement.

[2] However, upon further investigation, if a regional water use policy strategy proves ineffective due to inter-basin transfers of water supplies, the next step will be to develop a state-wide water use policy to comprehensively abate the threat of water withdrawals.

- Establish a network of demonstration forest with help from private consultants and DOF that promotes sustainable forestry, longer rotations, hardwood regeneration and saw timber procurement.

2. Establish hunting preserves for quail and turkey to promote sustainable forestry.
3. Secure conservation easements for patches of core forest area or significant linkages between large patches through partners such as the Forest Legacy program or VOF.
4. Work with DOD's Natural Resources staff at Fort A.P. Hill to manage forest for mature, un-even aged mixed pine/hardwood community types.

Key Partners: DOF, DCR, USFWS, DOD, private consultants, private landowners, and local organizations

- **Strategy 2.** ***Restore connectivity of matrix forest through conversion of key agricultural lands to mixed hardwood/pine forest*** (**ADL**, LLC, JKD).

Action Steps:

1. Identify key agricultural lands necessary for forest restoration in matrix sites and work to acquire legal interests.
2. Continue to work with the Rappahannock Working Group to add key tracts to the Rappahannock Valley NWR using funds from the LWCF and to reforest these tracts where appropriate.

Key Partners:
USFWS, NRCS, local organizations, private landowners

IV. Invasive Fishes

- **Strategy 1.** ***Determine invasive/ non-native fish species that contribute the greatest threats to conservation target*** (**ADL**, Aquatic Ecologist).

Action Steps:

1. Conduct a cost-benefit analysis to determine the feasibility for DGIF to promote recreational fishing of native fish species over non-native species in terms of revenue generated from recreational fishing licenses.
2. Meet with DGIF to promote inventory and monitoring of native and invasive fishes on the Mattaponi, Pamunkey and Dragon Run.
3. Research possible funding sources (i.e. EPA, USFWS, NOAA, TNC Invasives Program) and submit proposals to fund DGIF to inventory and monitor native and non-native invasive fishes on Mattaponi, Pamunkey and Dragon Run.
4. Sponsor conferences for the Chesapeake Bay region on the potential impacts of all invasive species to native aquatic and terrestrial biodiversity to communicate the current state of knowledge, research and strategies for effective control measures.
5. Model the distribution and abundance of anadromous fish nursery habitat and invasive predatory fish abundance.
   - Apply for FWI project grant support with match by the ACE to contract a university (i.e. VCU) to conduct work on the Rappahannock.
   - Using grant money, establish baseline data on fish (anadromous natives and invasives), impediments and physical/chemical attributes of water.

- Build GIS model that predicts the distribution and of andromous fish reproductive habitat and invasive predatory fish habitat (or density?).
- Work to gather data and model habitat for fishes on the Mattaponi, Pamunkey and Dragon Run as well.

Key Partners:
ACE, VCU, CBF, DGIF, local organizations

- **Strategy 2.** ***Develop policy to eliminate introduction and stocking of non-native fish species in the Coastal Plain and Piedmont*** (**ADL**, NMR, Aquatic Ecologist).

Action Steps:

1. Work to develop list of alternative native species for stocking as well as aquarium and bait trade.
2. Build Chesapeake Rivers coalition with Bay organizations (CBF) and local grass roots river organizations, including sports fisherman groups, dedicated to public education, advocacy of regulatory policies and protection of native, anadromous fishes.
3. With coalition, approach Gary Martel and Bill Woodfin of VDGIF with proposed alternatives to current stocking and aquarium/bait trade policies and regulations.
4. Work with NRCS and the Cooperative Extension to promote alternatives to current recommended species for stocking ponds and reservoirs on private land.
5. Research Maine's laws banning the importation of non-native fish species.

Key Partners: CBF, VDGIF, NRCS, local organizations, Coastal Conservation Association (CCA), and American Sport Fishermen's Association (ASFA).

- **Strategy 3.** ***Work with local, state and federal agencies to develop policy to reduce and control non-native/invasive fish populations and to enforce existing laws*** (**ADL**, NMR, Aquatic Ecologist).

Action Steps:

1. Consult with commercial fishery operations in areas where invasive fishes are native to research the types of markets for these fishes.
2. Working with partners and university community, explore measures for controlling fish populations at large through methods such as low frequency electrofishing, bio-controls and weirs that restrict upstream passage of larger invasive species.

Key Partners:
CBF, VCU, local organizations, CCA, and ASFA

- **Strategy 4.** ***Promote sound fisheries management to increase anadromous fish abundance*** (**ADL**, NMR, Aquatic Ecologist).

Action Steps:

1. [***Repeat***] Build Chesapeake Rivers coalition with Bay organizations (CBF) and local grass roots river organizations, including sports fisherman groups, dedicated to public education, advocacy of regulatory policies and protection of native, anadromous fishes.

2. Approach VMRC to initiate dialogue regarding regulations and policies that will protect all anadromous clupeid fish targets similar to those that already exist for the American shad.
3. [***Repeat***] Model the distribution and abundance of anadromous fish nursery habitat and invasive predatory fish abundance.
   - Apply for FWI project grant support with match by the ACE to contract a university (i.e. VCU) to conduct work on the Rappahannock.
   - Using grant money, establish baseline data on fish (anadromous natives and invasives), impediments and physical/chemical attributes of water.
   - Build GIS model that predicts the distribution and of andromous fish reproductive habitat and invasive predatory fish habitat (or density?).
   - Work to gather data and model habitat for fishes on the Mattaponi, Pamunkey and Dragon Run as well.
4. Work with DOT and VDGIF to install fish passage-friendly culverts.
5. Work with local organizations and volunteers to remove obstructed culverts in critical areas for spring migration of anadromous fishes in small headwater streams.

Key Partners:
CBF, VMRC, AMFC, local organizations, CCA, and ASFA

V. Invasive Plants

- **Strategy 1.** ***Determine invasive/ non-native plant species that contribute the greatest threats to conservation targets*** (**SGL**, JKD, JA).

Action Steps:

1. Create list of actual and potential invasive plant species by literature review, consultation with partners and observation.
2. Assess risk of invasion posed by each species based on the following:
   - Life history characteristics.
   - Observed invasion of habitats similar to targets elsewhere in the target's range.
   - Proximity of species to key conservation area.
   - Vector of invasion.
3. Determine degree of impact of high risk invasive plants on conservation targets by performing literature review and expert interview and by working with academic partners to perform applied research.
4. ***[Repeat]*** Sponsor conferences for the Chesapeake Bay region on the potential impacts of all invasive species to native aquatic and terrestrial biodiversity to communicate the current state of knowledge, research and strategies for effective control measures.

Key Partners:
DCR, USFWS, CBF, VNPS, local river groups, universities

- **Strategy 2.** ***Develop control strategies for priority invasive plant species in key conservation areas*** (**SGL**, JKD, JA).

Action Steps:

1. Map weed control zones based on degree of threat and feasibility of control for high risk invasive plant species.
2. Acquire management agreements or form collaborative partnerships to control invasive species in weed control zones not in TNC ownership.
3. Recruit volunteer weed watchers to survey and weed control zones for imminent invasions by high risk species on TNC preserves.
4. Assess the availability and risks of bio-control methods for invasive species targeted for control.
5. Work with partners to have priority invasive species listed as noxious weeds by VDACS to limit trade.
6. Continue community-based control of *Phragmites* on the Rappahannock, and expand to the Mattaponi and Pamunkey, lower Dragon/Piankatank.
7. Work with state and federal regulators to implement monitoring and control of *Phragmites* as part all permits granted for wetland-related activities (mitigation, construction of docks, peers, etc.).

Key Partners:
DCR, USFWS, CBF, VNPS, RPAC, local river groups, universities

- **Strategy 3.** ***Work with state/federal agencies and other conservation partners to prevent the introduction of new invasive plant species*** **(SGL**, NMR, JKD**).**

Action Steps:
1. Improve enforcement of noxious weed law.
2. Work with Mid-Atlantic Pest Council and VA-DCR to gather information on new, anticipated invasive species and control strategies for these species.

Key Partners:
DCR, USFWS, CBF, VNPS, local river groups, universities

VI. Sea Level Rise

- **Strategy.** ***Evaluate current and future effects of sea level rise on species and communities in Coastal Plain to determine compensatory conservation actions to protect conservation targets*** **(JKD)**.

Action Steps:
1. Gather current research, literature and predictive models on sea level rise due to global climate change and its potential effects on mid-Atlantic coastal plain terrestrial and aquatic communities.

Key Partners:
Universities, research centers, EPA, NOAA

VII. Seep Restoration/Management

- ***Support Fort A.P. Hill's Natural Resources Division to restore seepage wetlands*** **(JKD**, ADL, SGL).

Action Steps:

2. Target examples of potentially viable seepage bogs at Fort A.P. Hill for restoration and implement fire management plan for bogs in collaboration with DOD Natural Resources staff and DCR.
3. Work with DOD Natural Resources staff to remove beavers and beaver dams from seepage swamps with critical *Helonias bullata* habitat.

Key Partners:
DOD and DCR

Table 8. Profile of each Chesapeake Rivers conservation strategy, the targets benefited, threats abated and goals met.

Strategy	**Targets benefited by strategy**	**Threats abated by strategy**	**Threat abatement goals to be met by strategy**
1. Identify tracts of land with the most viable occurrences of conservation targets and protect through acquisition or conservation easements.	➢ Tidal Freshwater System ➢ Upland Terrestrial Forest System ➢ Calcareous Forests ➢ Seepage Wetlands ➢ Bald Cypress Forests ➢ Fluvial Terrace Woodland	➢ Development (residential homes, roads, other infrastructures) ➢ Incompatible forestry practices (silviculture) ➢ Lack of fire ➢ Conversion to agriculture (Active)	➢ Protect key tracts with exemplary occurrences of conservation targets. ➢ Reduce the impacts of development on conservation targets. ➢ Restore at least one functional upland terrestrial forest (>10,000 acres) in each matrix block. ➢ Restore viable seepage wetlands
2. Develop/promote land use policies and compatible economic development initiatives that conserve land in matrix blocks and protect water quality/flow regimes.	➢ Tidal Freshwater System ➢ Upland Terrestrial Forest System ➢ Calcareous Forests ➢ Seepage Wetlands ➢ Anadromous Fishes	➢ Development (residential homes, roads, other infrastructures) ➢ Incompatible forestry practices (silviculture) ➢ Lack of fire ➢ Conversion to agriculture (Active)	➢ Protect key tracts with exemplary occurrences of conservation targets. ➢ Reduce the impacts of development on conservation targets. ➢ Restore at least one functional upland terrestrial forest (>10,000 acres) in each matrix block.
3. Develop regional water use policy to determine the source of current and future water need and to affect the best method to meet the need.	➢ Tidal Freshwater System ➢ Anadromous Fishes	➢ Development (residential homes, roads, other infrastructures) ➢ Water Management ➢ Structural impediments to fish passage (dams, clogged culverts)	➢ Preserve natural range of variability of flow regimes of tidal freshwater system.
4. Restore connectivity of matrix forest through a shift in current pine management to longer-rotation mixed hardwood/pine forest.	➢ Upland Terrestrial Forest System	➢ Incompatible forestry practices (silviculture) ➢ Conversion to agriculture (Active)	➢ Restore at least one functional upland terrestrial forest (>10,000 acres) in each matrix block.
5. Restore connectivity of matrix forest through conversion of key agricultural lands to mixed hardwood/pine forest.	➢ Upland Terrestrial Forest System	➢ Conversion to agriculture (Historical)	➢ Restore at least one functional upland terrestrial forest (>10,000 acres) in each matrix block.
6. Determine invasive/ non-native fish species that contribute the greatest threats to conservation target.	➢ Anadromous Fishes	➢ Invasive and/or non-native fish species	➢ Reduce the threat of non-native, invasive predatory fishes on anadromous fish populations.
7. Develop policy to eliminate introduction and stocking of non-native fish species in the Coastal Plain and Piedmont.	➢ Anadromous Fishes	➢ Invasive and/or non-native fish species	➢ Reduce the threat of non-native, invasive predatory fishes on anadromous fish populations.
8. Work with local, state and federal agencies to develop policy to reduce and control non-native/invasive fish	➢ Anadromous Fishes	➢ Invasive and/or non-native fish species	➢ Reduce the threat of non-native, invasive predatory fishes on anadromous fish populations.

Strategy	Targets benefited by strategy	Threats abated by strategy	Threat abatement goals to be met by strategy
populations and to enforce existing laws.			
9. Determine invasive/ non-native plant species that contribute the greatest threats to conservation targets.	➢ Tidal Freshwater System ➢ Upland Terrestrial Forest System ➢ Calcareous Forests	➢ Invasive and/or non-native plant species	➢ Reduce the threat of non-native, invasive plant species in tidal freshwater and upland terrestrial systems.
10. Develop control strategies for priority invasive plant species in key conservation areas.	➢ Tidal Freshwater System ➢ Upland Terrestrial Forest System ➢ Calcareous Forests	➢ Invasive and/or non-native plant species ➢	➢ Reduce the threat of non-native, invasive plant species in tidal freshwater and upland terrestrial systems.
11. Work with state/federal agencies and other conservation partners to prevent the introduction of new invasive plant species.	➢ Tidal Freshwater System ➢ Upland Terrestrial Forest System ➢ Calcareous Forests	➢ Invasive and/or non-native plant species	➢ Reduce the threat of non-native, invasive plant species in tidal freshwater and upland terrestrial systems.
12. Evaluate current and future effects of sea level rise on species and communities in Coastal Plain to determine compensatory conservation actions to protect conservation targets.	➢ Tidal freshwater system ➢ Bald Cypress Forests	➢ Sea level rise	➢ Assess long-term effects of sea level rise on project area and conservation targets.
13. Promote sound fisheries management policy to increase anadromous fish abundance.	➢ Tidal Freshwater System ➢ Anadromous Fishes	➢ Fishing (includes boating) ➢ Structural impediments to fish passage (dams, clogged culverts)	➢ Reduce the threat of fishing to anadromous fish populations.
14. Support Fort A.P. Hill's Natural Resources Division to restore seepage wetlands.	➢ Seepage Wetlands	➢ Lack of fire ➢ Dam construction by beavers	➢ Restore viable seepage wetlands

Table 9. Evaluation of Chesapeake Rivers conservation strategies in terms of benefits to conservation targets, feasibility and cost of implementation.

	Benefits					**Feasibility**			**Cost**
Conservation Strategies	Threat Abatement Benefit	Restoration Benefit	Leverage	Overall Benefits	Overall Benefits User Override	Lead Institution/ Individual	Ease of Implement ation	Overall Feasibility	
Determine invasive/ non-native fish species that contribute the greatest threats to conservation target.	High	-	High	High		Medium	Medium	Medium	Medium
Determine invasive/ non-native plant species that contribute the greatest threats to conservation targets.	High	-	High	High		High	Medium	Medium	Medium
Develop control strategies for priority invasive plant species in key conservation areas.	High	-	High	High		Medium	Medium	Medium	High
Develop policy to eliminate introduction and stocking of non-native fish species in the Coastal Plain and Piedmont.	High	-	Medium	High		High	Medium	Medium	Medium
Develop state water use policy to determine the source of current and future water need and to affect the best method to meet the need.	Medium	-	High	Medium		Medium	Low	Low	High
Develop/promote land use policies with partners (CBF, localities), focusing on counties within Upper Rappahannock and Dragon/Mattaponi matrix blocks.	High	-	High	High		Low	Medium	Low	High
Evaluate current and future effects of sea level rise on species and communities in Coastal Plain to determine compensatory conservation actions that buffer sea level rise impacts on conservation targets.	Medium	-	High	Medium		Low	Low	Low	Medium
Identify tracts of land with the most viable occurrences of conservation targets and protect through acquisition or conservation easements.	High	-	High	High		Very High	Very High	Very High	High
Promote sound fisheries management policy to increase anadromous fish abundance.	Medium	-	Very High	High		High	Medium	Medium	Medium

	Benefits					**Feasibility**			**Cost**
Conservation Strategies	Threat Abatement Benefit	Restoration Benefit	Leverage	Overall Benefits	Overall Benefits User Override	Lead Institution/ Individual	Ease of Implement ation	Overall Feasibility	
Restore connectivity of matrix forest through a shift in current pine management to longer-rotation mixed hardwood/pine forest.	High	-	Medium	**High**		Low	Low		High
Restore connectivity of matrix forest through conversion of key agricultural lands to mixed hardwood/pine forest.	High	-	Medium	**High**		Low	Low		High
Support Fort A.P. Hill's Natural Resources Division to manage and restore seepage wetlands.	Medium	-	High	Medium		High	High	High	
Work with federal/state agencies and other conservation groups to prevent the introduction of new invasive plant species.	High	-	Medium	**High**		High	Medium	Medium	Medium
Work with local, state and federal agencies to develop strategy and policy for eradication of non-native/invasive fish species and to enforce existing laws regarding non-native/invasive species.	High	-	High	**High**		High	Medium	Medium	Medium

Conclusion

The Chesapeake Rivers project area while currently a relatively stable area in terms of land use, human population growth and economy, faces several signficant threats over the next 10-20 years, including residential sprawl and development from surrounding urban areas, widespread industrialized forestry and removal of hardwood resources, invasive plants and animals, and water withdrawals—in addition to the uncertain changes wrought by global warming and sea level rise. To abate these threats to the area's native biodiversity, The Nature Conservancy of Virginia is embarking upon many new, challenging and complex conservation strategies to achieve mission success in the Chesapeake Rivers. Among the most formidable frontiers are large-scale forest restoration, water use policy, invasive species policies and management, and land use policy. Working with partners such as USFWS, DOD, VA-DGIF, VA-DOF, Chesapeake Bay Foundation (CBF), Rappahannock Working Group, planning district commissions and localities, and local groups is critical to implementing conservation strategies at the scale of the landscapes that fall within in this project area. Moreover, TNC-VA has committed significant resources towards building the necessary capacity to implement strategies as well through the establishment of the Chesapeake Rivers Program in Tappahannock. The pristine nature of the rivers combined with the predominately rural landscape offer promising opportunities for TNC-VA, our partners, and the Chesapeake Rivers community at large to effectively conserve and restore the biological diversity and ecological processes that characterize this irreplaceable coastal plain landscape.

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APPENDIX A. CHESAPEAKE RIVERS CONSERVATION TARGET DESCRIPTION MATRIX

Appendix A. Chesapeake Rivers conservation target description matrix.

Target	Description	Distribution	Nested Targets	Key Processes
Tidal Freshwater System	Mosaic of inter-grading tidal freshwater emergent herbaceous marshes, mudflats, semi-open multi-strata hardwood swamp forest, and submerged aquatic vegetation found in the uppermost portions of the estuarine zone along inner coastal plain rivers; provides habitat numerous globally rare plant species as well as for migratory waterfowl; marshes at site are likely the most exemplary and extensive on the Atlantic coast.	***Biophysical:*** Marshes and swamp forests found in low, flat tidally flooded areas along rivers and tributaries, mudflats and SAV found in open channels. ***Site:*** On Pamunkey, located between Sweet Hall marsh to just past Liberty Hall; on the Mattaponi, between Gleason marsh and Aylett; on Rappahannock from Peedee Creek to Fredericksburg. ***Global:*** Marshes occur along tidal portions of rivers throughout the Atlantic coastal plain; tidal forest restricted to coastal plain rivers north of James.	***Ecological groups[3]:*** 1. **Tidal Freshwater Marshes**. Consist of several community associations dominated by *Peltandra virginica, Leersia oryzoides, Zizania aquatica, Bidens laevis, Polygonum punctatum, P. arifolium, P. sagittatum, Zizaniopsis miliacea, and Acorus calamus.* ➢ Associated Rare Species: *Aeschynomene virginica* (G2), *Chaemacrista fasiculata var macrosperma* (G5T2) ➢ Migratory waterfowl habitat 2. **Tidal Freshwater Forests**. Semi-permenantly saturated forest with canopy dominants *Nyssa biflora, Fraxinus profunda*, and *F. pennsylvanica.* Shrub layer consists of *Clethra alnifolia, Alnus serrulata, Myrica cerifera, Viburnum nudum* and *V. dentatum.* 3. **Sand/Gravel/Mud Bars and Shores**. Semi-permenantly flooded *Nuphar lutea* spp. *advena* dominated mudflats w/several other fine-scaled sub-types including populations of *Elatine minima, Ludwigia palustris, Justicia americana, Isoetes* spp., *Lilaeopsis chinensis*, and other rare plants. ➢ Associated Rare Species: *Eriocaulon parkerii* (G3), *Cardamine longii* (G3Q), and *Bacopa innominada* 4. **Tidal Freshwater Aquatic Beds**. Consists of permanently flooded *Ceratophyllum demersum* with associated occurrences of *Utricularia* spp., *Elodea nuttallii, Spirodela polyrrhiza* and *Wolffiella gladiata.*	Flooding from diurnal lunar tides up to 1.5 m; maintenance of freshwater regime (<.5ppt); natural variability of sedimentation/erosion cycle; adequate light (for SAV)

[3] All ecological groups are based on the VA Division of Natural Heritage's publication *The Natural Communities of Virginia: Classification of Ecological Community Groups* (First Approximation) (Fleming et al. 2001), except where noted.

Target	Description	Distribution	Nested Targets	Key Processes
Bald Cypress Forests	Progression of tidal bald cypress forest and woodlands to non-tidal, seasonally to semi-permanently flooded cypress-gum primarily along Dragon Run. Non-tidal swamp on Dragon represents the most significant northernmost example of its kind on the coastal plain. The tidal forest is of outstanding quality in terms of size and condition.	***Biophysical***: Found in upper tidal reaches of rivers and in backswamps, sloughs, and low terraces adjacent to coastal plain rivers. ***Site:*** Occurs extensively along the Dragon Run ***Global***: Tidal swamp may be restricted to CBY ecoregion but southern distribution in MACP is unknown; non-tidal swamp found in coastal plain from Virginia to Texas.	***Ecological Groups:*** ➢ **Bald Cypress-Tupelo Swamps**. Seasonally to semi-permanently flooded forest with *Taxodium distichum* and *Nyssa biflora dominant* and *Acer rubrum, Fraxinus pennsylvanica* are canopy associates and understory species and variable herb layer (includes *Saururus cernuus, Boehmeria cylindrica* and *Tiadenum walteri*). ➢ **Tidal Bald Cypress Forest and Woodlands**. *T. distichum* dominated canopy with or without co-dominants *N. biflora* or *F. pennsylvanica*, shrub and herb layers a mixture of marshes and swamp vegetation. ➢ **Associated Rare Species**: populations of *Ranunculus flabellaris* (G5/S1), *Chelone obliqua* (G4/S1); possibly Mabee's (G4/S1) and tiger salamander (G5/S1) and other breeding amphibians; *Epitheca spinosa* (robust baskettail) (G3G4/S2)	Seasonal and semi-permanent flooding and innundation during growing season; periodic drawdowns for regeneration and seedling recruitment (non-tidal)
Fluvial Terrace Woodlands	Small patch, open woodland communities composed of xeric hickories and oak species anomalous due to elevated topographic position and sandy substrate in floodplain--likely relicts of sandhill communities. Occurrence along Dragon Run is especially unusual due presence of calciphiles such as *Cercis canadensis*, *Aquilegia canadnsis*, and *Arabis laevigata* var. *laevigata*, etc. intermixed with typical sandhill species favoring acidic, lower nutrient conditions.	***Biophysical***: Found on elevated, flat, xeric sandy islands and terraces adjacent to forest swamps. ***Site***: Only 2 known occurrences in study area (on Dragon Run and on Mattaponi). ***Global***: Occurs sporadically along coastal plain rivers in eastern VA (G?).	***Ecological group:*** ➢ **Fluvial Terrace Woodlands**. Overstory consists of *Carya pallida, C. alba*, and to a lesser extent *Quercus falcata, Q. nigra, Q. marilandica, Q. alba.* Shrubs include *Q. margarettiae, Symplocos tinctoria, Ilex opaca* and *Juniperus virginiana.* Herb layer consists of *Carex* spp., *Helianthemum canadense, Clitoria mariana, Solidago tarda* and *Opuntia humifusa.*	Edaphically limited; perhaps fire is important (long return interval of >40 years?) for oak regeneration and open stand structure

Target	Description	Distribution	Nested Targets	Key Processes
Upland Terrestrial Forest System	Well-drained upland forests consisting of beech, oaks, hickories and other common hardwood species; drier, acidic variants consist of strong ericad shrub component, little herbaceous cover and overall low species diversity; richer, mesic variants have higher (almost double) species diversity with paw-paw, holly, spicebush, dogwood with ferns and other herbaceous species in understory. Represents remnant occurrences of a formerly characteristic upland matrix forest of the coastal plain and will require significant restoration.	***Biophysical***. Found on mesic to xeric acidic, nutrient-poor soils of uplands and flats. ***Site***: Fragmented patches scattered throughout uplands; some good patches documented at Rappahannock tributaries in Fort A.P. Hill and others have been observed on the Gasch, Massie and Hanover School for Boys properties in the Pamunkey watershed. ***Global***: Characteristic upland hardwood forests types of the Atlantic coastal plain ecoregions (G5).	***Ecological Groups:*** ➢ **Mesic Mixed Hardwood Forests**. Dominated by *Fagus grandifolia, Quercus alba, Liriodendron tulipifera* and *Carya spp.* with *Ilex opaca, Cornus florida* and *Carpinus caroliniana* in the understory. ➢ **Mixed Oak/Heath Forests**. Canopy dominants include various combinations of *Quercus spp.* (*Q. alba, Q. montana, Q. falcata*) and associates *Acer rubrum, Nyssa sylvatica* and/or *Oxydendrum arboreum.* Shrub layer consists of ericads such as *Kalmia latifolia* and *Gaylussacia* spp. ➢ **Acidic Oak-Hickory Forests**. *Quercus* spp. canopy dominants, hickories are canopy associates and understory trees; *Vaccinium pallidum* and *V. stamineum* shrub layer; rich herbaceous layer. ➢ **Chestnut Oak Forests**. Canopy dominated by *Quercus montana* with associates *Fagus grandifolia* and *Ilex opaca*. Shrub layer consists of a variety of ericads such as *Kalmia latifolia.* ➢ **Piedmont/Coastal Plain Oak-Beech/Heath Forest**. Like Mesic Mixed Forests but with greater abundance of heaths and fewer mesophytic plants. ➢ **Associated Rare Species:** *Isotria medeoloides* (G2G3)	Gap regeneration and seedling recruitment of characteristic species resulting in uneven, mature age structure; occasional fire to regenerate oaks and heaths (every 30-50 years)—but not in mesic forest types.
Calcareous Forest	Small patch, rich northeast-facing, mature oak-hickory-beech-poplar forests with paw-paw dominant in the shrub layer and a diverse herb layer consisting of rock ferns, columbine, and other mountain disjuncts found in unique calcareous ravines. Distinctive and unusual communities in the coastal plain because of geology, species composition and maturity relative to other	***Biophysical***: Found where erosion has cut through surficial non-calcareous soils into marine shell deposits from Pliocene epoch. ***Site***: Notable occurrences documented at Fort A.P. Hill and Gasch property. ***Global***: Probably G4/G5 community, found scattered throughout the Piedmont and coastal plain, but more unusual in coastal plain.	***Community type (Fleming 2000):*** ➢ *Fagus grandifolia-Liriodendron tulipifera-Carya cordiformis/ Asimina triloba/ Lindera benzoin/ Podophyllum peltatum* Forest ➢ **Note**: A very rare calcareous forest type (G1) is found on dry south-facing convex slopes and is dominated by *Quercus muehlenbergii* and diverse, dry-site herbs; not known in site but is likely be present (occurrences documented in Stafford and Surry Counties).	Gap regeneration and seedling recruitment of characteristic species resulting in uneven, mature age structure.

Target	Description	Distribution	Nested Targets	Key Processes
	upland hardwood communities.			
Seepage Wetlands	A mosaic of intergrading fire-maintained shrub/ graminoid-dominated seepage bogs and forested seepage swamps; support rare plant species and critical breeding habitat for odonates and amphibian species; the groundwater supports globally rare interstitial gastropods and isopods. Seepage wetlands (particularly the fire-dependent open bogs) are mostly extirpated throughout site due to fire-suppression and hydrological degradation and are in need of significant restoration.	***Biophysical:*** Occur in small patches in areas of dissected topography and sandy/peaty soils in braided seepage streams of small headwaters and toe slopes fed by groundwater. ***Local:*** Caroline Co. (Fort A.P. Hill) is has highest density of seepage wetlands in the site, while occurrences elsewhere are scattered and isolated. ***Global:*** Scattered throughout inner coastal plain and Piedmont (G3/G4?).	***Ecological Groups:*** 1. **Coastal Plain/ Piedmont Acidic Seepage Swamp.** Saturated forests characterized by *Acer rubrum-Nyssa sylvatica-Liriodendron tulipifera/ Magnolia virginica-Clethra alnifolia-Vaccinium* spp./ *Symplocarpus foetidus-Parnassia asarifolia*/ various sedges/ *Sphagnum.* ➢ Associated Rare Species: *Helonias bullata* (G3, LT) 2. **Coastal Plain/ Piedmont Seepage Bog.** Woody species include *Magnolia virginica, Toxicodendron vernix, Vaccinium spp., Viburnum nudum* var. *nudum, Alnus serrulata.* Typical herbaceous spp. Include *Eleocharis tortilis, Rhynchospora spp., Dichanthelium* spp., *Fuirena squarrosa, Rhexia* spp., etc. ➢ Associated Rare Species: *Juncus caesariensis (G2)* ➢ **Note**: Breeding amphibians such as salamanders (e.g. Mabee's and tiger salamanders) are of special management concern in these communities.	Groundwater flow and recharge; frequent fire return interval
Anadro-mous Fishes	Unique assemblage of herrings--includes *Alosa aestivalis* (blueback herring), *Alosa pseudoharengus* (alewife), *Alosa mediocris* (hickory shad), *Alosa sapidissima* (American shad). Rappahannock, Mattaponi and Pamunkey watersheds (to Fall Line) maybe the only place where all 4 fish species are still able to migrate/reproduce successfully. Target is the reproductive habitat of these fishes in the site.	***Biophysical:*** Shads restricted to mainstem and large tributaries for spawning and herring and alewife utilize smaller tributaries. ***Local:*** Historically found from Chesapeake Bay to upper portions of Chesapeake River watersheds in Piedmont and Blue Ridge. ***Global***: Fishes found throughout the rivers of the Atlantic seaboard from Newfoundland to Florida.	NA	Long, largely unaltered natural passages for migration and spawning; appropriate substrate for spawning; emergent vegetation for nurseries

APPENDIX B. CHESAPEAKE RIVERS CONSERVATION TARGET VIABILTY ATTRIBUTES

Appendix B. Viability Attributes for Occurrences of Conservation Targets in the Chesapeake Rivers Project area. Generic community viability specifications ("EO Specs") developed for use in ecoregional planning were used as a general guideline for defining size, condition and context for each target. Attributes are based on extensive personal communication with ecologists Gary Fleming, Dean Walton and Phil Coulling (VA-DCR Division of Natural Heritage). These attributes were used to determine the viability ranks for the conservation targets, found in the text under the "Conservation Targets" chapter. **PLEASE NOTE** that anadromous fishes do not have viability attributes at this time due to lack of sufficient information. As this information is obtained through research and monitoring, it will be included in the plan.

Table B.1. Viability attributes for Tidal Freshwater System

Rank	Size (acres)	Condition	Landscape Context
Very Good	>1000 acres	Intergrading mosaic of native emergent marsh vegetation dominated by *Peltandra virginica, Leersia oryzoides, and Zizania aquatica* and tidal forest dominated by canopy of *Nyssa biflora, Fraxinus profunda*, and *F. pennsylvanica.* Small intermittent patches of SAV and mudflat vegetation in open channels and on marsh edges. Species diversity between 9 and 34, depending on community type. Minor presence of invasive species like *Murdannia keisak, Phragmites australis* and *Hydrilla verticillata.* Historic rare plant populations persistent in marshes/ mudflats such as *Aeschynomene virginica, Chaemacrista fasiculata var macrosperma, Eriocaulon parkerii, Cardamine longii,* and *Bacopa innominata.*	Well connected to landscape of 80% natural vegetation-agricultural-silvicultural lands. Well drained forests in uplands, oligohaline marshes downstream, non-tidal alluvial forests and wetlands upstream. Natural range of variable flow patterns in riverine system occur that maintain the sedimentation regime. Freshwater conditions prevail (<.5 ppt salinity).
Good	>500	Increase in shrub density within swamp forest. Trees show some evidence of crown stress and mortality. Invasives species present. Slight decrease in abundance and distribution of rare plant species.	Moderately connected to landscape of 80% natural vegetation-agricultural-silvicultural lands. Moderate modification to natural range of variable flow patterns affecting sediment budget (either increasing/decreasing accretion or erosion).
Fair	>200	Lower plant species diversity among and within marsh types. Trees show increasing crown stress and mortality with canopy cover less than 10-15% in some places, leading to an increase in competitive displacement of forest by marsh and shrub species and communities. Increased competitive displacement by invasive species and perhaps by brackish species. Competitive displacement by hydrilla in SAV communities. Occurrences of historically rare plant populations are marginally viable.	Somewhat isolated, surrounded predominately by human altered landscapes (roads, industrial/commercial, development) and 20-50% natural vegetation/silviculture/agriculture. Alteration of natural flow regime due to dams, water withdrawals, sea level rise significantly adversely impacting the sediment regime to extremes which in turn threaten the persistence of marsh vegetation. Increasingly oligohaline conditions moving upstream as sea level rises.

Rank	Size (acres)	Condition	Landscape Context
Poor	<200	Mortality of swamp forest, succeeded by tidal marsh and shrub vegetation. Competitive exclusion of tidal freshwater marsh vegetation by dominant brackish or invasive species types. Disappearance of mudflat communities. Extirpation of all native SAV. Possible shift to aquatic system with sea level rise	Highly isolated, almost entirely surrounded by urban land use with 0-20% vegetation/silviculture/agriculture. Persistent oligohaline conditions. Higher tidal amplitude and flooding. Simplification of natural flow regime.

Table B.2. Viability attributes for Upland Terrestrial Forest System

Rank	Size (acres)	Condition	Landscape Context
Very Good	>10,000	Canopy dominants found in varying compositions including *Quercus* spp., *Carya* spp., *Fagus grandifolia, Pinus* spp., *Liriodendron tulipifera*, etc. Variable herbaceous and shrub diversity (shrubs are predominately in the ericad family), composition and abundance depending on substrate. Uneven age structure w/mature dominants 100+ years old. No invasive species present.	Well connected to predominant natural landscape mosaic of 80% natural vegetation/silviculture.
Good	>5,000	Younger forest w/characteristic canopy dominants and associates. Increase in even aged stands of individual weedy species (e.g. pines, red maple, sweet gum, tulip poplar). Evidence of logging in last ~40 to 80 years. Invasives present (i.e. *Allaria petiolata, Lonicera japonica, Microstegium vimineum, Ligustrum sinese*)	Moderately connected to landscape with 50-80% natural vegetation/silviculture.
Fair	>2,000	Young even aged stands of forest prevalent, composed of weedy single species canopy dominants, especially pines (*Pinus taeda, P. virginiana*). Little oak or ericad regeneration occurring. Evidence of clearcutting in last ~30-40 years Invasive species competitively displacing native understory species (both herbs and shrubs), resulting in lower diversity and abundance native species. Episodic gypsy moth infestations resulting in mortality of oaks.	Somewhat isolated, surrounded predominately by human altered landscapes (agriculture, roads, development) and 20-50% natural vegetation/silviculture.
Poor	<2,000	Conversion to pine plantation or agriculture OR current clearcutting is occurring. Immature and even aged stands of weedy species, pines dominant. No oak regeneration. Invasive species well established and competitively displacing all native herbaceous and shrub diversity.	Highly isolated, almost entirely surrounded by agricultural or urban land use with 0-20% natural vegetation.

Table B.3. Viability attributes for Bald Cypress Forests

Rank	Size (acres)	Condition	Landscape Context
Very Good	>1000 acres	Dominants in canopy are *Taxodium distichum* and *Nyssa biflora/ Nyssa aquatica*; canopy associates are *Fraxinus pennsylvanica* and *Acer rubrum*; shrub and herbaceous layers variable in terms of composition and density from site to site with constants such as Carolina ash (*Fraxinus caroliniana*), climbing hydrangea (*Decumaria barbara*), lizards's tail (*Saururus cernuus*), false nettle (*Boehmeria cylindrica*), Walter's St. John's-wort (*Triadenum walteri*) and swamp beggar-ticks (*Bidens discoidea*). Mature dominants (100+ years). Uneven aged forest structure. No evidence of recent logging activity (in last 100 years).	Well connected to predominant natural landscape mosaic of >80% natural vegetation/silvicultural lands. Tidal forests area interspersed with tidal freshwater marsh communities and grade into non-tidal forests upstream. Non-tidal forests are connected with well-drained mixed pine-oak communities in uplands. Non-tidal forests are seasonally to semi-permanently flooded for part of year with some standing water during growing season. Tidal forests experience freshwater (<.5 ppt salinity) lunar tidal regimes.
Good	>500	Mostly connected progression of community types from headwaters to estuary; less cypress dominance and regeneration, increased dominance of *Nyssa* spp., *F. pennsylvanica* and *A. rubrum*. Intermittent patches of younger, even aged stands of *Nyssa* spp. or *F. pennsylvanica*. Evidence of logging within last 40-100 years.	Moderately connected to 50-80% natural vegetation (including a mix of pine plantations). Moderate alteration of periods of inundation in terms of both duration and volume.
Fair	>200	Cypress minor component of canopy with little regeneration, *Nyssa* spp., *F. pennsylvanica* and *A. rubrum*. dominant in canopy. Mix of even aged stands of immature trees with other uneven aged stands Evidence of clearcutting in last 30-40 years Increased presence of shrubs and emergent vegetation.	Somewhat isolated, surrounded predominately by human altered landscapes (agriculture, roads, development) and 20-50% natural vegetation/silviculture. Significant alteration of periods of inundation in terms of both duration and volume. Persistent oligohaline conditions in tidal zone, moving upstream.
Poor	<200	Highly fragmented and isolated patches. Dominance of pure even aged stands of *Nyssa* spp., *F. pennsylvanica* and *A. rubrum*. Very recent clearcutting. Forest die-off and possible succession to brackish emergent vegetation.	Highly isolated, almost entirely surrounded by agricultural or urban land use with 0-20% natural vegetation/silviculture. Severe alteration of hydrology Mesohaline conditions in tidal zone, moving upstream.

Table B.4. Viability attributes for Fluvial Terrace Woodland

Rank	Size (acres)	Condition	Landscape Context
Very Good	>50	Canopy dominants consist of hickories (*Carya pallida, C. alba*) and to a lesser extent oaks (*Quercus falcata, Q. nigra, Q. marilandica, Q. alba*). Shrubs include *Q. margarettiae, Symplocos tinctoria, Ilex opaca* and *Juniperus virginiana.* Herb layer consists of *Carex* spp., *Helianthemum canadense, Clitoria mariana, Solidago tarda* and *Opuntia humifusa.* Uneven age woodlands with canopy dominants 100+ years old. Open, woodland structure. No evidence of logging activity.	Well connected to landscape of 80% natural vegetation-agricultural-silvicultural lands. Surrounded by either bald cypress swamp forests or alluvial floodplain forests. Possible long interval fire regime (every 50+ years)
Good	> 20	*Pinus virginica* is a minor canopy component and is present in moderate abundance as saplings. Small patches of more even aged, younger (30+ yrs.) dominant trees. Canopy cover shows slight increase, shading out some of the herbaceous species. Evidence of logging over last 40-80 years. Presence of invasive species such as *Lonicera japonica.*	Moderately connected to landscape with 50-80% natural vegetation- agricultural-silvicultural lands.
Fair	> 10	*P. virginica* becomes more significant component in canopy as saplings mature, little oak and hickory regeneration. Trees are predominately young, even aged and densely distributed, competitively displacing characteristic shrub and herbaceous species. Litte oak regeneration. More closed, short stature canopy. Invasive species competitively displace characteristic herbaceous species. Logging activities in past 30-40 years.	Somewhat isolated, surrounded predominately by human altered landscapes (roads, industrial/commercial, development) and 20-50% natural vegetation/silviculture/agriculture.
Poor	< 10	No oak or hickory regeneration; mostly immature, even aged pine, creating excessive shade. Invasive species prevalent. Clearcutting or destruction of habitat in last 30 years.	Highly isolated, almost entirely surrounded by urban land use with 0-20% vegetation/silviculture/agriculture.

Table B.5. Viability attributes for Calcareous Forests

Rank	Size (acres)	Condition	Landscape Context
Very Good	>50	*Fagus grandifolia-Liriodendron tulipifera-Carya cordiformis/ Asimina triloba/ Lindera benzoin/ Podophyllum peltatum* Forest w/a diverse herb layer consisting of rock ferns, columbine, and other mountain disjuncts. Uneven age w/ relatively mature dominants (+150 years) No evidence of logging activity over last 150 yrs. High herbaceous diversity.	Well connected to predominant natural landscape mosaic of 80% natural vegetation/silviculture. Found interspersed in forested landscape surrounded by bottomland hardwoods in floodplain and mixed oak-heath forest on ridge tops, grading into mixed mesic hardwoods on slopes. Substrate intact.
Good	>20	Younger forest w/characteristic canopy dominants and associates. Increase in even aged stands of individual weedy species (e.g. *Liriodendron tulipifera* and *Acer rubrum*). Evidence of logging in last ~40 to 80 years Invasive species present (i.e. *Allaria petiolata, Lonicera japonica, Microstegium vimineum, Ligustrum sinese*) in herbaceous layer.	Moderately connected to landscape with 50-80% natural vegetation/silviculture. Moderate erosion of calcareous substrate.
Fair	>10	Young, even aged stands of *L. tulipifera* and *A. rubrum* as canopy dominants more prevalent. Evidence of logging activity in last ~30-40 years Invasive species competitively displacing native herbaceous species—lower diversity and abundance of native species.	Somewhat isolated, surrounded predominately by human altered landscapes (agriculture, roads, development) and 20-50% natural vegetation/silviculture. Significant erosion of calcareous substrate.
Poor	<10	Clearcutting and/or destruction of habitat Immature, weedy saplings of *L. tulipifera* and *A. rubrum* dominate. Invasive species rampant. Little to no herbaceous diversity remains.	Highly isolated, almost entirely surrounded by agricultural or urban land use with 0-20% natural vegetation Severe erosion of calcareous substrate.

Table B.6. Viability attributes for Seepage Wetlands

Rank	Size (acres)	Condition	Context
Very Good	Size irrelevant (all example are small between 1 and 2 acres)	Mosaic of intergrading fire-maintained shrub/ graminoid-dominated seepage bogs and forested seepage swamps. Swamps characterized by mature, uneven aged canopy dominants *Acer rubrum, Nyssa sylvatica* and *Liriodendron tulipifera* with a shrub layer consisting of *Magnolia virginica, Clethra alnifolia, Vaccinium* spp., and common herbs such as *Symplocarpus foetidus, Parnassia asarifolia*, various sedges and *Sphagnum*. Open bogs are a mosaic of graminoids such as *Eleocharis tortilis, Rhynchospora spp., Dichanthelium* spp., and woody species including *Magnolia virginica, Toxicodendron vernix, Vaccinium spp., Viburnum nudum* var. *nudum,* and *Alnus serrulata.* Support viable populations of rare plant species *Juncus caesariensis* and *Hellonias bullata* as well as critical breeding habitat for odonates and amphibian species.	Well connected to landscape of 80% natural vegetation-agricultural-silvicultural lands. Connected to upland and palustrine Coastal Plain vegetation such as mesic mixed forests, non-riverine hardwood forests and open graminoid dominated habitats. Fire occurs frequently in landscape (possibly every 1-10 years?) Unimpeded flow into seep from ground water creating saturated conditions.
Good	Size irrelevant (all example are small between 1 and 2 acres)	Seepage wetland mosaic fragmented increasingly into disconnected, discrete occurrences of bog vs. swamps. Species diversity, structure and abundance is slightly modified. In the swamp this is due to intermittent occurrences of younger (30+ years) canopy dominants (e.g *Acer rubrum*) and a decrease in overall canopy cover, leading to the invasion of more partially shade tolerant species in the herbaceous layer. In the bogs, this is due to competition by increasing density of young woody and shrubby species.	Moderately connected to landscape with 50-80% natural vegetation-agricultural-silvicultural lands. Fire occurs less frequently in landscape (possibly every 10-20 years?) Moderate disturbance to groundwater flow regime manifest by less saturated conditions in seep.
Fair	Size irrelevant (all example are small between 1 and 2 acres)	Swamps and bogs are mostly isolated, discrete occurrences. Species diversity, structure and abundance is significantly modified. In the swamps, this is due to the succession of a young <30 yrs.), even aged weedy canopy trees in the wake of a disturbance, leading to the competitive displacement of the characteristic herbaceous layer, including *H. bullata.* In bogs, this is due to the encroachment and succession of woody and shrubby species that displace characteristic graminoids and herbs, including *J. caesariensis.* For both, may see succession by facultative upland/wetland	Somewhat isolated, surrounded predominately by human altered landscapes (roads, industrial/commercial, development) and 20-50% natural vegetation/silviculture/agriculture. Bogs may be maintained artificially by mowing in power cuts. Fire excluded (lack of ignition sources and actively suppression) for long periods of time (20 to 30 years?). Significant disturbance to groundwater flow regime manifest by less saturated conditions in seep OR intermittent flooding by beaver dams/other impediments to flow.

Rank	Size (acres)	Condition	Context
		herbaceous and woody species due to falling water levels OR increased die off of all vegetation due to rising water levels. Decreasing diversity and abundance of odonates and amphibians species.	
Poor	Size irrelevant (all example are small between 1 and 2 acres)	Extirpation of bogs due to progressive succession by weedy tree species which create a shaded environment. Swamp structure and composition is dominated by immature, weedy even aged tree species w/poor herbaceous diversity in understory. **OR** both swamp and bog vegetation succeeded entirely by non-wetland vegetation **OR** drown by flooding. Rare plants extirpated. No evidence of successful breeding by odonate and amphibian species.	Highly isolated, almost entirely surrounded by urban land use with 0-20% vegetation/silviculture/agriculture. Hydrology severely altered either by reduction in flow to seep or flooding of seep. No fire over long term (30+ years?)

APPENDIX C. CHESAPEAKE RIVERS 5-S WORKBOOK

APPENDIX D. CHESAPEAKE RIVERS SPECIES DATA

Appendix D. I. Natural species elements that are inventoried and tracked by the Department of Conservation and Recreation's Division of Natural Heritage (DCR-NHP), including global rank, state rank, federal and state protection status. In addition, tracked elements selected conservation targets in the Chesapeake Bay Lowlands (CBY) Ecoregional Plan are indicated in the column "CBY Target?"

Major Taxonomic Group	*Scientific Name*	**Common Name**	**Global Rank**	**State Rank**	**Federal Status**	**State Status**	**CBY Target?**
Amphibians	*Siren intermedia*	Lesser siren	G5	S2			
	Siren lacertina	Greater siren	G5	S2			
Birds	*Aimophila aestivalis*	Bachman's sparrow	G3	S1		LT	
	Asio flammeus	Short-eared owl	G5	S1			
	Haliaeetus leucocephalus	Bald eagle	G4	S2	LT	LT	Yes
	Rallus elegans	King rail	G4G5	S2			
Crustaceans	*Stygobromus araeus*	Tidewater interstitial amphipod	G2G3	S2		SC	Yes
	Stygobromus indentatus	Tidewater amphipod	G2G3	S2		SC	Yes
Insects	*Anax longipes*	Comet darner	G5	S2			
	Atlides halesus	Great purple hairstreak	G5	S2S3			
	Boloria selene	Silver-bordered fritillary	G5	S2			
	Callophrys irus	Frosted elfin	G3	S2			Yes
	Enallagma dubium	Burgundy bluet	G5	S2			
	Epitheca spinosa	Robust baskettail	G4	S2			Yes
	Helocordulia selysii	Selys' sundragon	G4	S2			
	Isoparce cupressi	Cypress sphynx	G4				
	Libellula exusta	White corporal skimmer	G4	S1			
	Nannothemis bella	Elfin skimmer	G4	S1			
	Nehalennia gracilis	Sphagnum sprite	G5	S2			
	Nehalennia integricollis	Southern sprite	G5	S2			
	Sigara depressa	Virginia piedmont water boatman	G1G3	S1S3			
	Somatochlora filosa	Fine-lined emerald	G5	S2			
	Somatochlora provocans	Treetop emerald	G4	S2			Yes
	Stenogomphurus rogersi	Sable clubtail	G4	S2			
Mussels	*Alasmidonta heterodon*	Dwarf wedgemussel	G1G2	S1	LE	LE	Yes
	Elliptio lanceolata	Yellow lance	G2G3	S2S3		SC	
	Lampsilis cariosa	Yellow lampmussel	G3G4	S2		SC	Yes
	Lampsilis radiata	Eastern lampmussel	G5	S2		SC	
	Lasmigona subviridis	Green floater	G3	S2		SC	Yes
Bryophytes	*Sphagnum carolinianum*	Carolina peatmoss	G3	S2			
	Sphagnum strictum	Straight peatmoss	G5	S2			
Vascular Plants	*Aeschynomene virginica*	Sensitive joint-vetch	G2	S2	LT		Yes
	Bacopa innominata	Tropical water-hyssop	G3G5	S2		LE	
	Chelone obliqua	Red turtlehead	G4	S1			
	Cuscuta cephalanthi	Button-bush dodder	G5	S1?			
	Cuscuta polygonorum	Smartweed dodder	G5	S2?			
	Desmodium ochroleucum	Creamflower tick-trefoil	G2G3	S1			Yes
	Desmodium strictum	Pineland tick-trefoil	G4	S2			
	Elatine minima	Small water-wort	G5	S1			

Major Taxonomic Group	*Scientific Name*	Common Name	Global Rank	State Rank	Federal Status	State Status	CBY Target?
	Hottonia inflata	Featherfoil	G4	S2S3			
	Kalmia angustifolia	Sheep-laurel	G5	S2			
	Mimosa quadrivalvis var angustata	Little-leaf sensitive-briars	G5T5	S2			
	Quercus prinoides	Dwarf chinquapin oak	G5	S2			
	Ranunculus flabellaris	Yellow water-crowfoot	G5	S2			
	Ranunculus trichophyllus var trichophyllus	White water crowfoot	G5T5	S1			
	Rorippa sessiliflora	Stalkless yellowcress	G5	S1			
	Sabatia kennedyana	Plymouth gentian	G3	S1			Yes
	Sarracenia flava	Yellow pitcher-plant	G5?	S1			
	Sarracenia purpurea ssp purpurea	Northern purple pitcher-plant	G5T5	S2?			
	Solidago uliginosa var uliginosa	Bog goldenrod	G4G5T?	S2			
	Tetragonotheca helianthoides	Pineland squarehead	G5	S1			
	Utricularia purpurea	Purple bladderwort	G5	S2			
	Juniperus communis var depressa	Ground juniper	G5T5	S1			
	Bolboschoenus fluviatilis	River bulrush	G5	S1			
	Carex lacustris	Lake-bank sedge	G5	S1			
	Carex vestita	A sedge	G5	S2			
	Digitaria cognata	Mountain hairgrass	G5	S2			
	Eleocharis robbinsii	Robbins spikerush	G4G5	S1			
	Eriocaulon parkeri	Parker's pipewort	G3	S2			Yes
	Helonias bullata	Swamp-pink	G3	S2S3	LT	LE	Yes
	Isotria medeoloides	Small whorled pogonia	G2G3	S2	LT	LE	Yes
	Juncus caesariensis	New jersey rush	G2	S2			Yes
	Lachnocaulon anceps	Bog-buttons	G5	S2			
	Leersia hexandra	Club-head cutgrass	G5	SH			
	Paspalum dissectum	Walter paspalum	G4?	S2			
	Platanthera blephariglottis var conspicua	Large white fringed orchid	G4G5T3T4	S1			
	Potamogeton oakesianus	Oakes pondweed	G4	S2			
	Potamogeton spirillus	Spiral pondweed	G5	S1			
	Rhynchospora alba	White beakrush	G5	S2			
	Schoenoplectus subterminalis	Water bulrush	G4G5	S1S2			
	Wolffia columbiana	Columbia water-meal	G5	S1			
	Thelypteris simulata	Bog fern	G4G5	S1S2			

Apendix A.II. List of known fish, mussel, crayfish and odonate species found in the Chesapeake Rivers Drainage compiled from VA Department of Inland Game and Fisheries' collections database and VA Natural Heritage Program's biological database system.

1. Mattaponi Drainage

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Mussel	*Alasmidonta heterodon*	Mussel, dwarf wedge		LE	VDGIF
Mussel	*Alasmidonta heterodon*	Dwarf wedgemussel	G1G2	LE	VAHP
Mussel	*Alasmidonta undulata*	Mussel, triangle floater			VDGIF
Mussel	*Elliptio complanata*	Mussel, eastern elliptio			VDGIF
Mussel	*Elliptio lanceolata*	Mussel, yellow lance			VDGIF
Mussel	*Elliptio lanceolata*	Yellow lance	G2G3		VAHP
Mussel	*Lampsilis cariosa*	Yellow lampmussel	G3G4		VAHP
Mussel	*Lampsilis radiata*	Eastern lampmussel	G5		VAHP
Mussel	*Pyganodon (anodonta) cataracta catar*	Mussel, eastern floater			VDGIF
Mussel	*Pyganodon grandis*	Mussel, giant floater			VDGIF
Mussel	*Strophitus undulatus*	Mussel, creeper			VDGIF
Fish	*Acantharchus pomotis*	Sunfish, mud			VDGIF
Fish	*Alosa aestivalis*	Herring, blueback			VDGIF
Fish	*Alosa mediocris*	Shad, hickory			VDGIF
Fish	*Alosa pseudoharengus*	Alewife			VDGIF
Fish	*Alosa sapidissima*	Shad, american			VDGIF
Fish	*Ambloplites rupestris*	Bass, rock			VDGIF
Fish	*Ameiurus catus*	Catfish, white			VDGIF
Fish	*Ameiurus natalis*	Bullhead, yellow			VDGIF
Fish	*Ameiurus nebulosus*	Bullhead, brown			VDGIF
Fish	*Amia calva*	Bowfin			VDGIF
Fish	*Anguilla rostrata*	Eel, american			VDGIF
Fish	*Aphredoderus sayanus sayanus*	Perch, pirate			VDGIF
Fish	*Brevoortia tyrannus*	Menhaden, atlantic			VDGIF
Fish	*Catostomus commersoni*	Sucker, white			VDGIF
Fish	*Centrarchus macropterus*	Flier			VDGIF
Fish	*Clinostomus funduloides*	Dace, rosyside			VDGIF
Fish	*Cyprinella analostamas*	Shiner, satinfin			VDGIF
Fish	*Cyprinus carpio*	Carp, common			VDGIF
Fish	*Dorosoma cepedianum*	Shad, gizzard			VDGIF
Fish	*Enneacanthus gloriosus*	Sunfish, bluespotted			VDGIF
Fish	*Enneacanthus obesus*	Sunfish, banded			VDGIF
Fish	*Erimyzon oblongus*	Chubsucker, creek			VDGIF
Fish	*Esox americanus americanus*	Pickerel, redfin			VDGIF
Fish	*Esox niger*	Pickerel, chain			VDGIF
Fish	*Etheostoma fusiforme*	Darter, swamp			VDGIF
Fish	*Etheostoma olmstedi*	Darter, tessellated			VDGIF
Fish	*Etheostoma vitreum*	Darter, glassy			VDGIF
Fish	*Exoglossum maxillingua*	Minnow, cutlips			VDGIF
Fish	*Fundulus diaphanus*	Killifish, banded			VDGIF
Fish	*Gambusia holbrooki*	Mosquitofish, eastern			VDGIF

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Fish	*Hybognathus regius*	Minnow, eastern silvery			VDGIF
Fish	*Hypentelium nigricans*	Sucker, northern hog			VDGIF
Fish	*Ictalurus punctatus*	Catfish, channel			VDGIF
Fish	*Lampetra aepyptera*	Lamprey, least brook			VDGIF
Fish	*Lampetra appendix*	Lamprey, american brook			VDGIF
Fish	*Lepisosteus osseus*	Gar, longnose			VDGIF
Fish	*Lepomis auritus*	Sunfish, redbreast			VDGIF
Fish	*Lepomis cyanellus*	Sunfish, green			VDGIF
Fish	*Lepomis gibbosus*	Pumpkinseed			VDGIF
Fish	*Lepomis gulosus*	Warmouth			VDGIF
Fish	*Lepomis macrochirus*	Bluegill			VDGIF
Fish	*Lepomis microlophus*	Sunfish, redear			VDGIF
Fish	*Luxilus cornutus*	Shiner, common			VDGIF
Fish	*Micropogonias undulatus*	Croaker, atlantic			VDGIF
Fish	*Micropterus dolomieu*	Bass, smallmouth			VDGIF
Fish	*Micropterus salmoides*	Bass, largemouth			VDGIF
Fish	*Morone americana*	Perch, white			VDGIF
Fish	*Morone saxatilis*	Bass, striped			VDGIF
Fish	*Moxostoma macrolepidotum*	Redhorse, shorthead			VDGIF
Fish	*Nocomis leptocephalus*	Chub, bluehead			VDGIF
Fish	*Nocomis micropogon*	Chub, river			VDGIF
Fish	*Notemigonus crysoleucas*	Shiner, golden			VDGIF
Fish	*Notropis amoenus*	Shiner, comely			VDGIF
Fish	*Notropis bifrenatus*	Shiner, bridle			VDGIF
Fish	*Notropis hudsonius*	Shiner, spottail			VDGIF
Fish	*Notropis procne*	Shiner, swallowtail			VDGIF
Fish	*Noturus gyrinus*	Madtom, tadpole			VDGIF
Fish	*Noturus insignis*	Madtom, margined			VDGIF
Fish	*Perca flavescens*	Perch, yellow			VDGIF
Fish	*Percina notogramma*	Darter, stripeback			VDGIF
Fish	*Percina peltata*	Darter, shield			VDGIF
Fish	*Petromyzon marinus*	Lamprey, sea			VDGIF
Fish	*Phoxinus oreas*	Dace, mountain redbelly			VDGIF
Fish	*Pimephales notatus*	Minnow, bluntnose			VDGIF
Fish	*Pimephales promelas*	Minnow, fathead			VDGIF
Fish	*Pomoxis nigromaculatus*	Crappie, black			VDGIF
Fish	*Rhinichthys atratulus*	Dace, blacknose			VDGIF
Fish	*Semotilus atromaculatus*	Chub, creek			VDGIF
Fish	*Semotilus corporalis*	Fallfish			VDGIF
Fish	*Trinectes maculatus*	Hogchoker			VDGIF
Fish	*Umbra pygmaea*	Mudminnow, eastern			VDGIF
Insects	*Anax longipes*	Comet darner	G5		VAHP
Insects	*Callophrys irus*	Frosted elfin	G3		VAHP
Insects	*Enallagma dubium*	Burgundy bluet	G5		VAHP
Insects	*Nannothemis bella*	Elfin skimmer	G4		VAHP
Insects	*Nehalennia integricollis*	Southern sprite	G5		VAHP

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Insects	*Sigara depressa*	Virginia piedmont water boatman	G1G3		VAHP
Insects	*Somatochlora filosa*	Fine-lined emerald	G5		VAHP
Insects	*Stenogomphurus rogersi*	Sable clubtail	G4		VAHP

2. Pamunkey Drainage

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Crayfish	*Cambarus bartonii bartonii*	Crayfish			VDGIF
Crayfish	*Stygobromus araeus*	Tidewater interstitial amphipod	G2G3		VAHP
Mussel	*Alasmidonta heterodon*	Mussel, dwarf wedge		LE	VDGIF
Mussel	*Alasmidonta heterodon*	Dwarf wedgemussel	G1G2	LE	VAHP
Mussel	*Elliptio complanata*	Mussel, eastern elliptio			VDGIF
Mussel	*Elliptio lanceolata*	Mussel, yellow lance			VDGIF
Mussel	*Elliptio lanceolata*	Yellow lance	G2G3		VAHP
Mussel	*Lampsilis cariosa*	Yellow lampmussel	G3G4		VAHP
Mussel	*Lampsilis radiata*	Eastern lampmussel	G5		VAHP
Mussel	*Lasmigona subviridis*	Green floater	G3		VAHP
Fish	*Acantharchus pomotis*	Sunfish, mud			VDGIF
Fish	*Acipenser oxyrhynchus*	Sturgeon, atlantic			VDGIF
Fish	*Alosa aestivalis*	Herring, blueback			VDGIF
Fish	*Alosa mediocris*	Shad, hickory			VDGIF
Fish	*Alosa pseudoharengus*	Alewife			VDGIF
Fish	*Alosa sapidissima*	Shad, american			VDGIF
Fish	*Ameiurus catus*	Catfish, white			VDGIF
Fish	*Ameiurus natalis*	Bullhead, yellow			VDGIF
Fish	*Ameiurus nebulosus*	Bullhead, brown			VDGIF
Fish	*Amia calva*	Bowfin			VDGIF
Fish	*Anguilla rostrata*	Eel, american			VDGIF
Fish	*Aphredoderus sayanus sayanus*	Perch, pirate			VDGIF
Fish	*Brevoortia tyrannus*	Menhaden, atlantic			VDGIF
Fish	*Carpiodes cyprinus*	Quillback			VDGIF
Fish	*Catostomus commersoni*	Sucker, white			VDGIF
Fish	*Centrarchus macropterus*	Flier			VDGIF
Fish	*Clinostomus funduloides*	Dace, rosyside			VDGIF
Fish	*Cyprinella analostamas*	Shiner, satinfin			VDGIF
Fish	*Cyprinus carpio*	Carp, common			VDGIF
Fish	*Dorosoma cepedianum*	Shad, gizzard			VDGIF
Fish	*Dorosoma petenense*	Shad, threadfin			VDGIF
Fish	*Enneacanthus gloriosus*	Sunfish, bluespotted			VDGIF
Fish	*Enneacanthus obesus*	Sunfish, banded			VDGIF
Fish	*Erimyzon oblongus*	Chubsucker, creek			VDGIF
Fish	*Esox americanus americanus*	Pickerel, redfin			VDGIF
Fish	*Esox lucius*	Pike, northern			VDGIF
Fish	*Esox niger*	Pickerel, chain			VDGIF
Fish	*Etheostoma olmstedi*	Darter, tessellated			VDGIF

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Fish	*Etheostoma vitreum*	Darter, glassy			VDGIF
Fish	*Exoglossum maxillingua*	Minnow, cutlips			VDGIF
Fish	*Fundulus diaphanus*	Killifish, banded			VDGIF
Fish	*Fundulus heteroclitus*	Mummichog			VDGIF
Fish	*Gambusia holbrooki*	Mosquitofish, eastern			VDGIF
Fish	*Hybognathus regius*	Minnow, eastern silvery			VDGIF
Fish	*Hypentelium nigricans*	Sucker, northern hog			VDGIF
Fish	*Ictalurus furcatus*	Catfish, blue			VDGIF
Fish	*Ictalurus punctatus*	Catfish, channel			VDGIF
Fish	*Lampetra aepyptera*	Lamprey, least brook			VDGIF
Fish	*Lampetra appendix*	Lamprey, american brook			VDGIF
Fish	*Lepisosteus osseus*	Gar, longnose			VDGIF
Fish	*Lepomis auritus*	Sunfish, redbreast			VDGIF
Fish	*Lepomis gibbosus*	Pumpkinseed			VDGIF
Fish	*Lepomis gulosus*	Warmouth			VDGIF
Fish	*Lepomis macrochirus*	Bluegill			VDGIF
Fish	*Lepomis megalotis*	Sunfish, longear			VDGIF
Fish	*Lepomis microlophus*	Sunfish, redear			VDGIF
Fish	*Luxilus cornutus*	Shiner, common			VDGIF
Fish	*Lythrurus ardens*	Shiner, rosefin			VDGIF
Fish	*Menidia beryllina*	Silverside, inland			VDGIF
Fish	*Micropterus dolomieu*	Bass, smallmouth			VDGIF
Fish	*Micropterus punctulatus*	Bass, spotted			VDGIF
Fish	*Micropterus salmoides*	Bass, largemouth			VDGIF
Fish	*Morone americana*	Perch, white			VDGIF
Fish	*Morone saxatilis*	Bass, striped			VDGIF
Fish	*Moxostoma macrolepidotum*	Redhorse, shorthead			VDGIF
Fish	*Nocomis leptocephalus*	Chub, bluehead			VDGIF
Fish	*Nocomis micropogon*	Chub, river			VDGIF
Fish	*Notemigonus crysoleucas*	Shiner, golden			VDGIF
Fish	*Notropis amoenus*	Shiner, comely			VDGIF
Fish	*Notropis bifrenatus*	Shiner, bridle			VDGIF
Fish	*Notropis hudsonius*	Shiner, spottail			VDGIF
Fish	*Notropis procne*	Shiner, swallowtail			VDGIF
Fish	*Notropis rubellus*	Shiner, rosyface			VDGIF
Fish	*Noturus gyrinus*	Madtom, tadpole			VDGIF
Fish	*Noturus insignis*	Madtom, margined			VDGIF
Fish	*Perca flavescens*	Perch, yellow			VDGIF
Fish	*Percina notogramma*	Darter, stripeback			VDGIF
Fish	*Percina peltata*	Darter, shield			VDGIF
Fish	*Petromyzon marinus*	Lamprey, sea			VDGIF
Fish	*Phoxinus oreas*	Dace, mountain redbelly			VDGIF
Fish	*Pimephales notatus*	Minnow, bluntnose			VDGIF
Fish	*Pomoxis annularis*	Crappie, white			VDGIF
Fish	*Pomoxis nigromaculatus*	Crappie, black			VDGIF
Fish	*Rhinichthys atratulus*	Dace, blacknose			VDGIF
Fish	*Semotilus atromaculatus*	Chub, creek			VDGIF

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Fish	*Semotilus corporalis*	Fallfish			VDGIF
Fish	*Stizostedion vitreum vitreum*	Walleye			VDGIF
Fish	*Trinectes maculatus*	Hogchoker			VDGIF
Fish	*Umbra pygmaea*	Mudminnow, eastern			VDGIF
Insects	*Boloria selene*	Silver-bordered fritillary	G5		VAHP
Insects	*Helocordulia selysii*	Selys' sundragon	G4		VAHP
Insects	*Sigara depressa*	Virginia piedmont water boatman	G1G3		VAHP
Insects	*Stylurus laurae*	Laura's clubtail	G4		VAHP

3. York Drainage

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Crayfish	*Stygobromus araeus*	Tidewater interstitial amphipod	G2G3		VAHP
Fish	*Alosa aestivalis*	Herring, blueback			VDGIF
Fish	*Alosa pseudoharengus*	Alewife			VDGIF
Fish	*Alosa sapidissima*	Shad, american			VDGIF
Fish	*Ameiurus catus*	Catfish, white			VDGIF
Fish	*Ameiurus natalis*	Bullhead, yellow			VDGIF
Fish	*Ameiurus nebulosus*	Bullhead, brown			VDGIF
Fish	*Amia calva*	Bowfin			VDGIF
Fish	*Anchoa mitchilli*	Anchovy, bay			VDGIF
Fish	*Anguilla rostrata*	Eel, american			VDGIF
Fish	*Aphredoderus sayanus sayanus*	Perch, pirate			VDGIF
Fish	*Bairdiella chrysoura*	Perch, silver			VDGIF
Fish	*Cyprinus carpio*	Carp, common			VDGIF
Fish	*Dorosoma cepedianum*	Shad, gizzard			VDGIF
Fish	*Enneacanthus gloriosus*	Sunfish, bluespotted			VDGIF
Fish	*Erimyzon oblongus*	Chubsucker, creek			VDGIF
Fish	*Esox americanus americanus*	Pickerel, redfin			VDGIF
Fish	*Etheostoma olmstedi*	Darter, tessellated			VDGIF
Fish	*Fundulus diaphanus*	Killifish, banded			VDGIF
Fish	*Fundulus heteroclitus*	Mummichog			VDGIF
Fish	*Fundulus majalis*	Killifish, striped			VDGIF
Fish	*Gambusia holbrooki*	Mosquitofish, eastern			VDGIF
Fish	*Ictalurus punctatus*	Catfish, channel			VDGIF
Fish	*Lampetra aepyptera*	Lamprey, least brook			VDGIF
Fish	*Leiostomus xanthurus*	Spot			VDGIF
Fish	*Lepisosteus osseus*	Gar, longnose			VDGIF
Fish	*Lepomis gibbosus*	Pumpkinseed			VDGIF
Fish	*Lepomis gulosus*	Warmouth			VDGIF
Fish	*Lepomis macrochirus*	Bluegill			VDGIF
Fish	*Lepomis microlophus*	Sunfish, redear			VDGIF
Fish	*Menidia beryllina*	Silverside, inland			VDGIF
Fish	*Micropogonias undulatus*	Croaker, atlantic			VDGIF
Fish	*Micropterus salmoides*	Bass, largemouth			VDGIF

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Fish	*Morone americana*	Perch, white			VDGIF
Fish	*Morone saxatilis*	Bass, striped			VDGIF
Fish	*Notemigonus crysoleucas*	Shiner, golden			VDGIF
Fish	*Notropis hudsonius*	Shiner, spottail			VDGIF
Fish	*Noturus gyrinus*	Madtom, tadpole			VDGIF
Fish	*Perca flavescens*	Perch, yellow			VDGIF
Fish	*Petromyzon marinus*	Lamprey, sea			VDGIF
Fish	*Pomoxis nigromaculatus*	Crappie, black			VDGIF
Fish	*Trinectes maculatus*	Hogchoker			VDGIF
Fish	*Umbra pygmaea*	Mudminnow, eastern			VDGIF

4. Great Wicomico-Piankatank Drainage

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Crayfish	*Stygobromus araeus*	Tidewater interstitial amphipod	G2G3		VAHP
Crayfish	*Stygobromus indentatus*	Tidewater amphipod	G2G3		VAHP
Mussel	*Elliptio complanata*	Mussel, eastern elliptio			VDGIF
Fish	*Alosa aestivalis*	Herring, blueback			VDGIF
Fish	*Alosa pseudoharengus*	Alewife			VDGIF
Fish	*Alosa sapidissima*	Shad, american			VDGIF
Fish	*Ameiurus catus*	Catfish, white			VDGIF
Fish	*Ameiurus natalis*	Bullhead, yellow			VDGIF
Fish	*Ameiurus nebulosus*	Bullhead, brown			VDGIF
Fish	*Anguilla rostrata*	Eel, american			VDGIF
Fish	*Aphredoderus sayanus sayanus*	Perch, pirate			VDGIF
Fish	*Cynoscion regalis*	Weakfish			VDGIF
Fish	*Cyprinella analostamas*	Shiner, satinfin			VDGIF
Fish	*Cyprinus carpio*	Carp, common			VDGIF
Fish	*Dorosoma cepedianum*	Shad, gizzard			VDGIF
Fish	*Enneacanthus gloriosus*	Sunfish, bluespotted			VDGIF
Fish	*Enneacanthus obesus*	Sunfish, banded			VDGIF
Fish	*Erimyzon oblongus*	Chubsucker, creek			VDGIF
Fish	*Esox americanus americanus*	Pickerel, redfin			VDGIF
Fish	*Esox niger*	Pickerel, chain			VDGIF
Fish	*Etheostoma fusiforme*	Darter, swamp			VDGIF
Fish	*Etheostoma olmstedi*	Darter, tessellated			VDGIF
Fish	*Fundulus diaphanus*	Killifish, banded			VDGIF
Fish	*Fundulus heteroclitus*	Mummichog			VDGIF
Fish	*Fundulus luciae*	Killifish, spotfin			VDGIF
Fish	*Fundulus majalis*	Killifish, striped			VDGIF
Fish	*Gambusia holbrooki*	Mosquitofish, eastern			VDGIF
Fish	*Hybognathus regius*	Minnow, eastern silvery			VDGIF
Fish	*Ictalurus punctatus*	Catfish, channel			VDGIF
Fish	*Lampetra aepyptera*	Lamprey, least brook			VDGIF

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Fish	*Leiostomus xanthurus*	Spot			VDGIF
Fish	*Lepomis auritus*	Sunfish, redbreast			VDGIF
Fish	*Lepomis gibbosus*	Pumpkinseed			VDGIF
Fish	*Lepomis gulosus*	Warmouth			VDGIF
Fish	*Lepomis macrochirus*	Bluegill			VDGIF
Fish	*Lepomis microlophus*	Sunfish, redear			VDGIF
Fish	*Menidia menidia*	Silverside, atlantic			VDGIF
Fish	*Micropogonias undulatus*	Croaker, atlantic			VDGIF
Fish	*Micropterus salmoides*	Bass, largemouth			VDGIF
Fish	*Morone americana*	Perch, white			VDGIF
Fish	*Morone saxatilis*	Bass, striped			VDGIF
Fish	*Notemigonus crysoleucas*	Shiner, golden			VDGIF
Fish	*Notropis amoenus*	Shiner, comely			VDGIF
Fish	*Notropis chalybaeus*	Shiner, ironcolor			VDGIF
Fish	*Notropis hudsonius*	Shiner, spottail			VDGIF
Fish	*Notropis procne*	Shiner, swallowtail			VDGIF
Fish	*Noturus gyrinus*	Madtom, tadpole			VDGIF
Fish	*Noturus insignis*	Madtom, margined			VDGIF
Fish	*Perca flavescens*	Perch, yellow			VDGIF
Fish	*Percina notogramma*	Darter, stripeback			VDGIF
Fish	*Percina peltata*	Darter, shield			VDGIF
Fish	*Petromyzon marinus*	Lamprey, sea			VDGIF
Fish	*Rhinichthys atratulus*	Dace, blacknose			VDGIF
Fish	*Semotilus atromaculatus*	Chub, creek			VDGIF
Fish	*Semotilus corporalis*	Fallfish			VDGIF
Fish	*Umbra pygmaea*	Mudminnow, eastern			VDGIF
Insects	*Atlides halesus*	Great purple hairstreak	G5		VAHP
Insects	*Cicindela dorsalis dorsalis*	Northeastern beach tiger beetle	G4T2	LT	VAHP
Insects	*Epitheca spinosa*	Robust baskettail	G4		VAHP
Insects	*Helocordulia selysii*	Selys' sundragon	G4		VAHP
Insects	*Isoparce cupressi*	Cypress sphynx	G4		VAHP

4. Lower Rappahannock Drainage

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Crayfish	*Stygobromus indentatus*	Tidewater amphipod	G2G3		VAHP
Mussel	*Alasmidonta heterodon*	Mussel, dwarf wedge		LE	VDGIF
Mussel	*Alasmidonta heterodon*	Dwarf wedgemussel	G1G2	LE	VAHP
Mussel	*Alasmidonta undulata*	Mussel, triangle floater			VDGIF
Mussel	*Corbicula fluminea*	Clam, asian			VDGIF
Mussel	*Elliptio complanata*	Mussel, eastern elliptio			VDGIF
Mussel	*Elliptio fisheriana*	Mussel, northern lance			VDGIF
Mussel	*Elliptio lanceolata*	Yellow lance	G2G3		VAHP
Fish	*Acantharchus pomotis*	Sunfish, mud			VDGIF
Fish	*Alosa aestivalis*	Herring, blueback			VDGIF
Fish	*Alosa mediocris*	Shad, hickory			VDGIF

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Fish	*Alosa pseudoharengus*	Alewife			VDGIF
Fish	*Alosa sapidissima*	Shad, american			VDGIF
Fish	*Ambloplites rupestris*	Bass, rock			VDGIF
Fish	*Ameiurus catus*	Catfish, white			VDGIF
Fish	*Ameiurus natalis*	Bullhead, yellow			VDGIF
Fish	*Ameiurus nebulosus*	Bullhead, brown			VDGIF
Fish	*Amia calva*	Bowfin			VDGIF
Fish	*Anchoa mitchilli*	Anchovy, bay			VDGIF
Fish	*Anguilla rostrata*	Eel, american			VDGIF
Fish	*Aphredoderus sayanus sayanus*	Perch, pirate			VDGIF
Fish	*Brevoortia tyrannus*	Menhaden, atlantic			VDGIF
Fish	*Catostomus commersoni*	Sucker, white			VDGIF
Fish	*Centrarchus macropterus*	Flier			VDGIF
Fish	*Clinostomus funduloides*	Dace, rosyside			VDGIF
Fish	*Cynoscion regalis*	Weakfish			VDGIF
Fish	*Cyprinella analostamas*	Shiner, satinfin			VDGIF
Fish	*Cyprinus carpio*	Carp, common			VDGIF
Fish	*Dorosoma cepedianum*	Shad, gizzard			VDGIF
Fish	*Enneacanthus gloriosus*	Sunfish, bluespotted			VDGIF
Fish	*Erimyzon oblongus*	Chubsucker, creek			VDGIF
Fish	*Esox americanus americanus*	Pickerel, redfin			VDGIF
Fish	*Esox niger*	Pickerel, chain			VDGIF
Fish	*Etheostoma olmstedi*	Darter, tessellated			VDGIF
Fish	*Etheostoma vitreum*	Darter, glassy			VDGIF
Fish	*Etrumeus teres*	Herring, round			VDGIF
Fish	*Exoglossum maxillingua*	Minnow, cutlips			VDGIF
Fish	*Fundulus diaphanus*	Killifish, banded			VDGIF
Fish	*Fundulus heteroclitus*	Mummichog			VDGIF
Fish	*Fundulus majalis*	Killifish, striped			VDGIF
Fish	*Gambusia holbrooki*	Mosquitofish, eastern			VDGIF
Fish	*Hybognathus regius*	Minnow, eastern silvery			VDGIF
Fish	*Hypentelium nigricans*	Sucker, northern hog			VDGIF
Fish	*Ictalurus furcatus*	Catfish, blue			VDGIF
Fish	*Ictalurus punctatus*	Catfish, channel			VDGIF
Fish	*Lampetra aepyptera*	Lamprey, least brook			VDGIF
Fish	*Lampetra appendix*	Lamprey, american brook			VDGIF
Fish	*Leiostomus xanthurus*	Spot			VDGIF
Fish	*Lepisosteus osseus*	Gar, longnose			VDGIF
Fish	*Lepomis auritus*	Sunfish, redbreast			VDGIF
Fish	*Lepomis cyanellus*	Sunfish, green			VDGIF
Fish	*Lepomis gibbosus*	Pumpkinseed			VDGIF
Fish	*Lepomis gulosus*	Warmouth			VDGIF
Fish	*Lepomis macrochirus*	Bluegill			VDGIF
Fish	*Lepomis microlophus*	Sunfish, redear			VDGIF
Fish	*Lucania parva*	Killifish, rainwater			VDGIF
Fish	*Luxilus cornutus*	Shiner, common			VDGIF
Fish	*Lythrurus ardens*	Shiner, rosefin			VDGIF

Tax Group	Scientific name	Common name	Grank	Federal status	Data source
Fish	*Menidia beryllina*	Silverside, inland			VDGIF
Fish	*Menidia menidia*	Silverside, atlantic			VDGIF
Fish	*Micropogonias undulatus*	Croaker, atlantic			VDGIF
Fish	*Micropterus dolomieu*	Bass, smallmouth			VDGIF
Fish	*Micropterus salmoides*	Bass, largemouth			VDGIF
Fish	*Morone americana*	Perch, white			VDGIF
Fish	*Morone saxatilis*	Bass, striped			VDGIF
Fish	*Moxostoma macrolepidotum*	Redhorse, shorthead			VDGIF
Fish	*Nocomis leptocephalus*	Chub, bluehead			VDGIF
Fish	*Nocomis micropogon*	Chub, river			VDGIF
Fish	*Notemigonus crysoleucas*	Shiner, golden			VDGIF
Fish	*Notropis amoenus*	Shiner, comely			VDGIF
Fish	*Notropis bifrenatus*	Shiner, bridle			VDGIF
Fish	*Notropis chalybaeus*	Shiner, ironcolor			VDGIF
Fish	*Notropis hudsonius*	Shiner, spottail			VDGIF
Fish	*Notropis procne*	Shiner, swallowtail			VDGIF
Fish	*Notropis rubellus*	Shiner, rosyface			VDGIF
Fish	*Noturus gyrinus*	Madtom, tadpole			VDGIF
Fish	*Noturus insignis*	Madtom, margined			VDGIF
Fish	*Perca flavescens*	Perch, yellow			VDGIF
Fish	*Percina notogramma*	Darter, stripeback			VDGIF
Fish	*Percina peltata*	Darter, shield			VDGIF
Fish	*Petromyzon marinus*	Lamprey, sea			VDGIF
Fish	*Phoxinus oreas*	Dace, mountain redbelly			VDGIF
Fish	*Pimephales notatus*	Minnow, bluntnose			VDGIF
Fish	*Pomoxis annularis*	Crappie, white			VDGIF
Fish	*Pomoxis nigromaculatus*	Crappie, black			VDGIF
Fish	*Rhinichthys atratulus*	Dace, blacknose			VDGIF
Fish	*Semotilus atromaculatus*	Chub, creek			VDGIF
Fish	*Semotilus corporalis*	Fallfish			VDGIF
Fish	*Trinectes maculatus*	Hogchoker			VDGIF
Fish	*Umbra pygmaea*	Mudminnow, eastern			VDGIF
Insects	*Cicindela dorsalis dorsalis*	Northeastern beach tiger beetle	G4T2	LT	VAHP
Insects	*Enallagma dubium*	Burgundy bluet	G5		VAHP
Insects	*Libellula exusta*	White corporal skimmer	G4		VAHP
Insects	*Lordithon niger*	Black lordithon rove beetle	G1		VAHP
Insects	*Nehalennia gracilis*	Sphagnum sprite	G5		VAHP
Insects	*Somatochlora provocans*	Treetop emerald	G4		VAHP
Insects	*Stenogomphurus rogersi*	Sable clubtail	G4		VAHP

APPENDIX E. AQUATICS EXPERT MEETING INFORMATION

PLEASE NOTE:

The following information was compiled from an aquatic experts meeting held at the TNC-VA office on October 18th, 2000. The objective of the meeting was to determine which aquatic conservation targets should be selected for the Chesapeake Rivesr site conservation plan. Several professors from Virginia universities, DGIF biologists and staff from the Freshwater Initiative attended. Both individual species and aquatic systems were discussed as potential conservation targets. In addition, the Freshwater Initiative performed a classification of the aquatic systems and macrohabitats of the Rappahannock and York Drainages.

Information on this meeting is divided into 2 sections:

I. Synopsis of Chesapeake Rivers aquatic target selection meeting

II. Freshwater aquatic systems classification (methods and results)

Appendix E. I. Synopsis of Chesapeake Rivers aquatic target selection meeting

The Nature Conservancy-Virginia Chapter, Charlottesville, Virginia
October 18, 2000.

In attendance: Paul Angermeier (VT), Braven Beaty (TNC-Clinch), Gwynn Crichton (TNC-VAFO), Brian van Eerden (TNC-Chesapeake), Dean Fowler (VDGIF), Greg Garman (VCU), Chas Gowan (Randolph-Macon), Steve McInninch (VCU), Monte McGregor (VDGIF), Jen Perot (TNC-FWI), Brian Richter (TNC-FWI), Steve Roble (VDCR-Heritage), and Andy Warner (TNC-FWI)

Overall summary

The group considered potential conservation targets at the species, community and systems level for the Pamunkey, Mattaponi and Rappahannock drainages. The general conclusions were that besides anadromous fishes, no individual species or species assemblages of aquatic biota should be designated as conservation targets. The data and expertise of the participants show that there are no truly endemic or unique species to the Chesapeake rivers, though there are a couple of federally listed species (Atlantic sturgeon and dwarf wedge mussel—addressed below).

Jen Perot presented the 13 abiotic aquatic systems developed through the Freshwater Initiative's classification method using GIS. While the group is very much in favor of this methodology, they were not confident that the systems represented truly different biological communities. It was suggested that the systems be tested using available and historical biological data of species occurrences to determine if they in fact represent distinct, legitimate ecological communities. Moreover, it was pointed out that the model used to classify the systems should be modified for the coastal plain to reflect the fact that pH and stream permanence are more indicative of species distribution than stream size. Overall, it was the general opinion of everyone that the coastal plain and the Piedmont are both homogeneous compositionally and could easily be considered as 2 systems. Given this, and TNC's limited ability to test the systems or revise the model at this point, recognizing these 2 systems is most realistic and practical approach for us to take.

TNC's primary goal at this site is to conserve the best remaining functional freshwater systems of the coastal plain in the Chesapeake drainage. Having stated this, the two clear conservation targets that emerged were anadromous fishes (including the Atlantic sturgeon) and the coastal plain aquatic system. While protection of the anadromous fish will of course warrant the inclusion of the mainstem rivers into the Piedmont as part of the Chesapeake Rivers site, there is no clear rationale for including Piedmont headwater streams and watersheds as conservation targets. Moreover, it was pointed out that there is little to no connection between the processes governing viability of the upper portions of the Chesapeake rivers' watersheds in the Piedmont and the lower watersheds in the coastal plain except for the mainstems themselves. Rather than designating the aquatic systems in the Piedmont as targets, TNC will work in these areas as necessary to abate threats and improve the viability of focal conservation targets in the coastal plain.

Though we have "rolled-up" these aquatic targets, they have yet to be integrated with the other vegetation communities/terrestrial systems. The other potential targets are as follows:

- Tidal freshwater system
- Non-tidal freshwater system (includes palustrine wetlands)
- Submerged aquatic vegetation
- Estuarine systems (salt marshes and sandy beaches)
- Non-tidal bottomland hardwood forest
- Upland forest (mesic mixed hardwoods and oak/pine/ericad forests)
- Calcareous ravines

It is questionable whether "coastal plain aquatic system" will stand as its own target or be integrated into the tidal freshwater and non-tidal system targets (split to reference the very distinctive vegetative communities found in each system). This should be determined based on whether or not there are significant differences in the environmental

and ecological processes governing the health and persistence of the aquatic fauna versus the vegetation communities. I welcome your suggestions on this issue.

Finally, I have listed the invasive species that we discussed considering as "negative" targets for threat abatement. Once we have a final list of our conservation targets, the next step will be to do a qualitative baseline assessment of the targets' viability followed by a detailed threat evaluation. As part of this process, it will be critical to examine what makes these invasive species such successful competitors and identify exactly how they threaten the persistence of native aquatic species.

I. Potential Aquatic Conservation Targets of the Chesapeake Rivers

A. Coastal Plain Aquatic System
Definition:

- Includes full tidal gradient in the Chesapeake Bay Lowlands ecoregion from the estuary to the fall line.
- Includes the 4 freshwaters systems identified by through the FWI classification (i.e., blackwaters, mainstems (Rappahannock and Mattaponi/Pamunkey,respectively), and river tributaries/headwaters
- Includes all native, representative aquatic fauna
- Does not include species considered to be invasive (e.g. blue catfish, grass carp)
- Includes all environmental and ecological processes that maintain aquatic biota

Justification:
This aquatic system will capture the characteristic *native* aquatic biodiversity of the coastal plain portion of the Chesapeake drainage (see attached list of species). While there are likely more distinctive systems within this broad system, we cannot verify with certainty their legitimacy at this time. For example, past data analysis of fish communities by Dr. Steve McIninch has indicated that that no tidal fish assemblage can be distinguished from other coastal plain fish communities. Overall, the aquatic biological diversity is lower relative to the James and the Potomac and is homogeneous throughout the area rivers and tributaries. The value of these biota is that collectively they are representative of the coastal plain and that they occur in high quality, in tact environments with functional ecological processes relative to other coastal plain rivers and tributaries of the Chesapeake Bay.

The group suggested a few aquatic species/assemblages/communities that are or potentially may be significant components of the "coastal plain aquatic system". They are as follows:

1. **Coastal plain mussel assemblage**. This characteristic assemblage of the coastal plain includes the *Lampsilis cariosa* complex (yellow lamp mussel), *Lampsilis radiata* (eastern lamp mussel), *Leptodea ochracea* (tidewater mucket), and *Ligumia nasuta* (eastern pond mussel). *Lampsilis cariosa* is a major taxonomic question and may represent multiple species in the coastal plain. It also is in need of state protection. Overall, however, aquatic systems and fish assemblages are considered to be adequate surrogates for this mussel assemblage.
2. **SAV dependent species assemblages (including blackwater minnows).** Assemblages of species dependent on SAV have a more localized and patchy distribution throughout the coastal plain rivers. Since the quality and abundance of SAV is highly threatened due to nutrient loading and sedimentation, so too is the habitat and food source for many aquatic species. Visual feeders like the red fin pickerel, the banded sunfish, the long-nose gar, the iron-colored shiner and the bridle shiner are all dependent on SAV, while other species such as the eastern silvery minnow, the swallowtail shiner and spot tail shiner are considered SAV associates rather than dependents as their distribution is more common and widespread. Two minnows, the iron-colored shiner and the bridle shiner, also have a close association with blackwater conditions (i.e. highly acidic). However, there is very little data available on the distribution of pH in these rivers to determine the how acidic conditions vary with SAV and minnow assemblages.
3. **Alkaline associated species/communities.** While, it has been proposed that there may be unique species assemblages in alkaline waters, there is no data to support this currently, partly due to inventory and the lack of good pH information for the river systems. Often alkaline waters are more productive and have a higher diversity of species.
4. **Low oxygen adapted fish species assemblage**. These species can persist in naturally occurring low oxygen zones in small intermittent streams and pools in the headwaters of the coastal plain rivers. They include mud

minnows, bowfin, American eel, pirate perch, flyer, long nosed gar, chain pickerel and warmouth. While none of these species individually is rare, their collective occurrence under low oxygen conditions is noteworthy. However, targeting this type of assemblage would be very difficult in that nutrient loading from agriculture creates many low oxygen areas.

5. **Lampreys**. These uncommon and potentially declining species (i.e. least brook lamprey and American brook lamprey) are of interest as they are sensitive indicators of water quality, requiring clear, clean sand-gravel substrate in small low to medium gradient brooks and small streams. Lampreys on the whole have been under-sampled and more information is needed on their distribution throughout the Chesapeake River systems. However, they are most likely captured within the coastal plain aquatic system target.

B. Anadromous Fish

Definition:

Includes the *Alosa aestivalis* (blueback herring), *Alosa pseudoharengus* (alewife), *Alosa mediocris* (hickory shad), and *Alosa sapidissima* (American shad)

Justification:

The Pamunkey, Mattaponi and Rappahannock represent one of the few remaining areas on the Atlantic slope providing long, largely unaltered natural passages for this assemblage of anadromous fish. In addition, this may the only place where one can find all 5 of these species together. Moreover, Atlantic sturgeon, a federally and state listed species of concern, is extremely rare in the York and Rappahannock drainages due to overfishing damming, and pollution. Overall, anadromous fish may be the best indicators of a functional natural flow regime and the connectivity of the river systems at a regional scale, migrating from the Chesapeake Bay all the way into the upper reaches of the rivers and associated tributaries to spawn in the springtime. Their ability to reproduce is seriously imperiled by hydrologic alteration such as impoundments and channelization. Currently, the major dam impeding the upstream migration of the fish is Embrey Dam on the Rappahannock in Fredricksburg. However, this dam is scheduled to be removed in 2002. The anadromous fish also play an important ecological role as host fish for mussels, and therefore are targeted as surrogates for mussel diversity through the rivers systems as well.

II. Other species/assemblages of conservation interest:

***Alasmidonta heterondon* (dwarf wedge mussel)**

This is a globally rare mussel that is federally listed as endangered. In the Chesapeake rivers area, it is found primarily in the Po River system along the fall zone and into the Piedmont, close to the southern end of its distribution. This is an ecoregional target for the Chesapeake Bay Lowlands ecoregion due to the coastal plain populations found in Maryland, but in Virginia, it is primarily found in the Piedmont and fall zone; therefore, it may not be an appropriate target if our primary focus is the coastal plain. Regardless of this issue, we need to think carefully about designating an individual species as a conservation target. What special processes or habitat does this mussel species require to be viable that would not be accounted for by a system level target or by the anadromous fish target?

Cambarus diogenes

This crayfish may need special attention, as it requires different habitat than most coastal plain mussels and crayfish, burrowing in floodplains and palustrine wetlands. However, palustrine wetlands will most likely be a terrestrial conservation target that will in turn account for populations of *C. diogenes.*

Leptoxis carinata

This snail is found in non-fish areas in riffles and on boulders and is useful as an indicator of water pollution.

Swampfish

This is an uncommon to rare species that lives in lowland blackwater swampy creeks, rivers, ponds, etc., and is associated almost exclusively with low oxygen waters. It is mostly found in the Chowan Basin but may occur in the Chesapeake Rivers as well.

American eel
This catadromous species has a widespread distribution (Greenland to Brail to the Great Lakes!) and very unique life history strategies. It is more common in the coastal plain than in the upper watersheds of the Atlantic drainage where it is rare and localized due to dams. It is appealing as a potential target because of its regional distribution and sensitivity to hydrologic alteration; however, it will most likely be well represented by the anadromous fish conservation target.

III. Other general comments on the aquatic biota of the project area:

- Most crayfish found in the York/Rappahannock drainages are common to the coastal plain. This are represents the southernmost limit for *Orconectes limosus* and the easternmost limit for *Cambarus bartonii*. There are new records from DGIF that need to be added to the collections database.
- Snails are woefully under-inventoried. No comprehensive survey has been conducted. There are about 7 representative species in the Chesapeake Rivers area.
- Virtually no data exists on aquatic insects in the coastal plain drainages. No formal inventory has been conducted and there are no resident experts on insects in Virginia. There may be 200-300 genera in this area. Insect diversity is known to be tightly linked to habitats and fish species; therefore, the use of an abiotic or ecological classification of aquatic systems should be considered the best alternative to capturing native aquatic insect diversity. However, local non-fish ponds, emphemeral pools and wetlands were cited as having potentially unique assemblages of aquatic insects and snails that could not otherwise occur with fish predation.

IV. Problem invasive species (or potential "negative" targets):

Fish
- Blue catfish
- Grass carp
- Red shiner
- Flat-head catfish
- Threat-fin shad
- Common carp
- Channel catfish
- Large-mouth bass
- Spotted bass

Mollusks
- Chinese/Japanese mystery snail
- Asian clam

Crayfish
- Orconectes virilis

V. Contact Information for Aquatic Experts in Attendance:

Dr. Greg C. Garman
Director, Center for Environmental Studies
Virginia Commonwealth University
816 Park Avenue, Rm. 108
P.O Box 843050
Richmond, VA 23284-3050
Phone (804) 225-3559
Email: ggarman@atlas.vcu.edu

Dean Fowler
Department of Game and Inland Fisheries
5806 Mooretown Road
Williamsburg, VA 23188
Phone: (757) 253-4170
Email: dfowler@dgif.state.va.us

Monte McGregor
Department of Game and Inland Fisheries
1132 Thomas Jefferson Road
Forest, VA 24551
Phone: (804) 525-7522 ..
Email: mmcgregor@dgif.state.va.us
.

Dr. Charles Gowan
Department of Biology and
Environmental Studies Program
Randolph-Macon College
Ashland, Virginia 23005
Phone: 804-752-7293
Email Address: cgowan@rmc.edu

Dr. Paul Angermeier
Fisheries & Wildlife
Virginia Tech
144 Cheatham Hall
Blacksburg, VA 24061
Email: biota@vt.edu
Phone: 540-231-4501

Steve Roble
Division of Natural Heritage, VA Dept. of Parks and Rec.
217 Governor Street, 3rd Floor
Richmond, VA 23219
Phone: 804-371-7951
Email: sroble@dcr.state.va.us

Mike Pinder
Department of Game and Inland Fisheries
Draper Aden Bldg.
2206 S. Main, Ste. C
Blacksburg, VA 24060
Phone: (540) 951-7923
Email: mpinder@dgif.state.va.us

Brian Richter
Director, Freshwater Initiative
The Nature Conservancy
490 Westfield Road
Charlottesville, VA 22901
Phone: (804) 295-6106
Email: brichter@tnc.org

Jen Perot
Freshwater Initiative

The Nature Conservancy
4245 North Fairfax Drive, Ste.100
Arlington, Virginia 22203
Phone: (703) 841-5386
Email: jperot@tnc.org

Andy Warner
Freshwater Initiative
The Nature Conservancy
4245 North Fairfax Drive, Ste.100
Arlington, Virginia 22203
Phone: (703) 841-8136
Email: awarner@tnc.org

Appendix E. II. Freshwater Aquatic Systems Classification (methods and results)

Aquatic Conservation Targets in the Chesapeake Bay Lowlands ecoregion

The Nature Conservancy is developing an aquatic conservation plan for the Chesapeake Bay Lowlands by assessing the ecological patterns within the ecoregion. The ecoregions being used by the Conservancy are modifications of the USDA Forest Service ecoregions, and represent areas of distinct ecological patterns within broad regions of similar climate, geology and landform. Identifying the suite of priority aquatic conservation sites that will represent an ecoregion's aquatic biodiversity requires a comprehensive picture of aquatic ecosystem and biological diversity. However, many ecoregions have limited, or currently unavailable spatially-referenced information about the distribution of aquatic species, and most, generally lack data on natural aquatic assemblages.

We do know that environmental gradients of climate, elevation, and geology shape aquatic ecosystems at several spatial scales, and the influence of physical habitat on the diversity of aquatic species and communities has been well documented. Based on these relationships, we have developed a method to create an approximate comprehensive picture of ***potential*** aquatic community diversity across an ecoregion. We use spatial data to describe units of aquatic ecosystems in terms of the regional driving factors that influence community distribution and composition. We first develop macrohabitats, and then look for patterns in the macrohabitat types and classification attributes to identify ecological systems. This classification approach has already been used to classify streams and lakes in many ecoregions. Once we have determined the potential diversity and distribution of aquatic systems within the ecoregions, we perform a quality assessment to identify the highest quality examples of the different systems. If no high quality systems are remaining, the best area for restoration is identified.

Macrohabitats

Macrohabitats are units of streams and lakes that are relatively homogeneous with respect to size, and thermal, chemical, and hydrological regimes. Stream macrohabitats were mapped in the Chesapeake Bay Lowlands based on three primary spatial data sets: hydrography, geology and elevation. Four stream variables were derived from these layers: stream size, connectivity (network position), gradient, and hydrologic and chemical regime. Lines representing stream reaches were attributed automatically in a GIS and aggregated into macrohabitat types as unique combinations of the four classification attributes described below.

1. Stream Size

We analyzed the hydrography data layer to describe two important variables: size and connectivity. We defined four stream size classes based on link number, which is a count of the number of first order streams upstream of a point. The classes are:

1	Headwater	Link 1 – 10
2	Creek	Link 11 – 100
3	Small river	Link 101 – 1000
4	Medium river	Link 1001 – 2500
5	Large river	Link >2500

2. Connectivity

Stream connectivity describes the position in the drainage network, which was measured as the link number of the downstream reach. We used the same hydrography data layer and classes for stream connectivity as for stream size.

4. Gradient:

In the Chesapeake Bay Lowlands, we measured only one topographic factor, gradient, that is the change in elevation of a stream reach over its length. Gradient is a useful single measure of channel morphology because it is correlated to sinuosity, pool-riffle pattern, confinement, substrate size, and water velocity. We calculated the gradient for each stream reach automatically from a digital elevation model (DEM) in the GIS, then averaged the gradient value for each macrohabitat. The four gradient classes we used to classify the macrohabitats are

1 Very low gradient <0.005
2 Low gradient 0.005 – 0.02
3 Moderate gradient >0.02 – 0.04
4 High gradient >0.04

4. Hydrologic and Chemical Regime

We used the surficial and bedrock geology texture and stream size to infer the hydrologic and chemical regime of each macrohabitat in terms of relative inputs of ground and surface water. The geologic codes in the Chesapeake Bay Lowlands and adjoining Piedmont ecoregion are:

Coastal Plain Surficial Geology Classes:
5 alluvial coarse
6 alluvial fine
7 alluvial/estuarine fine
8 beach & dune
9 marine fine
10 saline marsh
11 silt/clay

Piedmont Bedrock Geology Classes:
100 acidic sed/metased
200 acidic shale
300 calcareous sed/metased
400 mod calcareous sed/metased
500 acidic granitic
600 mafic/intermediate granitic
700 ultramafic
900 coarse sed

The hydrologic regime and chemistry was classified for macrohabitats using the following rules:

4a. Rules for 1st through 3rd order streams:

If areal coverage of geology in watershed at and above the reach is >40 % stable (coastal classes: 1, 5 & bedrock classes: 300, 400, 900), then flow in the reach is stable, otherwise flow is unstable.

If areal coverage of geology in watershed at and above reach is >40 % calcareous - neutral (coastal classes: 1, 2, 4, 5, 8, 12 & bedrock classes: 300, 400, 700), then chemistry is calcareous – neutral, otherwise acidic.

This results in four possible combinations for the hydrologic and chemical regime macrohabitat type:

1 Stable hydrology, calcareous - neutral chemistry (1, 5 & 300, 400)
2 Unstable hydrology, calcareous - neutral chemistry (2, 4, 8, 12 & 700)
3 Stable hydrology, acidic chemistry (900)
4 Unstable hydrology, acidic chemistry (100, 200, 500, 600)

A fifth code is assigned to reaches at the Coastal Plain Saline Marsh.

4b. Rules for 4th and 5th order rivers:

We assumed stable hydrology and calcareous-neutral chemistry unless:

For hydrologic regime, if areal extent of watershed at or above reach is >70% unstable (2, 4,8, 12 & 200) then code the reach unstable, otherwise stable.

For chemistry, if areal extent of watershed at or above reach is >70% acidic (100, 200, 500, 600, 900) then code the reach acidic, otherwise neutral

4c. Rules for 6th order or larger rivers:

We assumed stable hydrology and calcareous-neutral chemistry for all sixth order or larger rivers.

Ecological Systems

Aquatic ecological systems are dynamic spatial assemblages of multiple ecological communities that: 1) occur together in an aquatic landscape with similar geomorphological patterns; 2) are tied together by similar ecological processes (e.g., hydrologic and nutrient regimes, access to floodplains and other lateral environments) or environmental gradients (e.g., temperature, chemical and habitat volume); and 3) form a robust, cohesive and distinguishable unit on a hydrography map.

Within the ecoregion of the Chesapeake Bay Lowlands, there are ranges in the types of aquatic ecosystems. Ecological Systems summarize the range of macrohabitat types for sets of hydrologically-connected streams. Each system type represents a different pattern of physical settings thought to contain a distinct set of biological communities and is therefore a distinct conservation target. We looked for patterns in the macrohabitat types and 4 attributes used to classify the macrohabitats to identify ecological system types. Table 1 identifies and describes 13 different system types in the Chesapeake Rivers watersheds. The enclosed map illustrates the 13 system types. System type #12 is a unique system types. The map shows multiple examples of the remaining 12 system types.

Table E.1. Aquatic systems of the Chesapeake Rivers. Please cross-reference with Map 9 for a spatial display of the systems.

Code	Size	Geology	Hydrology	Chemistry	Gradient	Elevation	Notes	Examples
1	small river	acidic granite	stable	acidic	very low	bottomland	Rivers with headwaters in western Piedmont	South Anna River, North Anna River
2	small river	acidic granite, mafic hardrock - acidic sed/metased massive, non-massive - acidic granite	stable	acidic	very low, some low	bottomland, some low	Rivers with headwaters on Blue Ridge	Rappahannock River, Rapidan River
3	small river	acidic granitic, unconsolidated sands and gravels	stable	acidic	very low	bottomland	Fall Zone rivers; transitional streams from eastern Piedmont granites to coastal plain sands/gravels	South Anna R, North Anna R, and Rappahannock R
4	headwater, creek	acidic granitic, mafic hardrock, some acidic sed/metased	unstable	acidic	moderate, high, some low in creeks	moderate, low	River headwaters on Blue Ridge escarpment and foothills	Headwaters of Hazel River, Thornton River, Robinson River, Rapidan River
5	headwater, creek	mafic hardrock; massive and non-massive/erodible acidic sed/metased	unstable	acidic, some streams neutral	low, very low	low, some bottomland	Streams of the Mesozoic Basin - sandstones, shales as well as diabase intrusions	Tinpot Run, Walsh Run, Flat Run, Muddy Run, Jonas Run, Potato Run, Summerduck Run,
6	headwater, creek	acidic granitic, unconsolidated sands and gravels	moderately stable	acidic	very low	bottomland	Fall Zone streams; transitional streams from eastern Piedmont granites to coastal plain sands/gravels	Fall Zone tribs of South Anna R (lower Newfound R, Stone Horse, Cedar, and Beech Creeks), North Anna R (lower Little Creek, Bull Run, Long Creek), Mattaponi R (lower Ni and Po Rivers, Motto and South River headwaters), Rappahannock R (upper Massaponax Creek, Hazel, Mine, Deep and Rocky Pen Runs)

Code	Size	Geology	Hydrology	Chemistry	Gradient	Elevation	Notes	Examples
7	headwater, creek	massive acidic sed/metased, acidic granitic, some mafic hardrock	unstable	acidic, some streams neutral	low, very low	bottomland, some low	Streams of central and eastern Piedmont	North Anna R and all tributaries above Lake Anna, South Anna R and all tribs aboveFork Creek (Louisa Co.), headwaters of Po, Ni, and Ta Rivers, and tribs of Hazel River (Flat, Mine, Mountain, and Hazel Runs) and Rappahannock River (Deep, Rock, and Summerduck Runs, and lower Walsh Run) just above confluence, upper Newfound River and Little River, and small eastern Piedmont tribs of the Mattaponi R (upper Mat R)
8	headwater, creek	massive and some non-massive sed/metased, mafic hardrock, and some acidic granitic	unstable	acidic, some streams neutral	low, some very low, some high and moderate	low	Streams of western Piedmont and Blue Ridge foothills, some higher gradient headwaters along monadnocks, some very low gradient creeks along Piedmont floor	middle Piedmont tribs of: Rappahannock R (Carter Run, South Run, Great Run), Hazel R (Mountain Run, Indian Run, Waterford Run), Robinson R (Crooked Run, Deep Run, Little Dark Run, Beaverdam Run), and Rapidan R (Blue Run, Marsh Run)
9	headwater, creek	silt/clay, some alluvial/estuarine fine	unstable	neutral	low, very low	bottomland	Coastal Plain streams, some are tidal	Tributaries in Coastal Plain of Rappahannock, York, Mattaponi and Pamunkey (Corrotoman, Poropotank, Totuskey, Polecat, Marshy Swamp, Cat Point, Massaponax, Goldenvale, Mill, Elmwood, Occupacia, Mount Landing, Hoskins, Piscataway, South, Herring, Marracossic, Pantico Run, Corbin, Chapel Hill, Beverly Run, Matatequin)

Code	Size	Geology	Hydrology	Chemistry	Gradient	Elevation	Notes	Examples
10	headwater, creek	silt/clay, some alluvial/estuarine fine and alluvial coarse	moderately stable	acidic	very low	bottomland	Blackwater system with numerous wetlands along mainstem	Piankatank and its tributaries
11	small and medium river	alluvial coarse	stable	neutral	very low	bottomland	Tidal to approximately US 360 (not as far as the Fall Line). Headwaters start in Piedmont	Mainstems of Mattaponi, Pamunkey, and York Rivers
12	small and medium river	alluvial coarse	stable	neutral	very low	bottomland	Tidal to Fall Line. Headwaters start in Blue Ridge and flow across Piedmont	Mainstem of Rappahannock River
13	headwater, creek	silt/clay, some marine fine	unstable	neutral	low, very low	bottomland	Tidal streams connected to Chesapeake Bay	Ware and Great Wicomico Rivers

APPENDIX B. Rare Species and Community List

Table 4 indicates the rare species and natural communities that have been found in the Dragon Run watershed, according to the Virginia Division of Natural Heritage (Belden, Jr. et al., 2001; Belden, Jr. et al., 2003).

SCIENTIFIC NAME	COMMON NAME	STATUS
Animals		
Atlides halesus	Great purple hairstreak	S2, S3
Enallagma weewa	Blackwater bluet	S1
Epitheca spinosa	Robust baskettail	S2
Haliaeetus leucocephalus	Bald eagle	S2
Helocordulia selysii	Selys' sunfly	S2
Isoparce cupressi	Cypress sphinx	S1, S3
Somatochlora filosa	Fine-lined emerald	S2
Wyeomyia haynei	Southern pitcher-plant mosquito	S1
Plants		
Bolboschoenus fluviatillis	River bulrush	S2
Cardamine pratensis	Cuckooflower	S1
Carex decomposita	Cypress-knee sedge	S2
Chelone oblique	Red turtlehead	S1
Desmodium strictum	Pineland tick-trefoil	S2
Eriocaulon parkei	Parker's pipewort	S2
Sarracenia purpurea var. purpurea	Northern purple pitcher-plant	S2
**Hottonia inflata	Featherfoil	S3
**Ranunculus flabellaris	Yellow water crowfoot	S3
Natural Communities		
Baldcypress-Tupelo Swamp		
Fluvial Terrace Woodland		
Tidal Baldcypress-Tupelo Swamp		
Tidal Baldcypress Woodland/Savanna		
Tidal Freshwater Marsh		

S1 = Extremely rare; usually 5 or fewer occurrences in the state; or may have a few remaining individuals; often especially vulnerable to extirpation.

S2 = Very rare; usually between 5 and 20 occurrences; or few occurrences with many individuals; often susceptible to becoming endangered.

S3 = Rare to uncommon; usually between 20 to 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances

** = No longer tracked by the Division of Natural Heritage; placed on watchlist due to an increased number of documented occurrences within the state since 2001

Table 4. Rare species and natural communities in the Dragon Run watershed.

The following descriptions of natural communities are taken from *The Natural Communities of Virginia* (Fleming et al., 2001).

Bald Cypress-Tupelo Swamps
Seasonally to semipermanently flooded forests of backswamps, sloughs, and low terraces of Coastal Plain rivers and large streams. These swamp forests are distributed throughout southeastern Virginia, north to Dragon Swamp (Gloucester, King and Queen, and Middlesex Counties). Habitats are deeply flooded (up to 1m) for part of the year; most retain at least some standing water throughout the growing season. Microtopography is often pronounced with small channels, swales, tree-base hummocks, and numerous bald cypress "knees." Tree canopies vary from mixed stands of bald cypress (Taxodium distichum), water tupelo (Nyssa aquatica), and swamp tupelo (N. biflora) to nearly pure stands of one species or another. The three dominants have complex competitive and successional relationships. As a rule, the two tupelos are less shade-tolerant than bald cypress and regenerate more readily by sprouting in cut-over stands. Thus, tupelos tend to become dominant when bald cypress stands are heavily logged. Green ash (Fraxinus pennsylvanica) and red maple (Acer rubrum) are occasional canopy associates and frequent understory trees. Carolina ash (F. caroliniana) is often dominant in the small tree and shrub layers, while vines of climbing hydrangea (Decumaria Barbara) are often abundant. Herb layers vary from sparse to rather lush. Most herbaceous plants of bald cypress-tupelo swamps are tolerant of muck soils and fluctuating water levels, or are capable of becoming established on tree hummocks, stumps, and logs. A few of the typical herbs are lizard's tail (Saururus cernuus), false nettle (Boehmeria cylindrical), Walter's St. John's-wort (Triadenum walteri), swamp beggar-ticks (Bidens discoidea), weak stellate sedge (Carex seorsa), giant sedge (Carex gigantean), taperleaf bugleweed (Lycopus rubellus), and pale mannagrass (Torreyochloa pallida). Although community types in this group are relatively common, high-quality specimens of the dominant trees are known to provide nesting habitats for the globally uncommon, state-rare eastern big-eared bat (Corynorhinus rafinesquii macrotis) and southern myotis (Myotis austroparius). Old-growth stands of bald cypress-tupelo swamp with trees up to 800 years old occur along the Blackwater River in Surry and Isle of Wight Counties. References: Fleming and Moorhead (1998), Parker and Wyatt (1975), Plunkett and Hall (1995).

Tidal Bald Cypress Forests and Woodlands
Coniferous or mixed swamp forests and woodlands occurring along the upper tidal reaches of rivers in southeastern Virginia. Examples are documented from the Dragon Swamp/Piankatank River (Gloucester, King and Queen, and Middlesex Counties), the Chickahominy River (Charles City, James City, and New Kent Counties), the James River (Isle of Wight and Surry Counties), and the wind-tidal Northwest River (City of Chesapeake). At some sites, these communities occur in ecotones between tidal marshes and non-tidal backswamps or uplands. Bald cypress (Taxodium distichum) dominates the open to very open canopy, with or without hardwood associates such as swamp tupelo (Nyssa biflora), water tupelo (Nyssa aquatica), and green ash (Fraxinus pennsylvanica). Stand structure and canopy cover range from closed forest to very open woodland. Shrub and herb layers are variable but generally contain a mixture of species characteristic of both marshes and swamps. Some well-developed tidal bald cypress forests appear floristically similar to palustrine bald cypress-tupelo swamps. Other stands have a nearly monospecific herb dominance by shoreline sedge (Carex hyalinolepis). In a unique, possibly fire-influenced, savanna-like stand on the Northwest River, the herbaceous dominants, in rough seasonal order, are silvery sedge (Carex canescens spp. Disjuncta), spikerushes (Eleocharis fallax and E. rostellata), marsh rattlesnake-master (Eryngium aquaticum var. aquaticum), and wild rice (Zizania aquatica var. aquatica). The environmental dynamics, compositional variation,

and state-wide distribution of this group are poorly known and need intensive study. Reference: Fleming and Moorhead (1998).

Fluvial Terrace Woodlands

A somewhat enigmatic group of communities occurring on flat, sandy terraces and islands along Coastal Plain rivers in eastern Virginia. These habitats are elevated well above the level of adjacent swamps and are characterized by xeric, sandy soils and open forest or woodland vegetation. Single occurrences have been documented along the Nottoway River (Sussex County), Chickahominy River (New Kent County), Dragon Swamp (Middlesex County), and Mattaponi River (Caroline County). At all four sites, hickories (Carya pallida and C. alba) are dominant trees, with drought-tolerant oaks (Quercus falcate, Q. nigra, Q. marilandica, Q. alba) present in smaller numbers. Shrubs occurring at all or most sites include sand post oak (Q. margarettiae), horse-sugar (Symplocos tinctoria), American holly (Ilex opaca var. opaca), and eastern red cedar (Juniperus virginiana var. virginiana). Typical herbs include sedges (Carex albicans var. australis, C. pensylvanica, and C. tonsa), Canada frostweed (Helianthemum canadense), butterfly-pea (Clitoria mariana), late goldenrod (Solidago tarda), and prickly-pear (Opuntia humifusa). The Dragon Run site is anomalous in the presence (despite low soil pH and base status) of several calciphiles such as eastern redbud (Cercis canadensis var. canadensis), wild columbine (Aquilegia canadensis), smooth rock-cress (Arabis laevigata var. laevigata), robin's-plantain (Erigeron pulchellus var. pulchellus), and elm-leaved goldenrod (Solidago ulmifolia var. ulmifolia). A full understanding of the status and compositional relationships of this group will require additional inventory and assessment.

Tidal Freshwater Marshes

A diverse group of herbaceous wetlands subject to regular diurnal flooding along upper tidal reaches of inner Coastal Plain river and tributaries. Freshwater marshes occur in the uppermost portion of the estuarine zone, where the inflow of saltwater from tidal influence is diluted by a much larger volume of freshwater from upstream. Strictly speaking, freshwater conditions have salt concerntrations <0.5 ppt, but pulses of higher salinity may occur during spring tides or periods of unusually low river discharge. The most common species are arrow-arum (Peltandra virginica), dotted smartweed (Polygonum punctatum), wild rice (Zizania aquatic var. aquatica), pickerelweed (Pontederia cordata), rice cutgrass (Leersia oryzoides), tearthumbs (Polygonum arifolium and P. sagittatum), and beggar-ticks (Bidens spp.). Locally, sweetflag (Acorus calamus) and southern wild rice (Zizaniopsis miliacea) may form large dominance patches. Species diversity and vegetation stature vary with salinity, duration of inundation, and disturbance; the most diverse marshes occupy more elevated surfaces in strictly freshwater regimes. Mud flats that are fully exposed only at low tide support nearly monospecific stands of spatterdock (Nuphar advena), although cryptic submerged aquatic species may also be present. Tidal freshwater marshes are best developed on sediments deposited by large meanders of the Pamunkey and Mattaponi Rivers, although outstanding examples also occur along the Potomac, Rappahannock, Chickahominy, and James Rivers. These communities provide the principal habitat for the globally rare plant sensitive joint-vetch (Aeschynomene virginica). Chronic sea-level rise is advancing the salinity gradient upstream in rivers on the Atlantic Coast, leading to shifts in vegetation composition and the conversion of some tidal freshwater marshes into oligohaline marshes. Tidal Freshwater Marshes are also threatened by the invasive exotic marsh dewflower (Murdannia keisak). Several communities in this group are chiefly restricted to the Chesapeake Bay drainage basin and are considered globally rare or uncommon. References: Parker and Wyatt (1975), Perry and Atkinson (1997), Perry and Hershner (1999), McCoy and Fleming (2000).

APPENDIX C. Natural Heritage Rarity Ranks and Status Explanation

Natural Heritage Rarity Ranks and Status Explanation

Each of the significant natural features (species, community type, etc.) monitored by DCR-DNH is considered an element of natural diversity, or simply an element. Each element is assigned a rank that indicates its relative rarity on a five-point scale (1 = extremely rare; 5 = abundant; Table 1). The primary criterion for ranking elements is the number of occurrences, i.e., the number of known distinct localities or populations. Also of great importance is the number of individuals at each locality or, for highly mobile organisms, the total number of individuals. Other considerations include the condition of the occurrences, the number of protected occurrences, and threats. However, the emphasis remains on the number of occurrences, so that ranks essentially are an index of known biological rarity. These ranks are assigned in terms of the element's rarity within Virginia (its State or S-rank), the element's rarity within a Nation (its National or N-rank), and the element's rarity across its entire range (its Global or G-rank). Subspecies and varieties are assigned a Taxonomic (T-) rank in addition to their G-rank. A Q indicates taxonomic uncertainty. Taken together, these ranks give an instant picture of an element's rarity. For example, a designated rank of G5S1 indicates an element which is abundant and secure range-wide, but rare in Virginia. In some cases, ranks are provisional or lacking, due to ongoing efforts by the Natural Heritage network to classify community syntaxa and cryptic plants or animals. Rarity ranks used by DCR-DNH are not legal designations, and they are continuously updated to reflect new information.

Table E-1. Definition of Natural Heritage state rarity ranks. Global ranks are similar to state ranks, but refer to a species' range-wide status. Note that GA and GN are not used and GX means extinct. GM and GW are ranks used only for communities, and refer to highly modified (GM) and ruderal (GW) vegetation respectively. National ranks are similar as well, and refer to a species' rarity within a nation, such as the United States or Canada. Sometimes ranks are combined (e.g., S1S2) to indicate intermediate or somewhat unclear status. Elements with uncertain taxonomic validity are denoted by the letter Q, after the global rank. These ranks should not be interpreted as legal designations.

S1	Extremely rare; usually 5 or fewer occurrences in the state, or in the case of communities, covering less than 50 hectares in aggregate; or may have a few remaining individuals; often especially vulnerable to extirpation.
S2	Very rare; usually between 5 and 20 occurrences, or in the case of communities, covering less than 250 hectares in aggregate; or few occurrences with many individuals; often susceptible to becoming endangered.
S3	Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
S4	Common; usually more than 100 occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.
S5	Very common; demonstrably secure under present conditions.
SA	Accidental in the state.
SH	Historically known from the state, but not verified for an extended period, usually more than 15 years; this rank is used primarily when inventory has been attempted recently.

SM Applied to vegetation extensively modified by disturbance but considered recoverable by management, time, or restoration of ecological processes.

SN Regularly occurring migrants or transient species which are non-breeding, seasonal residents. (Note that congregation and staging areas are monitored separately).

SU Status uncertain, often because of low search effort or cryptic nature of the element.

SW Applied to vegetation dominated by ruderal or exotic species.

SX Apparently extirpated from the state.

The spot on the landscape that supports a natural heritage resource is an element occurrence. DCR-DNH has mapped over 7,500 element occurrences in Virginia. Information on the location and quality of these element occurrences is computerized within the Division's BCD system, and additional information is recorded on maps and in manual files.

In addition to ranking each element's rarity, each element occurrence is ranked to differentiate large, outstanding occurrences from small, vulnerable ones. In this way, protection efforts can be aimed not only at the rarest elements, but at the best examples of each. Species occurrences are ranked in terms of quality (size, vigor, etc.) of the population; the condition (pristine to disturbed) of the habitat; the viability of the population; and the defensibility (ease or difficulty of protecting) of the occurrence. Community occurrences are ranked according to their size and overall natural condition. These element occurrence ranks range from A (excellent) to D (poor). Sometimes these ranks are combined to indicate intermediate or somewhat unclear status, (e.g., AB or CD). In a few cases, especially those involving cryptic animal elements, field data may not be sufficient to reliably rank an occurrence. In such cases a rank of E (extant) may be given. A rank of H (historical) is used to indicate an historical occurrence that could not be relocated by recent survey. Element occurrence ranks reflect the current condition of the species' population or community. A poorly-ranked element occurrence can, with time, become highly-ranked as a result of successful management or restoration.

Element ranks and element occurrence ranks form the basis for ranking the overall significance of sites. Site biodiversity ranks (B-ranks) are used to prioritize protection efforts, and are defined in Table E-2.

Table E-2. Biodiversity ranks used to indicate site significance.

B1 Outstanding Significance: only site known for an element; an excellent occurrence of a G1 species; or the world's best example of a community type.

B2 Very High Significance: excellent example of a rare community type; good occurrence of a G1 species; or excellent occurrence of a G2 or G3 species.

B3 High Significance: excellent example of any community type; good occurrence of a G3 species.

B4 Moderate Significance: good example of a community type; excellent or good occurrence of state-rare species.

B5	General Biodiversity Significance: good or marginal occurrence of a community type or state-rare species.

The U.S. Fish and Wildlife Service (USFWS) is responsible for the listing of endangered and threatened species under the Endangered Species Act of 1973, as amended. Federally listed species (including subspecific taxa) are afforded a degree of legal protection under the Act, and therefore sites supporting these species need to be highlighted. USFWS also maintains a review listing of potential endangered and threatened taxa known as candidate species. Table E-3 illustrates the various status categories used by USFWS and followed in this report. The status category of candidate species is based largely on the Service's current knowledge about the biological vulnerability and threats to a species.

As of February 27, 1996, species formerly referred to as Category 2 (C2) candidates for listing as threatened or endangered are no longer considered "candidates" under the Endangered Species Act. The USFWS no longer maintains a formal, comprehensive list of such species. However, the Virginia Field Office of the USFWS intends to maintain an informal list of these and other "Species of Concern" that may warrant future consideration as candidates. These "Species of Concern" can be regarded as species for which the Service has insufficient scientific information to support a listing proposal. Former Category 1 (C1) species are now considered "candidates" (C) for listing. "Candidate" species are species for which the USFWS has enough scientific information to warrant a proposal for listing. The designation of Category 3 species (3A, 3B, 3C) has been discontinued. However, the USFWS will continue to maintain its files on these species in case new information indicates a need for reevaluation.

Table E-3. U.S. Fish and Wildlife Service species status codes, with abbreviated definitions

LE	Listed endangered
LT	Listed threatened
PE	Proposed to be listed as endangered
PT	Proposed to the listed as threatened
C	Candidate: status data supports listing of taxon as endangered or threatened
SOC	Species of Concern: no official status, evidence of vulnerability, but insufficient data exists.

In Virginia, two acts have authorized the creation of official state endangered and threatened species lists. One act (Code of Virginia ' 29.1-563 through 570), administered by the Virginia Department of Game and Inland Fisheries (DGIF), authorizes listing of fish and wildlife species, not including insects. The other act (Code of Virginia ' 3.1-1020 through 1030), administered by the Virginia Department of Agriculture and Consumer Services (VDACS), allows for listing of plant and insect species. In general, these acts prohibit or regulate taking, possessing, buying, selling, transporting, exporting, or shipping of any endangered or threatened species appearing on the official lists. Species protected by these acts are indicated as either listed endangered (LE) or listed threatened (LT). Species under consideration for listing are indicated as candidates (C).

(November 2000)

APPENDIX D. Dragon Run Watershed Management Plan

DRAGON RUN WATERSHED MANAGEMENT PLAN

NOVEMBER 2003

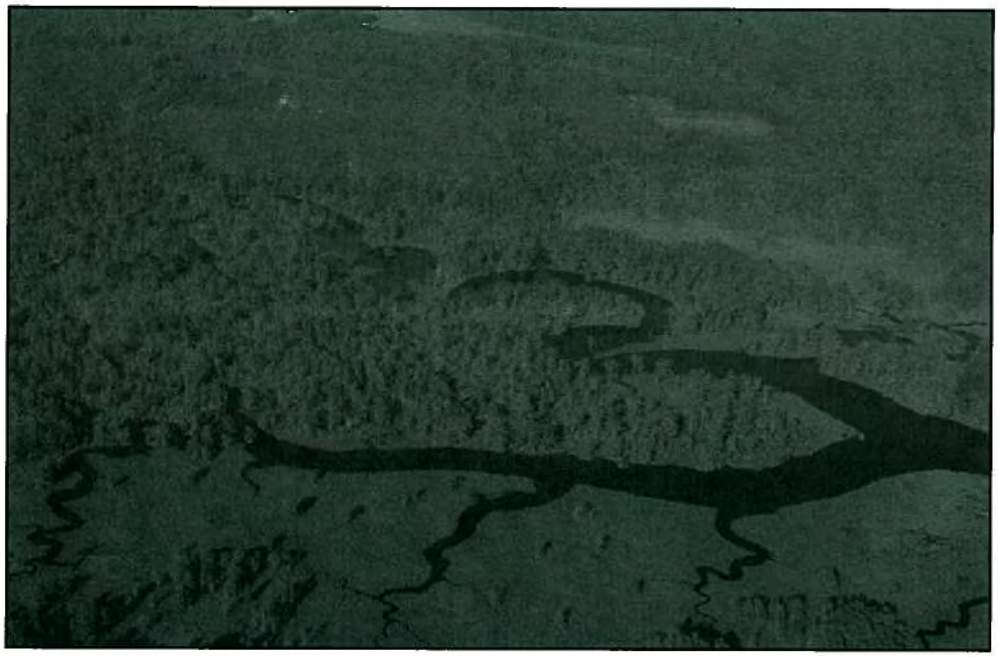

Photo credit: Teta Kain

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DEQ
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
VIRGINIA COASTAL PROGRAM

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

DRAGON RUN WATERSHED MANAGEMENT PLAN

NOVEMBER 2003

DRAGON RUN STEERING COMMITTEE,
MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

MARGARET DAVIS, CHAIR
WILLIAM F. HERRIN, VICE-CHAIR

DAVID FUSS
DIRECTOR, DRAGON RUN SPECIAL AREA MANAGEMENT PLAN
MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

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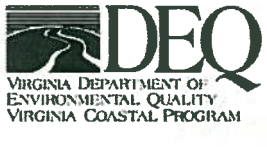

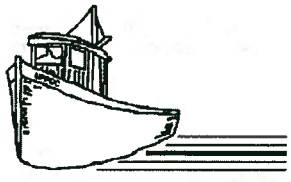

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ACKNOWLEDGEMENTS

David Fuss, Director of the Dragon Run Special Area Management Plan, at the Middle Peninsula Planning District Commission, compiled this report for the Dragon Run Steering Committee. The Dragon Run Steering Committee members are:

County	*Elected Official*	*Landowner*	*Landowner*
Essex	M. "Prue" Davis	Dorothy Miller	M. Scott Owen
Gloucester	Rick Allen	Elizabeth DeHardit	Jerry Horner
King and Queen	Keith Haden	William F. Herrin	Russell Williams
Middlesex	Jack Miller	Robert Major	Davis Wilson

The Dragon Run Steering Committee wishes to thank its Advisory Group, who met monthly from March 2002 to October 2003 to develop this plan. The Steering Committee also wishes to thank Julie Bixby and the Virginia Coastal Program for providing funding and oversight for the project. Ancillary funding was provided by the Environmental Protection Agency's Chesapeake Bay Program through the Virginia Department of Conservation and Recreation, via grant agreement number BAY-2002-20-SR. This report was printed with funds generated from the sale of Chesapeake Bay license plates through a Chesapeake Bay Restoration Fund Advisory Committee grant.

The current Steering Committee wishes to thank all of the former Steering Committee members, without whose hard work this project never would have materialized. The Steering Committee must also acknowledge the Dragon Run watershed's landowners for their excellent stewardship of a precious resource. Without them, the watershed would no longer be pristine.

The Dragon Run Steering Committee

The Steering Committee would also like to thank all of the citizens who participated in any of the meetings that led to the production of this watershed management plan. Participants are listed below:

Lorna Anderberg
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W.D. Edwards, Jr.
Frank Evans
Vladimir Gavrilovic
Robert E. Gibson
William Hester
Matt Higgins
Marv Hohenberger
Robert Hudgins
Eric Johnson
R.D. Johnson
Thomas Jordan
Paul Koll
Mary Ann Krenzke
Andy Lacatell
Lewie Lawrence
Carissa Lee
Beth Locklear
Clarence Major
Hubert Major
John E. Major
Hersey Mason, Jr.
David Milby
Warren Milby
William Milby
Elvin Miller
Nancy Miller
John D. "Buddy" Moore
John Munger
Anne Newsom
Gordon Page
Jimmie Pitts
Karen Reay
Willy Reay
Davis Rhodes
Wright Robinson
Garrie Rouse
William Saunders
Sidney Sheldon
Will Smith
Hugh Soles
Pat Tyrrell
Hoyt Wheeland
Rachel Williams
Cathy Wilson
Rebecca Wilson

Executive Summary

As one of the Chesapeake Bay watershed's most pristine waterways, the spring-fed Dragon Run flows forty miles along and through nontidal and tidal cypress swamp situated in portions of Essex, King and Queen, Middlesex, and Gloucester Counties. The Dragon Run plays a central role in the Middle Peninsula's culture and identity. Natural resources - forestry and farming - have been the bedrock of the watershed's economy. These land uses, together with extensive swamps and unique natural resources, are the main reasons that the Dragon Run remains wild and secluded.

The Dragon Run's unique character evokes strong feelings to protect the pristine watershed in both long-time residents and first-time visitors alike. Yet, opinions differ about how to address the threats of encroaching development and habitat fragmentation. An innate difference in point of view between property rights advocates and conservationists centers on how to maintain a pristine watershed into the future. Yet, substantial common ground exists for proactively preserving the Dragon Run for future generations that safeguards both natural resources and traditional uses of the land and water, including the property rights of landowners.

The Dragon Run Watershed Special Area Management Plan (SAMP), a partnership between the Virginia Coastal Program and the Dragon Run Steering Committee of the Middle Peninsula Planning District Commission, is designed to address both the differences of opinion and the common ground that exist concerning the future of the watershed. The Steering Committee believes that the best approach is to bring stakeholders to the table for proactive discussions of the issues. The Steering Committee and its Advisory Group, representing a broad cross-section of the community, have proactively developed a mission, goals, objectives, and action plans to address the priority issues facing the Dragon Run.

This watershed management plan for the Dragon Run watershed represents a body of work by citizens, stakeholders, and decision-makers to achieve a common vision for the future – the preservation of the traditional uses and unique resources in the pristine Dragon Run. It is a symbol of regional cooperation and coordination that crosses jurisdictional boundaries. It is not a static document. Rather, it is a modifiable guidebook that harnesses the passion and energy for the Dragon Run of those who live, work, and play in its watershed.

MISSION

To support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed.

GOALS

1. Establish a high level of cooperation and communication among the four counties within the Dragon Run Watershed to achieve consistency across county boundaries.
2. Foster educational partnerships and opportunities to establish the community's connection to and respect for the land and water of the Dragon Run.
3. Promote the concept of landowner stewardship that has served to preserve the Dragon Run Watershed as a regional treasure.

ACTIONS

Underway/Completed
1. Memorandum of Agreement
2. Establish Baseline Watershed Information
3. SAMP Project Awareness Campaign
Recommended
1. Land Use and Resource Preservation
A. Designate a Unified "Dragon Run Planning Area"
B. Implement Tools to Preserve Farm, Forest, and Natural Resources
C. Address Public and Landowner Access Issues
D. Control Invasive Species
2. Education and Landowner Stewardship
3. Encourage and Support Sustainable Economic Development
4. Monitor Plan Implementation

PART I

SECTION 1: Watershed Description

Section 1 describes the Dragon Run watershed's setting, its role in local history and culture, and its unique natural resources. The potential source of conflict is change in land ownership that threatens to fragment productive farm and forest land and natural habitat. The community's vision for the watershed is to preserve the traditional land uses – forestry, farming, hunting – and the unique natural resources. This section highlights both the differences of opinion on how to address the threat to the watershed and the common ground that defines the community's vision.

As one of the Chesapeake Bay watershed's most pristine waterways, the Dragon Run "encompasses some of the most extensive and unspoiled swamp forest and woodland communities in Virginia" (Belden, Jr. et al, 2001). Effectively bisecting Virginia's Middle Peninsula located between the York and Rappahannock Rivers, this fresh and brackish water stream (**Figure 1**) meanders forty miles along and through nontidal and tidal cypress swamp. The watershed is mainly undeveloped, almost entirely privately owned, and encompasses approximately 140 square miles (90,000 acres) of rural landscape – mostly forests, farms, and wetlands. The spring-fed Dragon Run flows through portions of Essex, King and Queen, Middlesex, and Gloucester Counties, emptying into the estuarine Piankatank River and ultimately the Chesapeake Bay.

Figure 1. The Dragon Run

The Dragon Run plays a central role in the Middle Peninsula's culture and identity. Its intriguing name is frequently borrowed by local enterprises and establishments and is often overheard in community conversations. Since European settlement in the early 1600's and Native American inhabitation up to 10,000 years before that, natural resources have been the bedrock of the watershed's economy. For older generations, forestry, farming, hunting, trapping and fishing were the primary ventures. Today, forestry and farming continue to generate wealth and drive the watershed's economy. Upholding an ancient tradition, hunters range over prime hunting grounds stalking prized game. These land uses, together with extensive swamps, are the main reasons that the Dragon Run remains wild and secluded.

The watershed's wilderness is both expansive and unique. The Dragon Run contains the northernmost example of the Baldcypress-Tupelo Swamp natural community in Virginia and the best example north of the James River (Belden, Jr. et al., 2001). Moreover, 14 rare species and 5 rare natural communities are found here (**Appendix A**). Based on his investigations of the watershed's aquatic communities, one researcher

observes that the Dragon Run is a "100 year old time capsule," resembling coastal plain streams in the Chesapeake Bay region at the turn of the 20th century (Garman, 2003).

The Dragon Run's unique character evokes strong feelings to protect the pristine watershed in both long-time residents and first-time visitors alike. Although development pressure in the watershed is currently low, the potential for significant land ownership changes (>25% in 10 years due to aging and absentee corporate landowners) threatens to disrupt the rural character and fragment productive farm and forest land. Likewise, habitat fragmentation jeopardizes the Dragon Run's unique natural communities. Landowner opinions about how to address these threats vary widely, ranging from the belief that "the Dragon takes care of itself" by its wild nature and voluntary landowner stewardship to enacting and enforcing regulations with "teeth."

The difference in point of view between property rights advocates and conservationists centers on how to maintain a pristine watershed into the future. Yet, as the Dragon Run Special Area Management Plan unfolds, the community is learning that substantial common ground exists for proactively preserving the Dragon Run for future generations that safeguards both natural resources and traditional uses of the land and water, including the property rights of landowners.

SECTION 2: Planning Approach

Section 2 describes the Dragon Run Steering Committee's planning approach. The Dragon Run Watershed Special Area Management Plan (SAMP), a partnership between the Virginia Coastal Program and the Dragon Run Steering Committee of the Middle Peninsula Planning District Commission, is designed to address both the differing viewpoints and the common ground that exist concerning the future of the watershed. The Steering Committee's approach to the SAMP is to stimulate and coordinate community involvement in the proactive development and implementation of goals, objectives, and action plans for a watershed management plan. The Steering Committee finds that the watershed approach is the most effective way to manage natural resources and traditional land uses. A Memorandum of Agreement describing the goals and objectives of the SAMP was signed by Essex, Gloucester, King and Queen, and Middlesex Counties and the Middle Peninsula Planning District Commission. The Steering Committee and its Advisory Group then developed watershed action plans designed to achieve those goals and objectives.

The Dragon Run Watershed Special Area Management Plan (SAMP), a partnership between the Virginia Coastal Program and the Dragon Run Steering Committee of the Middle Peninsula Planning District Commission, is designed to address both the differing viewpoints and the common ground that exist concerning the future of the watershed. The project began in January 2002 with a grant from the Virginia Coastal Program under authority of the National Oceanic and Atmospheric Administration (NOAA). Enabled by the federal Coastal Zone Management Act of 1972 as amended, SAMPs aim to protect significant coastal resources through a collaborative, multi-level planning process to develop and implement new enforceable policies.

One of the fundamental elements of a SAMP is that a strong regional entity must exist that is willing to sponsor the planning program. In the Dragon Run watershed's case, that regional entity is the Middle Peninsula Planning District Commission through its Dragon Run Steering Committee. Formed in 1985, the Dragon Run Steering Committee consists of landowners and local elected officials and is the key vehicle for cooperation and coordination among the four counties concerning watershed issues. The Steering Committee's approach to the SAMP is to stimulate and coordinate community involvement in the proactive development and implementation of goals, objectives, and action plans for a watershed management plan.

Another major element of a SAMP is that conflict exists concerning the area's proposed uses. The Steering Committee believes that the best approach is to proactively head off conflict before it grows by enabling stakeholders to openly discuss the issues. Potential conflicts in the Dragon Run watershed are: 1) the differences between conservation and property rights advocates; and 2) the private use of land versus the public use of the water. The Steering Committee finds that the watershed approach is the most effective way to manage natural resources and traditional land uses.

In this spirit, the Dragon Run Watershed SAMP (**Figure 2**) began with public planning forums in December 2001 and January 2002. Newspaper announcements were published and representatives from many sectors of the community were specifically invited. These planning forums led to two primary outcomes: 1) the development and confirmation of common themes for watershed issues; and 2) the establishment of a SAMP Advisory Group representing a broad cross-section of the community.

Building upon the foundation established by the planning forums, the SAMP Advisory Group developed a mission statement (see **Section 3**). The Advisory Group developed a list of three goals, each with several objectives. With minor modifications, the Steering Committee approved the goals and objectives, which were incorporated into a Memorandum of Agreement (**Appendix B**). Each county – Essex, Gloucester, King and Queen, and Middlesex - and the Middle Peninsula Planning District Commission signed the Agreement during the late summer and fall of 2002 and will consider the actions (see **Section 4**) recommended by the Steering Committee. The actions address the goals and objectives in the Memorandum of Agreement.

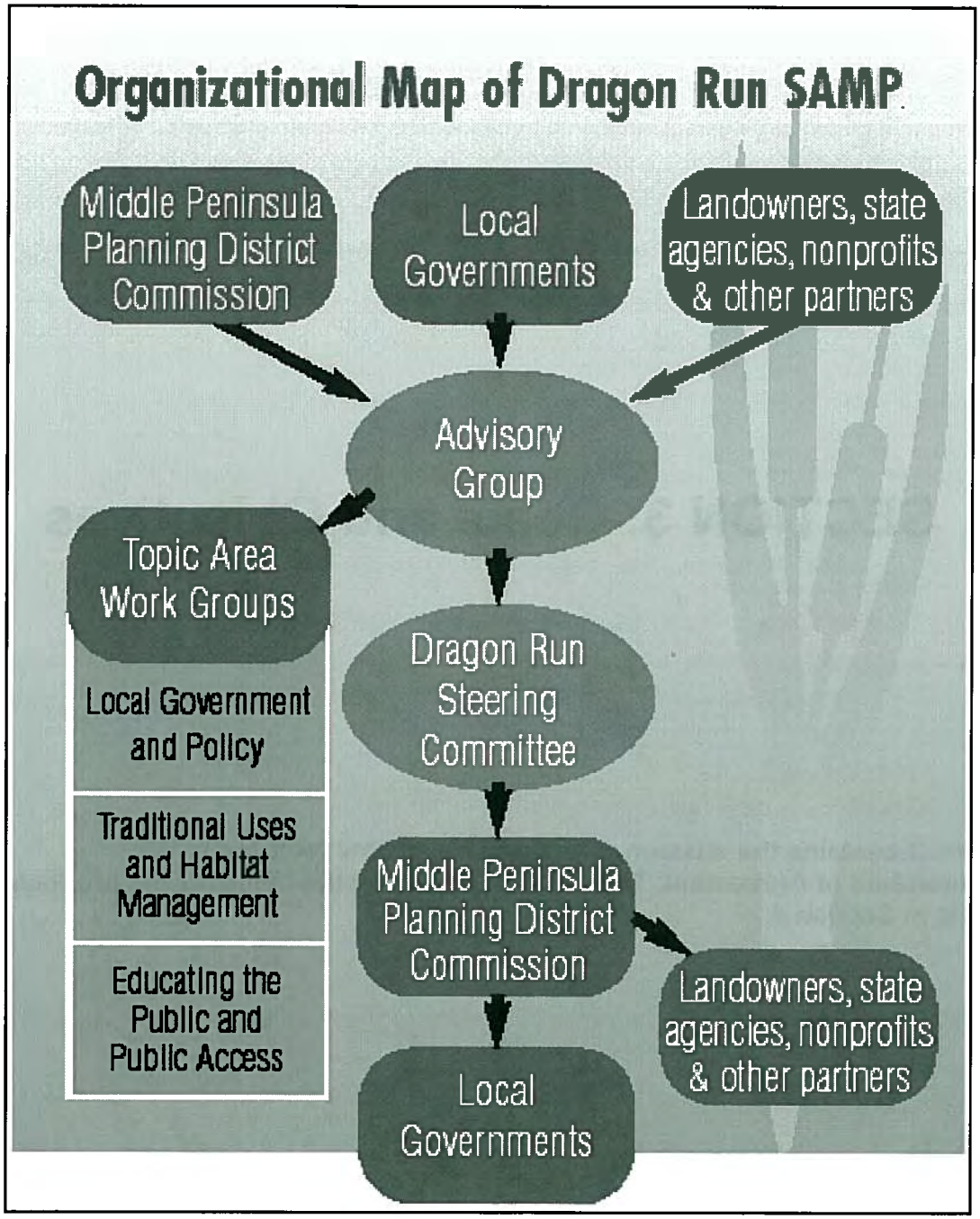


Figure 2. Organizational Map of the Dragon Run SAMP

SECTION 3: Goals and Objectives

Section 3 contains the mission, goals and objectives featured in the Memorandum of Agreement. This section serves as the basis for the proposed actions in Section 4.

MISSION
To support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed.

GOAL I
Establish a high level of cooperation and communication among the four counties within the Dragon Run Watershed to achieve consistency across county boundaries.

OBJECTIVE A
Develop a plan to address the inevitable future development pressure to change the traditional use of land in the Dragon Run Watershed.

OBJECTIVE B
Achieve consistency across county boundaries among land use plans and regulations in order to maintain farming and forestry and to preserve natural heritage areas by protecting plants, animals, natural communities, and aquatic systems.

OBJECTIVE C
Provide ongoing monitoring of existing plans and planning tools in order to assess traditional land uses and watershed health and take action necessary to preserve the watershed.

OBJECTIVE D
Comprehensively implement Best Management Practices (BMPs) for water quality, wildlife habitat, and soil conservation.

GOAL II
Foster educational partnerships and opportunities to establish the community's connection to and respect for the land and water of the Dragon Run.

OBJECTIVE A
Encourage experience-based education consistent with the Stewardship and Community Engagement goals of the Chesapeake 2000 Agreement.

OBJECTIVE B
Promote the community and economic benefits of the Dragon Run derived from its natural characteristics and traditional uses such as farming, forestry, hunting and fishing.

GOAL III
Promote the concept of landowner stewardship that has served to preserve the Dragon Run Watershed as a regional treasure.

OBJECTIVE A
Address the potential dilemma of preserving the watershed's sense of peace and serenity by protecting open space and reducing fragmentation of farms, forests, and wildlife habitat versus the landowners' rights in determining or influencing future land use.

OBJECTIVE B
Educate landowners about the regional importance of the Dragon Run.

SECTION 4: Actions

Section 4 explains and justifies the actions proposed to achieve the goals and objectives in Section 3. The proposed actions are:

Underway/Completed
1. Memorandum of Agreement
2. Establish Baseline Watershed Information
3. SAMP Project Awareness Campaign
Recommended
1. Land Use and Resource Preservation
A. Designate a Unified "Dragon Run Planning Area"
B. Implement Tools to Preserve Farm, Forest, and Natural Resources
C. Address Public and Landowner Access Issues
D. Control Invasive Species
2. Education and Landowner Stewardship
3. Encourage and Support Sustainable Economic Development
4. Monitor Plan Implementation

The actions in this **Section** address the Goals and Objectives in **Section 3**. Notations after each action indicate links to goals and objectives and responsibilities.

ACTIONS UNDERWAY OR COMPLETED

1. Memorandum of Agreement

The Middle Peninsula Planning District Commission entered into an agreement (**Appendix B**) with the Counties of Essex, Gloucester, King and Queen, and Middlesex to participate in the Dragon Run SAMP. The agreement established the signatories' acceptance of the goals and objectives of the SAMP (see **Section 3**) and willingness to consider the Steering Committee's recommendations for actions (**Section 4**).

This action addresses Goal I(B), II
Responsibility: Middle Peninsula Planning District Commission, Local Governments

2. Establish Baseline Watershed Information

The Dragon Run Steering Committee has identified the following studies that have been completed or are underway to help to establish baseline watershed information:

Title (citation)	Description
Natural Areas of the Chesapeake Bay Region: Ecological Priorities (Jenkins, 1974)	Natural area survey throughout the Chesapeake Bay watershed; Dragon Run ranks 2nd of 232 in importance
County comprehensive plans, land use policies and ordinances	Maps and narratives addressing environmental and land use policies
Dragon Run Access Plan (MPPDC, 1994)	Describes access to the Dragon Run and factors influencing its availability
Dragon Run Watershed Management Plan (DeHardit et al., 1996)	Evaluates watershed and land use issues; offers recommendations; not implemented
Dragon Run Land/Water Quality Preservation Project (MPPDC, 2001)	Comprehensive evaluation of water quality using historical and recent data
A Natural Heritage Inventory of the Dragon Run Watershed (Belden, Jr. et al., 2001)	Survey of rare species and natural communities for the main stem and adjacent wetlands
Dragon Run Management Framework (MPPDC, 2002)	GIS CD-ROM and report with 18 data sets; evaluates economic contributions of traditional uses
Dragon Run Watershed Land Use Policy Audit (MPPDC, 2003)	Evaluates existing land use policies; recommends improvements to protect natural resources and traditional uses
Living Resources Inventory of the Dragon Run (Garman et al., 2003)	Survey and analysis of fish and benthic macroinvertebrate communities
A Natural Heritage Inventory of 14 Headwater Sites in the Dragon Run Watershed (Belden, Jr. et al., 2003)	Survey of rare species and natural communities for headwaters

Title	Description
Virginia Dept. of Environmental Quality Water Quality Monitoring (ongoing)	Ambient water quality monitoring at U.S. 17 and Rt. 603
U.S. Geological Survey Gaging Station (ongoing)	Real-time gage height and discharge by volume at Mascot, Virginia

This action addresses Goal I(A,C)
Responsibility: Middle Peninsula Planning District Commission, universities, state and federal agencies

3. SAMP Project Awareness Campaign
Middle Peninsula Planning District Commission staff delivered presentations, brochures, and fact sheets to Boards of Supervisors, Planning Commissions, and community groups that explained key components of the SAMP project and critical watershed issues.

This action addresses Goal II(B), III(B)
Responsibility: Middle Peninsula Planning District Commission, Dragon Run Steering Committee

RECOMMENDED ACTIONS

1. Land Use and Resource Preservation
Currently, the watershed is 99% wetlands, forests, and farms (MPPDC, 2002) that support a variety of unique natural resources, including rare and threatened species (Belden, Jr. et al., 2001). To protect the unique natural resources and traditional land uses of the Dragon Run, it is crucial to work proactively to implement strong land use policies while development pressure and land use intensity are still low, rather than wait to react to intensifying development pressure (MPPDC, 2003). The Dragon Run Steering Committee **recommends** that counties proactively strengthen and better coordinate their land use policies within the watershed.

A. Designate a Unified "Dragon Run Planning Area"
All of the four counties share the goals of protecting traditional uses, rural character, and natural resources in the Dragon Run. Yet, none of the counties identifies the Dragon Run watershed as a distinct planning area. Based on the Dragon Run Land Use Policy Audit (MPPDC, 2003), the Dragon Run Steering Committee **recommends** a watershed approach to achieve better coordination of land use policies by designating the Dragon Run as a special planning area with a step-by-step implementation strategy.

Step 1	Adopt Watershed Management Plan
Step 2	Amend Comprehensive Plan
Step 3	Amend Zoning Ordinance

Step 1. Each county would adopt the Dragon Run Watershed Management Plan as an addendum to its comprehensive plan, requiring a simple amendment and a public hearing. This action would **not** require an amendment to the future land use maps. The purpose of Step 1 would be to formally acknowledge that the Dragon Run watershed deserves distinctive treatment.

By adopting the Watershed Management Plan, the counties would agree to the following policies:

- Recognize the overall value of maintaining the traditional rural character and forested and farmed landscape of the Dragon Run watershed
- Preserve the ecological integrity of the Dragon Run watershed
- Acknowledge the community and economic benefits of the Dragon Run watershed: for the production of agricultural and forest products; as a valued natural resource; for wildlife habitat; for maintaining water quality; and for scenic and aesthetic values
- Continue to fully enforce existing regulations and policies
- Protect forested and farmed land from fragmentation due to conversion to more intensive development
- Encourage a low-density, clustered pattern of development for new residential development in the watershed to protect open space and natural resources
- Seek techniques to protect open space in the watershed without infringing upon landowner rights to maintain an economic return from their property
- Identify land uses that are incompatible or competitive with traditional resource-based land uses (e.g. forestry, farming, hunting, fishing) and consider limiting them within the watershed
- Limit rezoning to more intense uses in order to protect the rural character and integrity of farming and forestry resources in the watershed
- Limit extension of public utilities and central water and sewer in the watershed
- Explore the feasibility of limiting major residential development in the watershed by aligning the Comprehensive Plan and Zoning Ordinance with provisions in the Subdivision Ordinance that limit major subdivisions
- Publish citizen stewardship materials that explain pertinent ordinances, policies, and regulations in easy-to-understand language

Step 2. Each county would create and map a specially designated "Dragon Run Planning Area" within its comprehensive plan. Placing detailed land use policies such as permitted uses, development density, and utility service into the plan text and the official Future Land Use map would stress that protection of the Dragon Run is an important priority in each county.

Specific goals, policies, and actions, based on a thorough review and analysis by the Dragon Run Steering Committee and its SAMP Advisory Group, would be summarized in a proposed "Model Comprehensive Plan Amendment for the Establishment of the Dragon Run Planning Area." Considerable staff and public input (e.g. public hearings) would address inconsistencies in land use policies across jurisdictions.

Step 3. Each county would adopt a model "Dragon Run Protection Zone" within its zoning ordinance involving both zoning map and zoning text amendments. The Dragon Run Protection Zone would apply beyond the main channel to the entire watershed.

This step would require considerable staff and public input (e.g. public hearings) to devise a unified set of standards (e.g. permissible uses, acceptable densities, development standards) that integrates with the existing regulatory scheme and that meets the goals of the Special Area Management Plan (see **Section 3**).

This action addresses Goal I(A,B,C), III(A)
Responsibility: Middle Peninsula Planning District Commission, Dragon Run Steering Committee, Local Governments

B. Implement Tools to Preserve Forest, Farm, and Natural Resources

A variety of tools exist with which to preserve forest and farmland (**Figure 3**) and unique natural resources within the Dragon Run watershed. These tools are highly flexible, rely mostly upon voluntary actions, and can provide ecological and cultural benefits. The Dragon Run Steering Committee **recommends** the implementation of an appropriate combination of the following tools (see **Appendix C** for description):

Tool	Responsibility
Conservation Easements	Landowners, non-profits, state and local governments
Purchase of Development Rights (PDR)	Local governments
Purchase of Agricultural Conservation Easements	Non-profits and federal, state and local governments
Enforcement of Chesapeake Bay Preservation Act and Other Ordinances	Local governments
Agricultural and Forestal Districts	Local governments
Land Use Assessment	Local governments
Utilize Farm Programs and Forest Stewardship Plans	State and federal agencies; local governments; landowners
Sliding Scale Property Tax Rate	Local governments
Sliding Scale Zoning	Local governments
Local "Right-to-Farm"	Local governments
State Forest	Department of Forestry
Virginia Natural Area Preserves System	Landowners, Natural Heritage Program
Virginia Estuarine and Coastal Research Reserve System	Chesapeake Bay National Estuarine Research Reserve

The Dragon Run Steering Committee also **recommends** the conservation of natural heritage resources and associated conservation sites as designated by the Virginia Natural Heritage Program (DCR, 2003a).

This action addresses Goal I(A,B,C), III(A)

Figure 3. Farming in the Dragon Run watershed.

C. Address Public and Landowner Access Issues

Public access to the Dragon Run is limited because property adjacent to the navigable stream is almost entirely privately owned. In most cases, access must be arranged by landowner consent. While generally effective, this informal arrangement has sometimes frustrated landowners and recreation-seekers alike. Private landowners express frustration with trespassers and with users who do not practice "leave no trace" recreation. In contrast, those seeking recreation are hindered by sparse access to the pristine river.

Landowners have expended time and money to resolve trespassing and vandalism problems, ranging from posting signs to instituting a formal program requiring verbal or written permission prior to visitation. Liability is often cited as a landowner concern. Virginia's landowner liability law (Code of Virginia §29.1-509), however, dismisses a landowner's liability when recreational users access their property with permission, express or implied, if no fee is charged to the user. Furthermore, if a landowner grants an access easement to a government agency or authority, then the landowner is held harmless from all liability and the easement holder is responsible for providing and paying for the cost of all legal services required as a result of a claim or suit.

As demand for public access has increased, recreation-seekers have encountered access limitations. Land-based public access exists at three locations: 1) Rappahannock Community College in Glenns (hiking); 2) Virginia Coastal Reserve in Mascot (education); and 3) Friends of Dragon Run property in Mascot (hiking/birding) with parking on a Virginia Department of Transportation unpaved lot. Fishing spots are limited to traditional access points, such as bridges. Also, the boating distance between traditional access points equates to nearly an entire day, causing logistical problems for novice paddlers. Occasionally, the sheriff's department must dispatch a rescue team to retrieve boaters who are lost in the dark. Organizations that offer guided paddling trips effectively manage access with trip planning and suitability, proper equipment and safety information, appropriate consideration for private property, and response to the unexpected (e.g. medical emergencies, cold water immersion).

The Dragon Run Steering Committee seeks to balance reasonable public access to publicly owned waters with private property rights, preservation of the watershed's sense of peace and seclusion, and the watershed's ecological integrity that are highly prized by landowners and visitors alike. The following is a list of **proposed** actions:

- Erect signage notifying boaters/recreationists of trespassing issues and the physical dangers of boating in a wilderness area
  Responsibility: Dragon Run Steering Committee
- Provide land-based access as an alternative to boat-based access
  Responsibility: Middle Peninsula Chesapeake Bay Public Access Authority, Virginia Coastal Reserve (Virginia Institute of Marine Science), Virginia Dept. of Forestry, local governments, non-profit organizations
- Supervise or manage public access sites
  Responsibility: Middle Peninsula Chesapeake Bay Public Access Authority, Virginia Coastal Reserve (Virginia Institute of Marine Science), Virginia Dept. of Forestry, Virginia Dept. of Transportation, local governments, non-profit organizations
- Assess recreational carrying capacity/access to determine appropriate recreational "load"
  Responsibility: Dragon Run Steering Committee

This action addresses Goal I(A,C), II(A), III(A)

D. Control Invasive Species

Recent state legislation establishing the policy-setting Virginia Invasive Species Council signifies an era of formal concern about invasive or non-native species and their impacts on the integrity of Virginia's native ecosystems. Invasive species are purposely or accidentally introduced from other regions or countries and often physically displace or consume native species because they have few competitors or predators. The Dragon Run Steering Committee **recommends** that a Dragon Run Invasive Species Initiative be established in the watershed.

This initiative could include the following elements:

1. Form Dragon Run Invasive Species Initiative with scientific and policy experts
   Responsibility: Dragon Run Steering Committee staff, state and federal agencies, universities, non-profit conservation organizations
2. Assess status of existing invasive species or potential for new invasive species
   Responsibility: Dragon Run Invasive Species Initiative
3. Encourage the creation of state-level policies by seeking representation on the Virginia Invasive Species Council's Advisory Committee
   Responsibility: Virginia Invasive Species Council, Dragon Run Invasive Species Initiative

4. Establish education program to reduce the potential for species introduction
   Responsibility: Dragon Run Invasive Species Initiative
5. Establish monitoring and control program
   Responsibility: Dragon Run Invasive Species Initiative

Examples of common or potentially devastating invasive species that could affect the relatively intact natural communities in the Dragon Run are: blue catfish (*Ictalurus furcatus*); common reed (*Phragmites australis*); zebra mussel (*Dreissena polymorpha*); Asiatic dayflower (*Murdannia keisak*); and Japanese stiltgrass (*Microstegium vimineum*). Blue catfish, common reed, Asiatic dayflower and Japanese stiltgrass occur in the Dragon Run. These invasive species should be monitored and, to the extent practicable, controlled or excluded from the watershed.

This action addresses Goal I(C), II, III(B)

2. Education and Landowner Stewardship

In order to enhance and solidify the community's connection to and respect for the land and water of the Dragon Run, public education must be a central element of the Special Area Management Plan. Education should target citizens and stakeholders and focus on the unique ecological and recreational values in the watershed, the community and economic benefits of traditional land uses, and the need to preserve both through exemplary stewardship and proactive planning for the watershed's future. The Dragon Run Steering Committee **recommends** that a comprehensive education program be established to communicate the regional importance of the Dragon Run watershed to its citizens and to demonstrate the link between decisions about land management and the watershed's integrity and quality.

Education Program Components	Responsibility
Hands-on Experiences	Dragon Run Steering Committee
Community Watershed Festival	Dragon Run Steering Committee
Watershed Stewardship Awards	Dragon Run Steering Committee
Watershed Boundary Signs	Dragon Run Steering Committee
Promote Use of Forest Stewardship Plans	Dragon Run Steering Committee; local governments; Dept. of Forestry
Promote Use of Farm Programs	Natural Resources Conservation Service; Virginia Cooperative Extension; Soil and Water Conservation Districts; Farm Service Agency; Virginia Farm Bureau
Promote Action-based Projects	Dragon Run Steering Committee; local governments; citizens

Hands-on Experiences

The Dragon Run Steering Committee **recommends** the use of hands-on experiences to produce an understanding and appreciation of the Dragon Run, targeting:

- State and federal legislators, Boards of Supervisors, Planning Commissions, and county staff
- Landowners, hunt clubs, land management consultants, and farmers and foresters who rent or lease land
- Chamber of Commerce, service clubs, civic and church groups, and non-profit organizations
- State and federal agency representatives
- Schools, 4-H Club, Scouts, class projects
- General public

The recommended approach encompasses a variety of methods and materials. Education would focus on field experiences that incorporate activities designed to address critical watershed issues (e.g. wetland and habitat values, biodiversity, water quality and quantity, riparian buffers).

This action addresses Goal II(A,B), III(B)

Community Watershed Festival

A component of the education program should be a community watershed festival as a celebration of the watershed's natural, cultural, and historic heritage. The festival would **not** serve as a promotional tool to attract visitors. Displays and activities highlighting natural and cultural heritage would be featured. The Dragon Run Steering Committee **recommends** the festival as a way to increase citizen awareness of watershed issues and as an opportunity to acknowledge citizens for exemplary watershed stewardship.

This action addresses Goal II(B), III(B)

Watershed Stewardship Awards

The Dragon Run Steering Committee **recommends** the establishment of watershed stewardship awards that would honor landowners and land managers who have demonstrated commendable stewardship within the watershed. Awards would be bestowed annually at the watershed festival for a variety of categories that may include: forestry; farming; hunting; commercial enterprises; conservation; education; planning; and science. The awards program should serve as an incentive to implement exemplary land stewardship practices.

This action addresses Goal II(B), III(B)

Watershed Boundary Signs

The Dragon Run Steering Committee **recommends** placing watershed boundary signs along frequently traveled highway and secondary roads to increase community awareness of the location and importance of the Dragon Run watershed. By indicating

the watershed boundary, the signs would alert citizens that they are in the watershed. Teamed with other educational efforts, the signs should lead to citizen awareness that their land management practices influence the health of the watershed.

This action addresses Goal II, III(B)

Promote Forest Stewardship Plans
The watershed is more than 80% forested and has intact riparian buffers. Since forested riparian buffers provide effective water quality protection and wildlife habitat, forested lands exhibit low nutrient input to adjacent streams relative to other land uses in the watershed (MPPDC, 2001). Therefore, forest stewardship plans have the potential to significantly influence the health and profitability of the watershed's forests. To benefit landowners and the local economy and to preserve the rural landscape and the natural resources in the watershed, the Dragon Run Steering Committee **recommends** promotion and implementation of forest stewardship plans prior to timber harvesting.

Forest stewardship plans are ecosystem management plans that combine ecological function with landowner goals to attain a vision for a particular property. The Department of Forestry's Forest Stewardship Plans leverage professional resources across disciplines to provide an inventory, recommendations and reference information that address landowners' specific goals and objectives, which may include: wildlife enhancement; aesthetics; recreation; water quality protection; forest regeneration; financial investment and incentives; and fire, pest, and disease control. The Virginia Department of Forestry prepares Forest Stewardship Plans for up to 200 acres at no cost to landowners. Beyond 200 acres, the Department charges fees, so it may be cost-effective for a consulting forester to develop a Forest Stewardship Plan.

This action addresses Goal I(A,B,D), II(B), III(A)

Promote Farm Programs
Agricultural lands make up 18% of the watershed and have the potential to contribute sediments, nutrients, and bacteria to ground and surface water. Existing state and federal farm programs (see **Appendix D** for description) can positively influence the health and profitability of the watershed by providing incentives for employing Best Management Practices or for taking marginal land out of agricultural production. To benefit farming operations, water quality, wildlife habitat, and the rural landscape and character of the watershed, the Dragon Run Steering Committee **recommends** promotion and implementation of programs, such as:

Program	**Responsibility**
Conservation Reserve Program (CRP)	Natural Resources Conservation Service
Conservation Reserve Enhancement Program (CREP)	Natural Resources Conservation Service, Soil and Water Conservation Districts, Farm Service Agency
Environmental Quality Incentives Program (EQIP)	Natural Resources Conservation Service

Program	Responsibility
Farm and Ranch Lands Protection Program	Natural Resources Conservation Service
FarmLink Program	Virginia Farm Bureau
Forest Land Enhancement Program (FLEP)	Natural Resources Conservation Service; Dept. of Forestry
Wetland Reserve Program	Natural Resources Conservation Service
Wildlife Habitat Incentives Program (WHIP)	Natural Resources Conservation Service

It should be noted that the existence and availability of these programs changes depending on funding. Also, Virginia Cooperative Extension provides considerable technical assistance to farmers and actively promotes these programs.

This action addresses Goal I(A,B,D), II(B), III(A)

Promote Action-based Projects

Action-oriented projects can sustain enthusiasm for watershed activities by involving community members in active resource stewardship. For example, James City County's program entitled "Protecting Resources in Delicate Environments" strives "to improve water quality…by teaching residents about the importance of watershed protection while providing residents and neighborhoods with specific watershed restoration and protection tools (James City County, 2003)." The Dragon Run Steering Committee **recommends** encouraging action-based projects, such as:

- Trash pickup (e.g. Adopt-a-Highway, Adopt-a-Stream)
- Development of nature trails
- Construction of rain gardens to capture roof runoff
- Stream bank stabilization
- Stream restoration

This action addresses Goal I(C,D), II(A), III(B)

3. Encourage and Support Sustainable Economic Development

While natural resource-based industries have been and continue to be at the core of the watershed's economy, external economic forces threaten to fragment these traditional uses and alter the rural landscape. The Dragon Run Steering Committee **recommends** that sustainable natural resource-based development be pursued to strengthen the region's economy and boost the quality of life, while supporting the traditional land uses that preserve the Dragon Run watershed and its resources.

Support Sustainable Forestry and Farming

Agriculture is Virginia's top sales industry, makes up 11.2% of Virginia's Gross State Product, and creates about 10% of the state's jobs (DACS, 2003). Similarly, forestry supports "one of the largest manufacturing industries in the state ranking first in employment, first in wages and salaries, and accounts for $1 out of every $8 of value added through manufacturing (DOF, 2003)." Forestry (**Figure 4**) and farming are key industries in the Dragon Run watershed.

Figure 4. Forestry in the Dragon Run watershed.

As the tax base expands with rapid population growth (>14.4% in 3 of 4 watershed counties), the demands for public services also grow, often at a faster rate than tax revenues. Many rapidly growing counties have found their ability to provide adequate public services outstripped by the rapid demand for those services.

In contrast, agricultural and forestal land have been shown to demand a low cost of public services ($0.23 relative to $1.00 generated in taxes in Northampton County, VA [American Farmland Trust, 2002]). Yet, farm and forest land continue to disappear at a rapid rate, giving way to suburban-style development.

For the natural resource-based industries to continue to thrive, the watershed communities **should** develop a regional capacity to produce value-added forest and farm products to capture additional value locally. With funding from the Virginia Coastal Program, the Dragon Run Steering Committee is sponsoring a study of potential sustainable economic development opportunities within the watershed. The study will involve local and regional experts in natural resource-based industries and demonstrate how sustainable natural resource-based development can generate wealth within the community.

This action addresses Goal I(A,B,C), II(B), III(A)
Responsibility: Dragon Run Steering Committee, local governments, business/industry

Encourage Sustainable Nature-based Tourism
Nature-based tourism and agritourism can help to diversify and strengthen the economy of a region that is rich in natural resources, such as the Middle Peninsula. Nature-based tourism is the fastest growing sector of the U.S. tourism industry and Virginia is one of the top 10 destinations for travelers (DGIF, 2002b). The Dragon Run Steering Committee **recommends** encouraging and supporting appropriate nature-based tourism and agritourism to benefit from these trends.

The Dragon Run watershed contains several sites on the newly established Virginia Birding and Wildlife Trail that is designed for car travel (DGIF, 2002a). In addition, the Virginia Ecotourism Association has developed a certification course using standards that avoid negative impacts on the resources that attract tourism. Supporting these initiatives in nature-based tourism could benefit the economy and, in turn, the natural resources of the watershed. For example, surveys along the Great Texas Coastal Birding Trail indicate that travelers spend ~$1,000 per person per trip, two-thirds of which flows directly into the local economy. More importantly, rural communities that are not able to promote their destinations are gaining economic stimulation from their assocation with the Trail. Meanwhile, the Trail increased awareness of the importance of the region's natural resources and the need to conserve them (DGIF, 2002b).

This action addresses Goal I(A,B,C), II(B), III(A)
Responsibility: Dragon Run Steering Committee, local governments, business/industry

4. Monitor the Implementation of the Watershed Management Plan
An important element of any planning effort is monitoring plan effectiveness. The Dragon Run Steering Committee **recommends** that a monitoring program be developed that assesses the results of watershed management plan implementation to ensure that the plan is effectively implemented.

The monitoring program should assess factors and parameters that are easily compared to the baseline information in the watershed management plan. Examples include: designation of watershed planning area; acres enrolled in farm and forest programs; land use/land cover; water quality; number of educational trips; invasive species; amount and type of public access; and number of action-based projects. Furthermore, the Dragon Run Steering Committee should coordinate and provide oversight for the monitoring program. For instance, the Steering Committee could draft an agreement with localities whereby the Committee reviews development applications in the watershed and offers advisory comments to the localities. Stable funding for staff support will continue to be a key component of Steering Committee activities.

The results of the monitoring program should be used to refocus efforts on actions that have not been fully implemented. The monitoring program may also highlight successes and identify new or unforeseen needs (e.g. funding for new projects).

This action addresses Goal I(C)
Responsibility: Dragon Run Steering Committee, local governments

HOW DO ACTIONS SUPPORT GOALS AND OBJECTIVES?

Actions in this **Section** support the goals and objectives stated in **Section 3** as shown in **Table 1**. For example, Recommended Action 1A: *Land Use: Designate a Unified "Dragon Run Planning Area"* (pp. 16-18) supports:

- Goal I (p. 12): Establish a high level of cooperation and communication between the four counties within the Dragon Run Watershed to achieve consistency across county boundaries.
  - Objective A: Develop a plan to address the inevitable future development pressure to change the traditional use of land in the Dragon Run Watershed.
  - Objective B: Achieve consistency across county boundaries among land use plans and regulations in order to maintain farming and forestry and to preserve natural heritage areas by protecting plants, animals, natural communities, and aquatic systems.
  - Objective C: Provide ongoing monitoring of existing plans and planning tools in order to assess traditional land uses and watershed health and take action necessary to preserve the watershed.
- Goal III (p. 13): Promote the concept of landowner stewardship that has served to preserve the Dragon Run Watershed as a regional treasure.
  - Objective A: Address the potential dilemma of preserving the watershed's sense of peace and serenity by protecting open space and reducing fragmentation of farms, forests, and wildlife habitat versus the landowners' rights in determining or influencing future land use.

Action [Section 4]	**Goal (Objective)** [Section 3]
Completed/Underway	
1	I (B); II
2	I (A, C)
3	II (B); III (B)
Recommended	
1A	I (A, B, C); III (A)
1B	I (A, B, C); III (A)
1C	I (A, C); II (A); III (A)
1D	I (C); II; III (B)
2	I (A, B, C, D); II (A, B); III (A, B)
3	I (A, B, C); II (B); III (A)
4	I (C)

Table 1. How actions support the Dragon Run SAMP's goals and objectives.

PART II

SECTION 5: Framework of Institutional and Regulatory Responsibility

Section 5 describes the responsibilities of federal, state, and local government agencies for mandatory and voluntary programs, policies, and regulations.

Neither the MPPDC nor its Dragon Run Steering Committee has regulatory authority. Rather, they serve to encourage and facilitate local-local and state-local government cooperation in addressing regional issues. Consisting of elected officials and citizens appointed by member local governments, the MPPDC and the Dragon Run Steering Committee offer recommendations and technical assistance to the localities. The MPPDC's purpose is "to promote the orderly and efficient development of the physical, social and economic elements of the Planning District by planning, and encouraging, and assisting governmental subdivisions to plan for the future" (MPPDC, 1972).

The Virginia Coastal Program is a system of state laws and policies administered by a network of core agencies and coastal localities that manage a variety of coastal resources. The Department of Environmental Quality (DEQ) serves as the lead agency for Virginia's networked Coastal Program and helps agencies and localities to develop and implement coordinated coastal policies.

Within the context of the SAMP, county governments are responsible for long-range planning of public facilities, utilities, transportation, and land use, and for developing, implementing, reviewing and updating the local Comprehensive Plan, Zoning Ordinance and other ordinances. Through Boards of Supervisors, Planning Commissions, and staff, counties process and review rezoning, conditional use permits, special exceptions, site plans, and subdivisions. Therefore, counties implement land use policies and regulations.

Counties also have responsibility for implementing the Chesapeake Bay Preservation Act (Bay Act). The Chesapeake Bay Local Assistance Department (CBLAD) is charged with oversight of local implementation of the Bay Act and the Chesapeake Bay Preservation Area Designation and Management Regulations. The Bay Act (§10.1-2100 et seq.) requires that localities protect water quality by establishing and protecting Chesapeake Bay Preservation Areas, including wetlands, shorelines, and a 100-foot buffer.

The Virginia Department of Conservation and Recreation (DCR) administers: 1) the Coastal Nonpoint Source Pollution Control Program under authority of Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990; 2) the Nonpoint Source Pollution Management Program under authority of Section 319 of the Clean Water Act of 1987; 3) the Virginia Stormwater Management Program; 4) the Erosion and Sediment Control Program; 5) the Nutrient Management Program; and 6) and the Chesapeake Bay and Tributary Strategies Programs. DCR's Natural Heritage Program reviews development proposals that might affect the state's natural heritage resources (e.g. rare species and natural communities). DCR's Shoreline Erosion Advisory Service offers assistance to landowners experiencing erosion problems.

The authority to issue National Pollutant Discharge Elimination System (NPDES) permits lies with the DEQ. Furthermore, the DEQ regulates air quality, waste management (e.g. landfills), ground water management, water withdrawal, and petroleum storage tanks. The DEQ is also responsible for setting state water quality

standards and preparing the 305(b) Water Quality Assessment Report and the 303(d) Report on Impaired Waters. Impaired waters do not meet water quality standards and usually require the development of a Total Maximum Daily Load (TMDL) report. The implementation of TMDLs may require regulations governing discharges and nonpoint source pollution to impaired waters.

The Virginia Department of Game and Inland Fisheries (DGIF) regulates hunting, freshwater fishing, and boating. Furthermore, the DGIF maintains public boating access sites. The DGIF also regulates threatened and endangered species.

The U.S. Army Corps of Engineers' Norfolk District Regulatory Branch (ACOE) regulates waters and wetlands under the authority of Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899.

The Virginia Marine Resources Commission's Habitat Management Division (MRC) regulates physical encroachment into bottomlands, tidal wetlands, and coastal primary sand dunes under Subtitle III of Title 28.2 of the Code of Virginia. The permit process is the joint responsibility of local wetlands boards, the MRC, the DEQ (Section 401 certification), and the ACOE. Additionally, the MRC regulates saltwater fishing.

The Virginia Department of Forestry (DOF) has authority to regulate forestry operations throughout the state. Silvicultural activities are exempt from most laws such as the Clean Water Act, the Chesapeake Bay Preservation Act, and Erosion and Sediment Control. In exchange for these exemptions, silvicultural activities must comply with Best Management Practices designated by DOF in *Virginia's Forestry Best Management Practices for Water Quality, 4th Edition* (2002). DOF has responsibility for inspecting forestry operations, reporting violations, and enforcing regulatory requirements.

The Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture administers: the Conservation Reserve Program; the Conservation Reserve Enhancement Program; the Environmental Quality Incentives Program; the Farm and Ranch Lands Protection Program; the Forest Land Enhancement Program; the Wetland Reserve Program; and the Wildlife Habitat Incentives Program. The NRCS helps private landowners conserve soil, water, and other natural resources through technical assistance, cost sharing, and financial incentives. The NRCS also provides assistance to local, state, and federal agencies.

SECTION 6: Watershed Characterization

Section 6 describes the watershed in detail to establish the Dragon Run's current status. Physical and environmental features are characterized. Land use policies and recreational and educational activities are assessed. This information is designed to serve as a baseline to which to compare the success or failure of the watershed management plan in achieving its goals and objectives. Finally, gaps in the baseline information are identified.

Physical and Environmental Factors

Located entirely within the coastal plain physiographic province, Virginia's Middle Peninsula is bracketed by the Rappahannock River to the north, the York River to the south, and the Chesapeake Bay to the east. The Dragon Run watershed is the Middle Peninsula's geographic centerpiece, expanding outward from its 40-mile fresh and brackish water stream that runs through Essex, Gloucester, King and Queen, and Middlesex Counties. The watershed encompasses 90,000 acres or 140 square miles and exhibits topography typical of coastal plain stream systems in Virginia (**Figure 5**). Watershed area by locality is shown in **Table 2**.

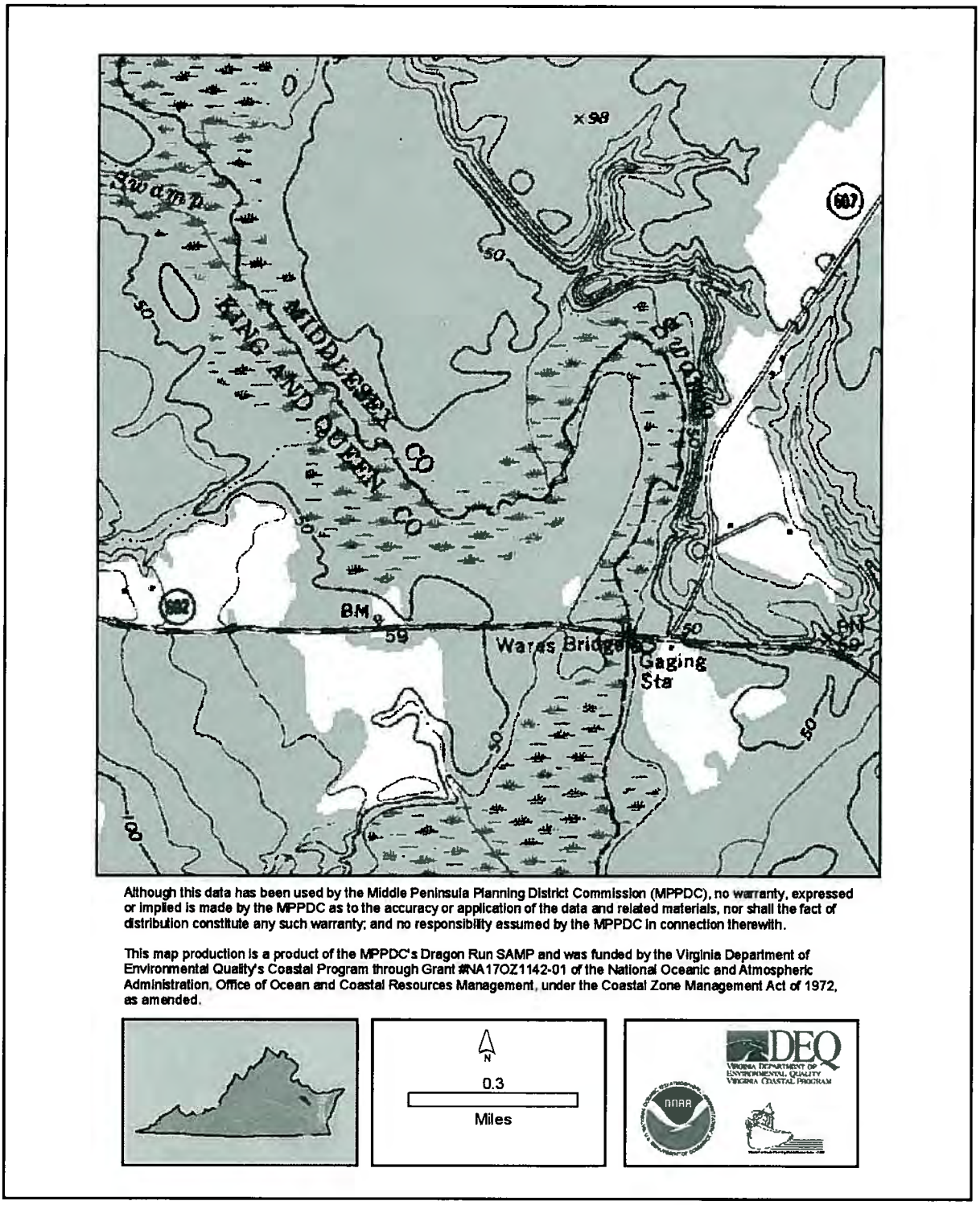
County	Area within Locality (acre)	% of Total Watershed	% of Locality within Watershed
Essex	18466.6	20.6	10.1
Gloucester	5671.7	6.3	3.1
King and Queen	46425.1	51.7	22.2
Middlesex	19207.7	21.4	16.3
Total	89771.1	100	

Table 2. Dragon Run watershed statistics by locality (from MPPDC, 2001).

The Dragon Run watershed, state hydrologic unit CO2, is a fourth-order stream system that is nontidal freshwater above the U.S. Route 17 bridge and tidal freshwater from the U.S. 17 bridge to its mouth at Meggs Bay (**Figure 6**). There it forms the Piankatank River, where it becomes estuarine, and eventually drains into the Chesapeake Bay (**Figure 7**). Underground springs, feeder swamps, and surface waters support streamflow in the Dragon Run. Significant tributaries include Dragon Swamp, Yonkers Swamp, Exol Swamp, Timber Branch Swamp, Briery Swamp, Holmes Swamp, White Marsh, Zion Branch, Carvers Creek, Mill Stream, and Meggs Bay (MPPDC, 2001).

Land cover data indicate that the watershed is 80.3-83.9% forested and wetlands, 15.1-18.4% agricultural, and 1.0-1.3 % commercial and residential (**Figure 8**) (MPPDC, 2002; DCR, 2003). The Dragon Run watershed lies within the transitional Oak-Pine vegetation region where dominant oaks share the forest with Virginia pine, shortleaf pine, and loblolly pine. Although loblolly pine originally appeared in the forest as scattered associates of oaks and other hardwoods, loblolly pine plantations are increasingly common.

Since the watershed is relatively intact, it contains many unique resources. For example, the Baldcypress-Tupelo Swamp community is extensive and is the northernmost example of this community type in Virginia and the best example north of the James River (Belden, Jr. et al., 2001). Natural heritage resources are abundant in the Dragon Run (**Figure 9**). Several rare natural communities occur in the Dragon Run, including Baldcypress-Tupelo Swamp, Tidal Baldcypress-Tupelo Swamp, Tidal



Although this data has been used by the Middle Peninsula Planning District Commission (MPPDC), no warranty, expressed or implied is made by the MPPDC as to the accuracy or application of the data and related materials, nor shall the fact of distribution constitute any such warranty; and no responsibility assumed by the MPPDC in connection therewith.

This map production is a product of the MPPDC's Dragon Run SAMP and was funded by the Virginia Department of Environmental Quality's Coastal Program through Grant #NA17OZ1142-01 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resources Management, under the Coastal Zone Management Act of 1972, as amended.

Figure 5. U.S. Geological Survey topographic map of the Dragon Run watershed in Middlesex and King and Queen Counties.

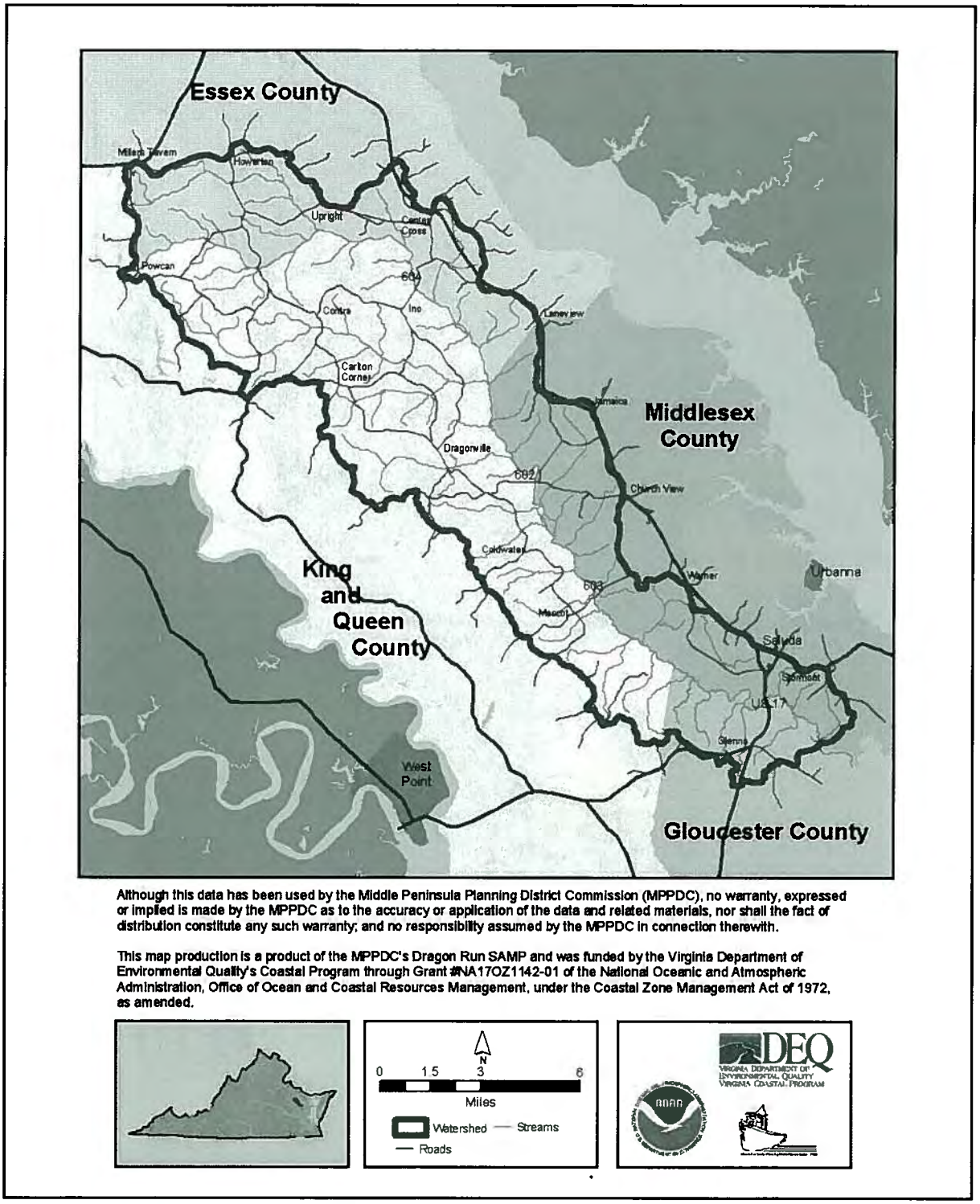


Figure 6. Map of the Dragon Run watershed boundary showing villages and towns.

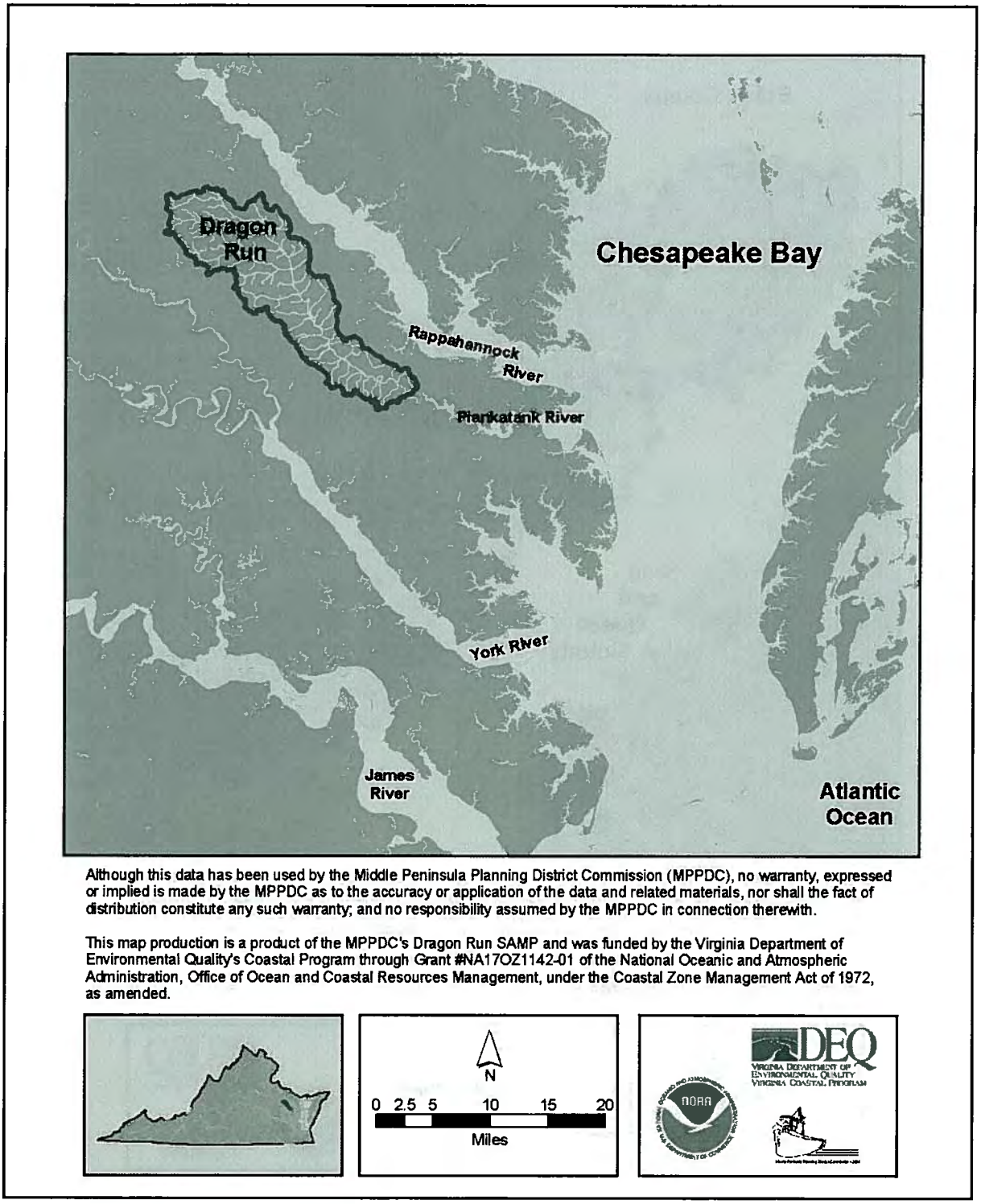


Figure 7. Map showing the Dragon Run watershed (in green) flowing into the Piankatank River and ultimately into the Chesapeake Bay.

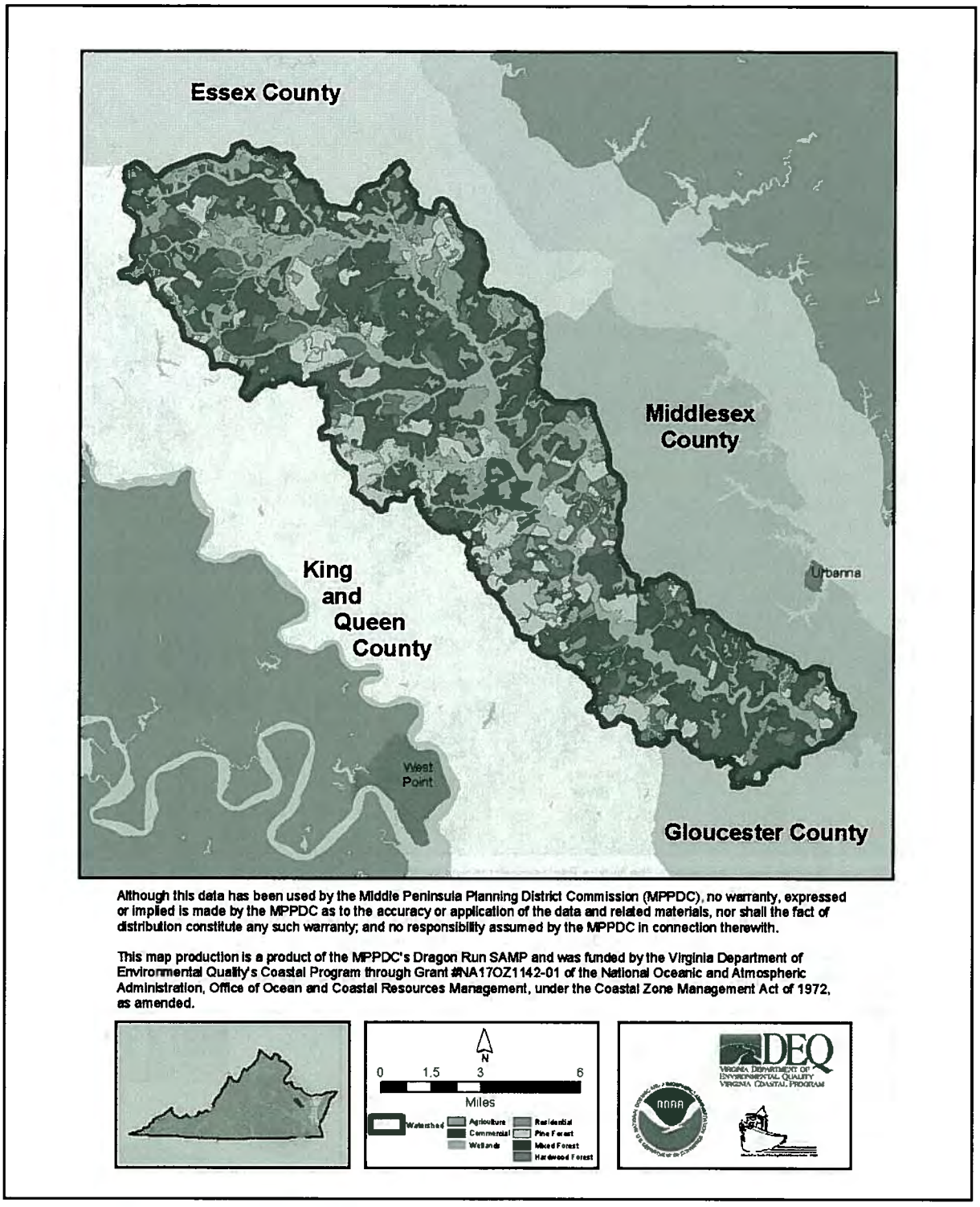


Figure 8. Land cover designations in the Dragon Run watershed.

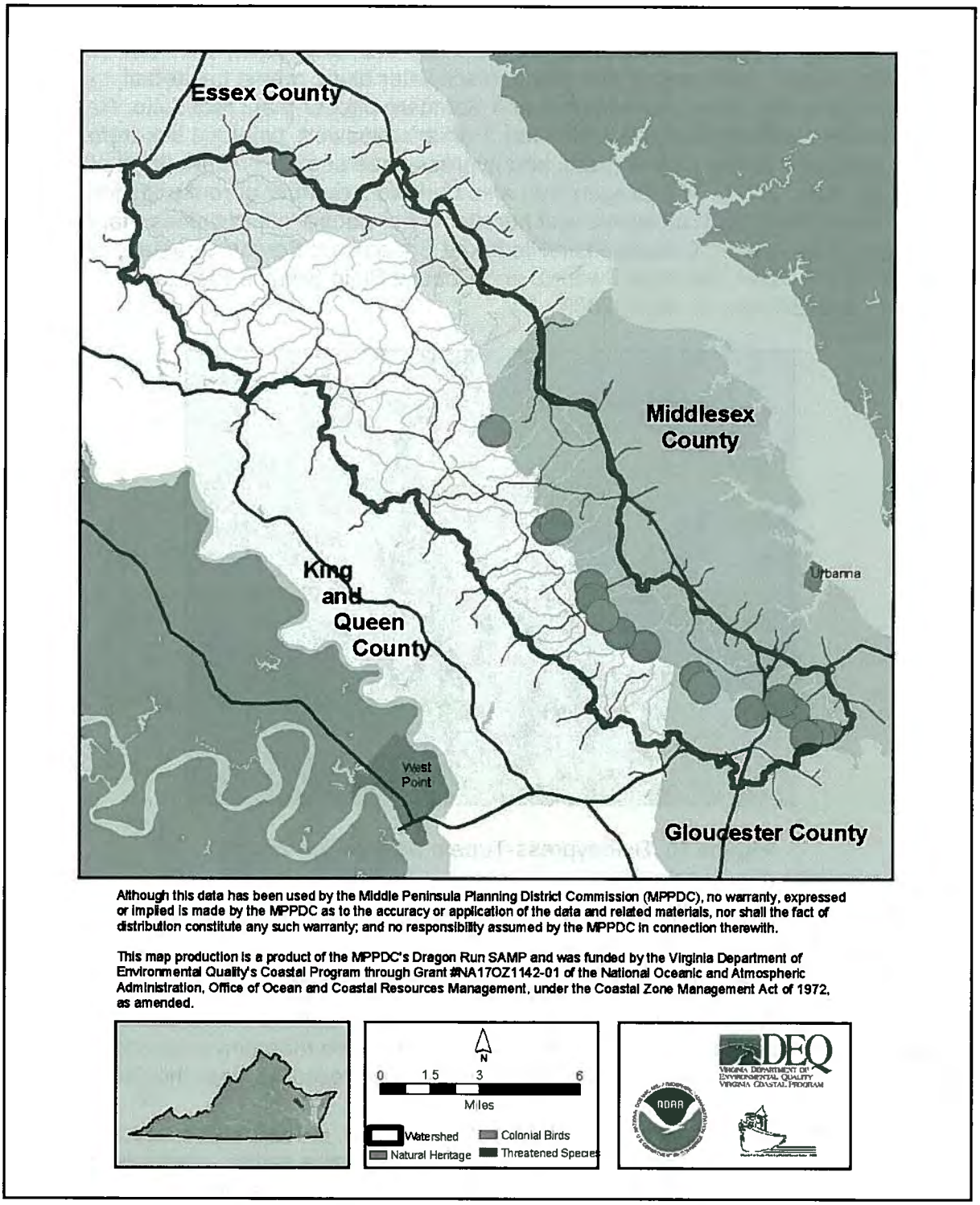


Figure 9. Occurrences of natural heritage resources in the Dragon Run watershed.

Baldcypress Woodland/Savanna, Fluvial Terrace Woodland, and Tidal Freshwater Marsh (see **Appendix A** for descriptions). The Baldcypress-Tupelo Swamp community (**Figure 10**) also harbors a number of rare plant and animal species. Rare animals include bald eagle, great purple hairstreak, blackwater bluet, robust baskettail, cypress sphinx, Selys' sunfly, fine-lined emerald and Southern pitcher-plant mosquito. Rare plants include cuckooflower, red turtlehead, Parker's pipewort, pineland tick-trefoil, river bulrush, Northern purple pitcher-plant, and cypress-knee sedge (Belden, Jr. et al., 2001; Belden, Jr. et al., 2003). The Dragon Run also harbors a number of rookeries for colonial water birds, such as egrets and herons. Other natural communities that occur in the Dragon Run include: Coastal Plain/Piedmont Bottomland Forest; Coastal Plain/Piedmont Acidic Seepage Swamp; and Coastal Plain Semipermanent Impoundment (Belden, Jr. et al., 2003).

Figure 10. Baldcypress-Tupelo Swamp community.

In addition to natural heritage resources, the Dragon Run supports a diversity of freshwater and estuarine fishes, aquatic macroinvertebrates, freshwater bivalves (primarily unionid mussels), and herptefauna (amphibians and reptiles) (McInnch et al., 2003). At least forty-five fish species from nineteen families have been collected in the Dragon Run, representing a mixed assemblage of mostly lowland freshwater forms that is highly dynamic spatially and temporally. At least sixty-five macroinvertebrate species from fourteen orders and forty-seven families have been recorded from the Dragon Run.

The watershed contains only limited examples of invasive, or non-native, species, again emphasizing a relatively intact natural system. Currently, blue catfish, common reed, Asiatic dayflower and Japanese stiltgrass occur in the Dragon Run in limited quantities (**Figure 11**).

Figure 11. Invasive species of the Dragon Run - clockwise: Asiatic dayflower (Brent Steury, NPS); Japanese stiltgrass (Ted Bodner); Common reed (Joseph McCauley, USFWS); Blue catfish (www.landbigfish.com)

According to the National Wetland Inventory, wetlands along the Dragon Run (**Figure 12**) are Palustrine, mostly Forested Wetlands except for Emergent Wetlands in Meggs Bay. U.S. Route 17 is the approximate demarcation between tidal wetlands and non-tidal wetlands. The hydrologic regime of most Dragon Run wetlands is Seasonally Flooded, Seasonally Flooded-Saturated, or Temporarily Flooded (Belden, Jr. et al., 2001).

The U.S. Geological Survey (USGS) maintained a streamflow gaging station at Church View (Route 602) from 1943 to 1981 that received drainage from 60% of the watershed (84 square miles) and has maintained a streamflow gaging station at Mascot (Route 603) since 1981 that receives drainage from 75% of the watershed (105 square miles). Median daily streamflow at Mascot from 1981 to 1999 was 79 ft^3/sec and varied between 0.01-6050 ft^3/sec. Median daily streamflow at Church View from 1943 to 1981 was 57 ft^3/sec and varied from 0-3790 ft^3/sec. Compared to other coastal plain stream systems such as the Chickahominy River (New Kent County), the Mattaponi River (King William County), and Cat Point Creek (Richmond County), the Dragon Run exhibits lower median daily streamflow per square mile of drainage area. Base flow, fed primarily by groundwater discharge, accounts for two-thirds of the Dragon Run's total streamflow, with the remaining third attributable to surface water runoff. Of the annual precipitation, only one-third becomes streamflow, with two-thirds lost to evapotranspiration. Seasonally, streamflow is highest in the spring and lowest in the fall (MPPDC, 2001).

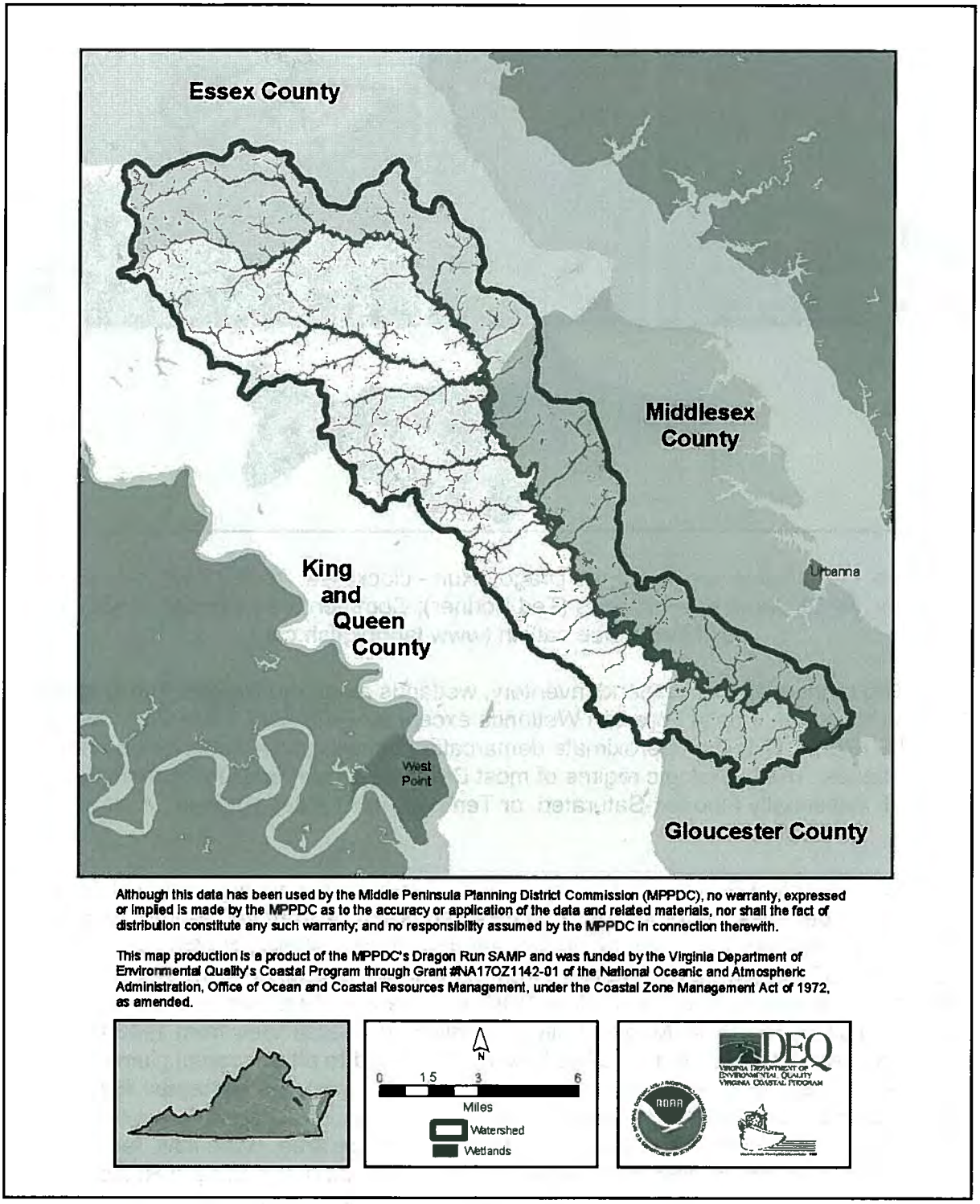


Figure 12. Wetlands in the Dragon Run watershed.

Geological features are described by the following excerpt from *A Natural Heritage Inventory of the Dragon Run Watershed* (Belden, Jr. et al., 2001):

Surficial deposits of riverine terraces bordering Dragon Run from the vicinity of the Essex-Middlesex county line to Meggs Bay belong to the Shirley Formation and the Sedgefield Member of the Tabb formation. The middle Pleistocene Shirley Formation consists of light- to dark-gray, bluish-gray and brown sand, gravel, silt, clay, and peat; the Sedgefield Member is of upper Pleistocene age and consists of pebbly to bouldery, clayey sand and fine to medium, shelly sand grading upward to sandy and clayey silt. Somewhat higher topography away from the waterway is underlain by the Chesapeake Group. This consists of fine to coarse quartzose sand, silt, and clay (variably shelly and diatomaceous) deposited in shallow waters of the upper Pliocene and lower Miocene periods. At still higher elevations, the Windsor Formation is found, consisting of gray and yellowish to reddish-brown sand, gravel, silt, and clay of lower Pleistocene or upper Pliocene age. At higher elevations southwest of Dragon Run, two other formations are prevalent, both of upper Pliocene age. The Bacons Castle Formation is characterized by gray, yellowish-orange, and reddish-brown sand, gravel, silt, and clay and the Moorings Unit by white, light gray, and grayish-yellow quartzose sand and clay to grayish-brown clayey silt and silty clay.

Watershed elevation ranges from 180 feet to near sea-level. Detailed soils information can be found in the *Soil Survey* for each county (Note: King and Queen County does not have a published *Soil Survey*). Many of these soils are considered prime farmland and are suitable for silviculture. Generally, soil associations are as follows:

Essex County

Emporia-Slagle-Atlee; Rumford-Suffolk-Emporia - somewhat excessively drained to moderately well drained loamy and sandy soils (Hoppe, 1989)

Middlesex County

Suffolk-Eunola-Remlik; Kempsville-Suffolk-Kinston; Emporia-Slagle-Nevarc - deep, well drained to poorly drained loamy or clayey soils (Newhouse et al., 1985); Pocaty-Kinston-Bibb - deep, very poorly to poorly drained organic and loamy soils that are flooded by fresh and brackish water (Newhouse et al., 1985)

Gloucester County

Suffolk-Eunola-Kenansville; Emporia-Hapludults-Wrightsboro - deep, well drained to moderately well drained loamy or clayey soils (Newhouse et al., 1980)

DCR's Shoreline Erosion Advisory Service identified five areas of streambank erosion in the lower Dragon Run (Vanlandingham, 2003). The lower Dragon Run undergoes an average of less than one foot per year of erosion that is mostly attributable to high water flow undercutting the stream bank during storms. These erosion "hot spots" are relatively few and small and are unlikely to cause impairment to the stream.

Water Quality

Water Quality Assessment

The primary water contaminant sources in the Dragon Run are point source discharges and nonpoint source pollution from precipitation (atmospheric deposition), residential land use, agricultural land use, and forested lands (MPPDC, 2002). According to the Virginia Department of Environmental Quality (DEQ), the Dragon Run generally exhibits

medium nutrient levels and is listed as "impaired" for pH, fecal coliform bacteria, mercury, and lead (DEQ, 2002). Based on agricultural, urban, and forested pollution loadings potential determined by DCR, however, the overall nonpoint source pollution potential rating is low for the Dragon Run (DCR, 2002).

Point source discharges, which are permitted and monitored by the Virginia Department of Environmental Quality, are relatively easy to quantify and, in turn, control or track. Point source discharges to the Dragon Run include: stormwater runoff from a wood treatment facility (arsenic, chromium, copper) at Pitts Lumber Company, Inc. to an intermittent stream adjacent to U.S. Route 17 in Middlesex County (Permit #VA0083011); discharge from a sewage treatment plant (biological oxygen demand, total suspended solids, ammonia nitrogen, total residual chlorine, pH, fecal coliform) at Rappahannock Community College to an intermittent stream near Glenns in Gloucester County (Permit #VA0028461); and discharge from a wellwater treatment plant (pH, total suspended solids) at the Miller's Square Subdivision to an intermittent stream near Miller's Tavern in Essex County (Permit #VA0075302). According to the Shoreline Sanitary Survey (Smither et al., 2003), there are 9 other indirect sources of pollution, including five animal pollution sources (Middlesex County near Saluda and Stormont and Gloucester County near Glenns); a solid waste dumpsite in Middlesex County near Stormont; and a potential pollution source in Middlesex County in Saluda. Furthermore, a network of water quality monitoring wells is maintained at the Browning-Ferris Industries landfill in King and Queen County.

Throughout the Chesapeake Bay, atmospheric deposition (e.g. precipitation) contributes a significant amount of the total nutrient loadings in coastal waters (MPPDC, 2001). Air quality is not currently monitored in the watershed.

More than 90% of residents in Gloucester, King and Queen, and Middlesex Counties use on-site wastewater treatment systems, commonly known as septic systems (MPPDC, 2001). When operated properly, conventional septic systems remove nutrients and fecal coliform. Conventional septic systems can pose potential environmental and health risks due to inappropriate design, poor maintenance, poor soils, or inefficient nitrogen removal. Driven by changes to Department of Health regulations for on-site wastewater treatment systems (12 VAC 5-610-10 et seq. effective July 2000), the popularity of "engineered" on-site wastewater treatment systems is increasing. These alternative systems, when properly maintained, can be effective at removing nutrients and fecal coliform in areas where conventional septic systems are ineffective. Regardless of the type, however, improperly maintained or failing septic systems pose significant environmental and health risks by contributing nutrients, pathogenic bacteria, and viruses to groundwater.

Forested lands, representing a significant land area, yield low nutrient input to streams relative to other land uses in the watershed. Best Management Practices (BMPs) are designed to minimize these inputs. For example, forested riparian buffers provide effective protection for water quality. The watershed currently exhibits intact riparian buffers.

By contrast, agricultural land use in rural and semirural areas in Virginia can be the source of significant sediments, fecal coliform bacteria, and nutrients such as nitrogen and phosphorus. Nitrogen is transported through the groundwater, whereas phosphorus is generally transported on soil particles in surface water. BMPs such as fencing cattle out of streams, conservation tillage, and expanded riparian buffers are designed to minimize these inputs.

Residential and commercial land uses typically contribute less nutrients and sediments than agriculture, but more than forestry. These residential and commercial contributions are mainly attributable to reduced or no riparian buffers, chemical application for landscaping, and stormwater runoff.

Water Quality Monitoring

Water quality data sets in the watershed are sparse in quantity, duration, and parameters measured. Existing data sets include: STORET, a database managed by the Virginia Department of Environmental Quality (DEQ); data collections during fish surveys by the Virginia Department of Game and Inland Fisheries (DGIF) and Virginia Commonwealth University (VCU); data collections by the Chesapeake Bay National Estuarine Research Reserve in Virginia at the Virginia Institute of Marine Science (VIMS); and a now-defunct volunteer water quality monitoring program in the watershed (MPPDC, 2001).

Two stations are currently sampled regularly by the DEQ. Station DRN003.40 is located at the U.S. Route 17 bridge and Station DRN010.48 is located at the Route 603 bridge near Mascot. Data are available from DRN003.40 for the period 1968-1974 and 1992-present and from DRN010.48 for the period 1992-present. Samples are evaluated bimonthly for nutrients, fecal coliform, suspended solids, dissolved oxygen, pH, salinity, and temperature and are occasionally evaluated for pesticides, toxic metals, and other harmful compounds (MPPDC, 2001). The data sets collected at these sampling stations were used by the DEQ to list the Dragon Run as "impaired" for pH and fecal coliform bacteria. Fish tissue samples were used by the DEQ to list the Dragon Run as "impaired" for mercury and lead. The Virginia Department of Health issued a health advisory for the Dragon Run for mercury contamination in largemouth bass (DOH, 2003). The DEQ attributes the pH impairment to natural causes, citing the acidic nature of water in swamps. The DEQ lists the cause of the fecal coliform and mercury and lead impairments as unknown. Potential sources of fecal coliform bacteria include: wildlife; failing septic systems; and livestock. Potential sources of metals include: atmospheric deposition; automobile and roadway deposits; and industrial operations.

Data collected by the DGIF in 1995-1996 and 1998 includes temperature, Secchi depth, pH, dissolved oxygen, conductivity, salinity, alkalinity, hardness, and total dissolved solids. Nutrient data are very limited and were frequently below detection limits. Dissolved oxygen at sampling stations with no or low flow frequently violated daily minimum standards to support aquatic life (MPPDC, 2001).

VIMS data from 2000-2001 measured temperature, salinity, total dissolved solids, pH, dissolved inorganic nitrogen, and fecal coliform bacteria. Of specific note, samples from Briery Swamp exhibited high nitrate and fecal coliform levels, indicating the presence of subsurface agricultural or wastewater drainage (MPPDC, 2001).

A weekly volunteer water quality monitoring program collected data throughout the watershed during the period 1994-1997, although monitoring was not continuous at all eight sites. Measurements included dissolved oxygen, Secchi depth, water and air temperature, pH, and water color. The findings indicated: low dissolved oxygen during warm temperatures and high dissolved oxygen during cold temperatures; low Secchi depth values during the summer associated with algal blooms and storm events; and acidic pH values in the upper Dragon Run with slightly more basic pH values in the tidal waters (MPPDC, 2001).

Impervious Cover

One key indicator of water quality status and stream health is the percentage of impervious surface in a watershed. The Dragon Run watershed exhibits a very low level of impervious cover and, in turn, is in good condition (e.g. natural heritage resources).

Impervious surfaces (e.g. paved streets and parking lots, rooftops) are hardened areas that do not allow infiltration of rainwater and promote runoff to streams. This runoff often occurs at a higher volume and velocity than normal stream flow and can lead to stream erosion and instability. Runoff also carries pollutants that are not absorbed by soil and plants and can lead to degraded water quality. The Center for Watershed Protection (2002) has developed a watershed vulnerability analysis that relies on an impervious cover model. The model indicates that watersheds are generally in good condition when impervious cover is less than 10%. From 10-25% impervious cover, watersheds are generally impacted, which means that they only partially support their intended uses (e.g. drinking, swimming, shellfish harvest). Above 25% impervious cover, watersheds generally do not support their intended uses at all.

Impervious cover can be estimated for the Dragon Run watershed. Based on the 1994 aerial photography, we learn that 1.3% of the watershed is commercial or residential development. Assuming 100% imperviousness, a highly conservative estimate, the watershed is approximately 1.3% impervious surface. The sparse road network is likely to add modestly to this estimate. Since the Dragon Run watershed exhibits less than 10% impervious cover, the Center for Watershed Protection's model (2002) predicts that it is in good condition, which is confirmed by the MPPDC's Dragon Run Watershed Land-Water Quality Preservation Project (MPPDC, 2001).

Recreation and Access

Significant recreational activities and opportunities exist in the Dragon Run watershed, including hunting, fishing, hiking, and boating. Educational opportunities and activities also exist. Meanwhile, access often requires landowner permission; public access is limited.

Hunting represents a significant recreational activity that generates at least $300,000 per year in the watershed. Seventeen hunt clubs lease approximately 42,000 acres, or 46%, of land in the watershed for hunting - mainly deer, turkey, and waterfowl (MPPDC, 2002). Hunt club leases provide income to landowners and offer hunting access to many acres of private lands.

Fishing is also a significant recreational activity in the Dragon Run. According to the DGIF, the Dragon Run's share of the state's fishing value is more than $1.6 million, including trip related expenses such as food and lodging and transportation (MPPDC, 2002). Fishing by boat is popular in the lower Dragon, while bank and fly fishing are more common in the upper Dragon. Fishermen regularly use the public, unpaved lot at Route 603 near Mascot, and a public boat ramp exists at Harcum in the Piankatank River (Gloucester County). Otherwise, landowner permission is generally required.

The Virginia Birding and Wildlife Trail for the Coastal Area, published in 2002 (DGIF, 2002a), describes two sites within the Dragon Run watershed. First, Rappahannock Community College (public), located in Glenns on State Route 33 in Gloucester County, offers wooded trails adjacent to a tributary to the Dragon Run. Second, the Friends of Dragon Run (private) offer a birding trail with views of the Dragon Run and the Baldcypress-Tupelo Swamp community. The site is located near Mascot on Route 603 with parking in a public, unpaved lot. It is important to note that the Friends' site and adjacent properties are privately owned.

Additionally, a 121-acre tract on Route 603 near Mascot is part of the Virginia Estuarine and Coastal Research Reserve System (public). The site can be accessed with permission and is used for research, long-term monitoring and education.

Besides the sites near Route 603, the Dragon Run Access Plan (MPPDC, 1994) indicates other traditional access sites in the watershed. Landowner permission is generally required at these sites, which include: Route 604 at the Essex/King and Queen county line (Byrd's Bridge); Route 602 at the Middlesex/King and Queen county line (Ware's Bridge); and U.S. Route 17 at the Middlesex/Gloucester county line (James Vincent Morgan Bridges).

Boating is also a significant recreational activity in the watershed. Motorized pleasure craft seasonally utilize the lower Dragon. Self-propelled boating is common from Route 602 to Meggs Bay. For example, waterfowl hunters often make short trips in canoes or jon boats, while guided and unguided paddling trips also occur. Several organizations offer guided paddling trips on the Dragon Run (**Figure 13**), including Gloucester County Parks and Recreation (2 trips/summer; ~30 people/summer); Chesapeake Bay Foundation (since 1995, 56 trips; 1080 people; for middle and high school students in Middlesex and Gloucester Counties); Rappahannock Community College (1 3-day trip/year; ~20 people); and Friends of Dragon Run (15-20 trips/year; ~200 people/year). Some outdoor outfitters offer guided trips by appointment.

Figure 13. Guided paddling trip on the Dragon Run.

Watershed Education

Limited watershed education efforts include workshops, field trips, and publications. Soil and Water Conservation Districts, Virginia Cooperative Extension, and the Natural Resources Conservation Service offer a variety of workshops, seminars, and publications related to watersheds, nonpoint source pollution, agriculture, and forestry. These programs mainly target those involved in agriculture and forestry activities. Rappahannock Community College and the Chesapeake Bay Foundation both lead students on paddle trips. The Friends of Dragon Run offer paddle trips to citizens and decision-makers. Finally, local governments provide publications explaining land use regulations. For example, King and Queen and Middlesex Counties distribute fact sheets about pertinent ordinances to new and prospective property owners.

Infrastructure and Planning

To effectively characterize the watershed's landscape and how it may change in the future, existing infrastructure and plans guiding future development must be assessed.

Future Land Use

Local comprehensive plans are intended to serve as the county's guide to its vision for the future. One of the most important elements of a comprehensive plan is future land use designation. In general, future land use throughout the Dragon Run watershed is primarily designated as rural in the comprehensive plans of the four counties. There exists, however, a wide range of specific land use designations within the watershed, ranging from industrial to commercial to town-like development, rural residential and rural preservation (**Figure 14**).

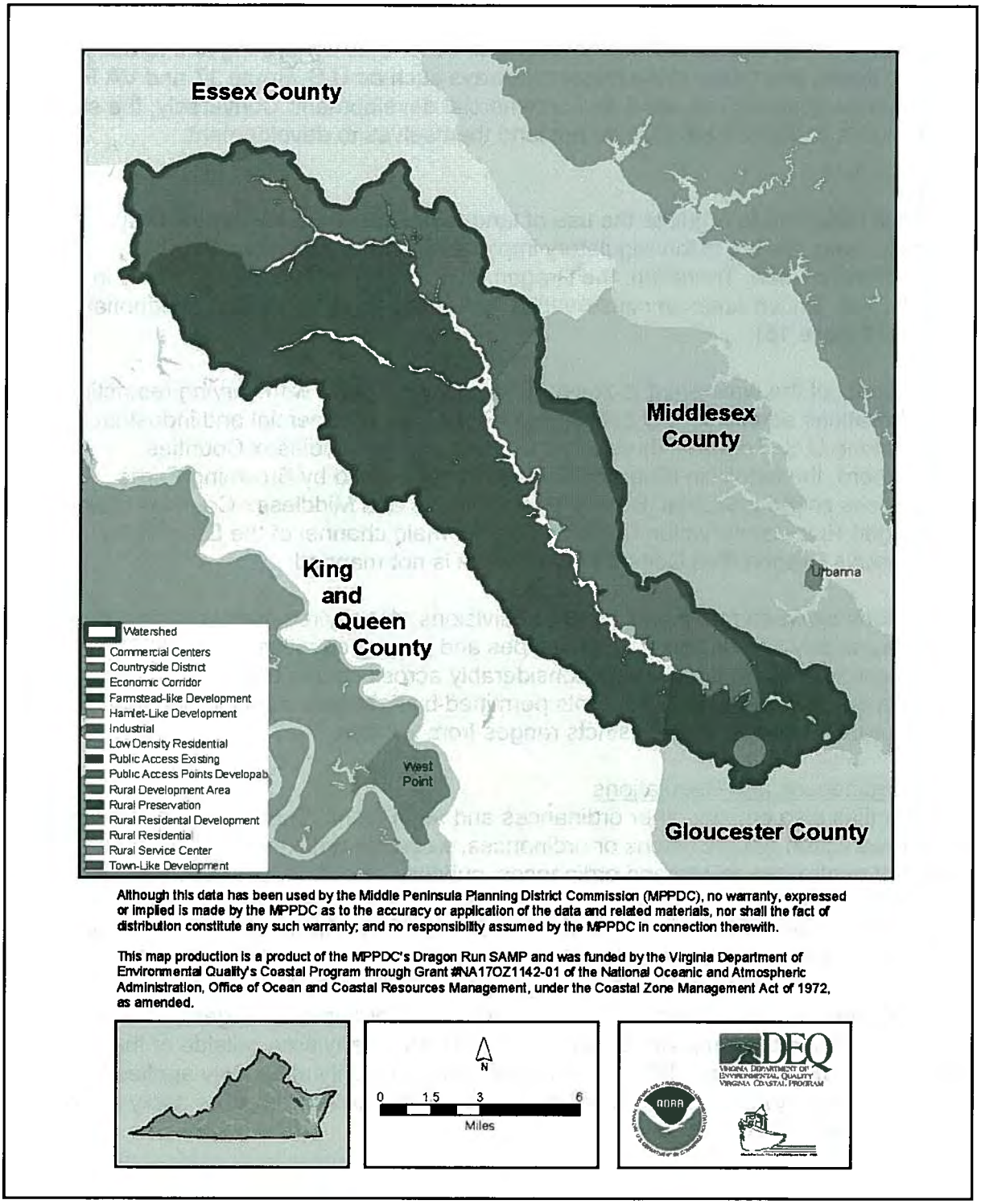


Figure 14. Future land use in the Dragon Run watershed.

Land use designations are tied to existing land uses, infrastructure, and anticipated growth patterns. It is clear through the comprehensive plans that localities expect that the majority of the watershed will remain rural, dominated by farming and forestry. Specific areas, like those along major roadways such as U.S. Route 17 and VA Route 33, are more suited to industrial and commercial development. Conversely, the swamps and streams of the Dragon Run do not lend themselves to development.

Zoning

Zoning is designed to regulate the use of land to ensure land use compatibility. Logically, then, zoning is the regulatory implementation of provisions in the comprehensive plan. Therefore, the Dragon Run watershed is zoned primarily in rural districts, with limited areas in conservation, industrial, commercial and residential districts (**Figure 15**).

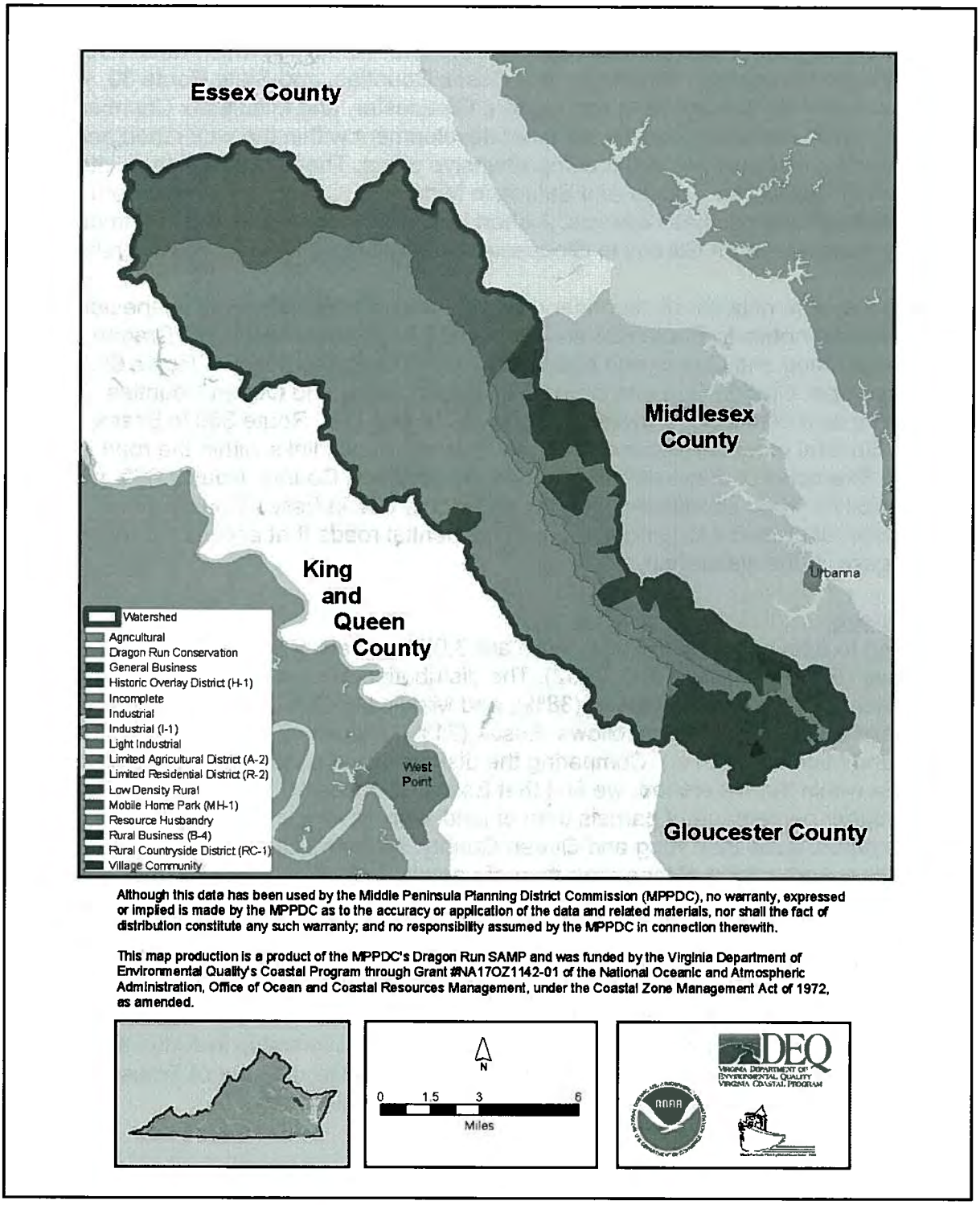
The majority of the watershed is zoned for agricultural uses, with varying restrictions and allowances across county boundaries. Significant commercial and industrial zoning occurs along U.S. Route 17 throughout Gloucester and Middlesex Counties. Furthermore, the landfill in King and Queen County owned by Browning-Ferris Industries is zoned industrial. Both King and Queen and Middlesex Counties maintain the Dragon Run Conservation District along the main channel of the Dragon Run. King and Queen's Dragon Run Conservation District is not mapped.

Distinctions between major and minor subdivisions, density requirements, and permitted uses vary widely across zoning district types and among counties. As a result, on-the-ground conditions can and do vary considerably across county boundaries. For instance, the maximum number of lots permitted by right (e.g. minor subdivisions) in agricultural and conservation districts ranges from 2-6 lots.

Other Ordinances and Regulations

The counties also employ other ordinances and regulations. These include Chesapeake Bay Preservation Act provisions or ordinances, wetlands ordinances, erosion and sediment control provisions and ordinances, subdivision ordinances, and site plan review. Some of the major effects of these regulations include land use restrictions and development standards in Chesapeake Bay Preservation Areas and the prohibition of major subdivisions in agricultural zoning districts.

A major difference between the counties is how the Resource Management Areas (RMA) are defined. Gloucester County defines RMA as any area outside of the Resource Protection Area (RPA) countywide. Essex County effectively applies RMA restrictions countywide, while King and Queen and Middlesex Counties apply a buffer landward of the RPA.



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This map production is a product of the MPPDC's Dragon Run SAMP and was funded by the Virginia Department of Environmental Quality's Coastal Program through Grant #NA17OZ1142-01 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resources Management, under the Coastal Zone Management Act of 1972, as amended.

Figure 15. Zoning classifications in the Dragon Run watershed.

Road Network

The road network within the watershed could be described as sparse (**Figure 16**), with few primary highways. The primary highways are U.S. Route 17, which runs north and south through Gloucester, Middlesex, and Essex Counties, and State Route 33, which runs east and west through King and Queen, Gloucester, and Middlesex Counties. Logically, these highways contain the most development within the watershed and are designated for that purpose in the comprehensive plans. These two highways intersect at Glenns in Gloucester County and Saluda in Middlesex County, which are both designated as rural business districts. A short length of State Route 198, a primary highway, runs east from Glenns in Gloucester County before leaving the watershed.

There is a sparse network of secondary roads, some of which serve as connectors along the road network. Route 603 and Route 602 both cross the middle Dragon Run and connect King and Queen and Middlesex Counties. Route 604 and Route 612 both cross the upper Dragon Run and connect Essex and King and Queen Counties. Route 684 serves as a connector between U.S. Route 17 and U.S. Route 360 in Essex County. Several other secondary roads serve as significant links within the road network. Examples of these are: Route 644 in Middlesex County; Routes 609, 610, 616, and 617 in King and Queen County; and Route 607 in Essex County. Finally, there is a network of unpaved logging, farm, and residential roads that access the more remote parts of the watershed.

Land Parcels

According to data collected in 2001, there are 3,073 parcels of land in the Dragon Run watershed (**Figure 17**) (MPPDC, 2002). The distribution of parcels is: Essex (25%); Gloucester (11%); King and Queen (38%); and Middlesex (26%). The land area within the watershed is distributed as follows: Essex (21%); Gloucester (6%); King and Queen (52%); and Middlesex (21%). Comparing the distribution of parcels to the distribution of land area within the watershed, we find that Essex, Gloucester, and Middlesex Counties have a higher percentage of parcels than of land area, meaning that they have smaller average parcel sizes than King and Queen County. King and Queen County has a much higher percentage of land area than of parcels, indicating a much larger average parcel size than the other three counties.

Land ownership is almost entirely private. A considerable amount of private land is owned by timber interests. For example, the single largest owner, John Hancock Life Insurance Company, owns approximately 26,000 acres (28.9% of the watershed). Much of this timber land is, in turn, leased to hunt clubs. Public ownership includes the College of William and Mary (121 acres) and the Virginia Department of Transportation (fee simple and prescriptive easements for roads and right-of-way).

Conservation

The Virginia Division of Natural Heritage has established conservation planning boundaries (**Figure 18**) around natural heritage resources - rare species and natural communities - based on their habitat needs to ensure their preservation. These conservation sites represent the ideal conservation scenario for these state and globally

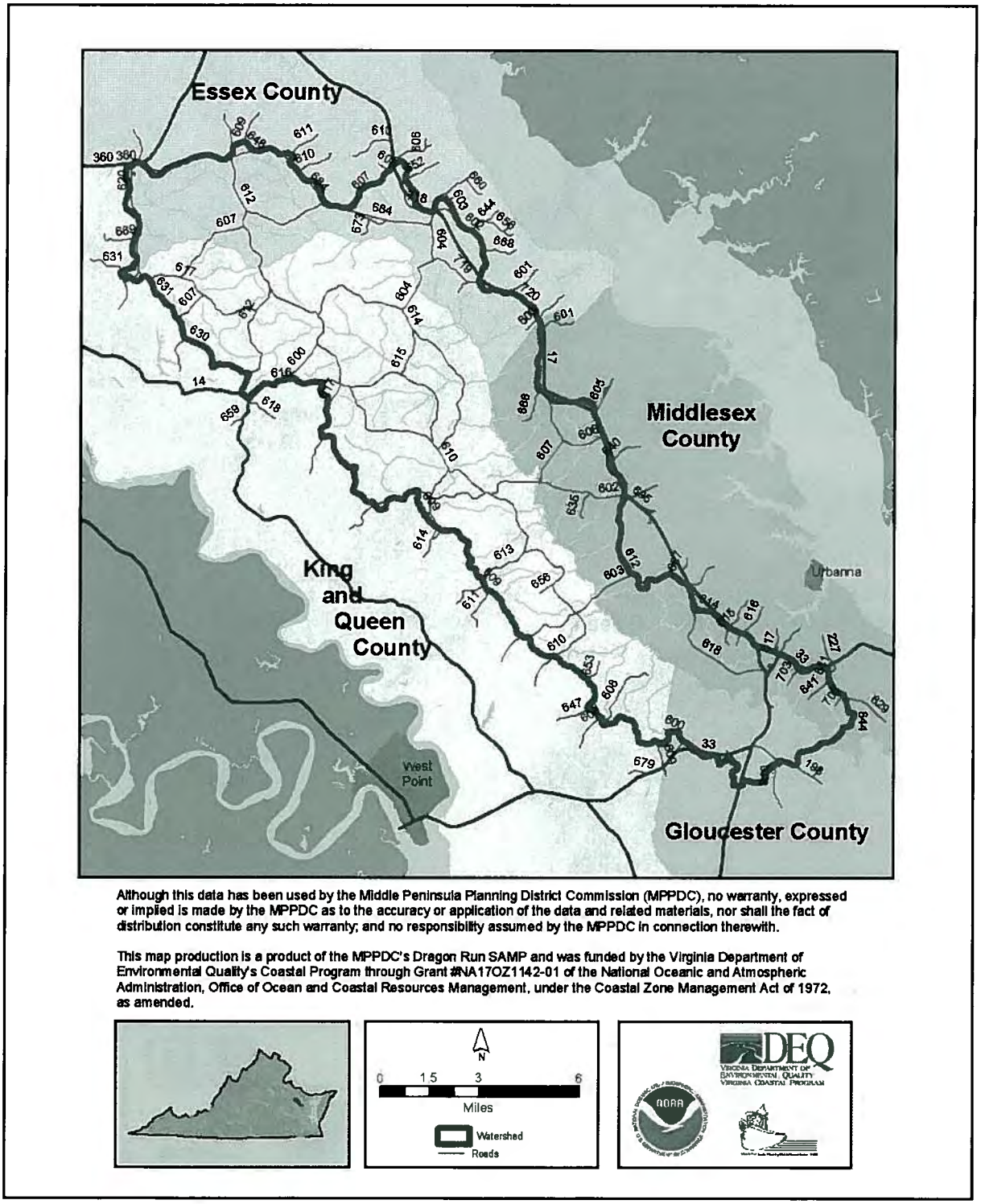

Figure 16. Road network in the Dragon Run watershed.

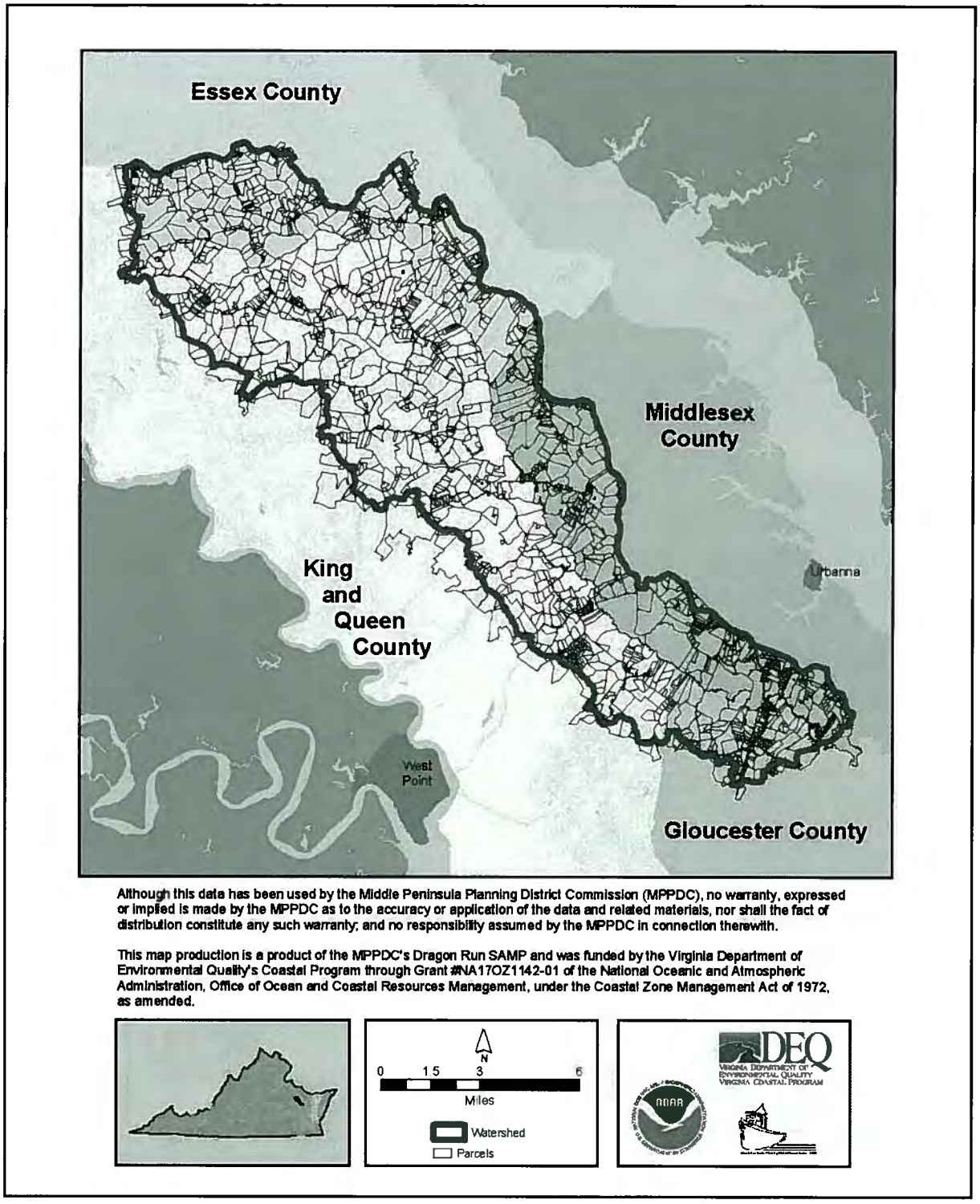

Figure 17. Parcels of land in the Dragon Run watershed.

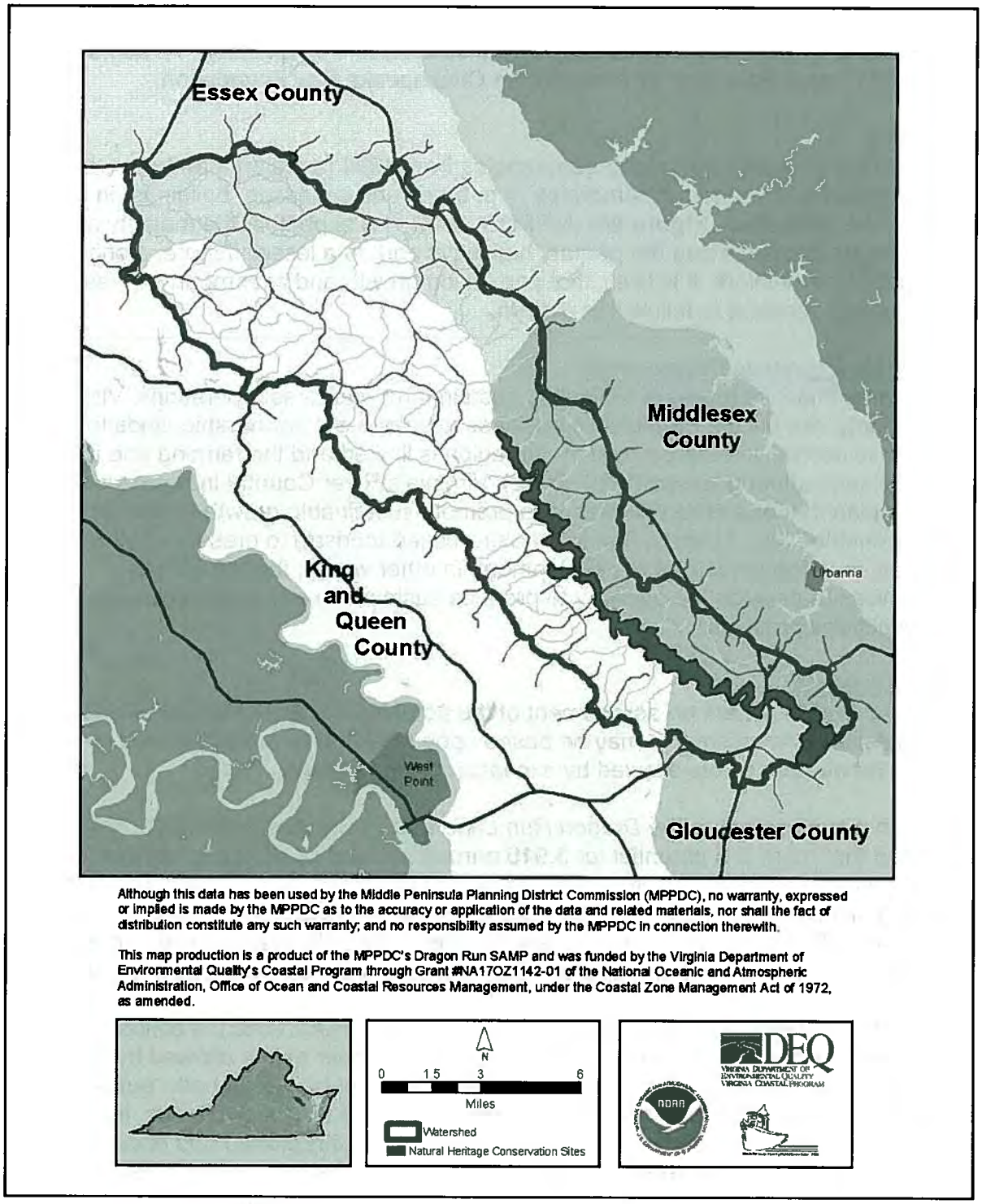

Figure 18. Natural heritage conservation sites for the Dragon Run watershed.

rare resources. Some of these resources have been conserved, either through fee simple purchase or purchase of conservation easements (**Figure 19).** Conservation easements are held on 235 acres by the Virginia Outdoors Foundation, 72 acres by Friends of Dragon Run, and 32 acres by the Chesapeake Bay Foundation.

Structures

Interpretation of digital orthophoto quadrangles from 1994 revealed that there were 1,311 structures or clusters of structures (e.g. barns and accessory buildings) in the Dragon Run watershed (**Figure 20**) (MPPDC, 2002). As expected, the majority of the structures are located along the primary highways and, to a lesser degree, along the secondary road network. It is likely that population growth and accompanying residential structures will continue to follow this pattern.

Sustainable Economic Development

Landowners find it increasingly difficult to sustain farm and forest operations. Virginia's River County, the Middle Peninsula's business development partnership, finds that sustainable economic development in the region is limited and the farming and forestry industries are suffering losses (VRC, 2002). Virginia's River Country indicates in its strategic plan that one of its priorities is to promote sustainable growth in resource-based industries (e.g. forestry, farming, nature-based tourism) to preserve natural resources from the pressures of development. In other words, the region has opportunities to develop the capacity to produce sustainable and value-added forest and agricultural products.

Buildout analysis

A buildout analysis offers an assessment of the potential number of lots allowed by land use regulations. Assessments may be based upon the number of lots allowed by right or upon the number of lots allowed by exception or by rezoning.

Based on a supplement to the *Dragon Run Land Use Policy Audit* (MPPDC, 2003), it is estimated that there is a potential for 3,916 parcels allowed by right (i.e. without the need for an exception or rezoning). This estimate is founded upon the number of lots and the minimum lot size permitted by right for minor subdivisions. The result represents a 27% increase in the potential number of parcels. An example of potential development under current land use policies in the watershed is featured in **Figure 21**.

As part of the *Dragon Run Management Framework* (MPPDC, 2002), a buildout analysis was completed based on both the potential number of lots allowed by right, by exception, or by rezoning. The analysis evaluated buildout based on both "build-compatible" values (i.e. wetlands) and "environmental" values (i.e. wetlands, topography [slope], floodplains, land cover, conservation easements, threatened and endangered species locations, and conservation species sites). An index was created based on these values and those that ranked low for development unsuitability were assessed for their development potential under current zoning designations. Based on zoning and subdivision rules, "theoretical lots" were then calculated within

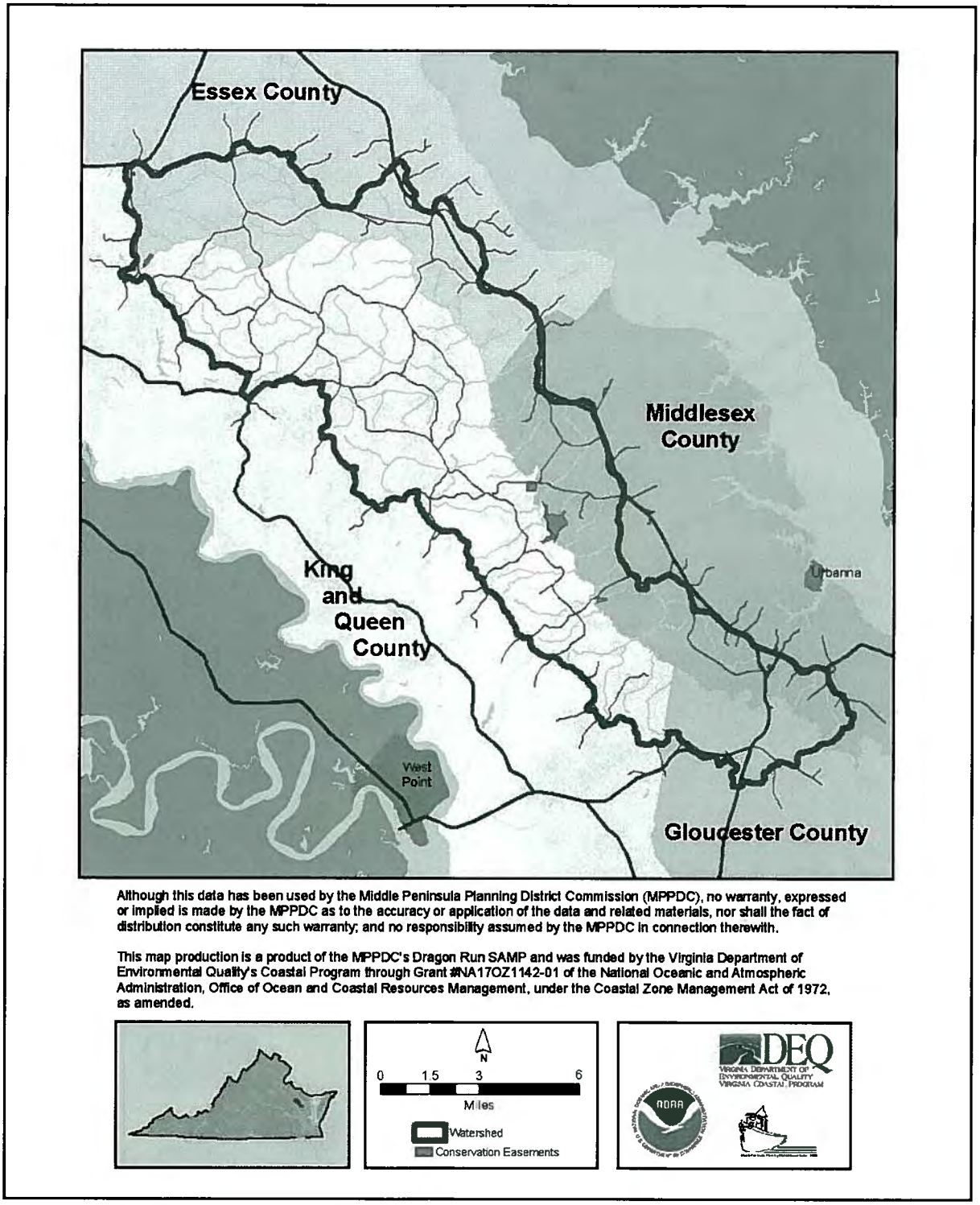

Figure 19. Conservation easements in the Dragon Run watershed.

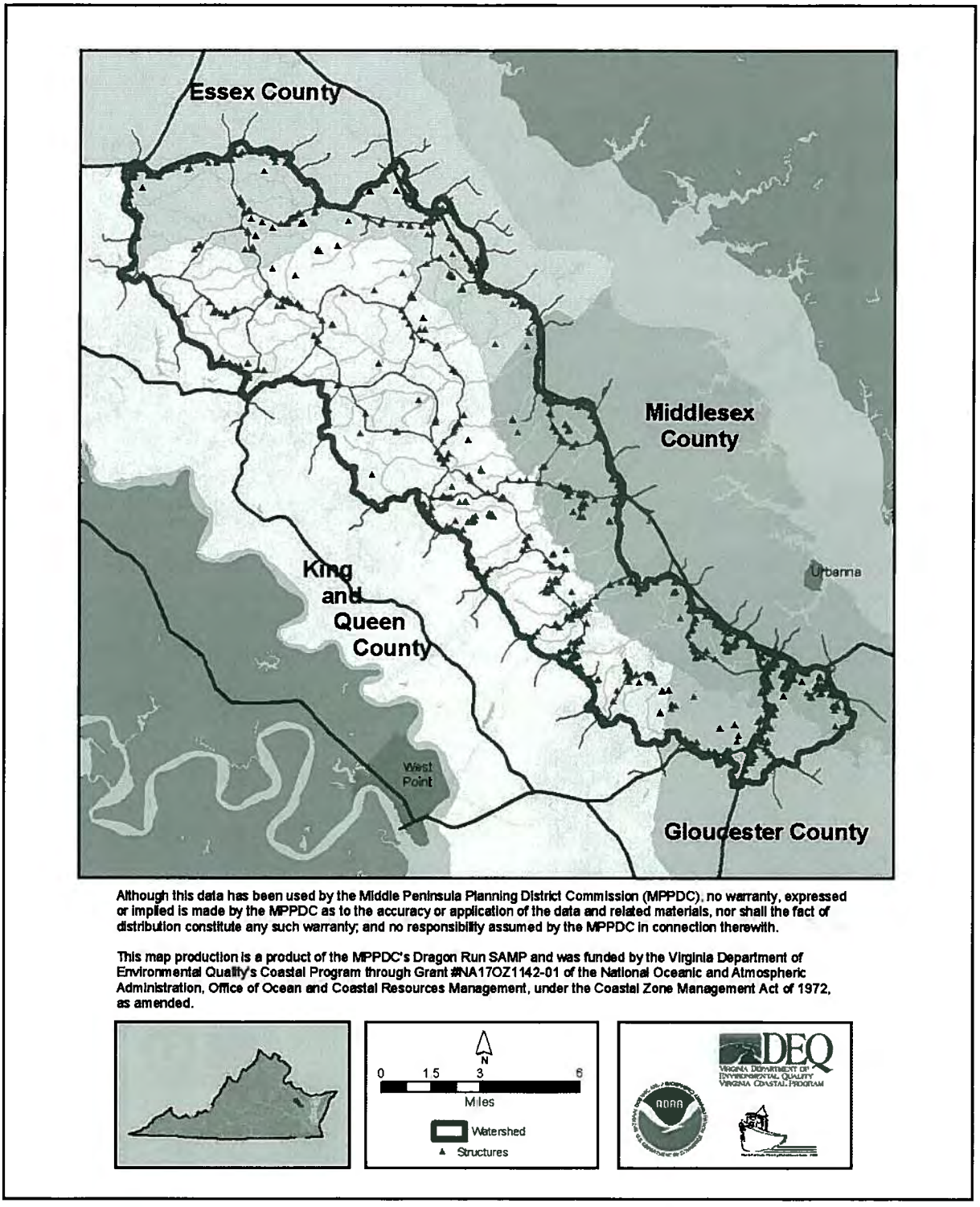

Figure 20. Structures in the Dragon Run watershed.

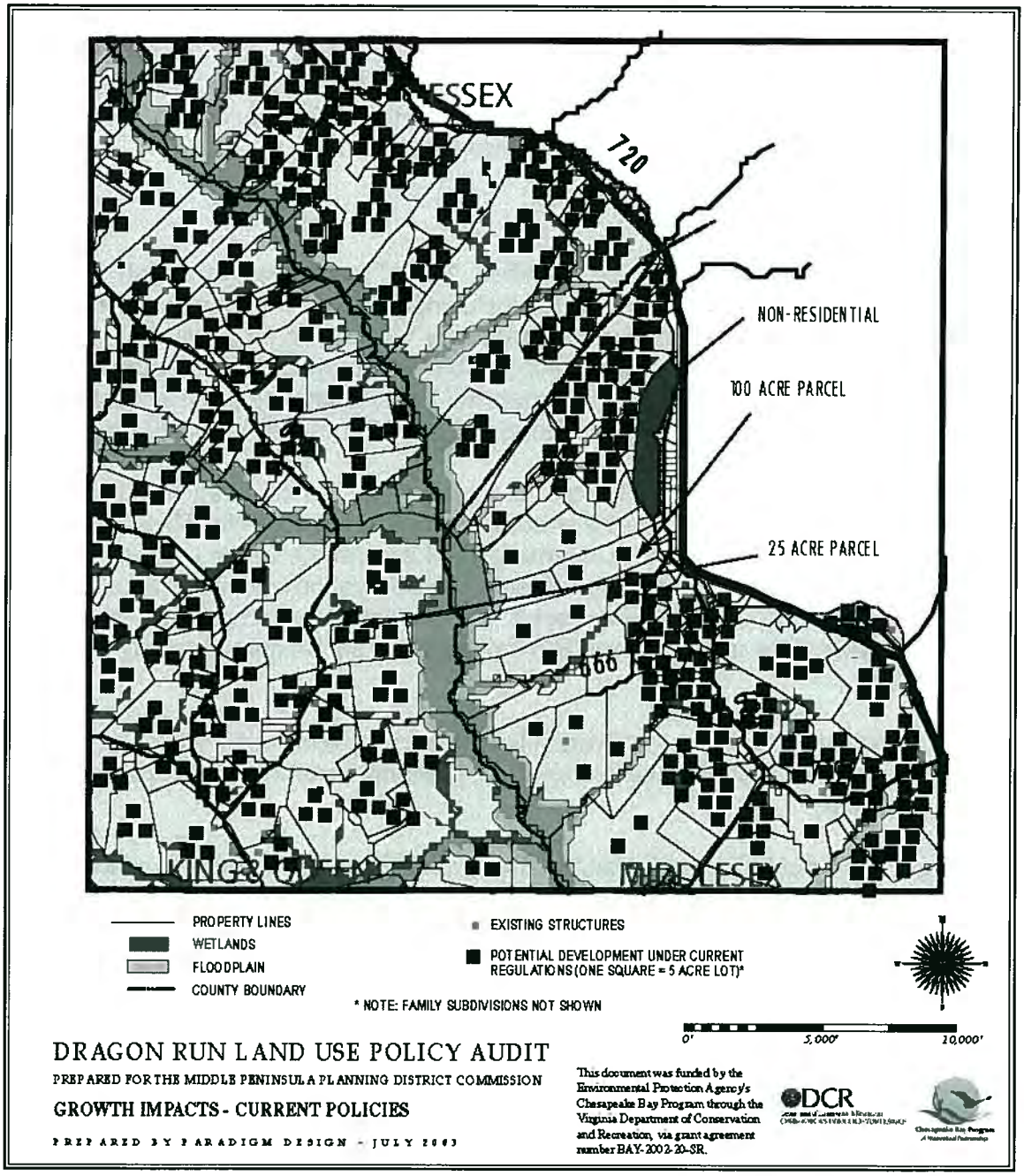

Figure 21. Potential development under current land use policies in the Dragon Run watershed (from MPPDC, 2003).

those areas that were ranked as suitable for development under both scenarios. The "build-compatible" analysis yielded a total of 40,851 theoretical lots that could be developed under current zoning, while the "environmental" analysis yielded 38,208 theoretical lots. The results of the analysis represent a 1,143% increase in the potential number of parcels based on "environmental" values and a 1,229% increase in the potential number of parcels based on "build-compatible" values.

Identified Data Gaps

Several gaps in the available data were identified. Two of these data gaps, fish communities and benthic macroinvertebrates including freshwater mussels, are being addressed by a research project being undertaken by Virginia Commonwealth University's Center for Environmental Studies (VCU). This project is anticipated to be completed during the fall of 2003. Its final report will also summarize previous data collection efforts by VCU and the Virginia Department of Game and Inland Fisheries.

Natural heritage information is available for the main channel of the Dragon Run and its adjacent swamps, but not for headwater streams and adjacent uplands. This data gap is being addressed by a natural heritage inventory of 14 sites in the upper reaches of the watershed being undertaken by the Department of Conservation and Recreation's Division of Natural Heritage. A technical report titled "A Natural Heritage Inventory of Fourteen Headwater Sites in the Dragon Run Watershed" will be completed by December 2003.

The status of invasive species in the Dragon Run is partially known. Efforts to gather more detailed information about invasive species, primarily common reed and blue catfish, are underway.

Other data gaps are not being addressed at this time. For example, there is scant information about migratory birds, other than highly specific research (e.g. bald eagle nesting assessment, colonial bird nesting assessment) and amateur observational records. The scope of a research project to comprehensively assess migratory bird activity in the watershed is tremendous and would require funding that is not available at this time.

Another data gap that is not currently being addressed is the source of water quality impairments (e.g. pH, fecal coliform, mercury, lead) for stream segments on the Virginia 303(d) list (DEQ, 2002). It is assumed that pH impairment is from natural sources (i.e. swamps are naturally acidic). Development of Total Maximum Daily Loads (TMDL) for impairments in Dragon Run stream segments are planned by the Virginia Department of Environmental Quality (DEQ) in 2010.

Finally, the effect of tax policies on the viability of farming and forestry operations is not fully understood in the watershed. The impact of tax incentive programs (e.g. land use taxation) and tax policies (e.g. taxation based on full development potential) on the sustainability of agriculture and silviculture has not been assessed.

SECTION 7: Resource Needs

Section 7 itemizes the resources needed to implement the actions in the watershed management plan. This section also identifies responsible parties and possible funding sources.

Table 3 lists Actions (**Section 4)** with responsibilities, estimates of funding needs, and possible funding sources.

ACTION	RESPONSIBILITY	FUNDING	FUNDING SOURCE
1. Land Use and Resource Preservation			
A. Designate a Unified "Dragon Run Planning Area"	MPPDC; Dragon Run Steering Committee; local governments	Minimal to moderate	MPPDC (VA Coastal Program); local governments
B. Implement Tools to Preserve Forest, Farm, and Natural Resources	Local, state, federal government; non-profits; landowners	Varies from minimal (local "right-to-farm") to considerable (PDR program)	Local, state governments; non-profits; EPA; Forest Legacy Program
C. Address Public and Landowner Access Issues	Dragon Run Steering Committee; local, regional, state gov'ts	Varies from low (signs) to considerable (land acquisition, site development)	VA Coastal Program; Public Access Authority
D. Control Invasive Species	Dragon Run Steering Committee; Invasive Species Initiative	Moderate	VA Coastal Program; DGIF; VMRC; DCR; U.S. Fish and Wildlife Service
2. Education and Landowner Stewardship	Dragon Run Steering Committee; local, state, federal gov'ts; citizens	~$20K/year; programmatic	VA Coastal Program; Dept. of Forestry; USDA/NRCS; DCR; EPA; US FWS
3.Encourage and Support Sustainable Economic Development	Dragon Run Steering Committee; local gov'ts; business	$18,000 in 2003-2004	VA Coastal Program
4. Monitor Plan Implementation	Dragon Run Steering Committee; local gov'ts	Minimal to moderate	MPPDC (VA Coastal Program); local gov'ts

Table 3. Resource needs for Dragon Run Watershed Management Plan.

SECTION 8: Progress Benchmarks

Section 8 serves as a monitoring framework for assessing the implementation of the watershed management plan.

Table 4 lists Actions from **Section 4** and their corresponding progress benchmarks, including responsible parties and anticipated completion time. This table serves as a monitoring plan framework.

ACTION	RESPONSIBILITY	BENCHMARK	COMPLETION
1. Land Use and Resource Preservation			
A. Designate a Unified "Dragon Run Planning Area"	MPPDC; Dragon Run Steering Committee; local governments	Adoption of phases of strategy in all four counties	Level 1 - September 2004; Levels 2 & 3 – 2005-2006?
B. Implement Tools to Preserve Forest, Farm, and Natural Resources	Local, state, federal government; non-profits; landowners	Use 1 or more tools to preserve 50 acres/year	Ongoing
C. Address Public and Landowner Access Issues	Dragon Run Steering Committee; local, regional, state gov'ts	Acquisition of 1 land-based site; erect trespassing signs at access points	December 2004
D. Control Invasive Species	Dragon Run Steering Committee; Invasive Species Initiative	Representation on Council; establish education materials	September 2004; ongoing
2. Education and Landowner Stewardship	Dragon Run Steering Committee; local, state, federal gov'ts; citizens	Establish festival and awards; perform 6 trips/year; post signs along major roadways; develop forest stewardship plans (5/year); enrollment in farm programs (100 acres/year); complete one action-based project/year	December 2004; ongoing
3. Encourage and Support Sustainable Economic Development	Dragon Run Steering Committee; local gov'ts; business	Complete sustainable economic development report; promote Coastal Birding Trail	September 2004; ongoing
4. Monitor Plan Implementation	Dragon Run Steering Committee; local gov'ts	Complete Table 4	As designated

Table 4. Benchmarks for monitoring the Dragon Run Watershed Management Plan.

SECTION 9: Conclusions

Section 9 reminds readers of the watershed management plan's purpose. This section recalls the plan's citizen-initiated beginnings and that it serves as a vision for the future of the Dragon Run watershed.

This watershed management plan for the Dragon Run watershed represents a body of work by citizens, stakeholders, and decision-makers to achieve a common vision for the future – the preservation of the traditional uses and unique resources in the pristine Dragon Run. It is a symbol of regional cooperation and coordination that crosses jurisdictional boundaries. It is the next logical step on the path towards protecting the Dragon Run watershed and preserving its cultural, historic, and natural heritage for future generations.

The plan's goals and objectives (**Section 3**) speak to the major issues at play in the watershed. Its actions (**Section 4**) attempt to address those issues. Together, they are a road map for the watershed.

The plan also captures the current status and state of knowledge of the watershed (**Section 6**). It highlights what we know and what we do not know. It also offers a mechanism for monitoring plan implementation by comparing the baseline watershed information to future results. Progress benchmarks are the basis for this monitoring (**Section 8**). The plan designates responsibility for plan implementation (**Sections 7 & 8**) and estimates costs and funding sources (**Section 7**).

The watershed management plan is not a static document. It is not an end in and of itself. It is a citizen-initiated vision for the future of the watershed that may be modified as situations change or as new information becomes available. It is a vision that harnesses the passion and energy for the Dragon Run (**Figure 22**) of those who live, work and play in its watershed.

Figure 22. A misty morning on the Dragon Run (Credit: Teta Kain)

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APPENDIX A: Rare Species and Natural Communities

Table 4 indicates the rare species and natural communities that have been found in the Dragon Run watershed, according to the Virginia Division of Natural Heritage (Belden, Jr. et al., 2001; Belden, Jr. et al., 2003).

SCIENTIFIC NAME	COMMON NAME	STATUS
Animals		
Atlides halesus	Great purple hairstreak	S2, S3
Enallagma weewa	Blackwater bluet	S1
Epitheca spinosa	Robust baskettail	S2
Haliaeetus leucocephalus	Bald eagle	S2
Helocordulia selysii	Selys' sunfly	S2
Isoparce cupressi	Cypress sphinx	S1, S3
Somatochlora filosa	Fine-lined emerald	S2
Wyeomyia haynei	Southern pitcher-plant mosquito	S1
Plants		
Bolboschoenus fluviatillis	River bulrush	S2
Cardamine pratensis	Cuckooflower	S1
Carex decomposita	Cypress-knee sedge	S2
Chelone oblique	Red turtlehead	S1
Desmodium strictum	Pineland tick-trefoil	S2
Eriocaulon parkei	Parker's pipewort	S2
Sarracenia purpurea var. purpurea	Northern purple pitcher-plant	S2
**Hottonia inflata	Featherfoil	S3
**Ranunculus flabellaris	Yellow water crowfoot	S3
Natural Communities		
Baldcypress-Tupelo Swamp		
Fluvial Terrace Woodland		
Tidal Baldcypress-Tupelo Swamp		
Tidal Baldcypress Woodland/Savanna		
Tidal Freshwater Marsh		

S1 = Extremely rare; usually 5 or fewer occurrences in the state; or may have a few remaining individuals; often especially vulnerable to extirpation.

S2 = Very rare; usually between 5 and 20 occurrences; or few occurrences with many individuals; often susceptible to becoming endangered.

S3 = Rare to uncommon; usually between 20 to 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances

** = No longer tracked by the Division of Natural Heritage; placed on watchlist due to an increased number of documented occurrences within the state since 2001

Table 4. Rare species and natural communities in the Dragon Run watershed.

The following descriptions of natural communities are taken from *The Natural Communities of Virginia* (Fleming et al., 2001).

Bald Cypress-Tupelo Swamps
Seasonally to semipermanently flooded forests of backswamps, sloughs, and low terraces of Coastal Plain rivers and large streams. These swamp forests are distributed throughout southeastern Virginia, north to Dragon Swamp (Gloucester, King and Queen, and Middlesex Counties). Habitats are deeply flooded (up to 1m) for part of the year; most retain at least some standing water throughout the growing season. Microtopography is often pronounced with small channels, swales, tree-base hummocks, and numerous bald cypress "knees." Tree canopies vary from mixed stands of bald cypress (Taxodium distichum), water tupelo (Nyssa aquatica), and swamp tupelo (N. biflora) to nearly pure stands of one species or another. The three dominants have complex competitive and successional relationships. As a rule, the two tupelos are less shade-tolerant than bald cypress and regenerate more readily by sprouting in cut-over stands. Thus, tupelos tend to become dominant when bald cypress stands are heavily logged. Green ash (Fraxinus pennsylvanica) and red maple (Acer rubrum) are occasional canopy associates and frequent understory trees. Carolina ash (F. caroliniana) is often dominant in the small tree and shrub layers, while vines of climbing hydrangea (Decumaria Barbara) are often abundant. Herb layers vary from sparse to rather lush. Most herbaceous plants of bald cypress-tupelo swamps are tolerant of muck soils and fluctuating water levels, or are capable of becoming established on tree hummocks, stumps, and logs. A few of the typical herbs are lizard's tail (Saururus cernuus), false nettle (Boehmeria cylindrical), Walter's St. John's-wort (Triadenum walteri), swamp beggar-ticks (Bidens discoidea), weak stellate sedge (Carex seorsa), giant sedge (Carex gigantean), taperleaf bugleweed (Lycopus rubellus), and pale mannagrass (Torreyochloa pallida). Although community types in this group are relatively common, high-quality specimens of the dominant trees are known to provide nesting habitats for the globally uncommon, state-rare eastern big-eared bat (Corynorhinus rafinesquii macrotis) and southern myotis (Myotis austroparius). Old-growth stands of bald cypress-tupelo swamp with trees up to 800 years old occur along the Blackwater River in Surry and Isle of Wight Counties. References: Fleming and Moorhead (1998), Parker and Wyatt (1975), Plunkett and Hall (1995).

Tidal Bald Cypress Forests and Woodlands
Coniferous or mixed swamp forests and woodlands occurring along the upper tidal reaches of rivers in southeastern Virginia. Examples are documented from the Dragon Swamp/Piankatank River (Gloucester, King and Queen, and Middlesex Counties), the Chickahominy River (Charles City, James City, and New Kent Counties), the James River (Isle of Wight and Surry Counties), and the wind-tidal Northwest River (City of Chesapeake). At some sites, these communities occur in ecotones between tidal marshes and non-tidal backswamps or uplands. Bald cypress (Taxodium distichum) dominates the open to very open canopy, with or without hardwood associates such as swamp tupelo (Nyssa biflora), water tupelo (Nyssa aquatica), and green ash (Fraxinus pennsylvanica). Stand structure and canopy cover range from closed forest to very open woodland. Shrub and herb layers are variable but generally contain a mixture of species characteristic of both marshes and swamps. Some well-developed tidal bald cypress forests appear floristically similar to palustrine bald cypress-tupelo swamps. Other stands have a nearly monospecific herb dominance by shoreline sedge (Carex hyalinolepis). In a unique, possibly fire-influenced, savanna-like stand on the Northwest River, the herbaceous dominants, in rough seasonal order, are silvery sedge (Carex canescens spp. Disjuncta), spikerushes (Eleocharis fallax and E. rostellata), marsh rattlesnake-master (Eryngium aquaticum var. aquaticum), and wild rice (Zizania aquatica var. aquatica). The environmental dynamics, compositional variation,

and state-wide distribution of this group are poorly known and need intensive study. Reference: Fleming and Moorhead (1998).

Fluvial Terrace Woodlands

A somewhat enigmatic group of communities occurring on flat, sandy terraces and islands along Coastal Plain rivers in eastern Virginia. These habitats are elevated well above the level of adjacent swamps and are characterized by xeric, sandy soils and open forest or woodland vegetation. Single occurrences have been documented along the Nottoway River (Sussex County), Chickahominy River (New Kent County), Dragon Swamp (Middlesex County), and Mattaponi River (Caroline County). At all four sites, hickories (Carya pallida and C. alba) are dominant trees, with drought-tolerant oaks (Quercus falcate, Q. nigra, Q. marilandica, Q. alba) present in smaller numbers. Shrubs occurring at all or most sites include sand post oak (Q. margarettiae), horse-sugar (Symplocos tinctoria), American holly (Ilex opaca var. opaca), and eastern red cedar (Juniperus virginiana var. virginiana). Typical herbs include sedges (Carex albicans var. australis, C. pensylvanica, and C. tonsa), Canada frostweed (Helianthemum canadense), butterfly-pea (Clitoria mariana), late goldenrod (Solidago tarda), and prickly-pear (Opuntia humifusa). The Dragon Run site is anomalous in the presence (despite low soil pH and base status) of several calciphiles such as eastern redbud (Cercis canadensis var. canadensis), wild columbine (Aquilegia canadensis), smooth rock-cress (Arabis laevigata var. laevigata), robin's-plantain (Erigeron pulchellus var. pulchellus), and elm-leaved goldenrod (Solidago ulmifolia var. ulmifolia). A full understanding of the status and compositional relationships of this group will require additional inventory and assessment.

Tidal Freshwater Marshes

A diverse group of herbaceous wetlands subject to regular diurnal flooding along upper tidal reaches of inner Coastal Plain river and tributaries. Freshwater marshes occur in the uppermost portion of the estuarine zone, where the inflow of saltwater from tidal influence is diluted by a much larger volume of freshwater from upstream. Strictly speaking, freshwater conditions have salt concerntrations <0.5 ppt, but pulses of higher salinity may occur during spring tides or periods of unusually low river discharge. The most common species are arrow-arum (Peltandra virginica), dotted smartweed (Polygonum punctatum), wild rice (Zizania aquatic var. aquatica), pickerelweed (Pontederia cordata), rice cutgrass (Leersia oryzoides), tearthumbs (Polygonum arifolium and P. sagittatum), and beggar-ticks (Bidens spp.). Locally, sweetflag (Acorus calamus) and southern wild rice (Zizaniopsis miliacea) may form large dominance patches. Species diversity and vegetation stature vary with salinity, duration of inundation, and disturbance; the most diverse marshes occupy more elevated surfaces in strictly freshwater regimes. Mud flats that are fully exposed only at low tide support nearly monospecific stands of spatterdock (Nuphar advena), although cryptic submerged aquatic species may also be present. Tidal freshwater marshes are best developed on sediments deposited by large meanders of the Pamunkey and Mattaponi Rivers, although outstanding examples also occur along the Potomac, Rappahannock, Chickahominy, and James Rivers. These communities provide the principal habitat for the globally rare plant sensitive joint-vetch (Aeschynomene virginica). Chronic sea-level rise is advancing the salinity gradient upstream in rivers on the Atlantic Coast, leading to shifts in vegetation composition and the conversion of some tidal freshwater marshes into oligohaline marshes. Tidal Freshwater Marshes are also threatened by the invasive exotic marsh dewflower (Murdannia keisak). Several communities in this group are chiefly restricted to the Chesapeake Bay drainage basin and are considered globally rare or uncommon. References: Parker and Wyatt (1975), Perry and Atkinson (1997), Perry and Hershner (1999), McCoy and Fleming (2000).

APPENDIX B: Memorandum of Agreement

Memorandum of Agreement

Between

Middle Peninsula
Planning District Commission

County of Essex, Virginia

County of Gloucester, Virginia

County of King and Queen, Virginia

County of Middlesex, Virginia

To Participate in the

Dragon Run Watershed
Special Area Management Plan

Memorandum of Agreement
Between

Middle Peninsula Planning District Commission
County of Essex, Virginia
County of Gloucester, Virginia
County of King and Queen, Virginia
County of Middlesex, Virginia

To Participate in the
Dragon Run Watershed Special Area Management Plan

1. PARTIES TO THE AGREEMENT

This Memorandum of Agreement (MOA) is between the following entities:

- Middle Peninsula Planning District Commission
- County of Essex, Virginia
- County of Gloucester, Virginia
- County of King and Queen, Virginia
- County of Middlesex, Virginia

2. ENABLING AUTHORITY

Counties of Essex, Gloucester, King and Queen, and Middlesex

Section 15.2-1300 of the Code of Virginia enables local governments to enter into cooperative agreements to exercise those powers that each may be enabled to exercise.

Middle Peninsula Planning District Commission

Section 15.2-4205 of the Code of Virginia enables the Middle Peninsula Planning District Commission to enter into cooperative agreements with local governments to exercise those powers that each may be enabled to exercise.

3. CONTEXT

The Dragon Run is a brackish water stream that flows forty miles through the Virginia Middle Peninsula counties of Essex, King and Queen, Middlesex, and Gloucester and eventually empties into the Piankatank River. The Dragon Run Watershed has been defined for the purposes of this Agreement as the Commonwealth Hydrologic Unit ID 'CO2' described by the Virginia Department of Conservation and Recreation from the streams' headwaters down to and including Meggs Bay (see Appendix).

The Dragon Run's pristine nature can, in large part, be attributed to exemplary landowner stewardship and difficult access and is a central part of the region's culture and identity. Ecologically unique, the Dragon Run was ranked second of 232 ecologically significant areas throughout the Chesapeake Bay region by the Smithsonian Institution and is characterized by extensive tidal and nontidal cypress swamp, which is otherwise rare this far north. Furthermore, the Virginia Division of Natural Heritage recognizes the importance of the Dragon Run due to occurrences of one endangered animal species, five rare animal species, eight rare plant species, and five rare natural communities. Moreover, the Dragon Run Watershed supports a high quality of life for its residents. For example, recreational activities, such as hunting, fishing, and paddling, are popular in the Dragon Run.

The Middle Peninsula Planning District Commission, advised by the Dragon Run Steering Committee, obtained a Virginia Coastal Resources Management Program grant for the development of the Dragon Run Watershed Special Area Management Plan (SAMP). Each county in the watershed makes three appointments – one elected official and two landowners along the Dragon Run – to the Dragon Run Steering Committee. The SAMP Advisory Group, which reports to the Steering Committee, represents a cross-section of the community, including: Steering Committee members; local government elected officials and planning staff; landowners; state agencies; farming; forestry; education; non-profit organizations; and ecotourism.

4. PURPOSE AND TERMS OF THE AGREEMENT

The project's mission, as recommended by the SAMP Advisory Group to the Dragon Run Steering Committee, is to support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed.

Each of the signatory entities in this Memorandum of Agreement agrees to participate in the Special Area Management Plan to promote the distinctive treatment deserving of the Dragon Run Watershed through the support and efforts of local government, the fostering of educational partnerships and grassroots support and the involvement of landowners whose stewardship has served to preserve the wonder of the Dragon. The signatories will consider the recommendations of the Dragon Run Steering Committee's SAMP Advisory Group to achieve the following goals and objectives that it developed by consensus:

GOAL I
Establish a high level of cooperation and communication between the four counties within the Dragon Run Watershed to achieve consistency across county boundaries.

OBJECTIVE A
Develop a plan to address the inevitable future development pressure to change the traditional use of land in the Dragon Run Watershed.

OBJECTIVE B
Achieve consistency across county boundaries among land use plans and regulations in order to maintain farming and forestry and to preserve natural heritage areas by protecting plants, animals, natural communities, and aquatic systems.

OBJECTIVE C
Provide ongoing monitoring of existing plans and planning tools in order to assess traditional land uses and watershed health and take action necessary to preserve the watershed.

OBJECTIVE D
Comprehensively implement Best Management Practices (BMPs) for water quality, wildlife habitat, and soil conservation.

GOAL II
Foster educational partnerships and opportunities to establish the community's connection to and respect for the land and water of the Dragon Run.

OBJECTIVE A
Encourage experience-based education consistent with the Stewardship and Community Engagement goals of the Chesapeake 2000 Agreement.

OBJECTIVE B
Promote the community and economic benefits of the Dragon Run derived from its natural characteristics and traditional uses such as farming, forestry, hunting and fishing.

GOAL III
Promote the concept of landowner stewardship that has served to preserve the Dragon Run Watershed as a regional treasure.

OBJECTIVE A
Address the potential dilemma of preserving the watershed's sense of peace and serenity by protecting open space and reducing fragmentation of farms, forests, and wildlife habitat versus the landowners rights in determining or influencing future land use.

OBJECTIVE B
Educate landowners about the regional importance of the Dragon Run.

The Advisory Group's recommendations to achieve the goals and objectives will be delivered by the Dragon Run Steering Committee to the signatory entities for their consideration.

5. MODIFICATIONS

Modifications to this Memorandum of Agreement must be submitted in writing and approved by all parties to the Memorandum of Agreement.

6. EFFECTIVE DATE

The effective date of the Memorandum of Agreement shall be the date of the signing of the Memorandum of Agreement by the Counties of Essex, Gloucester, King and Queen, and Middlesex and the Middle Peninsula Planning District Commission.

7. DURATION AND TERMINATION OF THE AGREEMENT

The duration of this Memorandum of Agreement will be until such time as it is terminated upon agreement of all parties; however, any party to the Memorandum of Agreement may terminate its participation by written notice to all other parties.

8. MANNER OF FINANCING

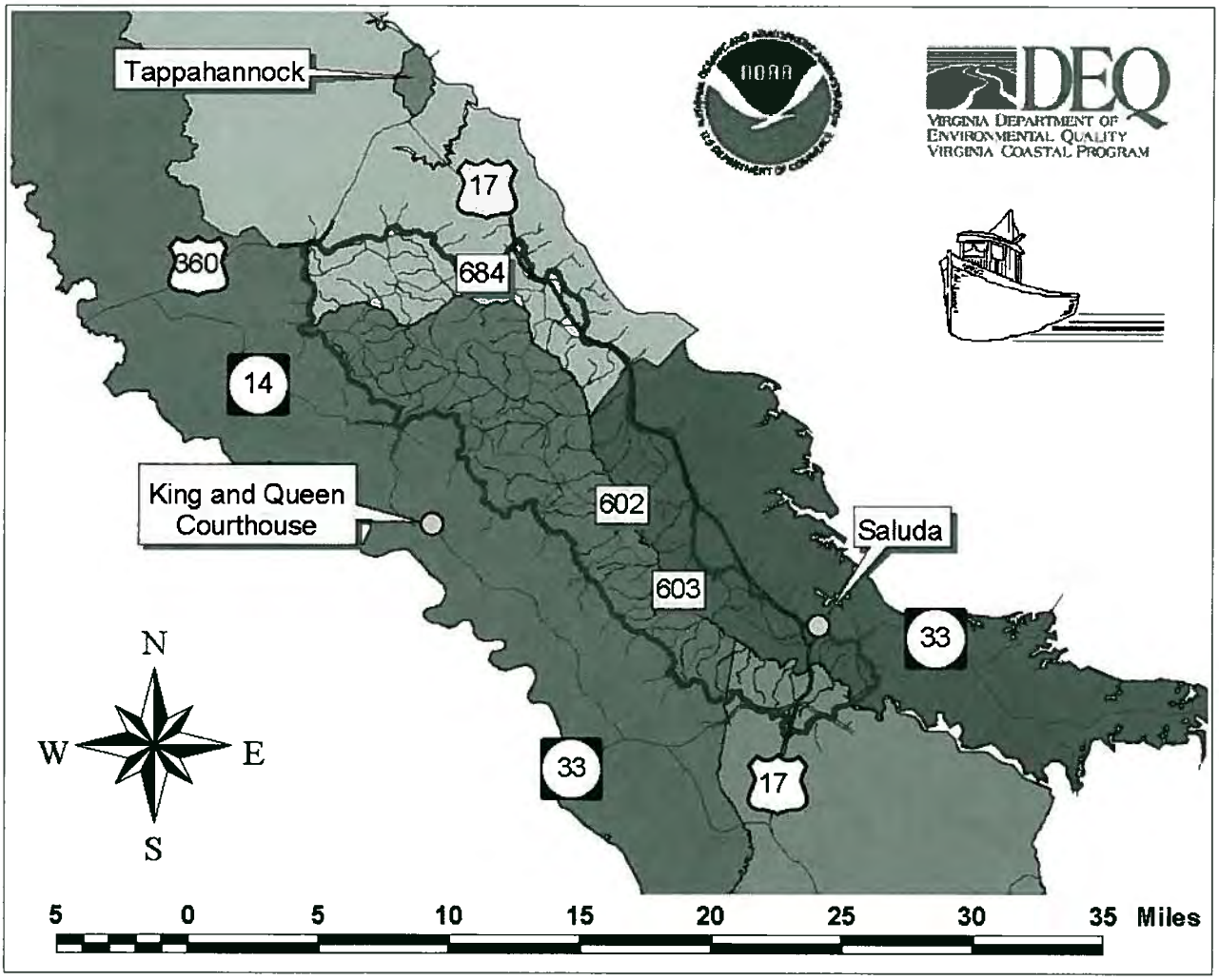
This Memorandum of Agreement will not require financing or budgeting from or by the signatory agencies; however, this clause will not preclude, under a separate document or agreement, grant funding or other financial assistance from one signatory to another for the purpose of carrying out the purposes of the Memorandum of Agreement.

9. OWNERSHIP OF PROPERTY

It is not the intent of the signatory parties that this Memorandum of Agreement will result in the purchase, ownership, holding or conveying of any real or personal property.

10. APPENDIX

Map of the Dragon Run Watershed - defined as Commonwealth Hydrologic Unit ID 'CO2' described by the Virginia Department of Conservation and Recreation from the streams' headwaters down to and including Meggs Bay.



LIST OF SIGNATORIES

Middle Peninsula Planning District Commission

County of Essex, Virginia

County of Gloucester, Virginia

County of King and Queen, Virginia

County of Middlesex, Virginia

SIGNATURE PAGE FOR THE MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

IN WITNESS WHEREOF, the following individuals execute this agreement

Chairman, Middle Peninsula Planning District Commission

County Administrator, County of Essex, Virginia

County Administrator, County of Gloucester, Virginia

County Administrator, County of King and Queen, Virginia

County Administrator, County of Middlesex, Virginia

MIDDLE PENINULA PLANNING DISTRICT COMMISSION

By: Charles E. Ingram

Date: 8-1-202

Attest:

Date: 8/1/02

SIGNATURE PAGE FOR THE COUNTY OF ESSEX, VIRGINIA

IN WITNESS WHEREOF, the following individuals execute this agreement

Chairman, Middle Peninsula Planning District Commission

County Administrator, County of Essex, Virginia

County Administrator, County of Gloucester, Virginia

County Administrator, County of King and Queen, Virginia

County Administrator, County of Middlesex, Virginia

COUNTY OF ESSEX, VIRGINIA

By: Margaret Davis

Date: AUGUST 20, 2002

Attest: Linda E. Simpson

Date: AUGUST 20, 2002

8

SIGNATURE PAGE FOR THE COUNTY OF GLOUCESTER, VIRGINIA

IN WITNESS WHEREOF, the following individuals execute this agreement

Chairman, Middle Peninsula Planning District Commission

County Administrator, County of Essex, Virginia

County Administrator, County of Gloucester, Virginia

County Administrator, County of King and Queen, Virginia

County Administrator, County of Middlesex, Virginia

COUNTY OF GLOUCESTER, VIRGINIA

By: _____

Date: 10-3-22

Attest: _____

Date: _____

SIGNATURE PAGE FOR THE COUNTY OF KING AND QUEEN, VIRGINIA

IN WITNESS WHEREOF, the following individuals execute this agreement

Chairman, Middle Peninsula Planning District Commission

County Administrator, County of Essex, Virginia

County Administrator, County of Gloucester, Virginia

County Administrator, County of King and Queen, Virginia

County Administrator, County of Middlesex, Virginia

COUNTY OF KING AND QUEEN, VIRGINIA

By: _____

Date: 9/9/02

Attest: K. Deane Debus

Date: 9-9-02

10

SIGNATURE PAGE FOR THE COUNTY OF MIDDLESEX, VIRGINIA

IN WITNESS WHEREOF, the following individuals execute this agreement

Chairman, Middle Peninsula Planning District Commission

County Administrator, County of Essex, Virginia

County Administrator, County of Gloucester, Virginia

County Administrator, County of King and Queen, Virginia

County Administrator, County of Middlesex, Virginia

COUNTY OF MIDDLESEX, VIRGINIA

By: C M Culley

Date: 10-2-02

Attest: Betty S. Callis

Date: 10-2-02

APPENDIX C: Description of Natural Resource Preservation Tools

Conservation Easements: According to the Virginia Conservation Easement Act (§10.1-1009 et seq.), a conservation easement "means a nonpossessory interest of a holder in real property, whether easement appurtenant or in gross, acquired through gift, purchase, devise, or bequest imposing limitations or affirmative obligations, the purposes of which include retaining or protecting natural or open-space values of real property, assuring its availability for agricultural, forestal, recreational, or open-space use, protecting natural resources, maintaining or enhancing air or water quality, or preserving the historical, architectural or archaeological aspects of real property." There are significant tax benefits associated with the donation of conservation easements. The terms of the easement are highly flexible and dictate the permissible uses of the land. The easement is attached to the deed for the property.

Purchase of Development Rights (PDR) or Purchase of Agricultural Conservation Easements (PACE): A voluntary land conservation program that pays landowners to protect the cultural and natural resource assets of their property. The purpose is to protect open-space, agricultural, historic, scenic, and natural resources. In particular cases, the purpose is to maintain the economic viability of farm and forest operations. The program allows landowners to enter into agreements to sell the development potential of qualifying property to the County while maintaining the right to continue to use, own, sell, mortgage, and bequeath the property. PDR programs accommodate a variety of conservation categories and generally protect land in perpetuity, while PACE programs are specifically geared to agricultural operations and sometimes offer a buyback option at the current fair market value after a specified period of time.

Chesapeake Bay Preservation Act: The Chesapeake Bay Preservation Act (§10.1-2100 et seq.) requires that "(i) the counties, cities, and towns of Tidewater Virginia incorporate general water quality protection measures into their comprehensive plans, zoning ordinances, and subdivision ordinances; (ii) the counties, cities, and towns of Tidewater Virginia establish programs, in accordance with criteria established by the Commonwealth, that define and protect certain lands, hereinafter called Chesapeake Bay Preservation Areas, which if improperly developed may result in substantial damage to the water quality of the Chesapeake Bay and its tributaries." Furthermore, the Act states that "Local governments have the initiative for planning and for implementing the provisions of this chapter, and the Commonwealth shall act primarily in a supportive role by providing oversight for local governmental programs, by establishing criteria as required by this chapter, and by providing those resources necessary to carry out and enforce the provisions of this chapter."

Agricultural and Forestal Districts: The Local Agricultural and Forestal Districts Act (§15.2-4400 et seq.) indicates that "It is state policy to encourage localities of the Commonwealth to conserve and protect and to encourage the development and improvement of their agricultural and forestal lands for the production of food and other agricultural and forestal products. It is also state policy to encourage localities of the Commonwealth to conserve and protect agricultural and forestal lands as valued natural and ecological resources which provide essential open spaces for clean air sheds, watershed protection, wildlife habitat, aesthetic quality and other environmental

purposes. It is the purpose of this chapter to provide a means by which localities may protect and enhance agricultural and forestal lands of local significance as a viable segment of the local economy and as an important economic and environmental resource." Agricultural/forestal districts qualify for reduction in property tax rate under land use assessment.

Land Use Assessment: Authorized by the Code of Virginia (§58.1-3229 et seq.), a land use assessment program provides for the deferral of real estate taxes on real estate that qualifies for agricultural, horticultural, forestry and/or open space uses. Assessed values under the program are generally less than those estimated at fair market value. The purpose of such a program is generally to encourage the preservation of land, the protection of natural resources, the supply of safe water, and the promotion of orderly land use planning and development.

Sliding Scale Property Tax Rate: Used in conjunction with a land use assessment program, local governments may reduce the tax rate on properties that agree to remain in their current use for up to 20 years. The sliding scale of tax rates is based upon the length of the agreement.

Sliding Scale Zoning: This zoning method targets land in agricultural zoning districts and is designed to preserve agricultural land and open space. Sliding scale zoning allows a range of density depending on the size of the original lot. As parcel size increases, the density of allowable dwelling units decreases, enabling the preservation of large contiguous tracts of land that can still be farmed or simply preserved as open space. Lots that have been created from a parent parcel cannot be subdivided.

Local "Right-to-Farm": Virginia's Right-to-Farm laws (§3.1-22.28 et seq.) make any agricultural or silvicultural operation a "by right" use in agriculturally zoned areas. Special use permits cannot be required for operations in these areas and these operations cannot be found guilty of nuisance. The local variation of Right-to-Farm triggers notification to new or potential purchasers of land in agricultural zones of daily farming activities and possible "inconveniences" (e.g. dust, odors, noise).

State Forest: The Virginia Dept. of Forestry (DOF) manages state forests by balancing a self-supporting operation with multiple benefits, such as timber management, recreation, aesthetics, wildlife, water quality, and stability of the local economy. Operations are funded by the sale of forest products, with twenty-five percent of this revenue returned to the county in which the state forest is located. Special demonstration, research, and recreation areas are sometimes featured in state forests.

Virginia Natural Area Preserves System: Administered by the Department of Conservation and Recreation's Division of Natural Heritage, the Virginia Natural Area Preserves System protects examples of some of the rarest natural communities and rare species habitats in the Commonwealth. Natural Area Preserves are managed for their rare plants, animals and natural communities. Natural Area Preserve dedication places legally binding restrictions on future activities on a property. Preserve ownership

includes the Department of Conservation and Recreation, local governments, universities, private citizens, and non-profit conservation organizations. Access ranges from low-intensity public access to owner permission.

Virginia Estuarine and Coastal Research Reserve System: The Virginia Estuarine and Coastal Research Reserve System (VECRRS), created in the Code of Virginia (28.2-1103 et seq.), protects estuarine and coastal lands for research and long-term monitoring that supports the Commonwealth's coastal resource management efforts. The Virginia Institute of Marine Science administers the Reserve System, which is coordinated with the Chesapeake Bay National Estuarine Research Reserve in Virginia. A 121-acre research reserve site is located in the Dragon Run watershed.

APPENDIX D: Description of Farm Programs

The **Conservation Reserve Program** (NRCS, 2003a) reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filterstrips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. Cost sharing is provided to establish the vegetative cover practices.

The **Conservation Reserve Enhancement Program (CREP)** (NRCS, 2003a) aims to improve Virginia's water quality and wildlife habitat by offering rental payments to farmers who voluntarily restore riparian buffers, filter strips and wetlands through the installation of approved conservation practices. CREP is an enhancement to the federal *Conservation Reserve Program*.

The Virginia CREP has two programs. The *Chesapeake Bay CREP* targets Virginia's entire bay watershed and calls for the planting of 22,000 acres of riparian buffer and filter strips as well as 3,000 acres of wetland restoration. The *Southern Rivers CREP* targets watersheds outside the bay drainage basin and will establish 8,500 acres of riparian buffer and filter strip plantings and 1,500 acres of wetland restoration.

The **Environmental Quality Incentives Program (EQIP)** (NRCS, 2003a) was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. These contracts provide incentive payments and cost-shares to implement conservation practices. Those engaged in livestock or agricultural production on eligible land may participate. EQIP activities are carried out according to an environmental quality incentives program plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice or practices to address the resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. The local conservation district approves the plan.

EQIP may cost-share up to 75 percent of the costs of certain conservation practices. Incentive payments may be provided for up to three years to encourage producers to carry out management practices they may not otherwise use without the incentive. However, limited resource producers and beginning farmers and ranchers may be eligible for cost-shares up to 90 percent. Farmers and ranchers may elect to use a certified third-party provider for technical assistance. An individual or entity may not receive, directly or indirectly, cost-share or incentive payments that, in the aggregate, exceed $450,000 for all EQIP contracts entered during the term of the Farm Bill.

The program targets watersheds, regions, and areas of special environmental sensitivity or other areas facing significant soil, water or related natural resources concerns. By encouraging voluntary landowner participation in these areas, EQIP supports the development and implementation of conservation plans in critical areas. Developed in cooperation with professional resource managers, the plans encompass both scientific management principles, and landowner objectives.

The **Farm and Ranch Lands Protection Program** (NRCS, 2003a) provides matching funds to help purchase development rights to keep productive farm and ranchland in agricultural uses. Working through existing programs, the U.S. Department of Agriculture (USDA) partners with State, tribal, or local governments and non-governmental organizations to acquire conservation easements or other interests in land from landowners. USDA provides up to 50 percent of the fair market easement value.

To qualify, farmland must: be part of a pending offer from a State, tribe, or local farmland protection program; be privately owned; have a conservation plan for highly erodible land; be large enough to sustain agricultural production; be accessible to markets for what the land produces; have adequate infrastructure and agricultural support services; and have surrounding parcels of land that can support long-term agricultural production.

The **FarmLink Program** (Virginia Farm Bureau, 2003) connects farmers who are looking to sell, but wish to see their farms remain active, with people who would like to farm. Currently, the "highest and best use" of most farmland is considered to be in housing lots and shopping malls. As farmers retire or move on, they are often forced to divide up their farmland to pay off debt. In other cases, the land is worth so much more as a "development" site that the farmer finds it impossible to turn this option down. The goal of the FarmLink Program is to curb this trend and maintain the state's agricultural heritage for generations to come.

Prospective farmers and farmers searching for options for their farms each fill out an application form. This information is entered into a database so that farms may be sorted by location, size, type and other features that a potential buyer might be seeking. When it appears that a match is possible, the buyer and seller are both contacted by the FarmLink coordinator. If the farm owner agrees to meet the potential buyer, they are connected. Because many people who are looking to farm cannot afford to buy a farm outright, sellers are asked to consider long-term leases and work-in options in addition to immediate sale.

The **Forest Land Enhancement Program** (FLEP) (NRCS, 2003a) was part of Title VIII of the 2002 Farm Bill. FLEP embodies a commitment to sustainable forest management to enhance the productivity of timber, fish and wildlife habitat, soil and water quality, wetlands, recreational resources, and aesthetic values of forest land. It also establishes a coordinated and cooperative Federal, State, and local sustainable forestry program for

the establishment, management, maintenance, enhancement, and restoration of forests on nonindustrial private forest land.

FLEP is a voluntary program designed to provide technical, educational, and cost-share assistance to promote sustainability of non-industrial private forest. State forestry agencies develop State Priority Plans that provide details for how the FLEP funds will be utilized, including minimum acres, maximum acres, aggregate payment, use for technical, educational and cost-share assistance, and all other factors for the program. Landowners are required to have a forest management plan to be eligible for cost-share. The practices to be cost-shared and the cost-share rate are described in the State Priority Plan.

The cost-share practices are limited to the treatment of 1,000 acres per year on non-industrial private forest (NIPF) with an aggregate payment not to exceed $100,000 for the life of this Farm Bill. A waiver for the treatment of up to 5,000 acres is available if significant public benefit is shown. There is no limit to the amount of forest land owned by an individual as long as the person qualifies as an NIPF owner.

The **Wetlands Reserve Program** (NRCS, 2003a) is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The USDA Natural Resources Conservation Service (NRCS) provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection.

The **Wildlife Habitat Incentives Program (WHIP)** (NRCS, 2003a) is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. NRCS provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the participant generally last from 5 to 10 years from the date the agreement is signed.

APPENDIX E. Deer Hunting Plan Samples and Sample Lease

Special Managed Waterfowl Hunt: KEY IDEAS

WHY CONDUCT A WATERFOWL HUNT ON A NATURAL AREA?

- Historical use: prior to acquisition and/or management by the state as a natural area; private interests hunted ducks and geese here regularly.

- TNC is now responsible for regulating and managing the use of portions of the property by the public. These uses must be compatible with the objectives for which the property was acquired by the state in the first place.

- Virginia law provides that anyone can hunt waterfowl in public waters during established seasons and using legal methods so long as they are not within 500 yards of an existing licensed waterfowl blind. Therefore, if TNC does not license, establish, and use (for the purpose of hunting) waterfowl blinds along the shoreline at the holding, then any member of the public has the opportunity to obtain a license and build a stationary hunting blind in the public waters surrounding the holding. Where stationary blinds are not built, anyone could legally hunt from licensed floating blinds (boats) in the waters adjacent to the holding.

- The result of TNC not establishing and managing the use of shore blinds at portions of the holding is expected to be the potential licensing and construction of blinds, and the frequent use of these blinds in the public waters surrounding the Reserve, making it a *de facto* waterfowl hunting area from November through January of every year. This unregulated use may not be in the interest of TNC and visitor/researcher safety could be of high concern.

The Department of Conservation and Recreation, Division of Natural Heritage allows managed waterfowl and deer hunting at selected Natural Area Preserves. The information that follows are examples of information that DCR-DNH distributes to potential and/or registered hunters participating in these hunts.

---------- Natural Area Preserve
Managed Deer Hunt Rules and Regulations

1. All hunters must sign in at the check-in kiosk when arriving at the Preserve and sign out when leaving.

2. All hunters in the party must possess a valid DCR hunting permit. Each permit will bear the name of the Chief-of-Party, who will be responsible for providing the name and Virginia Hunting License number of each party member on their hunting permit.

3. Each hunter must have on his/her person proof of successfully completing a Hunter Education Course (certificate or copy of certificate).

4. Hunters hunting alone must be 16 years of age by the date of the hunt. Youth hunters aged 12-15 must be accompanied by an adult at all times. Both the youth and the adult must possess a DCR hunting permit and proof of completing a Hunter Education Course.

5. Hunters must have all necessary state licenses and abide by all state and DCR regulations.

6. Allowable weapons are shotguns with rifled slugs or buckshot.

7. All deer targeted must be within the Preserve boundaries, which are marked by conspicuous white signs and yellow boundary paint.

8. A limit of two (2) deer per hunter, per day, one of which must be antlerless, may be harvested. **The objective of the hunt is to reduce the size of the deer herd. Therefore, the harvesting of antlerless deer is strongly encouraged.**

9. All deer harvested should be tagged immediately at the point of kill.

10. Hunters are asked to voluntarily provide the following data for harvested deer:
    - sex
    - weight (dressed)
    - number of points (bucks), lactation status, pregnancy & number of young (does)
    - general health and condition

Additional notes:

Data sheets will be available at the check-in kiosk. Scales for weighing deer will not be provided. It is requested that hunters bring their own scales to provide this key harvest statistic. If necessary and only if scales are unavailable, hunters should estimate the field dressed weights of harvested deer in order to complete the data sheet.

Hunter Information Summary Sheet
2004 Lottery Deer Hunt
---------- Natural Area Preserve

Dates: December 6-11, 2004 (Monday - Saturday)
December 13-18, 2004 (Monday - Saturday)

Type of Hunt:
- This is a **lottery** hunt.
- A non-refundable $5.00 State Park Reservation fee will be required at the time of application in order to enter the lottery. Applications and payment must be received by **5:00 PM on Friday, October 8, 2004**. Make checks payable to *Treasurer of Virginia.* Telephone applications and payment by credit card is also acceptable.
- Each selected applicant will be assigned one (1) hunt day during the 2-week hunting period. Selected applicants will be notified within two (2) weeks of the random drawing.
- Each selected applicant may request up to five (5) permits for their assigned hunt day, for a party of up to five hunters. For each member of the hunting party, a $10.00 Natural Area Preserve hunting permit fee must be remitted.
- Hunting permit fee payments must be received by Friday, November 5, 2004. Hunting permit fees must be made by personal check, payable to *Natural Area Preservation Fund*, and mailed to the Department of Conservation and Recreation, 217 Governor Street, Richmond, VA, 23219 – Attention: ---------- Deer Hunt

Participation Requirements:
All members of the hunting party:
1. Must possess all necessary state licenses.
2. Must possess issued hunt permit from DCR.
3. **Must show proof of having completed a Hunter Education Course.**
4. Must be 16 years of age or older to hunt alone. Hunters 12-15 years of age may hunt as a member of the party, but must be under the direct supervision of a hunting adult.
5. Must abide by and meet all rules and regulations, including but not limited to, weapons and ammunition restrictions/specifications and blaze orange requirements (vest and hat).

How to Participate:
- By filling out a lottery application and returning it to the State Parks Reservation Center – along with a non-refundable $5.00 application fee. Applications may also be made by telephone with application fees paid by credit card (call 1-800-933-PARK).

Applications must be received by 5:00 PM on October 8, 2004.
- Selected hunters will be notified by October 22, 2004. Each hunter must render payment of the Natural Area Preserve fee ($10.00 per hunter) to: DCR-Division of Natural Heritage, 217 Governor Street, Richmond, Virginia 23219. Payment must be received by November 5, 2004 or the hunt date will be forfeited and offered to hunters on a stand-by list. Payment should be by personal check made out to *Natural Area Preservation Fund.* Please specify -------- Deer Hunt on the memo line.
- The selected applicant will be considered the Chief-of-Party and will be responsible for all payment to DCR and distributing permits to hunt party members.

•Once payment is made, the Chief-of-Party will be sent an information packet, including maps and hunting permits.

Allowable Weapons:
Allowable weapons are shotguns with rifled slugs or buckshot.
Hunters may ground hunt or use portable tree stands with approved safety belts.

Hunt Zones:
Hunters may hunt anywhere within the preserve boundaries (299 acres). All deer targeted must be within the preserve boundaries. There will only be 1 hunting party on any given day (the hunting party consisting of the successful applicant and up to four other hunters if the applicant chooses).

Allowable Harvest:
A limit of two (2) deer per hunter, one of which must be antlerless, may be harvested. The objective of the hunt is to reduce the size of the herd. Therefore, the harvesting of does is strongly encouraged.

Additional Harvest Information:
All deer harvested must be tagged immediately. Field dressing of deer should occur at the point of kill.

Hunter's will be required to provide the following information for harvested deer:
•sex
•weight **(either live or dressed; hunter's must provide scale)**
•number of antler points, lactation status, pregnancy (as applicable)
•general health and condition.
Data sheets will be available at the Hunter Check-in Kiosk.

Disabled Hunters:
Hunting at ------- NAP requires traversing rough terrain (thick underbrush, sand dunes, drainage ditches, wetlands).

Scouting and Additional Information:
To arrange a scouting date or for additional information, call: -----

VIRGINIA HUNTING LEASE **7/18/08**

1. **LESSOR:** The Nature Conservancy, a nonprofit corporation, organized and existing under the laws of the District of Columbia

Contact: Andrew D. Lacatell Title: Director, Chesapeake Rivers Program
Address: 530 East Main Street, Suite 800
Richmond, VA 23219
Phone: 804-644-5800 ext. 18

2. **LESSEE:**

Contact:

Phone: (H) (W)

3. **PROPERTY:** More fully shown on attached Exhibit A

Site Name	Tract Name	Acres Leased	County
Dragon Run	Boyer	230.232	Middlesex
Dragon Run	Hall	222.57	Middlesex
Dragon Run	Keiningham	42.00	Middlesex
	Total Acres Leased:	494.802	

4. **TERM:** 12 months, commencing September 1, 2007 and terminating August 30, 2008 (unless sooner terminated as provided herein) at 11:59 p.m., local time.

5. **ANNUAL RENTAL:** $XXXX, due and payable in full, in advance and without notice or offset on or before the commencement date in paragraph 4. The ANNUAL RENTAL is based on the number of acres leased (495), times $X. The ANNUAL RENTAL also includes $X/acre for liability and accident insurance.

Throughout this Lease, the terms "LESSOR," LESSEE," "PROPERTY," "TERM," and "ANNUAL RENTAL" shall have the meanings set forth in paragraphs 1 through 5. THE TERMS AND CONDITIONS FROM THE REMAINING PAGES OF THIS LEASE, INCLUDING EXHIBIT B, ARE INCORPORATED HEREIN.

LESSOR: THE NATURE CONSERVANCY

By: _____

Its _____

LESSEE:

By: _____

Its _____

6. LESSOR hereby leases to LESSEE, for the ANNUAL RENTAL and upon the terms and conditions herein stated including Exhibit "B", all of the hunting rights and privileges on the PROPERTY.

7. The hunting privileges granted hereby are for exclusive use of members of LESSEE, their immediate families and accompanied guests, and do not include the right to sell or otherwise grant or license hunting privileges to non-members or permit commercialization of these hunting privileges in any way. A complete list of all members who will have hunting privileges will be submitted to the LESSOR with lease payment. Members are restricted to one guest at any one time.

8. In addition to the ANNUAL RENTAL, and as further consideration for this Lease, LESSEE will properly protect the PROPERTY, including the timber and trees thereon, from trespass and damage, post property boundaries with signs or paint provided by LESSOR, remove all trash and garbage and all spent shells or cartridge casings, and perform any additional duties set forth on Exhibit B.

9. LESSEE agrees to abide by all applicable federal, state or local laws regarding hunting and LESSEE further agrees to abide by rules established by LESSOR from time to time. As of the date of this Lease, such rules are stated on Exhibit B. The LESSOR reserves the right to change such rules, in its discretion, by notice to LESSEE. Any violation of federal, state or local hunting laws or of LESSOR's rules shall be a breach of this Lease.

10. Unless specifically permitted by Exhibit B, LESSEE and its members shall not construct any buildings or other permanent or semi-permanent structures on the PROPERTY and shall not construct permanent tree stands in any tree situated on the leased premises, or drive spikes, nails (except aluminum nails used for posting signs) wires or other foreign objects into any such tree. The use of farm tractors and other vehicles on the PROPERTY is prohibited, except as permitted by Exhibit B.

11. LESSEE, its successors and assigns, agrees to indemnify and hold LESSOR harmless from any and all claims, losses, damages, costs, liabilities or expenses made against or sustained by LESSOR by reason of injury or death to any person or persons, or damages to any person or property from any cause whatsoever occasioned by or arising out of the occupation or use of the PROPERTY by LESSEE, its members, guests, agents or employees.

    LESSEE will automatically be covered by the Hunt Liability Insurance program offered by the Davis-Garvin Agency while engaged in hunting activities on the PROPERTY. As an Additional Named Insured on the policy, LESSEE is afforded the same coverage and limitations as LESSOR. All administration of this insurance program is handled by Davis-Garvin. Direct any and all questions concerning this insurance program, any requests for certificates of insurance, or inquiries about coverage to:

    Mr. Ed Wilson or Ms. Jody Byrd
    Davis-Garvin Agency
    P.O. Box 21627
    Columbia, SC 29221
    Phone: (800) 845-3163 or (803) 732-0060
    Fax: (803) 781-6712

    If LESSEE desires a certificate of insurance, it must contact the Davis-Garvin Agency; it will not automatically receive one. LESSOR makes no representations as to the sufficiency of the coverage afforded to LESSEE as an Additional Named Insured under the policy. It is LESSEE'S responsibility to assess its own insurance needs and to obtain additional insurance, if necessary, to provide the types and levels of coverage appropriate to satisfy its particular circumstances.

12. The rights and privileges conferred by this Lease are to be exercised by LESSEE in such a way as not to interfere with the authorized cutting and removal of timber, or with other use of the PROPERTY by guests, licensees or other lessees of LESSOR, or with any sale or disposition LESSOR might make of the PROPERTY during the TERM; this Lease being specifically subject to any action of LESSOR related to the sale, lease or other disposition or development of the PROPERTY, it being understood and agreed that if LESSOR should sell, lease or make other disposition of the PROPERTY, it shall have the right to cancel this Lease at any time upon giving written notice addressed to LESSEE at its address set out above and upon the mailing of such notice, this Lease shall automatically be terminated.

In the event of such termination, LESSOR shall refund the ANNUAL RENTAL in proportion to the fraction in which the numerator is the number of days remaining in the hunting season as of the date of termination and the denominator is the total days in the entire hunting season.

13. LESSEE's breach of any term and condition of this Lease may, in LESSOR's sole and absolute discretion, result in the immediate termination of this lease without refund. LESSOR will provide written notification to LESSEE of any breach and of LESSOR's decision to terminate, and the Lease shall automatically be terminated upon receipt by LESSEE of such notification. Without limiting the generality of the foregoing, if any guest or non-guest hunting on the PROPERTY is found in violation of any rule or condition of this Lease, this Lease may be terminated by the LESSOR, in the LESSOR'S sole and absolute discretion, without refund of any portion of the ANNUAL RENTAL. This includes violation of any federal, state or local law, ordinance, or regulation committed on the PROPERTY or any violation of Virginia Department of Game and Inland Fisheries regulations.

14. LESSEE agrees to obtain all necessary licenses and permits required by federal, state and local laws, ordinances and regulations for any activity undertaken by said LESSEE whatsoever arising out of the use by LESSEE of the PROPERTY in accordance with this Lease.

15. No renewal, extension, addition or modification of this Lease shall be binding upon LESSOR, unless executed in writing by its authorized representative.

16. Where access to the PROPERTY is across lands owned by LESSOR but leased to others, such access shall be limited to roads designated by LESSOR.

17. Any notice required or permitted hereunder shall be deemed properly given when deposited in the U.S. mail, postage paid, certified, return receipt requested, to the addresses set forth in the first and second paragraphs of this Lease. Either party may change the address to which notices should be sent by proper notice to the other.

18. No provision of this Lease may be amended or waived except by an instrument in writing, signed by both parties. No act or failure to act by LESSOR shall be deemed a waiver of its rights and no waiver of any one provision or on any one occasion shall be deemed a waiver of other provisions or on other occasions. LESSOR shall have available, in addition to the right to terminate set forth in paragraph 13, all rights and remedies at law or in equity, and no exercise of one right or remedy shall be deemed an election of remedies precluding other remedies.

EXHIBIT "B"

NATURE CONSERVANCY RULES

DEER: Deer may be taken in accordance with published Virginia Department of Game and Inland Fisheries Regulations, "Hunting and Trapping in Virginia, July 2007 to June 2008 Regulations" (VDGIF Regulations)

TURKEY: No harming, killing or removing of turkey from The Nature Conservancy property in any way.

WATERFOWL: No harming, killing or removing of turkey from The Nature Conservancy property in any way.

BEAR: No harming, killing or removing of bears from The Nature Conservancy property in any way.

TRAPPING: Beavers may be removed in accordance with VDGIF Regulations. No trapping of other furbearers, predators or any other animals from The Nature Conservancy property is permitted.

FISHING: No fishing permitted on The Nature Conservancy property in any way.

BAITING: No baiting permitted on The Nature Conservancy property in any way.

MAINTENANCE: Maintain all existing roads, fences, gates and locks. Post all boundaries. If a lock is replaced, provide LESSOR with two keys within five days by certified mail, return receipt requested.

PARTICIPATION IN DMAP PROGRAM: Prior to the commencement of the term of this Lease, **LESSEE shall enroll in the Virginia Department of Game and Inland Fisheries (DGIF) Deer Management Assistance Program (DMAP), unless LESSEE is already enrolled in a similar DGIF program**.

ADDITIONAL OBLIGATIONS OF LESSEE: Completion of The Nature Conservancy Disclosure Form for Real Estate Transactions and Liability and Indemnity Agreement.

ADDITIONAL LEASE ON PROPERTY: Lessee recognizes there is a separate hunting lease for turkey. Lessee of the Deer hunting lease will not hunt on the Property from during the Spring Gobbler Season as outlined in the VDGIF Regulations.

PERMITTED VEHICULAR USE: Farm equipment (including tractors and backhoes) may be used on the property for the purpose of maintaining roads. There shall be no use of All-Terrain Vehicles (aka, "four-wheelers). All other vehicles must stay on existing roads.

APPENDIX F. Public Use Guide

What can the public do on rivers that are navigable for title purposes?
The three activities that the courts have traditionally mentioned are navigation, fishing, and commerce. The public can fish, from the river or from the shore below the "ordinary low water line." (Note that the fish and wildlife are owned by the state in any case.) But the courts have ruled that any and all non-destructive activities in these areas are legally protected.

What about getting to and from the river?
Normally there is no right to cross private land to get to or from a river. For example, there is no right to walk across a farmer's field to get from a public highway to a river.

However, the state has a duty to maintain public access routes to rivers under certain conditions, as part of its public trust duties. Courts have found it unlawful for a state to close off an existing public access route when there are no other public access routes nearby.

What about river pollution and leaving trash?
Local, state and federal regulations limit or prohibit water pollution. Hefty fines can apply.

Balancing private property and public rights through a Code of Conduct in the Dragon Run
The sense of being invaded by trespassers strikes a deep emotional chord in many a landowner who has a river flowing through his property. Some Dragon Run landowners tend to lump all river users together - those who canoe quietly down the middle of the river, those who stand quietly below the ordinary low water line to fish, those who stay on or near the river but litter and make noise, and those who proceed well away from the river onto private land. However, the right of the public for the use of title navigable waterways soundly exists in the Public Trust Doctrine. This right may be compared to the right to use a public roadway. Individuals have the right to use the roadway in its defined boundaries, but not drive through adjacent private yards or throw litter out of the window as they are passing through.

Additionally, while public roadways are generally well defined, the line between navigable and non-navigable waterways becomes increasingly vague as one travels further from the natural and ordinary Dragon Run mainstem, thereby increasing the potential for conflict between landowners and users.

Ultimately, the practice of responsible recreation coupled with an awareness of the public and private rights, including its vagueness in some locations, is the key to reducing conflict.

Acknowledgement: Adapted from *Who Owns the River?* From the National Rivers Website:
http://www.nationalrivers.org/us-law-who-

Virginia Coastal Zone MANAGEMENT PROGRAM

This work was funded by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant # NA06NOS4190241 Task 95 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended. The views expressed are those of the author(s) and do not necessarily reflect the views of NOAA or any of its subagencies.

Public Use Guide

Dragon Run WATERSHED

Mission: To support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed.

Saluda Professional Center
125 Bowden Street
P.O. Box 286
Saluda, VA 23149-0286
Phone: (804) 758-2311
Fax (804) 758-3221
sstamp@mppdc.com
www.mppdc.com/dragon.shtml

DRAGON RUN SPECIAL AREA MANAGEMENT PROGRAM

DRAGON RUN SPECIAL AREA MANAGEMENT PROGRAM

What is the Dragon Run Special Area Management Program (SAMP)?
This partnership between the Virginia Coastal Zone Management Program and the Dragon Run Steering Committee of the Middle Peninsula Planning District Commission is designed to address both the differing viewpoints and common ground that exist concerning the future of the watershed.

What is the Dragon Run Steering Committee?
Formed in 1985, the Dragon Run Steering Committee consists of landowners and local elected officials and is the key vehicle for cooperation and coordination among the four counties concerning watershed issues.

What counties are in the watershed?
The counties of Essex, Gloucester, King and Queen, and Middlesex contain the watershed.

STEERING COMMITTEE

Essex County – Prue Davis (Chair)(S), Fred Hudson (P), Dorothy Miller (L), M. Scott Owen (L)
Gloucester County – Charles "Rick" Allen (S), Dr. Eric Weisel (P), Terry DuRose (L), Dr. Willy Reay (L)
King and Queen County – Keith Haden (S), Kempton Shields (P), Robert Gibson (L), William "Frank" Herrin (L)
Middlesex – John D. "Jack" Miller (S), John England (P), R. D. Johnson (L), William Bagby (L)

(S) denotes Supervisor
(P) denotes Planning Commissioner
(L) denotes Land Interest

Staff – Sara Stamp

PUBLIC RIGHTS FOR USE OF THE DRAGON RUN

Which rivers are owned by the public?
The U.S. Supreme Court has held that the bed and banks under all rivers, lakes, and streams that are navigable, for title purposes, are owned by the states, held in trust for the public through the Public Trust Doctrine. Title in this context means ownership. In Virginia, this public-trust ownership extends up to the ordinary low water line, (or ordinary low water mark,) encompassing what is commonly referred to as the submerged and submersible land, as opposed to the upland.

What does navigability, for title purposes, mean?
Through various court cases, federal courts have articulated the following test, which is known as the federal test of navigability for title purposes:

* Navigability is determined as of the date of statehood
* Waters must be navigable in their natural and ordinary condition;
* The waterway must be usable for transportation conducted in customary modes of trade and travel on water; and
* The waterway must be capable of or susceptible to use as a highway for the transportation of people or goods.

The courts have determined that the use or potential for use by almost any type of watercraft is sufficient to determine this type of navigability.

Do shallows, rapids, and other obstacles make a river non-navigable for title purposes?
No. The courts make no requirements that a river be uniformly deep, or flat, or that navigation be practical going upstream as well as downstream. The presence of rapids, even numerous rapids and waterfalls, or blockages does not disqualify a river.

What if the river is only physically navigable during the wet season of the year?
It still qualifies as navigable for title purposes. But a normally dry creek bed or "wash" that is only temporarily navigable during extreme weather does not qualify. (If it's normally dry because of upstream dams, then it does qualify. The legal test is based on the river's natural condition.)

What if the current property owner's deed reads to the middle of a river, or seems to surround and include the river?

If the physical characteristics of the river are such that it meets the federal test of title navigability, it is public land up to the ordinary low water line. Since a deed can only convey interests actually owned by the seller, and since the bed and banks of all navigable rivers passed to the states at the time of statehood, it is likely that the state is the true owner. The state's ownership is a "prior existing right" and is frequently mentioned as such on deeds. Somewhere along the chain of property transactions, a deed may have been changed to include the riverbed. If this happened it was likely done incorrectly.

APPENDIX G. Dragon Flats Forestry Management Plan

Management Plan

"Dragon Run Block"
Boyer, Hall, Keiningham Tracts

Table of Contents

Management Plan

Introduction

This management plan covers three contiguous tracts located in Middlesex County, Virginia currently owned by The Nature Conservancy. They are:

1. Dragon Run (Boyer) 230 +/- acres
2. Dragon Run (Hall) 224 +/- acres
3. Dragon Run (Keiningham) 42 +/- acres

Although the above acreages combined total 496 a recent survey and the ArcMap Geographic Information System (GIS) show 495 total acres.

Background

"The Dragon Run is a brackish water, tidal/nontidal stream which flows forty miles through the Virginia Middle Peninsula counties of Essex, King and Queen, Middlesex, and Gloucester. Fed by underground springs, surface runoff and numerous feeder swamps, the Dragon Run twists and turns, meandering through the four-county area, eventually emptying at the headwaters of the Piankatank River. The stream, along with the surrounding Dragon Run Swamp, forms an ecologically unique system. A system of excellent water quality and numerous and diverse species of flora and fauna. It is characterized by dense stands of hardwoods with occasional upland ridges extending to the stream's edge. It supports both recreational fishing and excellent game and nongame wildlife. There is very little evidence of man's presence, essentially maintaining a primitive character throughout the entire system.

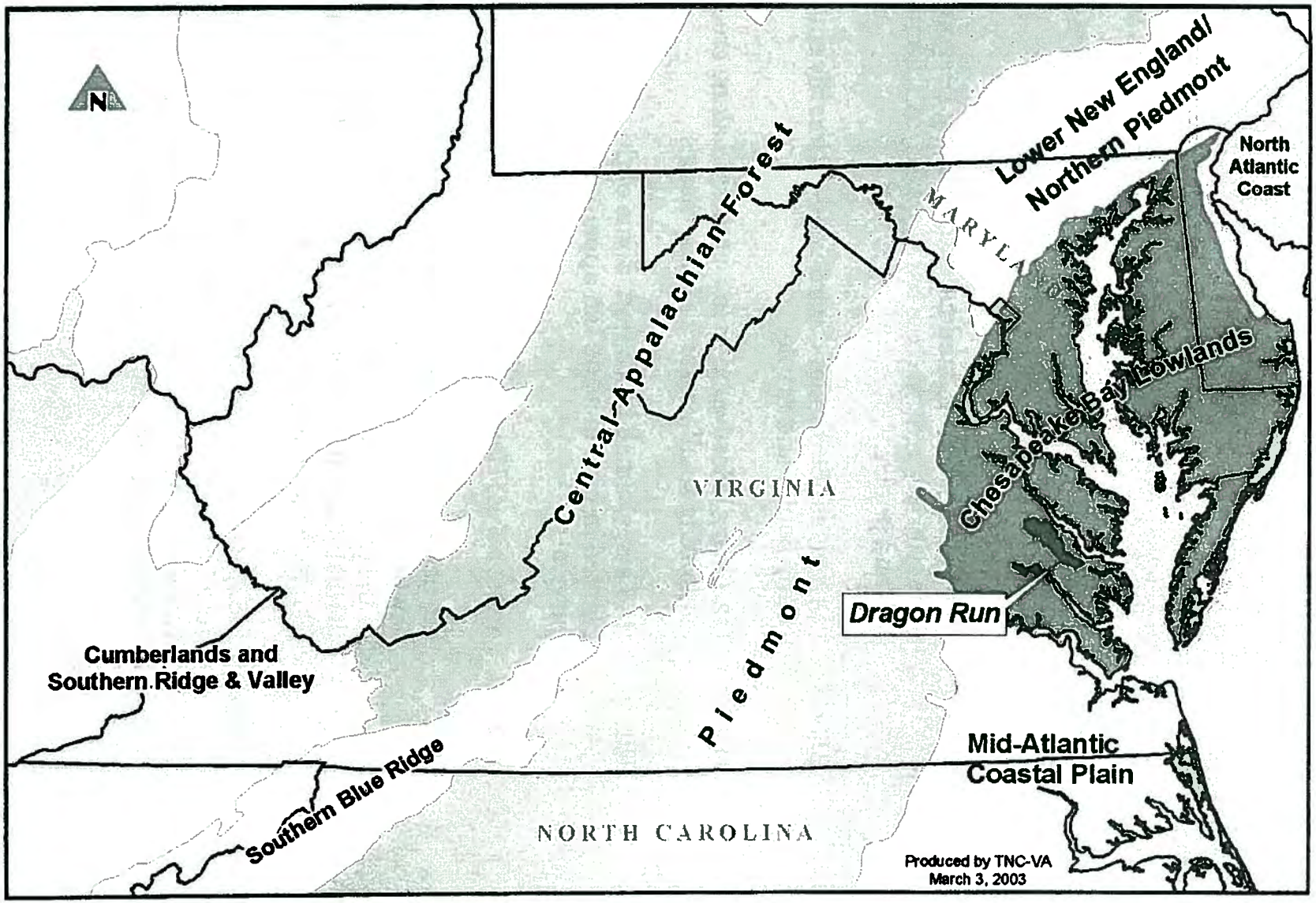
In 1974 the Smithsonian Institution reviewed and subsequently ranked 232 ecologically significant areas throughout the Chesapeake Bay region. The Dragon Run System was ranked second.

Prior to and since that time, concern has been voiced regarding the protection of this valuable natural resource. Early efforts to offer protection came in 1970, and most recently, again in 1985, to have the Dragon Run designated as a scenic river by the Virginia General Assembly." [1]

The Nature Conservancy purchased the tracts in 2003 due to their ecological significance. They adjoin the Dragon Run watershed which is at the Northern end of the North American range for bald cypress communities that are influenced by tidal changes. The Piankatank River is a tributary for the Chesapeake Bay. The Dragon Run watershed contains 22 rare plants and animals and more than 55 species of fish. There is an active bald eagle nest on the Hall property. One rare plant; the Pineland Tick-trefoil as well as a rare damselfly, the Blackwater Bluet, have been located less than 800 feet to the west of these tracts. The Cypress Sphinx, a rare moth species that is attracted to Mistletoe has been located on the site. This site is also visited by several species of neo-tropical migratory birds.
One of The Nature Conservancy's primary goals is to protect water quality and the ecosystem adjoining The Dragon Run in order to ensure habitat for the aforementioned species.

[1] "Dragon Run Watershed Management Plan" 1996 Jim Uzel Director of Regional Planning Middle Peninsula Planning District Commission

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH



Current State

Stand Descriptions (see map on page 7):

Beaver Pond	(.5 acres) Small impoundment containing an active beaver colony.
BH1	(88.3 acres) Bottom land hardwood along Dragon Run. Primarily contains mature bald cypress, ash, swamp white oak and poplar.
BH2	(44.5 acres) Bottomland hardwood- Primarily contains young poplar and maple.
H1	(12.1 acres) Hardwood in low areas and along creeks containing small poplar and oak species.
H2	(8.8 acres) Small hardwood. Some of this stand was planted in pine in 2000 but apparently did not have good survival.
H-SMZ	(26.2 acres) Hardwood in Streamside Management Zones.
P	(16 acres) This is a natural stand containing mature pine sawtimber and chip 'n saw as well as mature poplar. Some of the pine trees contain four or five sawlogs each with diameters up to 22 inches at 4.5 feet off the ground (DBH). The pine basal area average is 80.
P-1968	(18.5 acres) Loblolly pine stand planted 1968. Some of this stand has been thinned. Other sections of this stand contain average basal areas of 120. The stand contains a mixture of pulpwood, chip n' saw , and sawtimber.

Mona Griswold
9/2006

P-1974 (6.7 acres) Loblolly pine stand established in 1974. Areas of this stand are dead due to an infestation of Ips beetles and wind damage. Stocking is variable. Some areas have a basal area of 160 and others average 10 inches in DBH of scattered pine.

P-1975 (7.4 acres) Loblolly pine stand planted in 1975. Basal area averages 85. This stand was thinned for the second time in 2003.

P-1983 (78.6 acres) Loblolly stand planted in 1983. This stand has been thinned (5th row and select) within the past two years and the basal area averages 95.

P-1984 (98.6 acres) Loblolly pine stand planted in 1984. The basal area averages 110. There is a high volume of pine pulpwood and chip n' saw material. Parts of this stand have been thinned.

P-1987 (3.6 acres) Loblolly pine stand planted in 1987. This stand is overstocked and the diameter is small but the average basal area is 140.

P-1989 (12.2 acres) Loblolly pine stand planted in 1989. The stocking is highly variable and ranges from 40 to 140 basal area. This stand contains pine pulpwood and unmerchantable pine.

P-1990 (24.5 acres) Loblolly pine stand planted in 1990. The basal area averages 100. The pine is mostly pulpwood with some chip 'n saw material.

PH1 (4.5 acres) Mature pine- hardwood stand containing loblolly pine, poplar, red and white oak. The merchantable volume contains mostly pine chip n' saw and sawtimber and hardwood pulpwood and sawtimber. The volume is comprised of half pine and half hardwood.

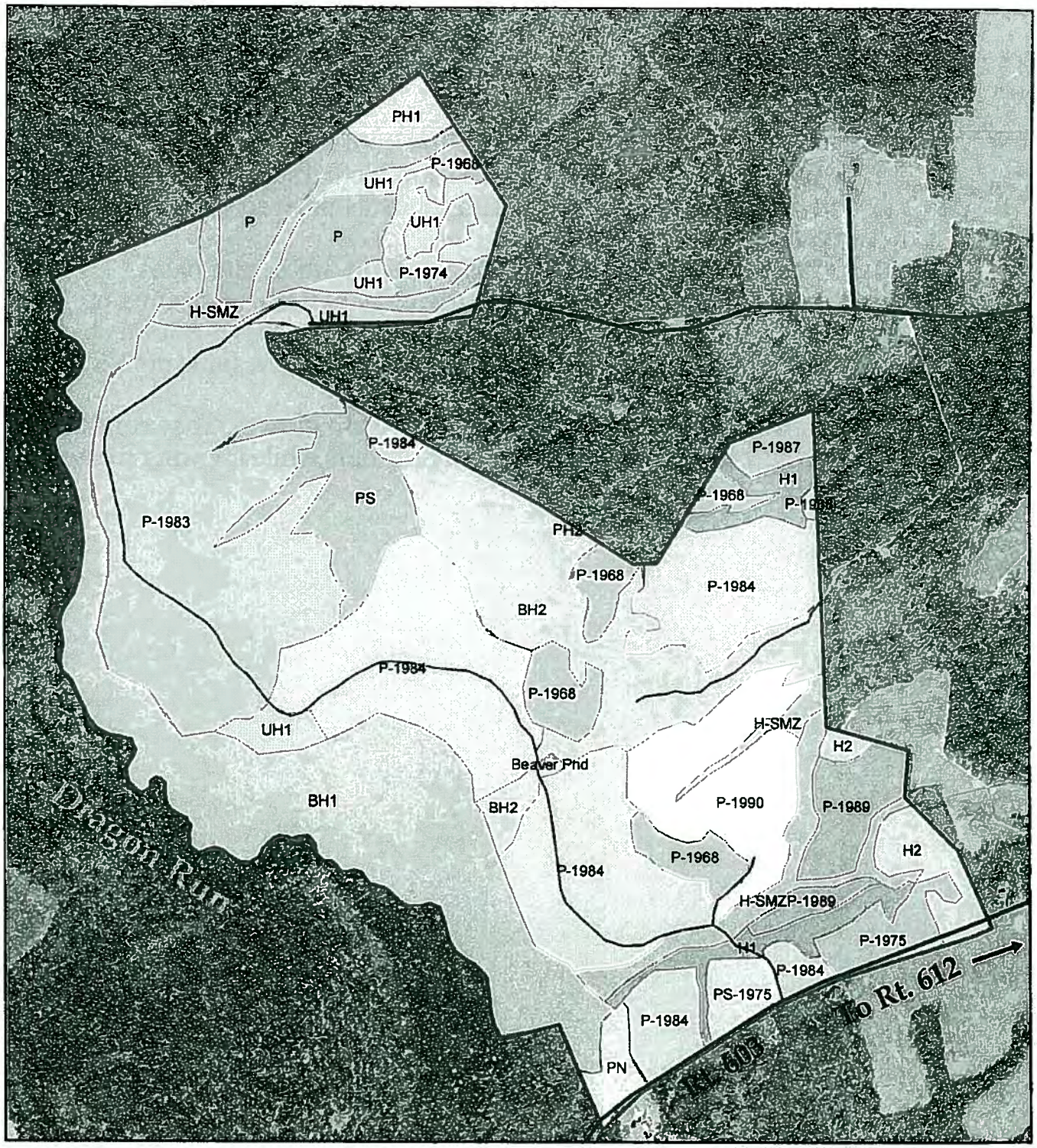
PH2 (.6 acres) A small stand of medium aged pine- hardwood with 70 basal area of pine and 45 basal area of hardwood.

PN (4.1 acres) A natural stand containing mature Loblolly and Virginia pine as well as red oak and yellow poplar. This stand was select cut in 2003.

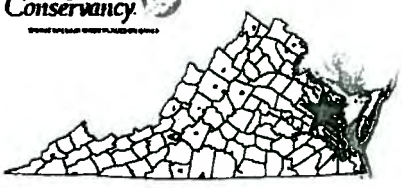
PS (17.6 acres) Loblolly pine stand planted in 1984. Survival in this stand was not good so the pine is very scattered and mixed with hardwood.

PS-1975 (4.9 acres) Loblolly pine stand planted in 1975. This stand was select cut in 2003 and has since sustained wind and ice damage and is understocked.

UH1 (16.8 acres) A highly variable medium aged stand containing pine and white oak, poplar, red oak, maple and beech much of which has been high- graded in the past leaving trees with poor form. The basal area averages 60.



The Nature Conservancy



While every effort has been made to ensure that this map and the data from which it is derived are accurate and reliable within limits of the current state of the art, TNC cannot assume liability for any damages caused by inaccuracies in the map or supporting data. TNC makes no warranty, express or implied, nor does the fact of distribution constitute such a warranty.

Dragon Run Block Stand Map

Access paths

Boundary

N

Feet

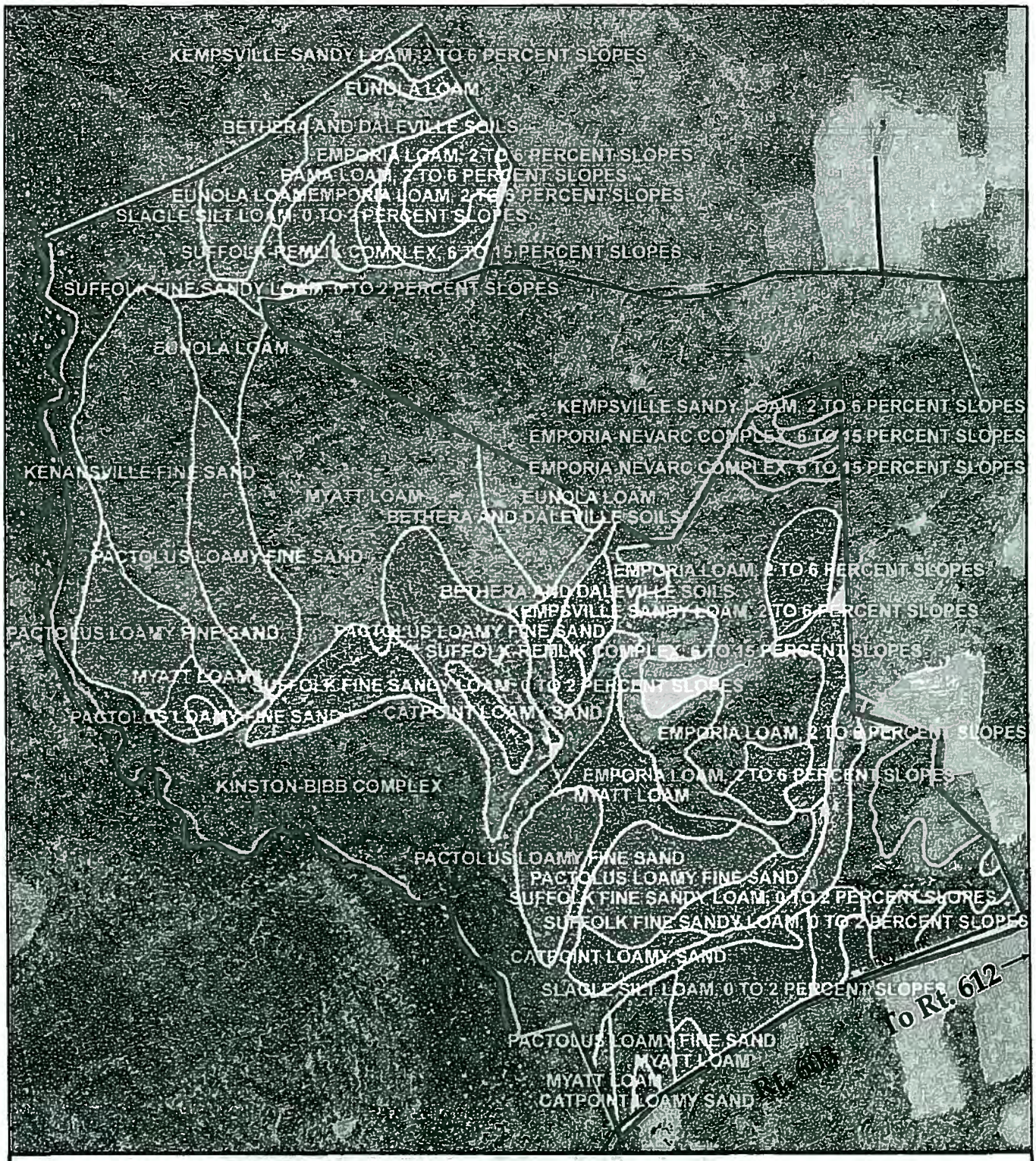
0 1,500

Soils:

There are several soil types found in this management block. They range from pure sand to pure loam including mixtures of the two in the form of loamy sands and sandy loams (see the map entitled "Dragon Run Block Soil Types).

Sandy soils have a low capacity to store water and plant nutrients due to the small surface are of the particles. Leaching of plant nutrients is an issue with sand. On this site this is not much of an issue due to the high content of organic matter in some of these soils as well as the low elevations.

Loam soils are highly desirable for plant growth. They contain enough clay to store water and plant nutrients while allowing for good aeration.



The Nature Conservancy

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Feet

0 1,000

Dragon Run Block

Soil Types

N

Ecological Goals

The ecological goals for this tract include promoting healthy ecosystems that preserve and/or enhance the number of rare and endangered species found on or near the site. They also include ensuring that the water quality in the Dragon Run and feeder streams remains excellent.

Some of the target species include the bald eagle, cypress sphinx moth (Isoparce cupressi), blackwater bluet and pineland tick-trefoil. The cypress sphinx moth is found in areas containing mistletoe (Phoradendron serotinum). This species of mistletoe (which is parasitic) is hosted by several species of hardwood.

The bottomland areas along the Dragon Run need to be preserved and protected to provide habitat for bald eagle, Blackwater Bluet (*Enallagma weewa*) (southern damselfly)and pineland tick-trefoil (*Desmodium strictum*). The Blackwater Bluet likes tannin-rich, dark water.

The flats adjacent to the Dragon Run contain wetland species primarily (bald cypress, ash and swamp white oak to name a few). The upland hardwood areas contain several species of red oak and white oak primarily along with yellow poplar.

Management Options

In the following sections I will discuss two options for managing this block of Dragon Run property. They include the "Working Forest" and a "Combination of a Working Forest and Ecological Ideal".

The working forest is primarily based on generating income for the Nature Conservancy. The combination of a working forest and ecological ideal combines' income generation with developing stands that best fit for the site ecologically.

Working Forest

This section of the management plan is devoted to describing how to finish converting the block containing the Boyer, Hall and Keiningham tracts into a working forest resulting in the highest return for investment for The Nature Conservancy. Much of this tract has been converted to pine plantation already. Most of the soil is very conducive to growing loblolly pine (Pinus taeda) which, from an economic standpoint, would be the best choice.

Assumptions:

- All Virginia Best Management Practices (BMP's) will be followed.
- Areas designated as wetlands by the NWI will be left untouched.
- Areas harvested or site prepared will be planted in pine. All pine seedlings planted will be from second generation, high quality loblolly pine families and will be planted between February 1st and March 15th. Spacing used will be 8 feet x 10 feet (544 seedlings per acre).
- The Dragon Run wetland area and its buffer will be left untouched.

- Areas to be prescribed burned will be "cool" burned so the residual pine is not damaged.
- Final harvest age will be determined by financial drive rather than a strict rotation age. If a strict rotation age type of management is desired then the final harvest should be conducted when the trees are at least 35 years old (which may change some of the recommendations listed below).

Harvesting and Planting Recommendations:

In order to convert the remaining stands, with the exception of the Dragon Run (BH1), Beaver Pond, and streamside management zones (H-SMZ), I recommend the following actions:

- Areas of the stand named BH2 that are not designated as wetlands should be converted to pine plantation. This would require site preparation and bedding before planting.

- Clearcut P, UH1, PH1, P-1968 and the P-1974 stands located on the Hall tract (area north of the access path in the northernmost section of tract). These areas should then be burned and planted with loblolly pine seedlings (see assumptions). Make sure that all of the streams running through this block are buffered according to Virginia's recommended BMP's. Intermittent streams should have a 25' wide buffer and perennial streams should be protected by a 50' wide buffer.

- Stand PS-1975 was damaged by wind and ice and should be harvested, burned and replanted at the same time.

- Harvest Stand PS, PN and the portions of stand H1 that are not within the buffer zone for H-SMZ. Site prepare (if necessary) and replant these areas.

- Part of H2 is a failed pine plantation. All of H2 needs to be site prepared and planted.

Thinning Recommendations:

P- 1968 Parts of this stand has been thinned. Other sections of this stand contain average basal areas of 120 and would benefit from one final thinning. The stand contains a mixture of pulpwood, chip n' saw, and sawtimber. Burning the understory is recommended. This stand is old enough to harvest at any time if there is a financial need to do so.

P-1983 This stand has been thinned within the last two years and should be ready for a second (and final) thinning within 3 or 4 years.

P- 1984 Parts of this stand have been thinned but it would benefit from a second thinning once there is enough volume per acre to remove to make it attractive to a logging contractor. This may not be practical until 2009. This stand is primarily pine pulpwood and Chip n' saw material with some sawtimber. The average basal area is 100. Burn the understory after thinning.

P-1987 This stand is overstocked and the diameter is small but the average basal area is 140. This stand needs to be thinned where practical and burned after thinning.

P-1989 The stocking is highly variable and ranges from 40 to 140 basal area. This stand contains pine pulpwood and unmerchantable pine. Some areas of this stand should be thinned. The understory needs to be burned to reduce competition and reduce the fire hazard.

P-1990 The basal area averages 100. The pine is mostly pulpwood with some chip 'n saw material. This stand should be thinned and the understory burned.

Mona Griswold
9/2006

Road Building Recommendations:

To facilitate future management work and harvesting two roads need to be built.

The current access path entering the tract from the east side of the Boyer tract should be connected to the main access path. Unfortunately, this will not be easy since the area between the two paths contains creeks and low land. I recommend asking personnel from the Department of Forestry to advise you on the best placement for this connection since they will enforce the BMP's regarding culvert size and soil stabilization.

A spur road off of the main access path should be constructed in the general vicinity of what is shown on the "Dragon Run Block Road Building" map to provide access to the eastern section of the tract.

Maintenance

Road maintenance:

Portions of the road have been rutted by the hunt club and need to be graded and surfaced with rock or sand.

There is a section of road on the north side Stand P-1983 that is too close to the Dragon Run and is a potential source of sedimentation. Measures should be taken to assure that this does not occur. There are a couple of solutions. Following the recommended BMP's is one option. This would entail erecting a silt fence and stabilizing the erodable areas with vegetation, rock or geotextile material. Moving a section of the road to the east one hundred feet is another solution. The old section of the road would have to be stabilized to prevent erosion.

Remove any trees that have fallen across the access path.

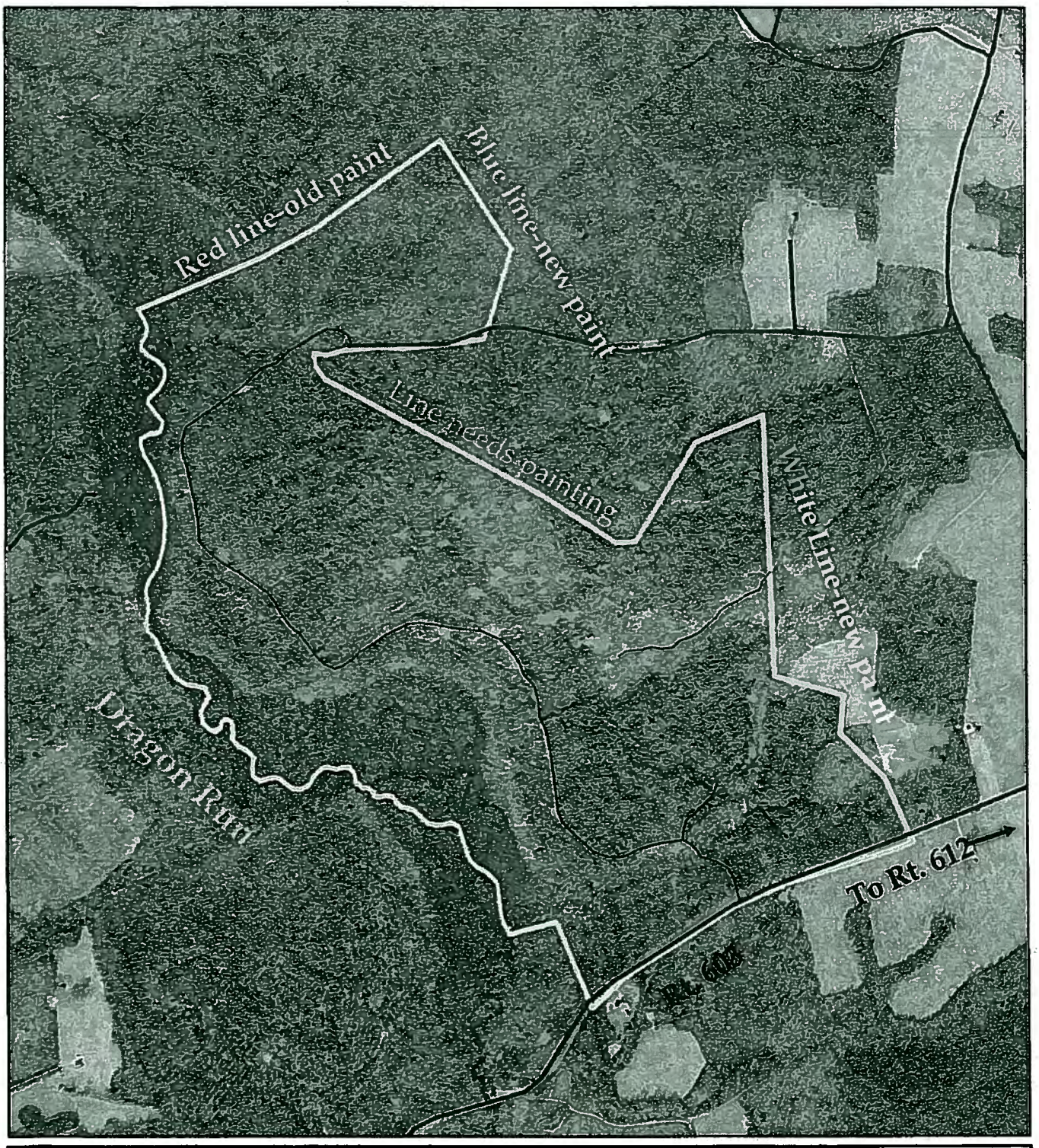
Trash control:

There is a small trash pile containing a chair and tires that needs to be removed. It is located on the right side of the path leading north from Route 603 after crossing the first stream.

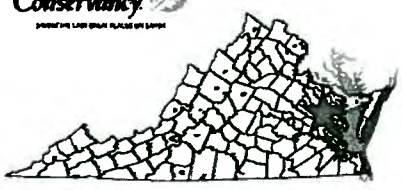
Boundary Line Maintenance:

The boundary lines are painted in a mixture of colors (see the map entitled "Dragon Run Block Boundary Line Paint") but most of them are in good shape. The east line of the Hall tract needs to be painted as soon as possible. The northwestern property line of the Hall tract will need to be repainted within the next two years. They should be repainted every 5 years.

Mona Griswold
9/2006



The Nature Conservancy



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Feet

0 1,500

Dragon Run Block Boundary Line Paint

Boundary

N

Combination of Working Forest and Ecological Ideal

In order for this combination to work I suggest preserving the entire bottomland hardwood area (BH1) and adding a 100 foot wide no-cut buffer along the high water line of the Dragon Run. I also recommend:

- Leave all wetlands areas and streamside management zones untouched.
- Convert the areas with soils best suited for hardwood growth to hardwood (see the map entitled "Dragon Run Block Combination Management"). Species most suited to these soils include yellow poplar (Liriodendron tulipifera) and southern red oak (Quercus falcata). Some of these areas already have these species growing on them which helps. Please see the harvesting recommendations listed below.
- Continue to grow pine on the other areas (with soils best suited to pine growth) in a sustainable manner with 100 foot wide hardwood travel corridors in between for mammal migration.
- Leave the beaver pond as is but control the beaver population to avoid immersion of pine areas.
- Control invasive species found in the Dragon Run Block. Invasive species found in other portions of the Dragon Run watershed include Phragmites, Blue Catfish, Asiatic Blueflower and Japanese Stiltgrass.

Harvesting and Planting Recommendations:

Harvest the portions of stands P, P-1968, P-1975, P-1984, P-1987, P-1989, P-1990 that fall within the areas designated for hardwood. Harvest pine only in the section of PS that falls within the wetland area as long as it will not cause soil damage. Allow these to regenerate naturally in hardwood. A couple of years after harvest timber stand improvement may become necessary to ensure that the desired species become dominant (oak-poplar). Future harvests in these stands should be limited to select cuts to promote the desired species.

Mona Griswold
9/2006

Follow the management recommendations listed above under "Working Forest" for the pine management areas. There are several natural travel corridors currently in place. Make sure that the corridors are marked on the ground and left primarily in hardwood when harvesting adjoining stands.

Additional roads will not be necessary for this scenario but the recommendations for road maintenance, boundary line maintenance and trash control will remain the same as the Working Forest.

Showcase options:

Some suggestions if this block becomes a showcase site for The Nature Conservancy:

- Construct a viewing platform for the bald eagle nest.
- Plant native grasses on old deck sites and on sections of the road that will no longer be utilized.
- Leave aesthetic buffers along Route 603 and the access path (if the public is allowed on the site) when stands are clearcut.
- Construct a viewing platform for the beaver pond.

Note: Photographs taken by Virginia Chapter of The Nature Conservancy personnel during a field trip to the Dragon Run Block on 4/27/2006

Mona Griswold
9/2006

The Nature Conservancy

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Feet

0 1,000

Dragon Run Block Combination Management

- Dragon Run High Water Line
- Wetlands
- Hardwood Stands
- Travel Corridor

N

Appendix 8: Dragon Bridge Adoption Letter and Management Plan

WILLIAM & MARY
VIMS
Virginia Institute of Marine Science
School of Marine Science

Chesapeake Bay National Estuarine Research Reserve in Virginia

August 14, 2008

Ms. Sara Stamp
Regional Planner
Middle Peninsula Planning District Commission
125 Bowden Street
PO Box 286
Saluda, Virginia 23149

Dear Ms. Stamp:

This letter is in response to the "Management Plan for Dragon Run Tract: Virginia Estuarine and Coastal Research Reserve" prepared by the Middle Peninsula Planning District Commission (MPPDC). I thank you for the time and effort required to develop and complete this plan. This management plan will serve as a five-year guide to the adaptive management process that balances the Chesapeake Bay National Estuarine Research Reserve in Virginia (CBNERRVA) mission while protecting the integrity of the natural resources located on and adjacent to the Dragon Bridge tract. We will incorporate the recommendations of the plan into our Reserve's Stewardship Program and implement the recommendations as resources allow.

Again, we appreciate your efforts and continue to benefit from our partnership with you, the MPPDC and Virginia's Coastal Zone Management Program administered by Virginia Department of Environmental Quality.

Sincerely,

William G. Reay, Ph.D.
Director, CBNERRVA

PO Box 1346 • Route 1208 Greate Road • Gloucester Point, Virginia 23062-1346 USA
804/684-7135 • FAX 804/684-7120

Management Plan for Dragon Bridge Tract: Virginia Estuarine and Coastal Research Reserve

Prepared by:
Middle Peninsula Planning District Commission
Dragon Run Special Area Management Plan

This work was funded by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant # NA06NOS4190241 Task 95 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended. The views expressed are those of the author(s) and do not necessarily reflect the views of NOAA or any of its subagencies.

Management Plan for Dragon Bridge Tract: Virginia Estuarine and Coastal Research Reserve

2008

Dragon Run Special Area Management Plan Technical Report 08-00

Middle Peninsula Planning District Commission
Dragon Run Special Area Management Plan
125 Bowden Street
PO Box 286
Saluda, Virginia 23149
(804) 758-2311

This document may be cited as follows:

Stamp, S.E. 2008. Management Plan for Dragon Bridge Tract: Virginia Estuarine and Coastal Research Reserve. Dragon Run Special Area Management Plan #08-00. Middle Peninsula Planning District Commission. Dragon Run Special Area Management Plan. Saluda, Virginia. 34 pp. plus appendices.

Modeled after:
Erdle, S. Y. and K. E. Heffernan. 2005. Management Plan for Goodwin Islands: Chesapeake Bay National Estuarine Research Reserve -Virginia. Natural Heritage Technical Report #05-03. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond, Virginia. 45 pp. plus appendices.

TABLE OF CONTENTS

***At the time of publication, a management plan nor a public access plan for the Virginia Estuarine and Coastal Research Reserve system had not been developed. As the policies of this system are consistent with the CBNERRVA system, the CBNERRVA Management Plan 2008 and CBNERRVA Public Access Plan has been utilized in the interim.*

LIST OF FIGURES

A**CKNOWLEDGMENTS**
This work was funded by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant #NA05NOS4191181 Task 91 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended. The views expressed are those of the author(s) and do not necessarily reflect the views of NOAA or any of its subagencies.

We'd like to acknowledge the Management Plan for Goodwin Islands: Chesapeake Bay National Estuarine Research Reserve -Virginia. Natural Heritage Technical Report #05-03 by Virginia Department of Conservation and Recreation, Division of Natural Heritage from which we borrowed heavily and/or copied outright in some instances.

This Management Plan for the Dragon Bridge Tract was compiled, developed, and completed with the combined expertise and reviews of individuals from Department of Game and Inland Fisheries, Department of Conservation and Recreation, Division of Natural Heritage (DCR-DNH), the Virginia Institute of Marine Science and the Middle Peninsula Planning District Commission.

SECTION 1: Management Framework

MANAGING ENTITY

The Dragon Bridge Tract is owned (fee simple) by the Virginia Institute of Marine Science (VIMS), College of William and Mary (W&M). The Virginia Estuarine and Coastal Research Reserve System (VECRRS), of which the Dragon Bridge Tract will be a part, is administered by VIMS and coordinated with the Chesapeake Bay National Estuarine Research Reserve of Virginia (CBNERRVA). The primary point of contact for this site is Dr. William Reay, Director, Chesapeake Bay National Estuarine Research Reserve, (804) 684-7119, wreay@vims.edu, P.O. Box 1346, Gloucester Point, VA 23062.

MANAGEMENT STRATEGY FOR DRAGON BRIDGE TRACT

Program Overview

The VECRRS was created in 1999 by the General Assembly of Virginia (Code of Virginia 28.2-1103 and 28.1-1104; see Appendix A). The mission of VECRRS is to establish a system of protected sites representative of the Commonwealth's estuarine and coastal lands in which research and long-term monitoring can be conducted in support of the Commonwealth's coastal resource management efforts. Reserve efforts to date have focused on two geographic areas, the Dragon Run Swamp watershed (Figure 1) and the tidal freshwater region of the James River.

Site Purpose

The Dragon Bridge Tract, part of one of Virginia's most extensive and relatively unimpacted swamp forest communities, was selected as a site representing one of the Chesapeake Bay's most pristine waterways. The Dragon Run Bridge Tract shall be used primarily for research and education. Natural resources on this site that make it representative of the ecosystems of the coastal plain include its uniquely pristine swamp habitat and its upland component with significant ecological value potential.

Policy and Management Approach

The purpose of this management plan is to guide an adaptive resource management process that protects key natural resources on Dragon Bridge Tract while providing for research and educational opportunities.

SECTION 2: Site Background and Resources

INTRODUCTION

Description and Location

The Dragon Bridge Tract is located west of the New Dragon Bridge on Route 603 (Figure 2). The site is an estimated 121.54 acres and includes pine plantations, quality riparian buffer forest and pristine swamp habitat (Figure 3).

The Dragon Run, headwaters to the Piankatank River, is one of the Chesapeake Bay's most pristine waterways. The Dragon Run watershed remains largely undeveloped and represents one of Virginia's most extensive and relatively unimpacted swamp forest communities. The Dragon Run contains the northernmost example of Baldcypress-Tupelo Swamp community in Virginia and four other natural communities (i.e. Fluvial terrace woodland, Tidal Baldcypress-Tupelo Swamp, Tidal Baldcypress-Woodland/Savanna, and Tidal freshwater marsh) and up to fifteen state rare species (Belden, A. et al. 2001 and 2003).

Climate

While detailed climatic data are not specifically available for Dragon Bridge Tract, data for nearby Urbanna, VA describe an average annual minimum temperature of (48.7° F/9.3°C) and an average annual maximum temperature of (68.5° F/20.3°C) from 1971 – 2000. Average monthly maximum temps for the same time period are in July (87.8° F/31°C) and the average minimum monthly temps are in January (29.8°F/-1.2°C). Precipitation is generally well distributed throughout the year with slightly more than average rainfall in the summer and slightly less in the autumn.

Average total precipitation for the same period is (42.22 inches) (Southeast Regional Climate Center, 2007). Soils tend to be wettest in winter and early spring due to reduced evapotranspiration. Snow can be expected any time from November to April and the site was significantly impacted by an ice storm in the late 1990s. The average growing season length is approximately 197 days, and although variable, first fall frosts usually occur in late October and the last spring frosts are often in early to mid-April.

As with most parts of Virginia's coastal plain, the Dragon Bridge Tract is vulnerable to hurricanes, tropical storms, ice storms and northeasters that affect the Chesapeake Bay and surrounding shores. Northeasters, usually the least severe of the three, tend to occur in the autumn, winter, and spring. Hurricanes and tropical storms are less frequent, generally more severe, and usually occur in late summer through autumn. Some northeasters may reach the strength of a tropical storm. These storm events can cause drastic changes to the physiography of the site and surrounding area. Many coastal forests lost a considerable number of trees during Hurricane Isabel in September 2003; however, the Dragon Bridge Trace received little damage from this storm.

Geology, Landforms, Soils

As one of the Chesapeake Bay watershed's most pristine waterways, the Dragon Run "encompasses some of the most extensive and unspoiled swamp forest and woodland

communities in Virginia" (Belden, A. et al, 2001). Effectively bisecting Virginia's Middle Peninsula located between the York and Rappahannock Rivers, this fresh and brackish water stream meanders forty miles along and through nontidal and tidal cypress swamp. Watershed elevation ranges from 180 feet to near sea-level (USGS topos).

Geological features are described by the following excerpt from *A Natural Heritage Inventory of the Dragon Run Watershed* (Belden, A. et al., 2001):
Surficial deposits of riverine terraces bordering Dragon Run from the vicinity of the Essex-Middlesex county line to Meggs Bay belong to the Shirley Formation and the Sedgefield Member of the Tabb formation. The middle Pleistocene Shirley Formation consists of light- to dark-gray, bluish-gray and brown sand, gravel, silt, clay, and peat; the Sedgefield Member is of upper Pleistocene age and consists of pebbly to bouldery, clayey sand and fine to medium, shelly sand grading upward to sandy and clayey silt. Somewhat higher topography away from the waterway is underlain by the Chesapeake Group. This consists of fine to coarse quartzose sand, silt, and clay (variably shelly and diatomaceous) deposited in shallow waters of the upper Pliocene and lower Miocene periods. At still higher elevations, the Windsor Formation is found, consisting of gray and yellowish to reddish-brown sand, gravel, silt, and clay of lower Pleistocene or upper Pliocene age. At higher elevations southwest of Dragon Run, two other formations are prevalent, both of upper Pliocene age. The Bacons Castle Formation is characterized by gray, yellowish-orange, and reddish-brown sand, gravel, silt, and clay and the Moorings Unit by white, light gray, and grayish-yellow quartzose sand and clay to grayish-brown clayey silt and silty clay.

Detailed soils information can be found in the Soil Survey for each county. The King and Queen County 2007 Soils Survey can be found online at http://soils.usda.gov/survey/online_surveys/virginia/#king2007. During the site survey, it was noted that much of the upland area consisted of primarily sandy soils. Richer soils were found in the riparian buffer area and the lands adjacent to the Dragon Run itself. Many of the soils in the watershed are considered prime farmland and are suitable for silviculture.

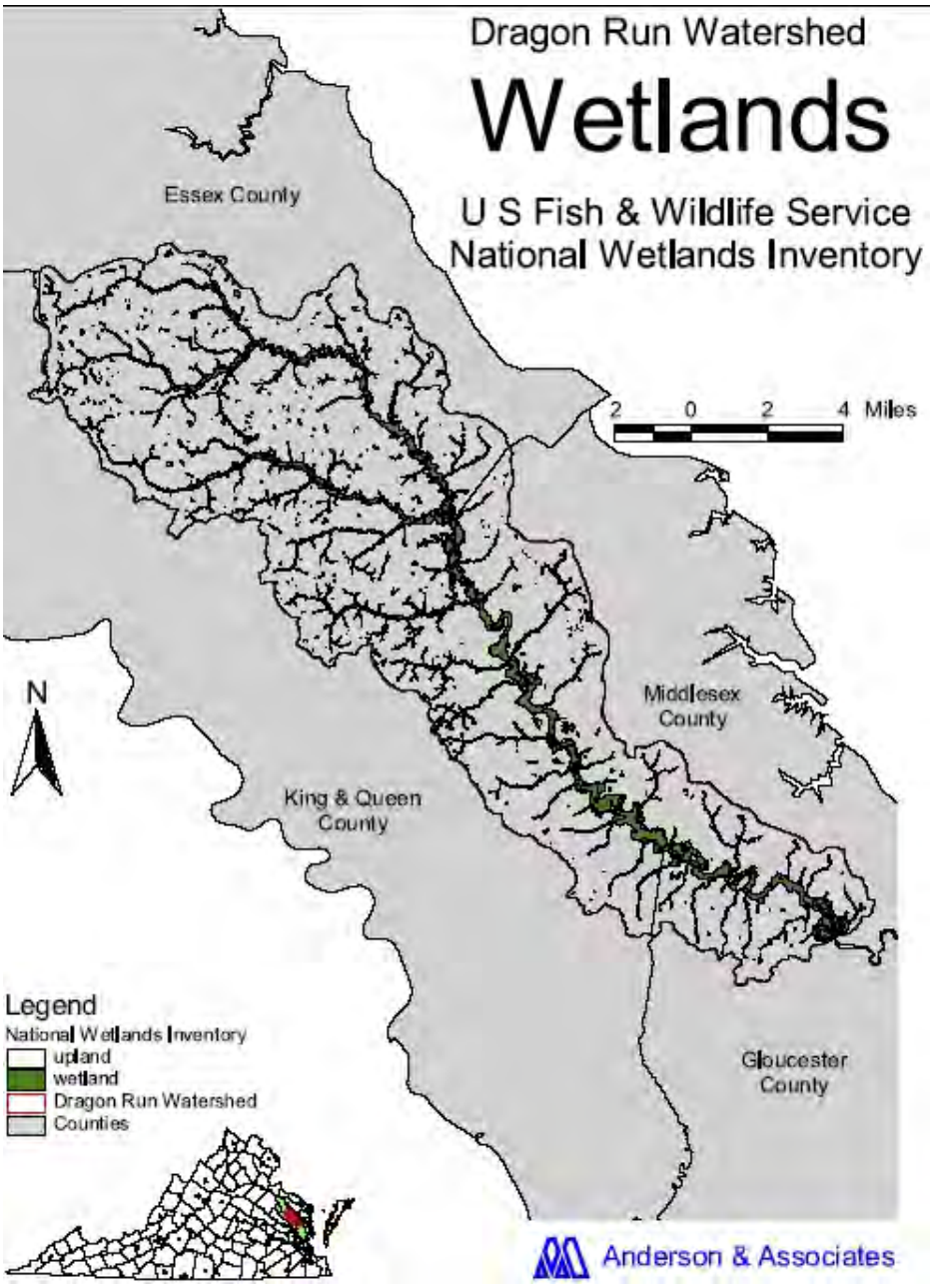
Hydrologic Conditions, Water Quality and Water Quality Monitoring

Hydrologic Conditions. Watershed boundary hydrologic units CB06, CB07, CB08 and CB09 encompass the Dragon Run Watershed. Hydrologic units are drainage areas that are delineated so as to nest into a multi-level hierarchical drainage system. Aside from the surface waters that are collected within the boundary of a hydrologic unit, it may also accept water from one or more points outside of the unit's boundary. To uniquely identify National Watershed Boundary Database (NWBD) units in Virginia without requiring the use of 10 or 12 digits, the Virginia Department of Conservation and Recreation developed a new four-character internal coding scheme for the 5th and 6th order units of the NWBD. The first two characters of the new code are based on the major stream name in the basin, or portion of the basin, where the unit is located. The two digits that follow these codes are a sequential numbering scheme based on the drainage flow (headwaters to mouth).

The Dragon Run is a fourth-order stream system that is nontidal freshwater above the U.S. Route 17 bridge and tidal freshwater from the U.S. 17 bridge to its mouth at Meggs Bay. There it forms the Piankatank River, where it becomes estuarine, and eventually drains into the Chesapeake

Bay. Underground springs, feeder swamps, and surface waters support streamflow in the Dragon Run. Significant tributaries include Dragon Swamp, Yonkers Swamp, Exol Swamp, Timber Branch Swamp, Briery Swamp, Holmes Swamp, White Marsh, Zion Branch, Carvers Creek, Mill Stream, and Meggs Bay (MPPDC, 2001).

According to the National Wetland Inventory, wetlands (Figure 7) along the Dragon Run are palustrine, mostly forested wetlands except for emergent wetlands in Meggs Bay. U.S. Route 17 is the approximate demarcation between tidal wetlands and nontidal wetlands. The hydrologic regime of most Dragon Run wetlands is seasonally flooded, seasonally flooded-saturated, or temporarily flooded (Belden, A. et al., 2001).



Map 1: US Fish and Wildlife Service National Wetlands Inventory

The U.S. Geological Survey (USGS) maintained a streamflow gaging station at Church View (Route 602) from 1943 to 1981 that received drainage from 60% of the watershed (84 square miles) and has maintained a streamflow gaging station at Mascot (Route 603) since 1981 that receives drainage from 75% of the watershed (105 square miles). Median daily streamflow at Mascot from 1981 to 1999 was 79 ft^3/sec and varied between 0.01-6050 ft^3/sec. Median daily streamflow at Church View from 1943 to 1981 was 57 ft^3/sec and varied from 0-3790 ft^3/sec. Compared to other coastal plain stream systems such as the Chickahominy River (New Kent County), the Mattaponi River (King William County), and Cat Point Creek (Richmond County), the Dragon Run exhibits lower median daily streamflow per square mile of drainage area. Base flow, fed primarily by groundwater discharge, accounts for two-thirds of the Dragon Run's total streamflow, with the remaining third attributable to surface water runoff. Of the annual precipitation, only one-third becomes streamflow, with two-thirds lost to evapotranspiration. Seasonally, streamflow is highest in the spring and lowest in the fall (MPPDC, 2001).

Water Quality. The primary water contaminant sources in the Dragon Run are point source discharges and nonpoint source pollution from precipitation (atmospheric deposition), residential land use, agricultural land use, and forested timber harvest (MPPDC, 2002). According to the Virginia Department of Environmental Quality (DEQ), the Dragon Run generally exhibits medium nutrient levels and is listed as "impaired" for pH, fecal coliform bacteria, mercury, and lead (DEQ, 2002). Based on agricultural, urban, and timbered land pollution loadings potential determined by DCR, however, the overall nonpoint source pollution potential rating is low for the Dragon Run (DCR, 2002).

Point source discharges, which are permitted and monitored by the Virginia Department of Environmental Quality, are relatively easy to quantify and, in turn, control or track. Point source discharges to the Dragon Run include: stormwater runoff from a wood treatment facility (arsenic, chromium, copper) at Pitts Lumber Company, Inc. to an intermittent stream adjacent to U.S. Route 17 in Middlesex County (Permit #VA0083011); discharge from a sewage treatment plant (biological oxygen demand, total suspended solids, ammonia nitrogen, total residual chlorine, pH, fecal coliform) at Rappahannock Community College to an intermittent stream near Glenns in Gloucester County (Permit #VA0028461); and discharge from a wellwater treatment plant (pH, total suspended solids) at the Miller's Square Subdivision to an intermittent stream near Miller's Tavern in Essex County (Permit #VA0075302). According to the Shoreline Sanitary Survey (Smither et al., 2003), there are 9 other indirect sources of pollution, including five animal pollution sources (Middlesex County near Saluda and Stormont and Gloucester County near Glenns); a solid waste dumpsite in Middlesex County near Stormont; and a potential pollution source in Middlesex County in Saluda.

Throughout the Chesapeake Bay, atmospheric deposition (e.g. precipitation) contributes a significant amount of the total nutrient loadings in coastal waters (MPPDC, 2001). Wet deposition is measured in the watershed. Air quality is not currently monitored in the watershed, although the Virginia Department of Environmental Quality does take some air quality measurements in West Point in close proximity to the watershed boundary.

More than 90% of residents in Gloucester, King and Queen, and Middlesex Counties use on-site wastewater treatment systems, commonly known as septic systems (MPPDC, 2001). When

operated properly, conventional septic systems remove nutrients and fecal coliform. Conventional septic systems can pose potential environmental and health risks due to inappropriate design, poor maintenance, poor soils, or inefficient nitrogen removal. Driven by changes to Department of Health regulations for on-site wastewater treatment systems (12 VAC 5-610-10 et seq. effective July 2000), the popularity of non-conventional on-site wastewater treatment systems is increasing. These alternative systems, when properly maintained, can be effective at removing nutrients and fecal coliform in areas where conventional septic systems are ineffective. Regardless of the type, however, improperly maintained or failing septic systems pose significant environmental and health risks by contributing nutrients, pathogenic bacteria, and viruses to groundwater.

Agricultural land use in rural and semirural areas in Virginia can be the source of significant sediments, fecal coliform bacteria, and nutrients such as nitrogen and phosphorus. Nitrogen is transported through the groundwater, whereas phosphorus is generally transported on soil particles in surface water. Best Management Practices (BMPs) are designed to minimize these inputs. BMPs such as fencing cattle out of streams, conservation tillage, and expanded riparian buffers are designed to minimize these inputs. Silvicultural lands, representing a significant land area, yield low nutrient input to streams relative to other land uses in the watershed. For example, forested riparian buffers provide effective protection for water quality. The watershed currently exhibits intact riparian buffers.

Residential and commercial land uses typically contribute less nutrients and sediments than agriculture, but more than forestry. These residential and commercial contributions are mainly attributable to reduced or no riparian buffers, chemical application for landscaping, and stormwater runoff.

Water Quality Monitoring. Water quality data sets in the watershed are sparse in quantity, duration, and parameters measured. Existing data sets include: STORET, a database managed by the Virginia Department of Environmental Quality (DEQ); data collections during fish surveys by the Virginia Department of Game and Inland Fisheries (DGIF) and Virginia Commonwealth University (VCU); data collections by the Chesapeake Bay National Estuarine Research Reserve in Virginia at the Virginia Institute of Marine Science (VIMS); and a short-term volunteer water quality monitoring program in the watershed (MPPDC, 2001). CBNERRVA established and maintained a continuous (15 minute) water quality station at the Route 603 bridge near Mascot during 2003 through 2005. Measured parameters included depth, temperature, specific conductance, dissolved oxygen, turbidity and pH; data are available through the Virginia Estuarine and Coastal Observing System web portal.

Two stations are currently sampled regularly by the DEQ. Station DRN003.40 is located at the U.S. Route 17 bridge and Station DRN010.48 is located at the Route 603 bridge near Mascot. Data are available from DRN003.40 for the period 1968-1974 and 1992- present and from DRN010.48 for the period 1992-present. Samples are evaluated bimonthly for nutrients, fecal coliform, suspended solids, dissolved oxygen, pH, salinity, and temperature and are occasionally evaluated for pesticides, toxic metals, and other harmful compounds (MPPDC, 2001). Data sets collected at these sampling stations were used by the DEQ to list the Dragon Run as “impaired” for pH and fecal coliform bacteria. The DEQ attributes the pH impairment to natural causes,

citing the acidic nature of water in swamps. The DEQ lists the cause of the fecal coliform and mercury and lead impairments as unknown. Potential sources of fecal coliform bacteria include: wildlife; failing septic systems; and livestock. Potential sources of metals include: atmospheric deposition; automobile and roadway deposits; and industrial operations. Fish tissue samples were also used by the DEQ to list the Dragon Run as "impaired" for mercury and lead. The Virginia Department of Health issued a health advisory for the Dragon Run for mercury contamination in largemouth bass (DOH, 2003).

Data collected by the DGIF in 1995-1996 and 1998 includes temperature, Secchi depth, pH, dissolved oxygen, conductivity, salinity, alkalinity, hardness, and total dissolved solids. Nutrient data are very limited and were frequently below detection limits. Dissolved oxygen at sampling stations with no or low flow frequently violated daily minimum standards to support aquatic life (MPPDC, 2001).

VIMS data from 2000-2001 measured temperature, salinity, total dissolved solids, pH, dissolved inorganic nitrogen, and fecal coliform bacteria. Of specific note, samples from Briery Swamp exhibited high nitrate and fecal coliform levels, indicating the presence of subsurface agricultural or wastewater drainage (MPPDC, 2001).

Site History

The Dragon Run plays a central role in the Middle Peninsula's culture and identity. Its intriguing name, which is derived from its meandering shape, is frequently borrowed by local enterprises and establishments and is often overheard in community conversations. Since European settlement in the early 1600's and Native American inhabitation up to 10,000 years before that, natural resources have been the bedrock of the watershed's economy. For older generations, forestry, farming, hunting, trapping and fishing were the primary ventures. Today, forestry and farming continue to generate wealth and drive the watershed's economy. Upholding an ancient tradition, hunters range over prime hunting grounds stalking prized game. These land uses, together with extensive swamps, are the main reasons that the Dragon Run remains wild and secluded.

While no archeological artifacts have been found on the Dragon Bridge Tract site according to the Virginia Department of Historic Resources, the New Dragon Bridge is considered to be a point of navigational significance. In the mid 1800s, the Dragon Swamp Navigation Company attempted to construct a navigational channel to allow for transportation (primarily of timber) from the Dragon Run to the Piankatank and on to the Chesapeake Bay. This channel was not utilized and considered to be a failure. The channel has since returned to its natural state and is virtually undistinguishable from the surrounding landscape.

Surrounding Land Use

The watershed is mainly undeveloped, almost entirely privately-owned, and encompasses approximately 140 square miles (90,000 acres) of rural landscape – mostly forests, farms, and wetlands (Figure 5). The spring-fed Dragon Run flows through portions of Essex, King and Queen, Middlesex, and Gloucester Counties, emptying into the estuarine Piankatank River and ultimately the Chesapeake Bay.

Land cover data indicate that the watershed is 80.3-83.9% forested and wetlands, 15.1-18.4% agricultural, and 1.0-1.3 % commercial and residential (MPPDC, 2002; DCR, 2003b). The Dragon Run watershed lies within the transitional Oak-Pine vegetation region where dominant oaks share the forest with Virginia pine, shortleaf pine, and loblolly pine. Although loblolly pine originally appeared in the forest as scattered associates of oaks and other hardwoods, loblolly pine plantations are increasingly common.

In recent years, several public and non-governmental organizations have been actively acquiring land in the Dragon Run watershed for conservation or conservation-compatible purposes. These entities include the Middle Peninsula Chesapeake Bay Public Access Authority, the Friends of Dragon Run, the Nature Conservancy and VIMS. Other conservation holdings in the vicinity of the Dragon Bridge Tract can be seen on Figure 4.

Associated Natural Resources

The watershed's wilderness is both expansive and unique. The Dragon Run contains the northernmost example of the Baldcypress-Tupelo Swamp natural community in Virginia and the best example north of the James River (Belden, Jr. et al., 2001). Natural Heritage Areas are numerous throughout the Dragon Run. Moreover, 14 rare species and 5 rare natural communities are found here (Appendix D). Based on his investigations of the watershed's aquatic communities, one researcher observes that the Dragon Run is a "100 year old time capsule," resembling coastal plain streams in the Chesapeake Bay region at the turn of the 20th century (Garman, 2003).

NATURAL HERITAGE RESOURCES

Overview

Natural heritage resources are defined in the Virginia Natural Area Preserves Act (Section 10.1-209 through 217, Code of Virginia), as "the habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest benefiting the welfare of the citizens of the Commonwealth." Natural heritage resources are the most likely natural resources to be lost without conservation action in the near future. DCR-DNH inventories and compiles lists of the natural heritage resources of the state.

Since the watershed is relatively intact, it contains many unique resources. Natural heritage resources are abundant in the Dragon Run. Several rare natural communities occur in the Dragon Run, including Baldcypress-Tupelo Swamp, Tidal Baldcypress-Tupelo Swamp, Tidal Baldcypress Woodland/Savanna, Fluvial Terrace Woodland, and Tidal Freshwater Marsh. Other natural communities that occur in the Dragon Run include: Coastal Plain/Piedmont Bottomland Forest; Coastal Plain/Piedmont Acidic Seepage Swamp; and Coastal Plain Semipermanent Impoundment (Belden, A. et al., 2003).

In addition to natural heritage resources, the Dragon Run supports a diversity of freshwater and estuarine fishes, aquatic macroinvertebrates, freshwater bivalves (primarily unionid mussels), and herptefauna (amphibians and reptiles) (McIninch et al., 2003). At least forty-five fish species from nineteen families have been collected in the Dragon Run, representing a mixed assemblage of mostly lowland freshwater forms that is highly dynamic spatially and temporally. At least

sixty-five macroinvertebrate species from fourteen orders and forty-seven families have been recorded from the Dragon Run.

Biodiversity Significance
A variety of rarity patterns exist based on the geographic range, habitat specificity and local abundance of species (Rabinowitz, 1981). Standard Natural Heritage methodology ranks plants, animals, and natural communities on two scales of rarity. The global rank (G-rank) and state rank (S-rank) are based on the number of occurrences of a species at a global scale and state scale, respectively (see Appendix E). G- and S-ranks help direct conservation actions to the rarest species and communities since these are usually the most vulnerable to extinction.

Natural Communities
The inventory and classification of natural communities constitute an important "coarsefilter" approach to biological conservation that ensures the protection of diverse organisms. The identification and protection of excellent examples of all natural community types facilitates the protection of the majority of component native plant and animal species, including a host of taxa too cryptic, poorly known, or numerous to receive individual management strategies.

At present DCR-DNH classifies communities principally at the level of an *ecological community group*, which represents a broadly defined unit based on combinations of topographic, edaphic, physiognomic, and gross floristic similarities).

Given below are brief descriptions from the DCR-DNH website (http://www.dcr.virginia.gov/natural_heritage/ncintro.shtml) of the primary ecological community groups and their respective ecological community type(s) occurring in the Dragon Run:

> **Baldcypress-Tupelo Swamp.** Forests in this group occupy seasonally to semipermanently flooded backswamps, sloughs, and first bottoms of Coastal Plain rivers and streams. These swamp forests occur throughout the Coastal Plain from Delaware south to Florida and west to eastern Texas, and in the Mississippi River alluvial basin north to Kentucky. They are distributed throughout southeastern Virginia, north to Dragon Swamp (Gloucester, King and Queen, and Middlesex Counties). Habitats are deeply flooded (up to 1.3 m) for part of the year; many retain at least some standing water throughout the growing season. Microtopography is often pronounced with small channels, swales, tree-base hummocks, and numerous bald cypress "knees." Overstory composition varies from mixed stands of bald cypress (*Taxodium distichum*), water tupelo (*Nyssa aquatica*), and/or swamp tupelo (*Nyssa biflora*) to nearly pure stands of one species or another. The three dominants have complex competitive and successional relationships. As a rule, the two tupelos are less shade-tolerant than bald cypress and regenerate more readily by sprouting in cut-over stands. Thus, tupelos tend to become dominant when bald cypress stands are heavily logged. In addition, swamp tupelo appears to be most abundant in organic swamp soils, while water tupelo appears to prefer mineral soils with high silt content.
>
> Green ash (*Fraxinus pennsylvanica*), overcup oak (*Quercus lyrata*), American elm (*Ulmus americana*), and red maple (*Acer rubrum*) are occasional overstory associates and

frequent understory trees; swamp cottonwood (*Populus heterophylla*) is also an occasional overstory associate and often abundant in disturbed or cut-over stands. Carolina ash (*Fraxinus caroliniana*) is often dominant in the small tree and shrub layers, while vines of climbing hydrangea (*Decumaria barbara*) and red-berried greenbrier (*Smilax walteri*) are often abundant.

Herb layers vary from sparse to seasonally lush. Most herbaceous plants of bald cypress-tupelo swamps are tolerant of muck soils and fluctuating water levels, or are capable of becoming established on tree hummocks, stumps, and logs. A few of the typical herbs are lizard's-tail (*Saururus cernuus*), false nettle (*Boehmeria cylindrica*), Walter's St. John's-wort (*Triadenum walteri*), swamp beggar-ticks (*Bidens discoidea*), weak stellate sedge (*Carex seorsa*), giant sedge (*Carex gigantea*), taperleaf bugleweed (*Lycopus rubellus*), catchfly cutgrass (*Leersia lenticularis*), and pale mannagrass (*Torreyochloa pallida*). Draw-down zones may support large populations of false pimpernel (*Lindernia dubia* var. *dubia*), marsh fleabane (*Pluchea camphorata*), horse-tail paspalum (*Paspalum fluitans*), Carolina boltonia (*Boltonia caroliniana*), and other fast-growing herbs. This group differs from Coastal Plain / Piedmont Swamp Forests in the clear dominance or co-dominance of bald cypress and tupelos (vs. dominance of mixed hardwoods) and apparently by longer hydroperiods and more deeply flooded habitats. It is distinguished from Non-Riverine Swamp Forests, which are also dominated by bald cypress and tupelos, by habitat (floodplains vs. non-riverine peatlands) and lower-strata floristics.

Although community types in this group are relatively common, high-quality examples are scarce and all stands provide valuable wildlife habitat and resources. Mature, hollow specimens of the dominant trees are known to provide nesting habitats for the globally uncommon, state-rare eastern big-eared bat (*Corynorhinus rafinesquii macrotis*) and southeastern myotis (*Myotis austroriparius*). Old-growth stands of bald cypress-dominated swamp with trees up to 800 years old occur along the Blackwater River in Surry and Isle of Wight Counties. However, the largest individuals of both bald cypress and water tupelo occur in swamps along the Nottoway River in Southampton County.

References: Fleming and Moorhead (1998), Parker and Wyatt (1975), Plunkett and Hall (1995).

Tidal Baldcypress Woodland. Coniferous or mixed swamp forests and woodlands dominated by bald cypress (*Taxodium distichum*) are known only from the upper tidal reaches of rivers in Maryland, southeastern Virginia and North Carolina. Examples are documented in Virginia from the lunar-tidal Dragon Swamp / Piankatank River (Gloucester, King and Queen, and Middlesex Counties), Chickahominy River (Charles City, James City, and New Kent Counties), and James River (Isle of Wight and Surry Counties); and the wind-tidal Northwest and North Landing Rivers (City of Chesapeake and Virginia Beach). At some sites, these communities occur in ecotones between tidal marshes and non-tidal backswamps or uplands.

In lunar-tidal stands, Bald cypress (*Taxodium distichum*) dominates an open to very open overstory, with or without hardwood associates such as swamp tupelo (*Nyssa biflora*),

water tupelo (*Nyssa aquatica*), and green ash (*Fraxinus pennsylvanica*). Stand structure and canopy cover range from closed forest to very open woodland. Shrub and herb layers are variable but generally contain a mixture of species characteristic of both marshes and swamps. Some well-developed tidal bald cypress forests appear floristically similar to palustrine Bald Cypress-Tupelo Swamps. Other stands have a nearly monospecific herb dominance by shoreline sedge (*Carex hyalinolepis*). In a unique, possibly fire-influenced, savanna-like stand on the Northwest River, the herbaceous dominants, in rough seasonal order, are silvery sedge (*Carex canescens* ssp. *disjuncta*), spikerushes (*Eleocharis fallax and Eleocharis rostellata*), marsh rattlesnake-master (*Eryngium aquaticum* var. *aquaticum*), and wild rice (*Zizania aquatica* var. *aquatica*).

A distinctive, mixed tidal swamp forest in extreme southeastern Virginia is subject to irregular wind-tidal flooding. As currently defined, this community type appears to be a globally rare endemic of the Embayed Region of southeastern Virginia and northeastern North Carolina; similar communities, however, may also occur in Maryland and Delaware. In Virginia, stands are confined to the North Landing and Northwest Rivers (Cities of Virginia Beach and Chesapeake), estuarine tributaries of Currituck Sound. Although these systems are no longer influenced by lunar tides because of inlet closures, they are subject to wind-driven currents that produce as much as 1 m (3 ft) of variation in water levels and contribute to a salinity regime that fluctuates between completely fresh and about 5 ppt. This forest borders the wind-tidal marshes along the lower portions of the two rivers, extending well upstream of the limit of marshes in narrowing channel-side belts. It appears to represent a long-term seral stage in succession from marsh to swamp forest. Habitats have a pronounced hummock-and-hollow microtopography, with an average flooding depth 40 cm (16 in) above the hollow bottoms. Soils are coarse, fibric peats that appear indistinguishable from adjacent marsh peats. Bald cypress (*Taxodium distichum*), swamp tupelo (*Nyssa biflora*), and loblolly pine (*Pinus taeda*) are the dominant overstory trees in variable combinations. Spanish moss (*Tillandsia usneoides*) is locally abundant, festooning the trees in some stands. Sweetbay (*Magnolia virginiana*) and red bay (*Persea palustris*) are scattered understory trees, while southern bayberry (*Myrica cerifera* var. *cerifera*) dominates the shrub layer. The herb layer is diverse, containing species characteristic of both marshes and swamps, but royal fern (*Osmunda regalis* var. *spectabilis*) often dominates. This type differs from vegetation of the Maritime Wet Pine Forests group, which also contains loblolly pine, southern bayberry, and royal fern, in its tidally flooded hydrologic regime (vs. non-tidal saturated hydrology, the co-dominance of bald cypress,) and the prevalence of numerous, flood-tolerant swamp species.

The environmental dynamics, compositional variation, and state-wide distribution of Tidal Bald Cypress Forests and Woodlands are not well known and need intensive study.

Reference: Fleming and Moorhead (1998).

Fluvial Terrace Woodland. This is a somewhat enigmatic group of communities occurring on flat, sandy terraces and islands along Coastal Plain rivers in eastern Virginia. These habitats are elevated well above the level of adjacent swamps and are

characterized by xeric, sandy soils and open forest or woodland vegetation. Single occurrences have been documented along the Nottoway River (Sussex County), Chickahominy River (New Kent County), Dragon Swamp (Middlesex County), and Mattaponi River (Caroline County). At all four sites, hickories (*Carya pallida* and *Carya alba*) are the dominant trees, with drought-tolerant oaks (*Quercus falcata*, *Quercus nigra*, *Quercus marilandica*, *Quercus alba*) and pines (*Pinus taeda*, *Pinus virginiana*) present in smaller numbers. Shrubs occurring at all or most sites include sand post oak (*Quercus margarettiae*), sweetleaf (*Symplocos tinctoria*), American holly (*Ilex opaca* var. *opaca*), and eastern red cedar (*Juniperus virginiana* var. *virginiana*). Typical herbs include sedges (*Carex albicans* var. *australis* , *Carex pensylvanica* , and *Carex tonsa*), Canada frostweed (*Helianthemum canadense*), butterfly-pea (*Clitoria mariana*), late goldenrod (*Solidago tarda*), and prickly-pear (*Opuntia humifusa* var. *humifusa*). The Dragon Run site is anomalous in the presence (despite low soil pH and base status) of several calciphiles such as eastern redbud (*Cercis canadensis* var. *canadensis*), wild columbine (*Aquilegia canadensis*), smooth rock-cress (*Arabis laevigata* var. *laevigata*), robin's-plantain (*Erigeron pulchellus* var. *pulchellus*), and elm-leaved goldenrod (*Solidago ulmifolia* var. *ulmifolia*). A full understanding of the status and compositional relationships of this group will require additional inventory and assessment.

Tidal Freshwater Marsh. This is a diverse group of herbaceous wetlands subject to regular diurnal flooding along the upper tidal reaches of inner Coastal Plain rivers and tributaries. Ranging from New York to North Carolina, freshwater marshes occur in the uppermost portion of the estuarine zone, where the inflow of saltwater from tidal influence is diluted by a much larger volume of freshwater from upstream. In Virginia, tidal freshwater marshes are best developed on sediments deposited by large meanders of the Pamunkey and Mattaponi Rivers, although outstanding examples also occur along the Potomac, Rappahannock, Chickahominy, and James Rivers. Strictly speaking, tidal freshwater conditions have salt concentrations < 0.5 ppt, but pulses of higher salinity may occur during spring tides or periods of unusually low river discharge.

The most common species are arrow-arum (*Peltandra virginica*) dotted smartweed (*Polygonum punctatum* var. *punctatum*), wild rice (*Zizania aquatica* var. *aquatica*), pickerelweed (*Pontederia cordata*), rice cutgrass (*Leersia oryzoides*), tearthumbs (*Polygonum arifolium* and *Polygonum sagittatum*), and beggar-ticks (especially *Bidens laevis* and *Bidens coronata*). Locally, sweetflag (*Acorus calamus*), waterhemp pigweed (*Amaranthus cannabinus*), marsh senna (*Chamaecrista fasciculata* var. *macrosperma*), and southern wild rice (*Zizaniopsis miliacea*) may form dominance patches. Species diversity and vegetation stature vary with salinity, duration of inundation, and disturbance; the most diverse marshes occupy more elevated surfaces in strictly freshwater regimes. Mud flats that are fully exposed only at low tide support nearly monospecific stands of spatterdock (*Nuphar advena*), although cryptic submerged aquatic species may also be present.

Tidal freshwater marshes provide the principal habitat for the globally rare plant sensitive joint-vetch (*Aeschynomene virginica*) and are important breeding habitats for a number of birds, *e.g.*, the least bittern (*Ixobrychus exilis*) . Chronic sea-level rise is advancing the

salinity gradient upstream in rivers on the Atlantic Coast, leading to shifts in vegetation composition and the conversion of some tidal freshwater marshes into oligohaline marshes. Tidal Freshwater Marshes are also threatened by the introduced invasive plant marsh dewflower (*Murdannia keisak*). Several communities in this group are chiefly restricted to the Chesapeake Bay drainage basin and are likely globally rare or uncommon.

References: Ahnert (1960), Coulling (2002), McCoy and Fleming (2000), Megonigal and Darke (2001), Parker and Wyatt (1975), Perry and Atkinson (1997), Perry and Hershner (1999).

Rare Plant and Animal Species. The Baldcypress-Tupelo Swamp community also harbors a number of rare plant and animal species. Rare animals include bald eagle, great purple hairstreak, blackwater bluet, robust baskettail, cypress sphinx, Selys' sunfly, fine-lined emerald and Southern pitcher-plant mosquito. Rare plants include cuckooflower, red turtlehead, Parker's pipewort, pineland tick-trefoil, river bulrush, Northern purple pitcher-plant, and cypress-knee sedge (Belden, A. et al., 2001; Belden, A. et al., 2003). The Dragon Run also harbors a number of rookeries for colonial water birds, such as egrets and herons.

SECTION 3: Management Guidance

RESOURCE STEWARDSHIP

Goals and Objectives

The primary goal of management at Dragon Bridge Tract is to preserve an intact ecosystem with a matrix of communities native to the site that will provide opportunities for long-term habitat-focused research. The philosophy and policy direction for management of VCERR sites are similar to those outlined for the CBNERRVA in Appendix B. Reserve-level management and monitoring actions, as well as cooperative management initiatives and protection strategies, are planned based on the best current information and available resources.

Management objectives for Dragon Bridge Tract include:

- Preserve and protect key pristine swamp habitat and manage upland component of parcel to maintain a high quality ecosystem with significant riparian buffer value.
- Foster research and educational opportunities to accomplish conservation goals and contribute to the body of knowledge on flora, fauna, and natural communities of Virginia.
- Manage habitat to benefit the array of natural resources, scenic resources, and historic resources over the long-term.
- Monitor and evaluate effects of short-term and long-term management strategies on plants, animals, and natural communities.
- Protect populations of rare or uncommon plants and animals.
- Foster consistency with surrounding parcel land uses.
- Ensure site-security and visitor safety.

SITE MANAGEMENT GUIDE

Aquatic and Wildlife Habitat Management Issues

Biological resource management actions shall be taken to preserve and maintain the unaltered nature of the swamp community and to use the upland area of the site as quality riparian buffer habitat. Due to the relatively undisturbed state of the ecosystem of the swamp community on the site, preventing ecosystem degradation is more applicable than ecosystem restoration. Regarding the upland portion of the site, the primary goal is to manage the area to become a higher quality habitat that provides superior buffer qualities to protect the swamp portion of the site.

Major threats to biodiversity generally include: habitat degradation/loss, invasive non-native species, pollution, overexploitation, disease, land conversion to development, water development (e.g., dams, drainage projects), agricultural practices, livestock grazing, some outdoor recreation (e.g. off-road vehicles), pollutants, infrastructure development (e.g. roads), disruption of fire regimes, logging, and mining activities (Wilcove et al., 1998). After habitat loss, invasive non-native species are the greatest threat to terrestrial species. For aquatic species, water pollution is the most significant threat after habitat loss (Richter et al., 1997). Because of these threats to biodiversity, active management is often needed to restore and maintain natural resources (Wilcove and Chen, 1998).

Biological issues of greatest concern and most likely to cause negative impacts to natural resources at Dragon Bridge Tract are potential invasive species introduction/expansion, use and development pressures outside the reserve, and native animal populations lacking natural abundance controls. Due to the permission-only use management of the site, habitat degradation by users should be relatively limited.

Upland/riparian buffer management.
Establishment and maintenance of riparian buffers is recognized as a significant protection mechanism of both water quality and key swamp ecosystems. One principle component of the site management goals includes establishment of a riparian buffer along Dragon Run and associated riparian zones, including the tributary creek at the entrance to the property. The most obvious line for the inner edge of the riparian buffer is the transition from planted pines to a mixed pine hardwood forest. The DGIF site surveyor recommendation is to leave the mixed hardwood forest in the bottomland as a riparian buffer, leaving the upland planted pines as an area for management activities. The current strategy for the upland pineland area is to allow for conversion to a mixed hardwood forest via natural plant succession. This result will most likely be a pine-dominated forest given that oak, beech or hickory species were not found in abundance in the understory. In order to maintain the health of the forested area, some future management activity (e.g. thinning) may be necessary. The existing road network and logging decks will be maintained as open areas in hopes that species will utilize the edge transition created around the open areas. It is recognized that this will create somewhat of a fragmented forest habitat on the land tract.

Road corridors.
The DGIF site surveyor identified road maintenance as an immediate priority. Routine road maintenance will serve multiple purposes including access for educational groups and for habitat maintenance.

The existing roads are covered in *Lespedeza cuneata* (sericea lespedeza), a non-native weed that is considered invasive. There is very little food value for wildlife associated with this plant due to the high tannin content of the seeds and very little cover value for small mammal and bird species. Overall, it is recommended that it be controlled using a chemical treatment. If a glyphosate product is used, all vegetation along roads will be killed, which may be beneficial depending on management goals. (See Appendix G for information on Chinese Lespedeza control.)

If the manager intends to use the road network for fire breaks as well, then it is recommended that the area be cleared 10 ft from the center to each side of the road. Roads will also have to be extended to completely surround the upland forested acres. As they exist now, they will not work as fire breaks. Road sides can then be planted in a perennial clover to serve as erosion control and a wildlife food source. Burning can be an important tool for promoting early successional growth in a pine ecosystem, especially once the pines grow large enough to shade out the understory.

Road maintenance should be performed regardless of the timber management method to allow access in specific cases as described. As an aside to overall road maintenance, the spillway at

the entrance needs to be rebuilt to allow the water level to be controlled so the road does not continue to flood out. The wetland habitat created by the beavers is excellent for water quality and wildlife, but must be managed to maintain the utility of the property (Figure 6).

Key habitat and Natural Heritage Resource protection zones. Areas identified as key habitat, such as the swamp and riparian buffer should be protected from being impacted by site activities. Most, if not all, of the Natural Heritage Communities may be found in these zones. Therefore, protection of these zones (identified in Figure 6) is equivalent to protection of the Natural Heritage Communities. Activities that may damage these habitats should be prohibited.

Threat mitigation.
Invasive, non-native species. Nationwide, invasive species have been identified as the second highest threat to biological diversity, second only to loss of species and habitat from development and urban sprawl (Stein et al., 2000). Control of invasive non-native plants is expensive, resources are limited, and management efforts must be prioritized (Hiebert and Stubbendieck, 1993).

The Dragon Run Watershed contains only limited examples of invasive, or non-native, species, again emphasizing a relatively intact natural system. Currently, blue catfish, common reed, Asiatic dayflower, Chinese Lespedeza and Japanese stiltgrass occur in the Dragon Run in limited quantities.

The goal of management at Dragon Bridge Tract is to prevent the worst invasive species from becoming established in its high-quality natural communities. At Dragon Bridge Tract, the following invasive plant was noted: Chinese Lespedeza (*Lespedeza cuneata* (sericea lespedeza)). Because of minimal infestations of invasive species at the site, eradication of the primary invasive identified at the site, Chinese Lespedeza, is potentially a practical option. Other management efforts should focus on preventing or reducing abundance of the most problematic invasive plants in the highest quality natural communities.

Chinese Lespedeza (*Lespedeza cuneata* (sericea lespedeza)). Chinese lespedeza, sometimes called sericea lespedeza, is primarily a threat to open areas such as meadows, prairies, open woodlands, wetland borders and fields. Once it gains a foothold, it can crowd out native plants and develop an extensive seed bank in the soil, ensuring its long residence at a site. Established dense stands of lespedeza suppress native flora and its high tannin content makes it unpalatable to native wildlife as well as livestock. See sericea lespedeza management guidance (Appendix G) for information and management regime.

Native animal problem species. Due to overabundance, certain native species of animals have become problematic – from both ecological and economic perspectives. While these species are native to Virginia, recent population increases have resulted in negative effects on habitat. Overabundance of some species is often incompatible with a broad array of resource management objectives. For ecological and/or economic reasons, natural resource managers must sometimes control burgeoning populations of native animals. The primary native species of impact at the Dragon Bridge Tract is the white-tailed deer.

White-tailed deer (*Odocoileus virginianus*). A large body of research (Russell et al., 2001) presents evidence that dense populations of deer in many eastern U.S. ecosystems can negatively impact tree and herb regeneration, recruitment and composition (Alverson and Waller, 1997, Horsley et al., 2003), alter natural community composition (Rooney and Dress, 1997), eliminate certain plant species from areas (Augustine and Frelich, 1998), and disrupt bird populations (deCalesta, 1994; McShea and Rappole, 1997). Deer also avoid browsing on the invasive non-native plants, such as Japanese stilt grass (Tu, 2000) further exacerbating the nefarious effects of these weeds on native flora. Of particular concern for natural areas management are negative effects of high deer densities on herbaceous plants (Balgooyen and Waller, 1995; Augustine and Frelich, 1998) and rare plants (Miller et al., 1992). At the end of the 19th century, deer were over-hunted to the point of near extirpation from Virginia. Since then, implementation of strict game laws, elimination of natural predators, and the changing landscape (with more edge habitat) has given rise to a burgeoning deer population that today, in most areas of the state, exceeds estimated pre-settlement deer densities (Knox, 1997).

Monitoring programs can be designed to estimate and track deer population densities and deer impacts in order to guide management actions. Additional information on white-tailed deer monitoring and control can be found in Appendix H.

Urban interface factors. Increasing development in the Dragon Run watershed, and specifically along the mainstem itself, has immediate and long-term impacts on natural resource quality and thereby natural resource-based industries. In particular, both large scale development and the placement of sporadic single family homes negatively impact these watershed values.

The network of roads that accompanies larger scale new development creates negative ecological impacts beyond just the effect of construction of new buildings. Increased impervious surfaces alter surface water flow and aquifer recharge, in addition to increased soil loss and sedimentation, which contribute to water quality degradation. Even more distantly located emissions from motor vehicles, power plants, industry, and other fossil-fuel producers have negative air and water quality impacts in the Dragon Run.

While development of single family homes along the Dragon Run may leave a smaller footprint with regard to impervious surfaces and infrastructure requirements, it contributes significantly to the fragmentation of key habitat. Most traditional uses, i.e. farming and forestry, which have been practiced in the Dragon Run require large tracts of land to operate. These large holdings have been the key to keeping the watershed primarily intact. The patchy placement of new single family homes, especially close to the mainstem itself, reduces the cohesiveness of the ecosystem, as well as the capacity of the traditional industries to operate effectively in the future.

To help mitigate and plan for impacts of the urban interface factors, VIMS should continue to support the Dragon Run Steering Committee and the Dragon Run Special Area Management Plan in efforts to work with the watershed counties to develop land-use planning recommendations that balance growth demands and the protection of traditional uses of the Dragon Run.

Fire management. Fire management is frequently an important facet of natural areas management in Virginia. Fire management activities include both prescribed fire implementation and wildfire management. While some wildfires are potentially destructive and should be suppressed, some situations – such as in the case of the Dragon Bridge Tract - should be explored as an opportunity to realize the benefits of fire in a natural setting.

To prepare for and provide guidance in the event of a wildfire in the future, a wildfire contingency plan should be developed for Dragon Bridge Tract. Such a plan should explore the past role of fire on the site, clearly state the potential benefits and disadvantages of wildfire under current landowner and management contexts, outline management objectives, and provide a viable set of management options should a wildfire occur. Development of a wildfire contingency plan would best be accomplished by VIMS staff working closely with agencies and organizations that frequently deal with fire management issues, including DCR, Department of Forestry (DOF), DGIF and The Nature Conservancy.

Cultural/Historic Site Protection

A Virginia Department of Historic Resources review was conducted and there do not appear to be any applicable archeological or architectural artifacts located on the site.

Use, Public Access, and Enforcement Plan

Operations management is a crucial aspect of natural area management, especially on lands where recreational uses by members of the public may conflict with the primary management objectives of research and natural resource protection. Managers must design and maintain infrastructure such as signs to best protect resources from adverse human effects. Routine operations management activities include boundary line maintenance, permitted/prohibited activity posting, and law enforcement. Since VIMS in unable to maintain an “on site” presence and lacks its own law enforcement staff, it will be necessary to partner with other natural resource agencies such as VDGIF when law enforcement issues affecting natural resource protection arise. Generally, the philosophy and policy direction for management of public access are similar to those outlined for the CBNERRVA in Appendix C.

Visitor management. All requests for access to and use of the Dragon Bridge Tract must be submitted to the CBNERRVA for review, processing and permission. Any permitted access or usage must be consistent and compatible with the management strategies and goals outlined in this management plan. Failure to comply with approved visitation permission stipulations shall result in the cessation of all activities by that entity. Trespass or failure to request permission for an activity shall result in cessation of use by that entity until such time as the activity is approved by the CBNERRVA.

Code of conduct. Site users should receive a copy of the Public Use Guide (Appendix I), which provides information regarding the public and private rights associated with waterways in Virginia. This brochure provides an overview of the Public Trust Doctrine and how it is applied. This use of this document may help to reduce conflicts between individuals exercising their public trust rights and landowners, and vice versa.

Federal and state natural resource laws. Laws potentially affecting management of the

Dragon Bridge Tract are noted in Appendix J. The conservation emphasis of management at VCERRS sites means that VIMS will rarely engage in land or water modifications subject to regulation. Decisions to permit fishing or hunting will comply with all federal and state game laws. At all VCERRS sites, efforts to control invasive species, protect rare and endangered species, and protect existing natural and historic resources fulfill the requirements of several natural resource laws.

Hunting. Virginia law provides that any appropriately licensed person can hunt waterfowl in public waters during established seasons and using legal methods so long as they are not within 457 meters (500 yards) of an existing licensed stationary waterfowl blind. Therefore, if VIMS does not license, establish, and use (for the purpose of hunting) stationary waterfowl blinds on Dragon Bridge Tract, then members of the public may obtain a license and build a stationary hunting blind in public waters surrounding and adjacent to the site. Where stationary blinds are not established, hunters could also legally hunt from licensed floating blinds in the waters adjacent to the site. It is recommended that VIMS work with DGIF biologists and game wardens to develop a waterfowl hunting plan, a deer hunting plan (such as the one in Appendix H) and provide appropriate signs that address trespass and appropriate and inappropriate activities.

Monitoring. A wide variety of monitoring techniques are used to assess change in natural community composition and rare species population status. Monitoring can determine if natural processes essential to natural resource health are occurring and whether or not management actions have been effective. Monitoring is also needed to document effects of human visitation and public use patterns on resources and other natural features protected within natural areas and reserves. The term “monitoring” describes several different types of data collection related to resource management and includes inventory, natural history study, research, implementation monitoring, trend measurement, baseline measurement, and longterm ecological studies. Monitoring in a strict sense is “the collection and analysis of repeated observation or measurements to evaluate changes in condition and progress towards meeting a management objective” (Elzinga et al., 1998).

Research. Research to improve understanding of natural history, biology, and population dynamics of rare species and key ecosystem functions is needed for sound and defensible management planning. Scientific studies are conducted by VIMS or other agencies through permission from VIMS to answer basic natural history questions and to inform management decisions and actions. Studies conducted on all VCERRS sites require submission of an application, which must be reviewed and subsequently approved by VIMS staff.

Plan for Consistency with Surrounding Properties and Participation with Regional Conservation Area Coordination Efforts

CBNERRS representatives have been active participants on the Dragon Run Steering Committee and the Dragon Run Special Area Management Plan (SAMP). CBNERRS representatives have also been key stakeholders in the development of the Dragon Run Watershed Management Plan (Appendix F). Action items identified in this plan shall be conducted in a method that consistent with the goals of the SAMP and the objectives identified in the Dragon Run Watershed Management Plan.

There are several sites in the vicinity of the Dragon Bridge Tract that also are conservation acquisitions held by public and non-governmental organizations, yet may have alternative goals and management schema than the Dragon Bridge Tract. It is recommended that the site managers communicate as needed to maximize opportunities that become available and to ensure consistency and compatibility across the watershed. The Dragon Run SAMP is currently working to coordinate the development of a public and NGO conservation acquisition managers group. It is expected that this group will communicate via meetings, group email or listserve, based on user preference.

Establishment of Conservation Easements

Although the site is owned by a public entity, it is recommended that a conservation easement be placed on the property, especially the swamp habitat and its riparian buffer to permanently protect the key natural habitats of this property.

Plan for Management Sustainability and Funding

As with most state entities, sustainability of funding is variable and subject to change. However, as a part of the VCERRS, the Dragon Bridge Tract does provide more definite sustainability of management. With its purpose identified by the Code of Virginia, § 28.2-1103, the goals of research and education are firmly acknowledged, as are uses, such as conservation, which are compatible with those goals.

IN SUMMARY
Summarized below are Action Items and Enforcement Items identified by this management plan to fulfill the Management Objectives listed in Section 3:

Action Items

- Continue to protect, manage and monitor riparian buffers/swamp/Natural Heritage Communities within the Dragon Bridge Tract.
- Roadway and drainage/spillway improvements as outlined in the Road Corridor section
- Allow for conversion of upland pineland area to a mixed hardwood forest via natural plant progression.
- Take prescribed measures to monitor and eradicate Chinese Lespedeza as well as monitor for other invasive species that may move into the area.
- Consider managed deer hunts to control white-tailed deer populations and developing a waterfowl management plan with consultation with the Department of Game and Inland Fisheries.
- Continue with Dragon Run Steering Committee participation and input, especially regarding land-use planning in King and Queen and the surrounding counties.
- Adopt Public Use Guide.
- Erect signage internal to the site with management contact information, use restrictions and guidance and other information, such as the Public Use Guide.
- Post boundary markers to differentiate the site from surrounding lands.
- Continue with permission-based management approach for site use.
- Coordinate with surrounding public and non-governmental entities regarding conservation site management goals and opportunities.

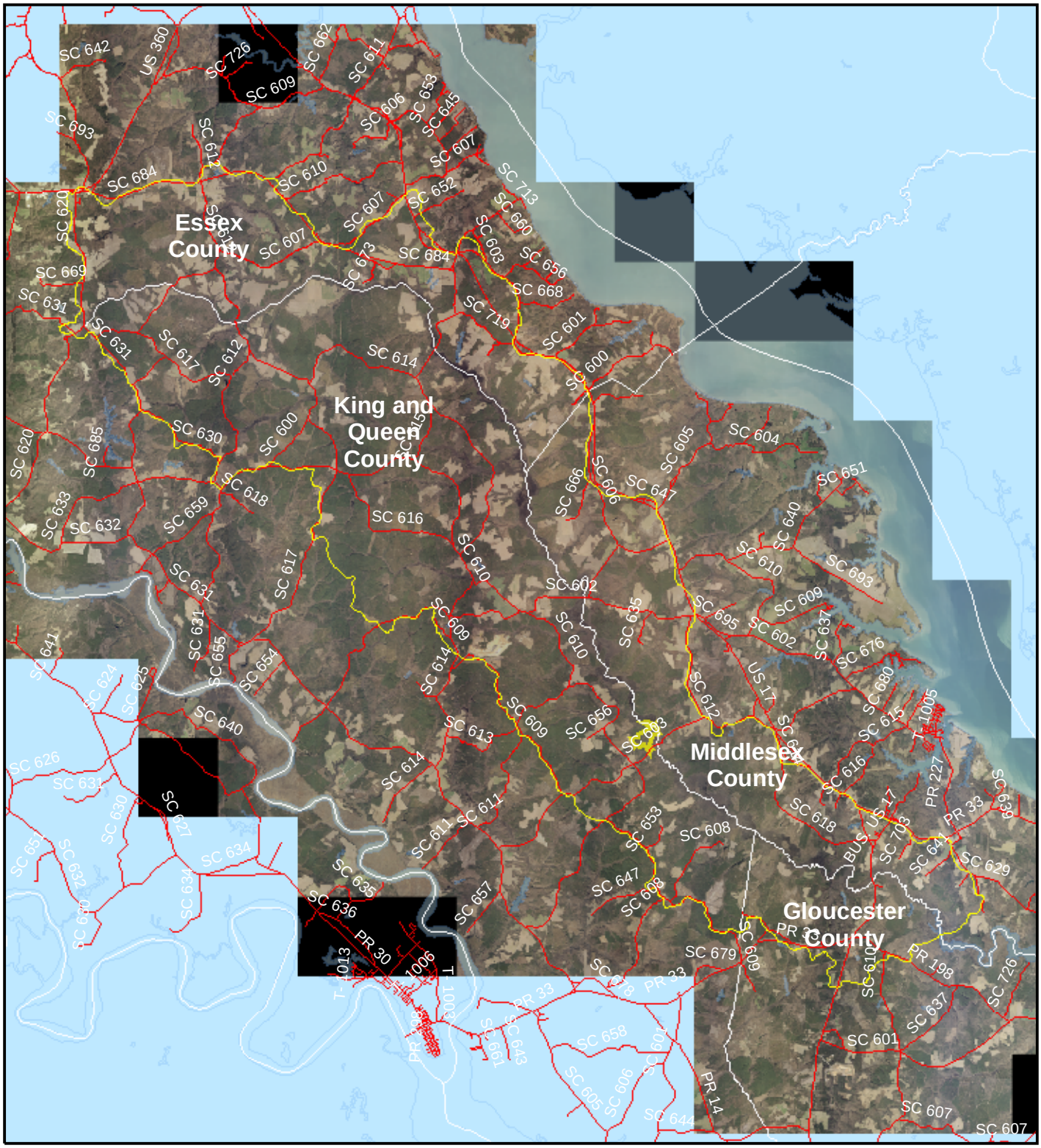
Data Gaps to Address in the Future:

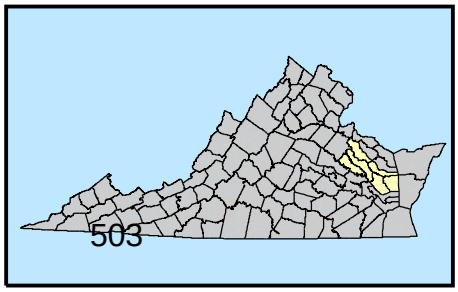
- Conduct on-site survey with representative for the Virginia Department of Historic Resources
- Conduct more detailed groundwater studies in the area

CONCLUSION
Contrary to the management of many conservation sites in more populated areas, the isolation and relatively undisturbed key habitats of the Dragon Bridge Tract require minimal active management. Because the swamp and primary riparian buffer of the site currently reflects the "natural" landscape of pre-industrial/pre-urban expansion America 500 years ago, a management strategy based on protection, maintenance and continued monitoring will go a long way to conserve natural resources. By addressing several key management issues, including road corridor maintenance, removal of invasive species, management of the upland forest, and by controlling activities and enforcing the prohibition of incompatible uses, it is likely that successful stewardship of natural resources will be attained.

LIST OF FIGURES

Figure 1: Dragon Run Watershed





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Dragon Run WATERSHED

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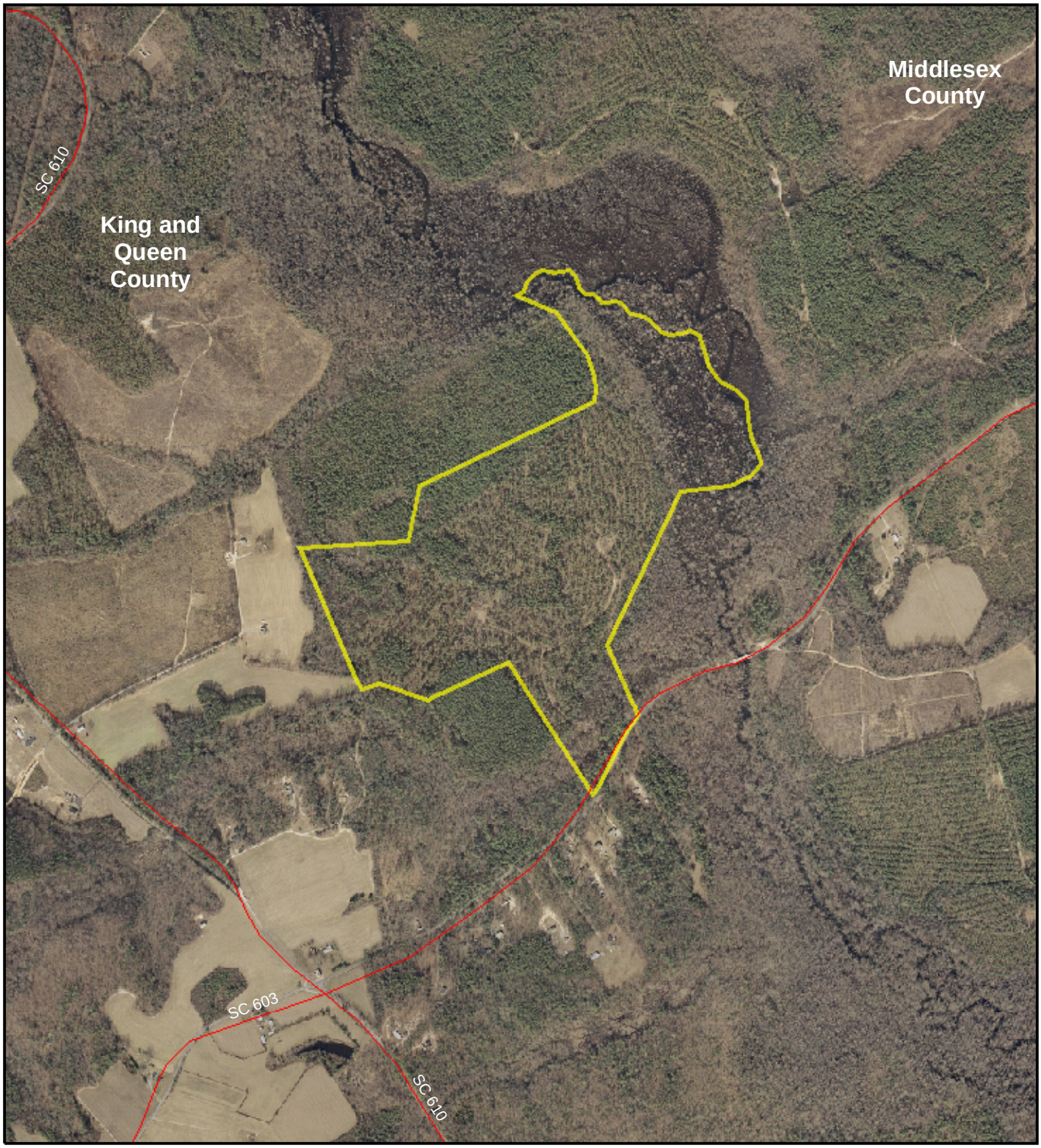
Figure 2: Dragon Bridge Tract - Site Boundary and Location



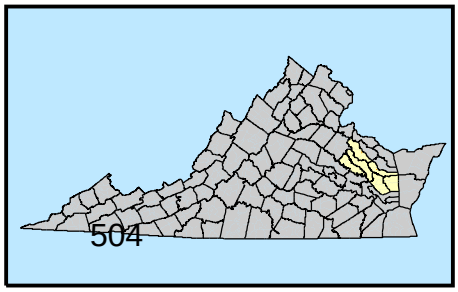


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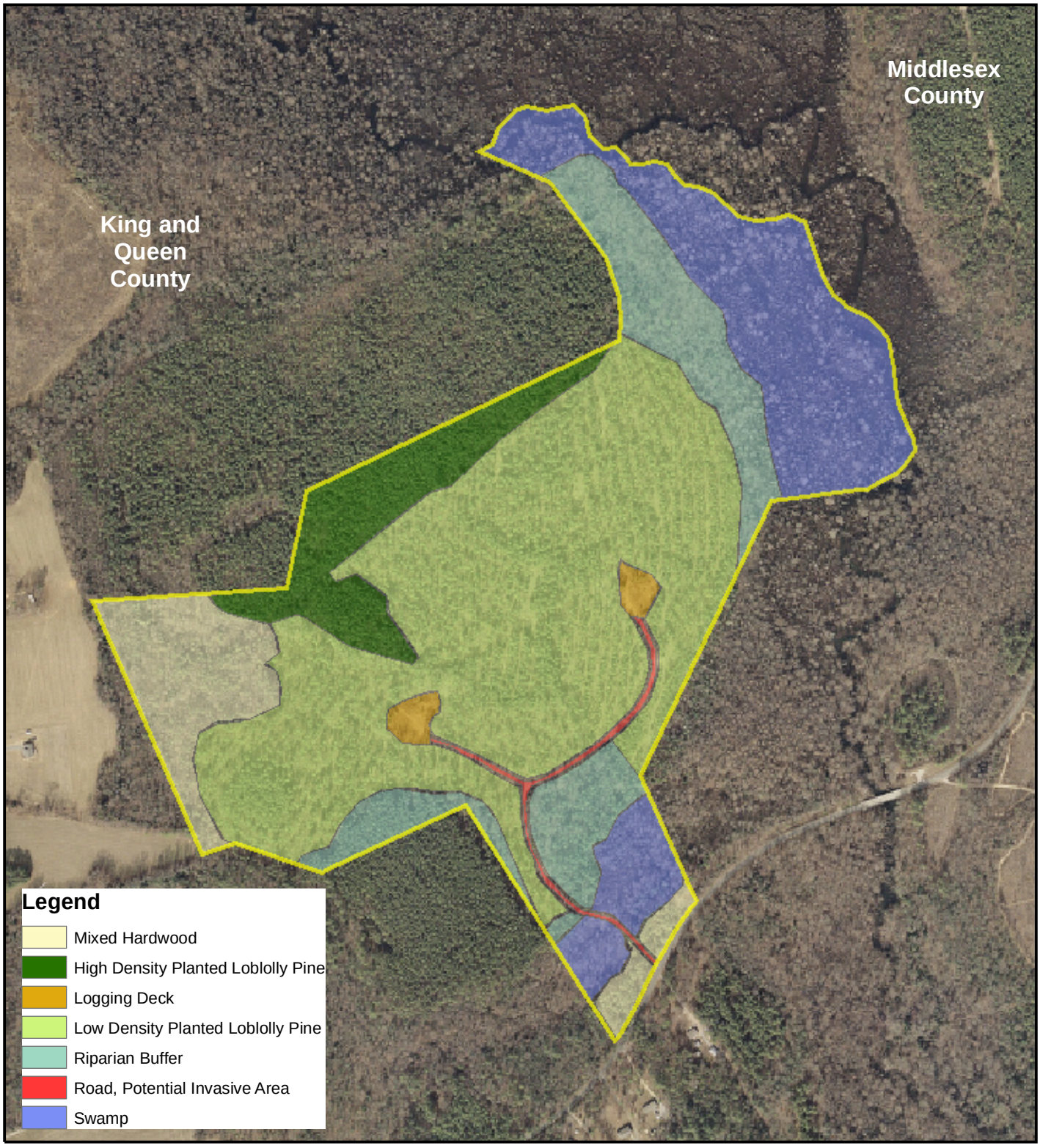
Figure 3: Dragon Bridge Tract - Site Survey



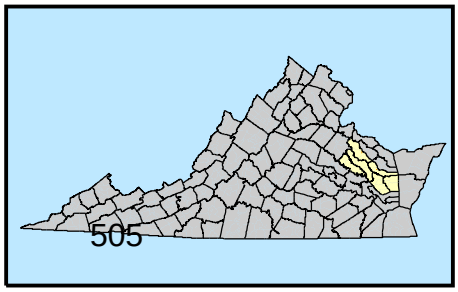


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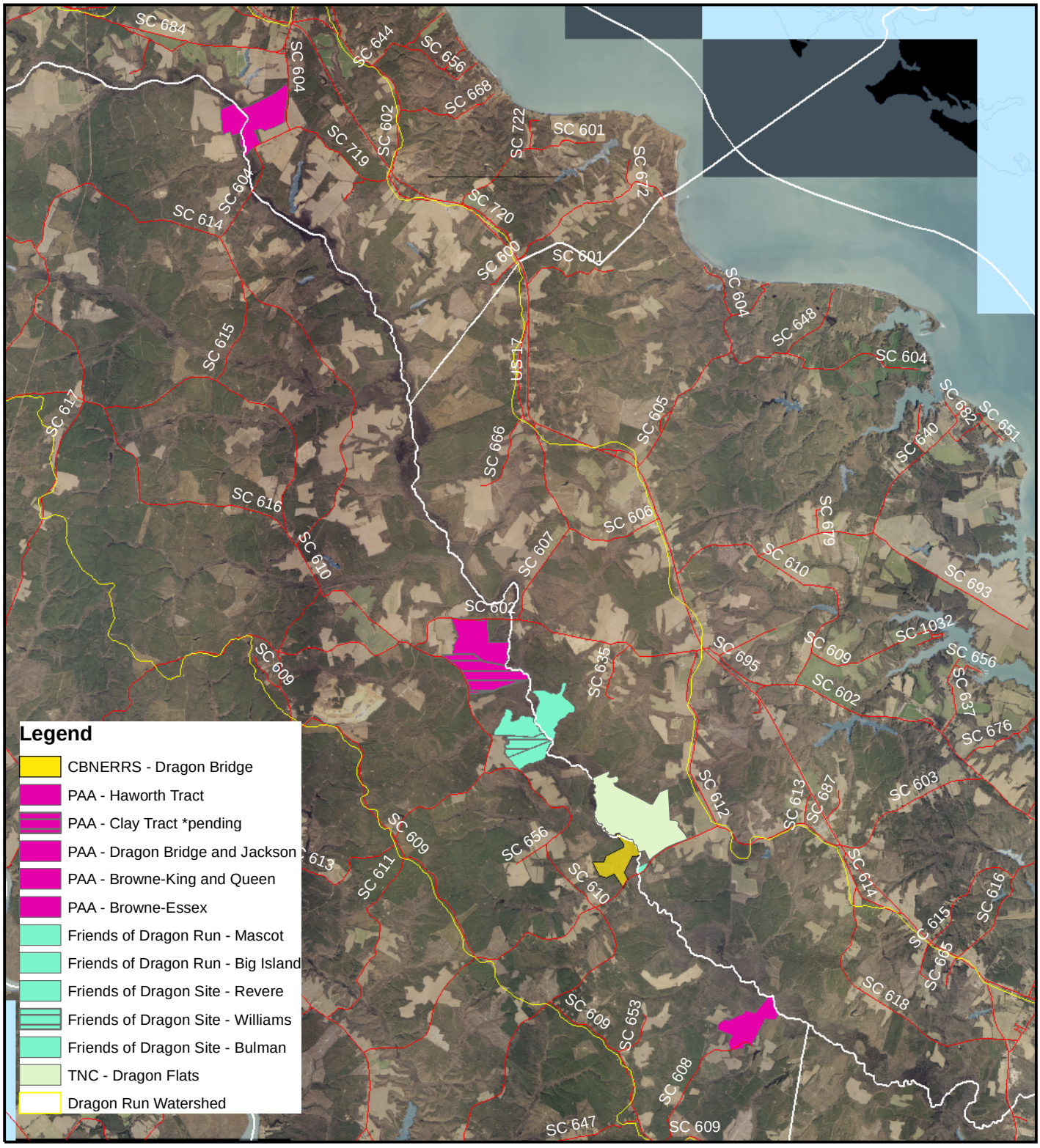
Figure 4: Dragon Bridge Tract - Surrounding Conservation Holdings



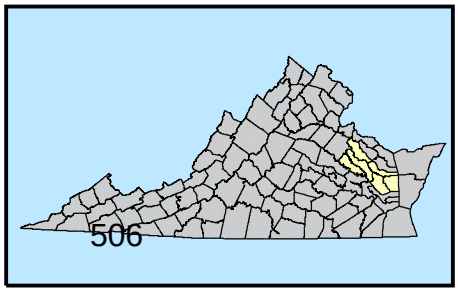


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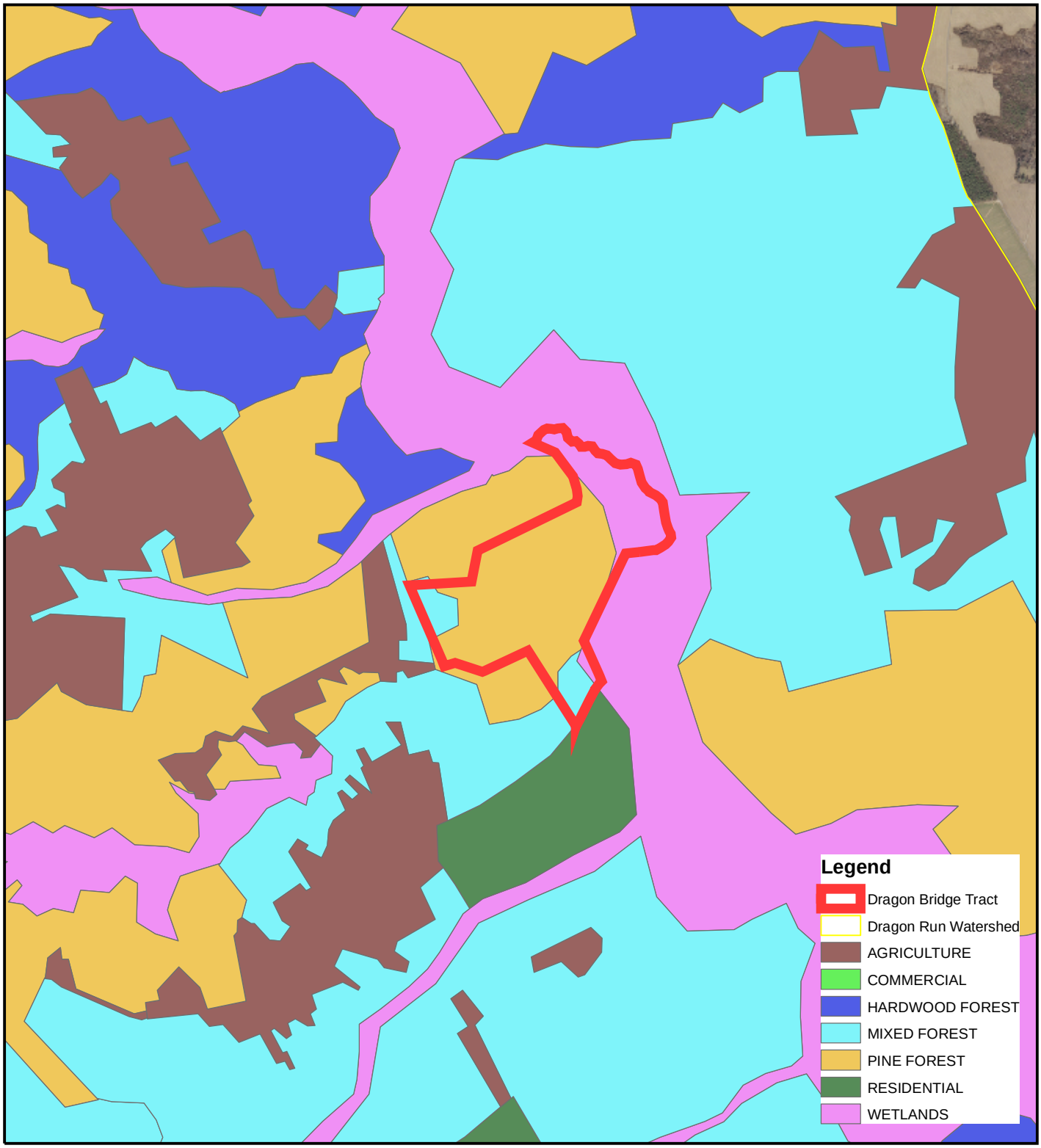
Figure 5: Dragon Bridge Tract - Surrounding Landcover



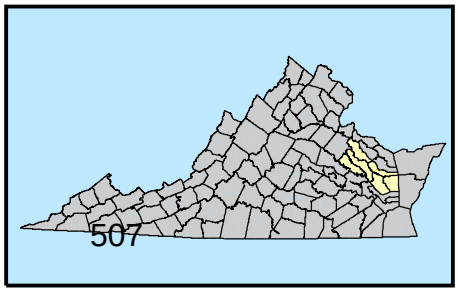


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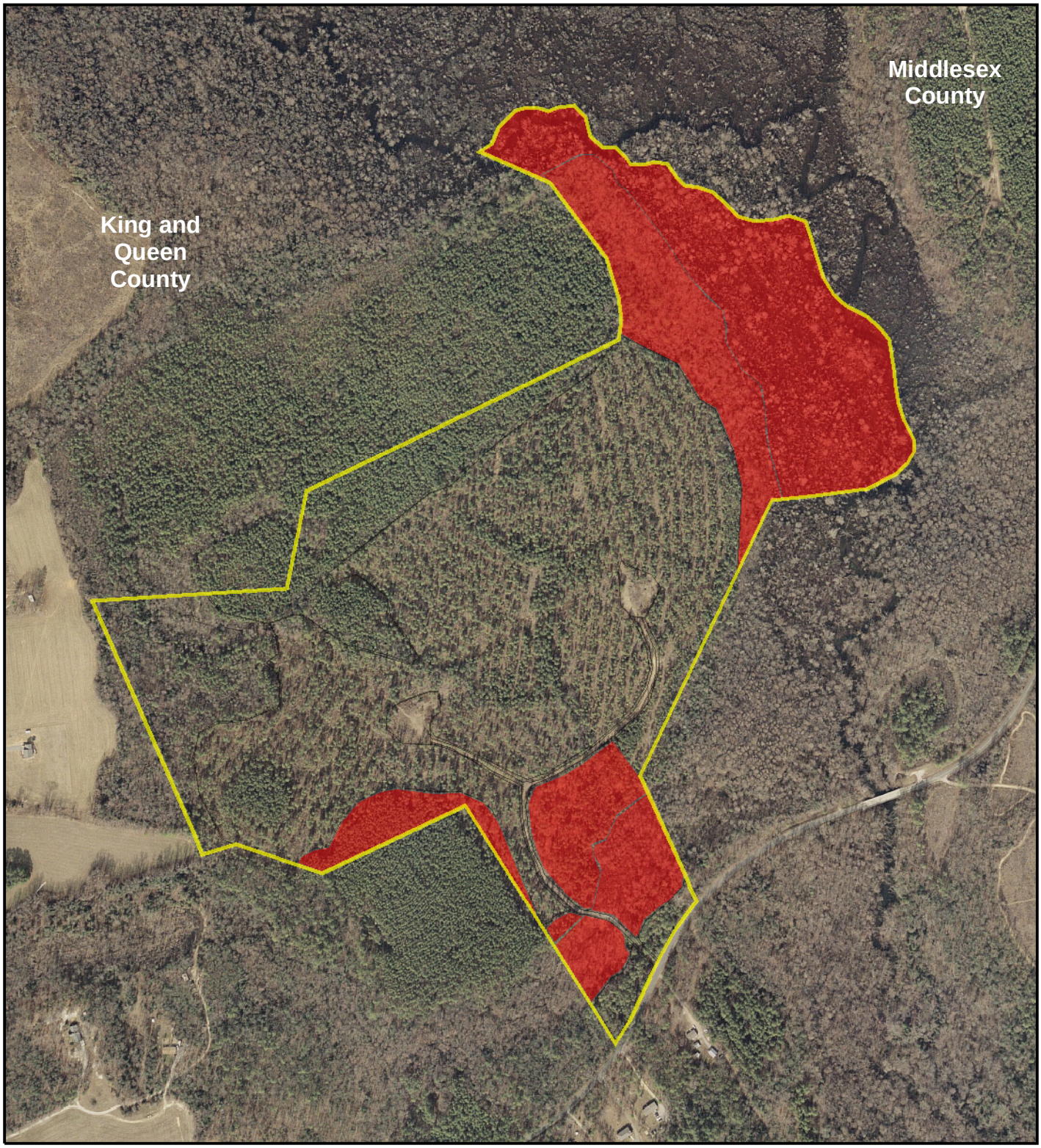
Figure 6: Dragon Bridge Tract - High Priority Conservation Areas



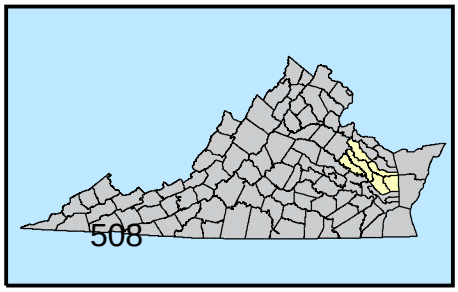


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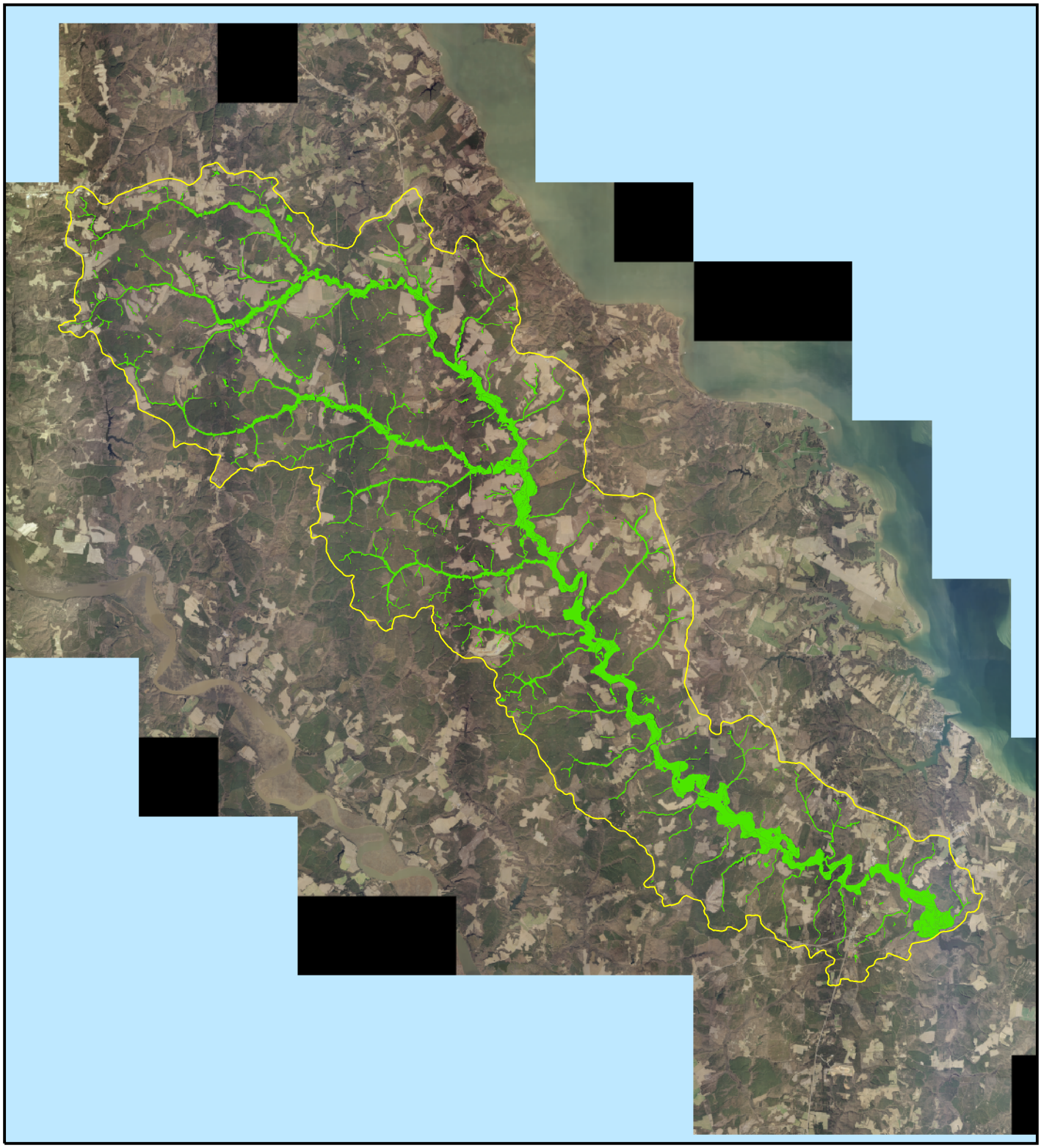
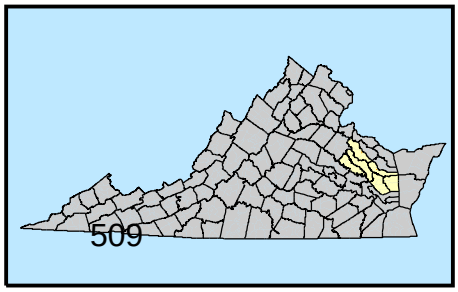
Figure 7: Dragon Run Wetlands





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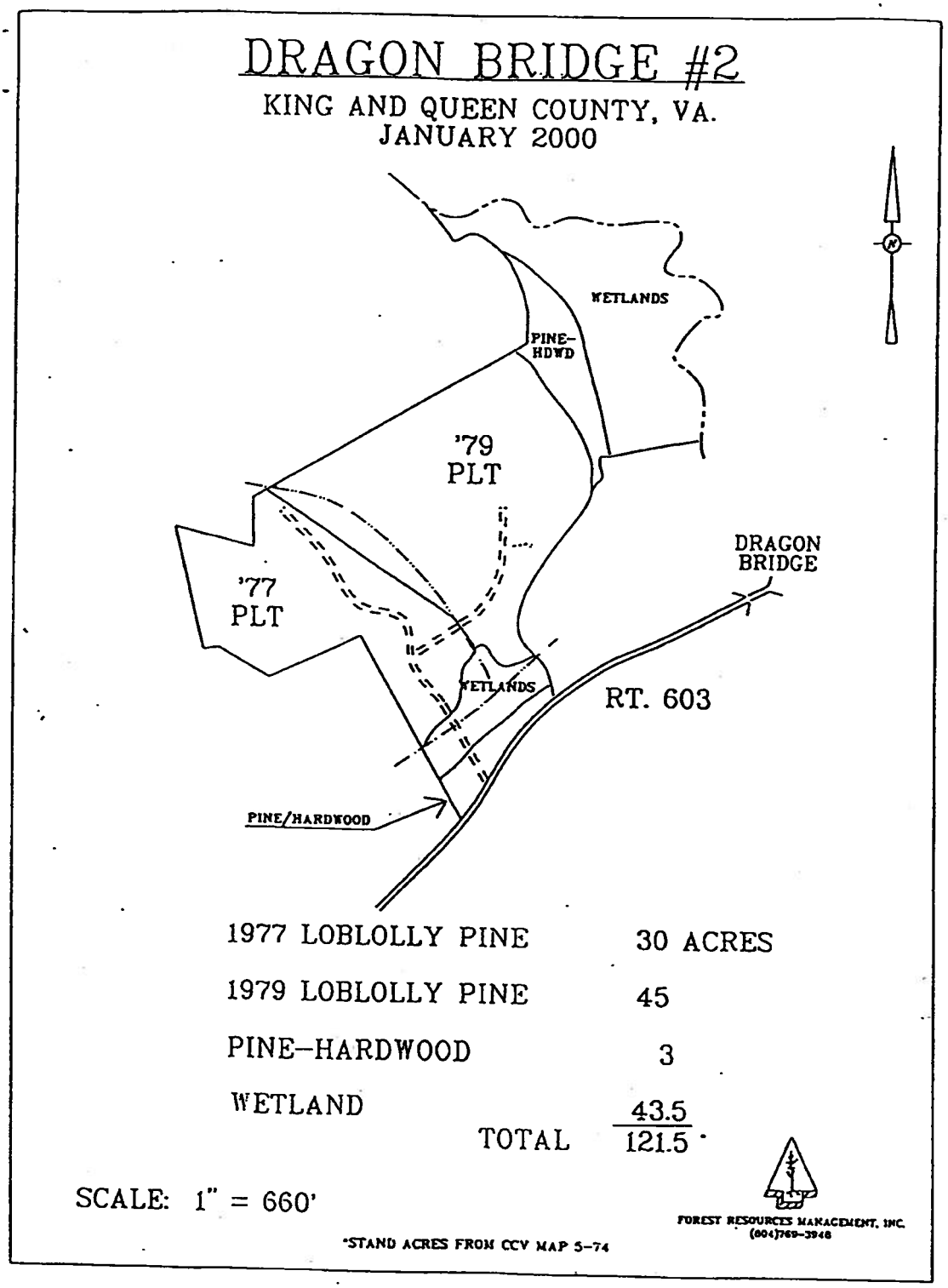
Site Plan

FIGURE 8:



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APPENDICES

A. VCERRS in the Code of Virginia
B. CBNERRVA Management Plan 2008**
C. General Public Access Plan – CBNERRVA**
D. Rare Species and Community List
E. Natural Heritage Rarity Ranks and Status Explanation
F. Dragon Run Watershed Management Plan
G. Chinese Lespedeza Management Guide
H. Managed Hunting Plan
I. Public Use Guide
J. Federal and State Natural Resource Laws
K. Glossary of Technical Terms and Abbreviations

***At the time of publication, a management plan nor a public access plan for the Virginia Estuarine and Coastal Research Reserve system had not been developed. As the policies of this system are consistent with the CBNERRVA system, the CBNERRVA Management Plan 2008 and CBNERRVA Public Access Plan has been utilized in the interim.*

Appendix A. Virginia Coastal Estuarine Research Reserve System enabled by the Code of Virginia

Code of Virginia - Title 28.2 - FISHERIES AND HABITAT OF THE TIDAL WATERS.

§ 28.2-1103. Virginia Estuarine and Coastal Research Reserve System created; purpose; Virginia Institute of Marine Science to administer.

A. There is hereby created the Virginia Estuarine and Coastal Research Reserve System (the System) for the purpose of establishing a system of protected sites representative of the Commonwealth's estuarine and coastal lands in which research and long-term monitoring will be conducted in support of the Commonwealth's coastal resource management efforts.

B. The System shall be established and administered by the Virginia Institute of Marine Science of The College of William and Mary. The Institute shall consult with and seek the advice of the Virginia Coastal Program and of those state agencies responsible for administering programs of the Virginia Coastal Program; the Marine Resources Commission; the Department of Game and Inland Fisheries; the Department of Conservation and Recreation; the Department of Health; and the Department of Environmental Quality.

C. Sites included within the System shall be within any jurisdiction included in Tidewater Virginia as defined in § 10.1-2101.

D. The Institute may accept the dedication, by voluntary act of the owner, of areas it deems suitable for the System. Dedication may include transfer of fee simple title or other interest in land to the Commonwealth or may be in the form of voluntary agreement with the owner to include the area within the System. Estuarine and Coastal Research Reserve System sites may also be acquired by gift, grant, or purchase.

E. The instrument of dedication may:

1. Contain restrictions and other provisions relating to management, use, development, transfer, and public access, and may contain any other restrictions and provisions as may be necessary or advisable to further the purposes of this article;

2. Define, consistent with the purposes of the article, the respective rights and duties of the owner and of the Commonwealth and provide procedures to be followed in case of violations of the restriction;

3. Recognize and create reversionary right, transfers upon conditions or with limitations, and gifts over; and

4. Vary in provisions from one System site to another, in accordance with differences in the characteristics and conditions of the several areas.

F. Public departments, commissions, boards, counties, municipalities, corporations, colleges, universities and all other agencies and instrumentalities of the Commonwealth and its political

subdivisions may enter into agreements with the Institute to dedicate suitable areas within their jurisdictions as Estuarine and Coastal Research Reserve System sites.

G. Subject to the approval of the Governor and the Attorney General, the Commonwealth may enter into amendments to the instrument of dedication upon finding that the amendment will not permit an impairment, disturbance, use, or development of the area that is inconsistent with the provisions of this article. If a fee simple estate in the Estuarine and Coastal Research Reserve System is not held by the Institute under this article, no amendment may be made without the written consent of the owner of the other interests therein.

H. The Institute is empowered to enter into agreements with federal agencies holding title to lands within Tidewater Virginia to include suitable portions of agency holdings in the Virginia Estuarine and Coastal Research Reserve System.

I. All lands within the system shall be used primarily for research and education. Other public uses such as hunting and recreation on those research reserve lands owned by the Institute shall be allowed, consistent with these primary uses. Improvements and alterations to research reserve lands owned by the Institute shall be limited to those consistent with these uses.

(1999, c. 553; 2005, c. 41.)

§ 28.2-1104. Coordination.

A. To the extent feasible, this system shall be carried out in coordination with the National Estuarine Research Reserve System established by 16 U.S.C. § 1461.

B. To the extent feasible, lands within the Virginia Estuarine and Coastal Research Reserve System shall be dedicated as part of the Commonwealth's natural area preserves components pursuant to § 10.1-213.

(1999, c. 553.)

Appendix B. Mission of CBNERRVA – from draft CBNERRVA Management Plan 2008-2012

5.1 Mission Statement

The mission of CBNERRVA is to:

> *preserve a network of reserves that represent the diversity of coastal ecosystems found within the York River estuary and its principal tidal tributaries and manage these reserves to support informed management of coastal resources through, estuarine research, education, stewardship, and advisory service*.

The Reserve's mission complements the three-part mission of the VIMS to conduct interdisciplinary research in coastal ocean and estuarine science, educate students and citizens, and provide advisory service to policy makers, industry, and the public.

5.2 Chesapeake Bay Management Issues and CBNERRVA Focus Areas (2007-2011)

Degradation of marine and estuarine environments is of global concern and the Chesapeake Bay system is no exception. A growing population along with associated land use changes are primary factors causing water quality and habitat degradation in the Bay's watershed, it's tributaries and the Bay proper. Key management issues and threats to the Bay system include:

Figure 5.1. Episodic large storms (Tropical Storm Ernesto, 9/1/2006) impact Bay resources and coastal communities. *Photo credit: William Reay.*

- excess nutrients, both nitrogen and phosphorus, that stimulate algal blooms and lead to oxygen deprived waters and reduced water clarity;
- excess sediments which result in degraded habitat, reduce water clarity, and serve to transport toxic materials, pathogens and nutrients to water resources;
- introduction of toxic chemicals (e.g., mercury, PCBs, pesticides) and associated health impacts on wildlife and humans;
- loss and/or degradation of key habitats (e.g., submerged aquatic vegetation, wetlands, riparian forests, oyster reefs) that provide critical services to a wide variety of residential and migratory species; and
- declining finfish and shellfish populations due to over-fishing and disease issues.

The CBNERRVA has developed focus areas that address national, regional and local issues. Cutting across specific program boundaries, issue focus areas allow the Reserve to address key management concerns in a more integrated and comprehensive manner. Primary focus areas directing Reserve programs include:

- Ecology of coastal shallow water environments;
- Watershed and atmospheric processes and material flux;
- Episodic storm events and climate change;
- Shoreline management;
- Integrated coastal and ocean observing systems; and
- Advisory service.

5.3 Reserve Goals and Objectives

5.3.1 Management Plan Framework

The CBNERRVA Management Plan has been developed to address specific goals and objectives within the Administration, Research and Monitoring, Education and Stewardship programs in order to support the Reserve's mission over the next five years (2007-2011). The Reserve's goals and objectives outlined in this management plan align with the goals and objectives of the NOAA/NERRS 2005-2010 Strategic Plan (see Section II.B3); see italicized text following CBNERRVA programmatic goals and objectives. The Reserve's management plan has been subdivided into basic responsibilities and activities associated with primary Reserve programs and operational responsibilities. Individual plans include:

- Administration
- Research and Monitoring;
- General Education and Outreach;
- Coastal Training Program;
- Stewardship and Public Access;
- Boundary and Acquisition;
- Facilities, Site Infrastructure and Equipment Support; and
- Special Programs.

Specific strategies have been developed to address each Reserve goal and objective. Serving as action items, these strategies provide focused guidance and allow for Reserve performance to be monitored.

5.3.2 Overview of Goals and Objectives

Goals and associated objectives to support the Reserve's mission are provided in Table 5.1. Specific strategies addressing Reserve goals and objectives are presented in the individual plan sections based on programs and operational responsibilities. A complete summary table of Reserve goals, objectives and strategies is provided in Appendix 2. In some cases, Reserve goals and objectives target specific programs (e.g., Administration, Research and Monitoring, General Education and Outreach, CTP and Stewardship). Whereas in other cases, activities and strategies associated with specific goals and objectives are integrated across programs. To aid in understanding Reserve operations and clarify program areas of emphasis and responsibility, lead and supporting Reserve programs have been identified for each goal and strategy.

Table 5.1. Summary of 2007-2011 CBNERRVA goals and objectives. Linked NOAA/NERRS 2005-2010 Strategic Plan goals and objectives, and CBNERRVA programmatic responsibilities are presented as italicized text.

Goal 1. Recognition of CBNERRVA as a regional leader in applying science and education to support coastal resource management and literacy. *(NERRS Strategic Plan Goal #2; all Programs)* **Objective 1.** Foster mutually supportive relationships internally between Reserve programs and externally with academic institutions, governmental agencies, nongovernmental organizations and communities. *(NERRS Strategic Plan Goal #2, Objective 1; all Programs)* **Objective 2.** Increase CBNERRVA and NERRS visibility among academic, governmental agencies, nongovernmental organizations and the general public. *(NERRS Strategic Plan Goal #2, Objectives 2 and 3; all Programs)*
Goal 2. Enhance scientific understanding of coastal ecosystems, surrounding environments and the natural and human processes influencing such systems. *(NERRS Strategic Plan Goals #1 and #2)* **Objective 1.** Characterize and monitor coastal ecosystems and surrounding environments to describe reference conditions and quantify spatial and temporal changes. *(NERRS Strategic Plan Goal #1, Objective 2; Goal #2, Objectives 1,2 and 3)* **Objective 2.** Determine linkages within and between coastal ecosystems and how linkages affect those systems. *(NERRS Strategic Plan Goal #1, Objective 2; Goal #2, Objectives 1,2 and 3)* **Objective 3.** Promote, coordinate and support research and monitoring activities within Reserve boundaries and the York River system. *(NERRS Strategic Plan Goal #2, Objective 1)*
Goal 3. Promote the effective management and conservation of natural and cultural coastal resources through informed decision-making. *(NERRS Strategic Plan Goals #2 and #3)* **Objective1.** Communicate results of research, environmental monitoring and best available science-based information to assist in improved coastal resource management. *(NERRS Strategic Plan Goal #2, Objectives 2 and 3; Goal #3, Objectives 1,2 and 3)*
Goal 4. Increase public awareness, understanding and appreciation of coastal environments. *(NERRS Strategic Plan Goal #3)* **Objective 1.** Increase student and teacher knowledge and understanding of coastal environments through formal education programs. *(NERRS Strategic Plan Goal #3, Objectives 1 and 2)* **Objective 2.** Increase general public awareness and appreciation of the Chesapeake Bay and other coastal environments through public outreach and interpretation programs. *(NERRS Strategic Plan Goal #3, Objectives 1 and 2)*
Goal 5. Provide administrative leadership and resources necessary to fulfill the Reserve's mission. . *(NERRS Strategic Plan Goals #1, #2 and #3)* **Objective 1.** Provide staffing, resources and a structured organization framework that allow for attainment of program goals and objectives. *(NERRS Strategic Plan Goal #1, Objective 3)* **Objective 2.** Manage Reserve components to fulfill mission and ensure representation of the diverse ecosystems found within the York River estuary. *(NERRS Strategic Plan Goal #1, Objective 3)* **Objective 3.** Support staff professional development to assure competence in current positions and allow for preparation for more advanced positions. **Objective 4.** Provide facilities, equipment and other infrastructure support that allow for attainment of program goals and objectives. *(NERRS Strategic Plan Goal #2, Objective 1; Goal #3, Objectives 1 and 2)* **Objective 5.** Maintain Reserve designation and fulfill grant-reporting requirements.
Goal 6. Strengthen the protection and management of Reserve coastal resources to ensure long-term integrity and diversity of its ecosystems and archaeological/cultural sites. *(NERRS Strategic Plan Goals #1, #2 and #3; Lead Program: Stewardship; Supporting Programs: All)* **Objective 1**. Support land and water conservation efforts that ensure representation of the diverse ecosystems found within the York River estuary and protect/conserve the larger landscape ecosystem that impact existing Reserve components. *(NERRS Strategic Plan Goal #1, Objective 3)* **Objective 2**. Provide for natural resource protection and management within Reserve boundaries. *(NERRS Strategic Plan Goal #1, Objective 3)* **Objective 3**. Provide for historical and archaeological resource protection and management within Reserve boundaries. *(NERRS Strategic Plan Goal #3, Objective 1)*

Objective 4. Manage public access within Reserve boundaries in order to protect the integrity of natural and historical/archaeological resources and provide for non-conflicting traditional uses. *(NERRS Strategic Plan Goal #1, Objective 3; Goal #3, Objectives 1 and 2)*

Goal 7. Promote and support special state and federal programs that identify CBNERRVA as a key partner entity.

Objective 1. Increase awareness, use, and support of the Virginia Estuarine and Coastal Research Reserve System.

Objective 2. Promote and support the U.S.-Republic of China Tianjin Palaeocoastal and Wetland National Nature Reserve Sister Reserve Program.

5.3.3 Relevant CBNERRVA Goals, Objectives and Strategies

CBNERRVA Goal 1 is an overarching goal that serves as a unifying target for all Reserve programs and for the Reserve, as a single entity, to strive towards. The Reserve has made significant progress towards this goal and anticipates further advancement through additional science, education and stewardship contributions of local, regional and national significance.

Goal 1. Recognition of CBNERRVA as a regional leader in applying science and education to support coastal resource management and literacy. *(NERRS Strategic Plan Goal 2; Lead Program: All)*

Objective 1. Foster mutually supportive relationships internally between Reserve programs and externally with academic institutions, governmental agencies, nongovernmental organizations and communities. *(NERRS Strategic Plan Goal #2, Objective 1)*

Strategies:

- Establish and maintain contact with academic institutions, governmental agencies and nongovernmental organizations involved in coastal and Chesapeake Bay focused research, education and resource management. (All Programs)
- Support, and where appropriate, coordinate local, regional and national research, general and technical education, and stewardship initiatives. (All Programs)
- Integrate site-based research, environmental monitoring, and natural resource stewardship into Reserve education programs. (All Programs)

Objective 2. Increase CBNERRVA and NERRS visibility among academic, governmental agencies, nongovernmental organizations and the general public. *(NERRS Strategic Plan Goal #2, Objectives 2 and 3)*

Strategies:

- Publish and/or communicate contributions of Reserve to appropriate audiences using a variety of formats including a Reserve annual report, peer-reviewed manuscripts, technical and education reports, newsletters (e.g., The Crest, Virginia Coastal Zone Management Magazine) and program fact sheets. (All Programs)
- Maintain and update CBNERRVA home and associated (e.g., VECOS, VIMS, NOAA/NERRS) websites to highlight Reserve associated opportunities, activities, and accomplishments and to provide data and information directly to users. (All Programs)
- Encourage news releases of Reserve activities and accomplishments. (All Programs)
- Establish and maintain an effective mechanism to communicate Reserve accomplishments and needs to the Institute, the State and to NOAA. (All Programs)

Appendix C. General Public Access Plan of CBNERRVA – from draft CBNERRVA Management Plan 2008-2012

X. Stewardship and Public Access Plan

10.1 Introduction

Stewardship is a functional role at each reserve, involving aspects of research, monitoring, education, policy and implementation of resource management actions. CBNERRVA, along with partner managing entities, is responsible for the long-term management of natural resources and antiquities found within Reserve boundaries. The Reserves are managed to ensure long-term integrity and diversity of it's ecosystems and archaeological/cultural sites while providing long-term research, monitoring and education opportunities. In some cases, the Reserve component can be managed to meet this objective while still supporting some level of public use. Land and resource management challenges are numerous and time-consuming, ranging from the mundane chore of maintaining visible boundary lines, to the on-going challenge of balancing public use with science and education efforts, to the complexities of maintaining and monitoring habitats for invasive and species of concern, to facilitating land acquisition. Reserve-level management and monitoring actions, as well as cooperative management initiatives and protection strategies developed with partner land and resource managing entities, are planned based on the best current information and available resources.

10.2 Relevant CBNERRVA Goals, Objectives and Strategies

CBNERRVA strives to achieve its natural and archaeological/cultural resource management responsibilities by implementing a variety of strategies in support of CBNERRVA programmatic goals and objectives listed below. All proposed actions are subject to funding and staff capabilities.

Goal 2. Enhance scientific understanding of coastal ecosystems, surrounding environments and the natural and human processes influencing such systems. *(NERRS Strategic Plan Goals 1 and 2; Lead Program: Research; Supporting Program: Stewardship)*

Objective 1. Characterize and monitor coastal ecosystems and surrounding environments to describe reference conditions and quantify spatial and temporal changes. *(NERRS Strategic Plan Goal 1, Objective 2; Goal 2, Objectives 1,2 and 3)*

Strategies:

- Conduct flora and faunal baseline surveys to fill information gaps and to better characterize Reserve living resources and environments with an emphasis on species and habitats of concern. (Stewardship)
- Support biological monitoring of critical habitats (e.g., emergent wetlands, submerged aquatic vegetation) and biological communities (e.g., benthic, nekton, plankton). (Research and Stewardship)
- Map current and historic coastal habitats, land-use and coastlines within the York River system. (Stewardship)
- Complete Reserve site profile. (Research and Stewardship)

Objective 2. Determine linkages within and between coastal ecosystems and how linkages affect those systems. *(NERRS Strategic Plan Goal #1, Objective 2; Goal #2, Objectives 1,2 and 3)*

Strategies:

- Examine how upland, shoreline and water management changes affect material flux and coastal ecosystems. (Research and Stewardship)
- Examine rates and patterns of sea-level rise, subsidence and shoreline erosion and ecosystem responses to these processes within the York River system. (Research and Stewardship)

Objective 3. Promote, coordinate, track and support research and monitoring activities within Reserve boundaries and the York River system. *(NERRS Strategic Plan Goal #2, Objective 1)*

Strategies:

- Establish and maintain contact, and where appropriate, coordinate activities among groups with estuarine research interests. (Research and Stewardship)
- Identify research priority focus areas and encourage their investigation within Reserve components and the broader York River and Chesapeake Bay system. (Research and Stewardship)
- Seek external funding to advance research and monitoring activities. (Research and Stewardship)

Goal 3. Promote the effective management and conservation of natural and cultural coastal resources through informed decision-making. *(NERRS Strategic Plan Goals 2 and 3; Lead Program: CTP; Supporting Programs: All)*

Objective1. Communicate results of research, environmental monitoring and best available science-based information to assist in improved coastal resource management. *(NERRS Strategic Plan Goal #2, Objectives 2 and 3; Goal #3, Objectives 1,2 and 3)*

Strategies:

- Serve in an advisory capacity to national, regional, state and local coastal resource management, research and education agencies, organizations and interest groups. (All Programs)
- Provide the best available science-based information and skill building opportunities, with respect to identified focus areas, to coastal resource decision-makers and other appropriate audiences. (CTP, Research and Stewardship)
- Develop, maintain and/or link to web-based data and information portals to manage and disseminate Reserve associated science and education information products, environmental databases, and associated metadata. (All Programs)
- Support the development and implementation of Bay-wide and specific tributary strategies and contaminant reduction plans in support of protection and restoration of water quality and habitats of concern. (Research, Stewardship and CTP)

Goal 6. Strengthen the protection and management of Reserve coastal resources to ensure long-term integrity and diversity of it's ecosystems and archaeological/cultural sites. *(NERRS Strategic Plan Goals #1, #2 and #3; Lead Program: Stewardship; Supporting Programs: Administration)*

Objective 1. Support land and water conservation efforts that ensure representation of the diverse ecosystems found within the York River estuary and protect/conserve the larger landscape ecosystem that impact existing Reserve components. *(NERRS Strategic Plan Goal #1, Objective 3)*

Strategies:

- Develop a Reserve Boundary Protection and Land Acquisition Plan. (Administration and Stewardship)
- Where appropriate, communicate and coordinate land and water conservation activities with neighboring private landowners, non-governmental organizations (e.g., land trusts) and local, state and federal government agencies. (Administration and Stewardship)

Objective 2. Provide for natural resource protection and management within Reserve boundaries. *(NERRS Strategic Plan Goal #1, Objective 3)*

Strategies:

- Implement developed Reserve component specific Natural Resource Management Plans. (Stewardship)
- Monitor and evaluate the effects of control strategies and restoration efforts. (Stewardship)
- Update Reserve component specific Natural Resource Management Plans ever 5 years. (Stewardship)
- Enforce prosecution of offenders of natural resource protection laws and regulations. (Administration and Stewardship)

Objective 3. Provide for historical and archaeological resource protection and management within Reserve boundaries. *(NERRS Strategic Plan Goal #3, Objective 1)*

Strategies:

- Encourage, and when possible support, initial survey/inventory of historical/archaeological resource survey within Reserve boundaries and assure proper stewardship of such resources. (Research and Stewardship)
- Enforce prosecution of offenders of historical and archaeological resource protection laws and regulations. (Administration and Stewardship)

Objective 4. Manage public access within Reserve boundaries in order to protect the integrity of natural and historical/archaeological resources and provide for non-conflicting traditional uses. *(NERRS Strategic Plan Goal #1, Objective 3; Goal #3, Objectives 1 and 2)*

Strategies:

- Clearly identify Reserve boundaries, public use sites, and appropriate public activities at each Reserve component. (Stewardship).
- Maintain and enhance, where appropriate, structures to provide for safe public access and support permitted wildlife watching and hunting activities. (Stewardship)

- Develop public access schedules, where appropriate, to minimize or eliminate user conflict. (Stewardship)
- Monitor and evaluate public use, and other user impacts at existing access points and throughout the Reserve. (Stewardship)
- Honor formal agreements and informal understandings with private property owners and public lands managers. (Administration and Stewardship)
- Enforce prosecution of trespass and vandalism, and offenders of plant and wildlife, antiquities and hunting and fishing regulations. (Administration and Stewardship)
- Develop and make available information material (e.g. York River State Park trail guides, species inventories) to enhance the public visitor's outdoor experience (Stewardship).

10. 3 Reserve Natural and Antiquities Resource Management

10.3.1 Management Guidelines

Management guidelines are intended to explain the general rationale for managing natural communities and rare species, to clarify the reasons for restricting public use and visitation, and to state principles and ideas that guide management of CBNERRVA natural areas. The primary and over-riding objective of natural areas stewardship is to provide for the continued presence of the diverse habitats and associated flora and fauna found within the boundaries of CBNERRVA. Reserve natural area management guidelines were adapted from the natural area preserve management guidelines developed by the VaDCR, Division of Natural Heritage (VaDCR 2000) and are provided in Appendix V.1. Archeological and historic resources within Reserve boundaries will be protected to the best of the Reserve's ability and follow general state management guidelines.

10.3.2 Directed Natural Resource Management

Management to protect and maintain natural resources, biological diversity and antiquities at Reserve components require ongoing actions and assessments to ensure that resources are conserved. The complexity of ecosystems and a general shortfall of staff time and funds usually preclude a full understanding of the effects on ongoing biological change and a sufficiency of management actions to direct and monitor that change. By taking an active and adaptive management approach, by using and building upon existing inventory baseline data, and by monitoring trends in natural communities and/or species populations following management actions, it is likely that successful stewardship of natural resources can be attained.

CBNERRVA in partnership with VaDCR/ Division of Natural Heritage have prepared natural resource management plans for Goodwin and Catlett Islands (Erdle and Heffernan 2005a and 2005b) and are currently preparing plans for the Taskinas Creek and Sweet Hall Marsh components of the Reserve. Expected date of completion for the Taskinas Creek and Sweet Hall Marsh Natural Resource Management Plans is Spring 2007. The purpose of these plans is to guide an adaptive management process that supports the research and education mission of the Reserve and protects the natural resources associated with the Reserve. The natural resource management plans incorporate the policy and management approach of the Reserve, background information (e.g. location, climate, geologic and hydrologic conditions, surrounding land use, site history), an inventory of natural resources derived from field surveys and review of literature, identified resource stewardship and research needs, and land acquisition and protection needs. The plans serve as the Reserve's principal resource to guide natural resource management within Reserve boundaries and have an intended timeline of approximately five years. Copies of completed plans are available upon request from CBNERRVA.

Identified Biological Management Issues

In the context of natural areas stewardship, biological resources management actions are taken to either maintain natural conditions or to return human-altered land or vegetation to a condition that supports continued existence of natural communities and/or key species. Threats to biodiversity include: (1) habitat degradation or loss, (2) land conversion to development, (3) water development (e.g. drainage, dams and water withdrawal projects), (4) some agricultural, silviculture and mining practices, (5) non-native invasive species, (6) disease, (7) air, land and water pollution, and (8) overexploitation. Habitat loss and non-native invasive species represent the greatest threats to terrestrial species. For aquatic species, habitat loss and water pollution are the most significant threats. Because of these threats to biodiversity, management actions are sometimes needed to restore and maintain natural resources (Wilcove and Chen 1998). Information derived from directed research and environmental and biological monitoring programs are at the foundation of developing and implementing natural resource management strategies. Details regarding natural resource management issues at specific Reserve component has been provided earlier in this report (Section III C) and are summarized in Table 10.1. CBNERRVA will strive to promote and support research that targets Reserve natural resource stewardship needs.

Table 10.1. Summary of identified biological/physical management issues regarding natural resource management of the Reserve components.

	Reserve Component			
Management Issue	Goodwin Islands	Catlett Islands	Taskinas Creek	Sweet Hall Marsh
Control of known invasive plant species	•	•		
Control of known invasive animal species				•
Control of known native plant species				
Control of known native animal species	•	•		
Assessment, protection and restoration of known finfish and shellfish spawning and nursery habitat	•	•	•	•
Assessment, protection and restoration of known bird breeding and nesting habitat	•	•	•	•
Assessment of sea level rise and shoreline erosion on critical habitats and geomorphic features	•	•	•	•
Determination of water clarity status for surrounding waters and assess the potential for submerged aquatic vegetation restoration		•		
Assessment of long-term reductions in stream flow on salinity patterns and the impacts on plant communities and fish spawning grounds				•
Source identification of mercury and other contaminant inputs and impacts upon the ecosystem				•

10.3.3 Archaeological, Historical and Cultural Resources Management

The immediate region occupied by the four components of CBNERRVA is rich in archaeological, historical and cultural resources. It is the aim of the Reserve to encourage, and where possible support, initial survey and inventory of objects possessing prehistoric and/or historic significance and to develop plans to protect such sites and objects within its boundaries. Reserve policy as related to archaeological, historical and cultural resources is:

- Archaeological investigations and removal of historic artifacts from federal lands requires an Archaeological Resources Protection Act permit.

- As with Commonwealth historical preservation laws, CBNERRVA forbids the unauthorized excavation and collection of upland and underwater archaeological and cultural sites.

- The collection of historic or archaeological artifacts for research purposes will be allowed only with approved collecting permits. Permits are required by VADHR, VaDCR (Taskinas Creek) and CBNERRVA.

- Non-disruptive research and educational use of archaeological and cultural sites requires approval by VaDCR (Taskinas Creek) and CBNERRVA.

- Collection of prehistoric, historic and cultural artifacts by the general public is prohibited within Reserve boundaries, as is the use of metal detectors.

- Archaeological and cultural sites will be protected and care will be taken not to draw public attention to these sites.

10.3.4 Fire Management

Fire management is frequently an important facet of natural areas management and involves both control and suppression of wildfires and prescribed fire implementation. A two-phased approach to prevent, manage and suppress wildfires will be encouraged. It is understood that fire is a natural process in landscape ecology and the Reserve may not seek to control all wildfires. Protection of structures and other significant resources that are sensitive to fire damage, and protection of human safety will require active fire suppression. The Reserve will utilize the expertise of other agencies and organizations that frequently deal with fire issues, including VaDOF, VaDCR and VaDGIF. If deemed necessary for resource management purposes, prescribed burns will be conducted only under the supervision of certified burners and in close coordination with local fire departments and relevant state agencies.

10.3.5 Hunting, Fishing and Other Traditional Uses

Details regarding regulation of hunting, fishing and other traditional uses, varies by Reserve component; details are provided in Section 10.4.2.

10.3.6 Oil and Toxic Substance Spill Response

Given the level of activity by Giant Oil Refinery and U.S. Naval operations within the York River, and the close proximity of the Reserve's Goodwin and Catlett Islands components to these operations, contingency plans for an oil or other toxic materials spill have been developed and are ready to implement on an emergency basis. Key federal (e.g., USCG, USDOD) and state agencies (VaDEQ) and other groups (Giant Refinery) are the lead entities if a spill were to occur. CBNERRVA will participate as a stakeholder and along with VIMS can provide specified expertise and other resources to compliment lead agencies efforts. A Reserve oil spill response plan has been developed and is provided in Appendix V.3.

10.3.7 Operations Management Issues and Law Enforcement

Operations management is a critical element of natural areas management, especially on lands where recreational uses by members of the public or commercial uses may conflict with the primary management objectives of research, education and natural resource protection. Routine operations management activities include boundary line maintenance, site security, and law enforcement. Boundary line maintenance at Reserve components is the responsibility of CBNERRVA. Site security is provided by the principal managing entities at each Reserve component, they are: CBNERRVA for Goodwin and Catlett Islands, VaDCR and CBNERRVA for Taskinas Creek, and Tacoma Hunt Club and CBNERRVA for Sweet Hall Marsh.

Because VIMS and CBNERRVA lacks its own law enforcement staff, it is necessary for the Reserve to partner with other natural resource agencies such as VaDGIF and VaMRC when law enforcement issues affecting natural resource protection arise. Likewise, CBNERRVA relies on local and state law enforcement for all other criminal matters. A summary of local and state law enforcement agencies assisting in Reserve operations is provided in Appendix V.4. CBNERRVA will request to be notified of all warnings and citations occurring within Reserve boundaries.

10.4 Public Access

10.4.1 Introduction and General Policy

CBNERRVA is responsible for the long-term management of its Reserve components in order to protect the ecological integrity of the natural system and provide a stable environment to support research, monitoring and education missions. In some cases, the Reserve component can be managed to meet this objective while still supporting some level of public use. Public access to the four Reserve components is managed on a site-specific basis. The objective of managed access is to maintain each site's integrity for research and education while permitting traditional uses which do not conflict with Reserve goals or agreements with private landowners and public lands managers. CBNERRVA and site property owners/managers reserve the right to impose additional restrictions to curtail any activity threatening to disturb natural conditions or ongoing research and education activities. It should be noted that some specific public uses are not compatible, for example bird and wildlife watching is not compatible with concurrent waterfowl hunting. In such cases, The Reserve and property managers will strive to minimize conflicts through spatial and temporal separation strategies. If negative public access impacts are observed, the causative public use(s) will be determined and re-evaluated. When warranted, the assistance of local and state law enforcement agencies may be called upon to enforce access regulations. Prosecution of violators will serve as a deterrent against vandalism, littering, arson and other violations.

10.4.2 Public Access Rules and Schedules

<u>Goodwin Islands</u>

CBNERRVA maintains a limited-use public access policy for the Goodwin Islands component of the Reserve. In accordance with that policy, Goodwin Islands are managed exclusively for research and education while allowing for some traditional uses. Goodwin Islands are only accessible by shallow draft boats and there are no docking facilities or designated trails on Goodwin Islands. The following access rules apply to Goodwin Islands:

- Public access is limited from dawn to dusk and therefore overnight camping is prohibited.
- Beach areas can be used for picnicking, beachcombing and other non-destructive activities if visitors do not willingly or negligently disturb the environment or scientific experiments/equipment.
- Bicycles, off-road vehicles, and horses are prohibited.

- Building of any type of fire is prohibited.
- Waterfowl hunting from floating blinds is allowed, however, a Reserve issued permit is required. No stationary blinds are allowed. Upland and wetland hunting activities are not permitted.
- Fishing, crabbing and collection of shellfish is allowed if in accordance with applicable state laws and regulations.
- Collection of plants, animals (other than that allowed by applicable state laws and regulations), minerals, or artifacts is strictly prohibited.
- Dogs or other domestic animals accompanying visitors must be kept on a leash at all times.

Appendix D. Rare Species List

Table 4 indicates the rare species and natural communities that have been found in the Dragon Run watershed, according to the Virginia Division of Natural Heritage (Belden, Jr. et al., 2001; Belden, Jr. et al., 2003).

SCIENTIFIC NAME	COMMON NAME	STATUS
Animals		
Atlides halesus	Great purple hairstreak	S2, S3
Enallagma weewa	Blackwater bluet	S1
Epitheca spinosa	Robust baskettail	S2
Haliaeetus leucocephalus	Bald eagle	S2
Helocordulia selysii	Selys' sunfly	S2
Isoparce cupressi	Cypress sphinx	S1, S3
Somatochlora filosa	Fine-lined emerald	S2
Wyeomyia haynei	Southern pitcher-plant mosquito	S1
Plants		
Bolboschoenus fluviatillis	River bulrush	S2
Cardamine pratensis	Cuckooflower	S1
Carex decomposita	Cypress-knee sedge	S2
Chelone oblique	Red turtlehead	S1
Desmodium strictum	Pineland tick-trefoil	S2
Eriocaulon parkei	Parker's pipewort	S2
Sarracenia purpurea var. purpurea	Northern purple pitcher-plant	S2
**Hottonia inflata	Featherfoil	S3
**Ranunculus flabellaris	Yellow water crowfoot	S3
Natural Communities		
Baldcypress-Tupelo Swamp		
Fluvial Terrace Woodland		
Tidal Baldcypress-Tupelo Swamp		
Tidal Baldcypress Woodland/Savanna		
Tidal Freshwater Marsh		

S1 = Extremely rare; usually 5 or fewer occurrences in the state; or may have a few remaining individuals; often especially vulnerable to extirpation.

S2 = Very rare; usually between 5 and 20 occurrences; or few occurrences with many individuals; often susceptible to becoming endangered.

S3 = Rare to uncommon; usually between 20 to 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances

** = No longer tracked by the Division of Natural Heritage; placed on watchlist due to an increased number of documented occurrences within the state since 2001

Table 4. Rare species and natural communities in the Dragon Run watershed.

The following descriptions of natural communities are taken from *The Natural Communities of Virginia* (Fleming et al., 2001).

Bald Cypress-Tupelo Swamps
Seasonally to semipermanently flooded forests of backswamps, sloughs, and low terraces of Coastal Plain rivers and large streams. These swamp forests are distributed throughout southeastern Virginia, north to Dragon Swamp (Gloucester, King and Queen, and Middlesex Counties). Habitats are deeply flooded (up to 1m) for part of the year; most retain at least some standing water throughout the growing season. Microtopography is often pronounced with small channels, swales, tree-base hummocks, and numerous bald cypress "knees." Tree canopies vary from mixed stands of bald cypress (Taxodium distichum), water tupelo (Nyssa aquatica), and swamp tupelo (N. biflora) to nearly pure stands of one species or another. The three dominants have complex competitive and successional relationships. As a rule, the two tupelos are less shade-tolerant than bald cypress and regenerate more readily by sprouting in cut-over stands. Thus, tupelos tend to become dominant when bald cypress stands are heavily logged. Green ash (Fraxinus pennsylvanica) and red maple (Acer rubrum) are occasional canopy associates and frequent understory trees. Carolina ash (F. caroliniana) is often dominant in the small tree and shrub layers, while vines of climbing hydrangea (Decumaria Barbara) are often abundant. Herb layers vary from sparse to rather lush. Most herbaceous plants of bald cypress-tupelo swamps are tolerant of muck soils and fluctuating water levels, or are capable of becoming established on tree hummocks, stumps, and logs. A few of the typical herbs are lizard's tail (Saururus cernuus), false nettle (Boehmeria cylindrical), Walter's St. John's-wort (Triadenum walteri), swamp beggar-ticks (Bidens discoidea), weak stellate sedge (Carex seorsa), giant sedge (Carex gigantean), taperleaf bugleweed (Lycopus rubellus), and pale mannagrass (Torreyochloa pallida). Although community types in this group are relatively common, high-quality specimens of the dominant trees are known to provide nesting habitats for the globally uncommon, state-rare eastern big-eared bat (Corynorhinus rafinesquii macrotis) and southern myotis (Myotis austroparius). Old-growth stands of bald cypress-tupelo swamp with trees up to 800 years old occur along the Blackwater River in Surry and Isle of Wight Counties. References: Fleming and Moorhead (1998), Parker and Wyatt (1975), Plunkett and Hall (1995).

Tidal Bald Cypress Forests and Woodlands
Coniferous or mixed swamp forests and woodlands occurring along the upper tidal reaches of rivers in southeastern Virginia. Examples are documented from the Dragon Swamp/Piankatank River (Gloucester, King and Queen, and Middlesex Counties), the Chickahominy River (Charles City, James City, and New Kent Counties), the James River (Isle of Wight and Surry Counties), and the wind-tidal Northwest River (City of Chesapeake). At some sites, these communities occur in ecotones between tidal marshes and non-tidal backswamps or uplands. Bald cypress (Taxodium distichum) dominates the open to very open canopy, with or without hardwood associates such as swamp tupelo (Nyssa biflora), water tupelo (Nyssa aquatica), and green ash (Fraxinus pennsylvanica). Stand structure and canopy cover range from closed forest to very open woodland. Shrub and herb layers are variable but generally contain a mixture of species characteristic of both marshes and swamps. Some well-developed tidal bald cypress forests appear floristically similar to palustrine bald cypress-tupelo swamps. Other stands have a nearly monospecific herb dominance by shoreline sedge (Carex hyalinolepis). In a unique, possibly fire-influenced, savanna-like stand on the Northwest River, the herbaceous dominants, in rough seasonal order, are silvery sedge (Carex canescens spp. Disjuncta), spikerushes (Eleocharis fallax and E. rostellata), marsh rattlesnake-master (Eryngium aquaticum var. aquaticum), and wild rice (Zizania aquatica var. aquatica). The environmental dynamics, compositional variation,

and state-wide distribution of this group are poorly known and need intensive study. Reference: Fleming and Moorhead (1998).

Fluvial Terrace Woodlands

A somewhat enigmatic group of communities occurring on flat, sandy terraces and islands along Coastal Plain rivers in eastern Virginia. These habitats are elevated well above the level of adjacent swamps and are characterized by xeric, sandy soils and open forest or woodland vegetation. Single occurrences have been documented along the Nottoway River (Sussex County), Chickahominy River (New Kent County), Dragon Swamp (Middlesex County), and Mattaponi River (Caroline County). At all four sites, hickories (Carya pallida and C. alba) are dominant trees, with drought-tolerant oaks (Quercus falcate, Q. nigra, Q. marilandica, Q. alba) present in smaller numbers. Shrubs occurring at all or most sites include sand post oak (Q. margarettiae), horse-sugar (Symplocos tinctoria), American holly (Ilex opaca var. opaca), and eastern red cedar (Juniperus virginiana var. virginiana). Typical herbs include sedges (Carex albicans var. australis, C. pensylvanica, and C. tonsa), Canada frostweed (Helianthemum canadense), butterfly-pea (Clitoria mariana), late goldenrod (Solidago tarda), and prickly-pear (Opuntia humifusa). The Dragon Run site is anomalous in the presence (despite low soil pH and base status) of several calciphiles such as eastern redbud (Cercis canadensis var. canadensis), wild columbine (Aquilegia canadensis), smooth rock-cress (Arabis laevigata var. laevigata), robin's-plantain (Erigeron pulchellus var. pulchellus), and elm-leaved goldenrod (Solidago ulmifolia var. ulmifolia). A full understanding of the status and compositional relationships of this group will require additional inventory and assessment.

Tidal Freshwater Marshes

A diverse group of herbaceous wetlands subject to regular diurnal flooding along upper tidal reaches of inner Coastal Plain river and tributaries. Freshwater marshes occur in the uppermost portion of the estuarine zone, where the inflow of saltwater from tidal influence is diluted by a much larger volume of freshwater from upstream. Strictly speaking, freshwater conditions have salt concerntrations <0.5 ppt, but pulses of higher salinity may occur during spring tides or periods of unusually low river discharge. The most common species are arrow-arum (Peltandra virginica), dotted smartweed (Polygonum punctatum), wild rice (Zizania aquatic var. aquatica), pickerelweed (Pontederia cordata), rice cutgrass (Leersia oryzoides), tearthumbs (Polygonum arifolium and P. sagittatum), and beggar-ticks (Bidens spp.). Locally, sweetflag (Acorus calamus) and southern wild rice (Zizaniopsis miliacea) may form large dominance patches. Species diversity and vegetation stature vary with salinity, duration of inundation, and disturbance; the most diverse marshes occupy more elevated surfaces in strictly freshwater regimes. Mud flats that are fully exposed only at low tide support nearly monospecific stands of spatterdock (Nuphar advena), although cryptic submerged aquatic species may also be present. Tidal freshwater marshes are best developed on sediments deposited by large meanders of the Pamunkey and Mattaponi Rivers, although outstanding examples also occur along the Potomac, Rappahannock, Chickahominy, and James Rivers. These communities provide the principal habitat for the globally rare plant sensitive joint-vetch (Aeschynomene virginica). Chronic sea-level rise is advancing the salinity gradient upstream in rivers on the Atlantic Coast, leading to shifts in vegetation composition and the conversion of some tidal freshwater marshes into oligohaline marshes. Tidal Freshwater Marshes are also threatened by the invasive exotic marsh dewflower (Murdannia keisak). Several communities in this group are chiefly restricted to the Chesapeake Bay drainage basin and are considered globally rare or uncommon. References: Parker and Wyatt (1975), Perry and Atkinson (1997), Perry and Hershner (1999), McCoy and Fleming (2000).

Appendix E. Natural Heritage Rarity Ranks and Status Explanation

Natural Heritage Rarity Ranks and Status Explanation

Each of the significant natural features (species, community type, etc.) monitored by DCR-DNH is considered an element of natural diversity, or simply an element. Each element is assigned a rank that indicates its relative rarity on a five-point scale (1 = extremely rare; 5 = abundant; Table 1). The primary criterion for ranking elements is the number of occurrences, i.e., the number of known distinct localities or populations. Also of great importance is the number of individuals at each locality or, for highly mobile organisms, the total number of individuals. Other considerations include the condition of the occurrences, the number of protected occurrences, and threats. However, the emphasis remains on the number of occurrences, so that ranks essentially are an index of known biological rarity. These ranks are assigned in terms of the element's rarity within Virginia (its State or S-rank), the element's rarity within a Nation (its National or N-rank), and the element's rarity across its entire range (its Global or G-rank). Subspecies and varieties are assigned a Taxonomic (T-) rank in addition to their G-rank. A Q indicates taxonomic uncertainty. Taken together, these ranks give an instant picture of an element's rarity. For example, a designated rank of G5S1 indicates an element which is abundant and secure range-wide, but rare in Virginia. In some cases, ranks are provisional or lacking, due to ongoing efforts by the Natural Heritage network to classify community syntaxa and cryptic plants or animals. Rarity ranks used by DCR-DNH are not legal designations, and they are continuously updated to reflect new information.

Table E-1. Definition of Natural Heritage state rarity ranks. Global ranks are similar to state ranks, but refer to a species' range-wide status. Note that GA and GN are not used and GX means extinct. GM and GW are ranks used only for communities, and refer to highly modified (GM) and ruderal (GW) vegetation respectively. National ranks are similar as well, and refer to a species' rarity within a nation, such as the United States or Canada. Sometimes ranks are combined (e.g., S1S2) to indicate intermediate or somewhat unclear status. Elements with uncertain taxonomic validity are denoted by the letter Q, after the global rank. These ranks should not be interpreted as legal designations.

S1	Extremely rare; usually 5 or fewer occurrences in the state, or in the case of communities, covering less than 50 hectares in aggregate; or may have a few remaining individuals; often especially vulnerable to extirpation.
S2	Very rare; usually between 5 and 20 occurrences, or in the case of communities, covering less than 250 hectares in aggregate; or few occurrences with many individuals; often susceptible to becoming endangered.
S3	Rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
S4	Common; usually more than 100 occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.
S5	Very common; demonstrably secure under present conditions.
SA	Accidental in the state.
SH	Historically known from the state, but not verified for an extended period, usually more than 15 years; this rank is used primarily when inventory has been attempted recently.

SM Applied to vegetation extensively modified by disturbance but considered recoverable by management, time, or restoration of ecological processes.

SN Regularly occurring migrants or transient species which are non-breeding, seasonal residents. (Note that congregation and staging areas are monitored separately).

SU Status uncertain, often because of low search effort or cryptic nature of the element.

SW Applied to vegetation dominated by ruderal or exotic species.

SX Apparently extirpated from the state.

The spot on the landscape that supports a natural heritage resource is an element occurrence. DCR-DNH has mapped over 7,500 element occurrences in Virginia. Information on the location and quality of these element occurrences is computerized within the Division's BCD system, and additional information is recorded on maps and in manual files.

In addition to ranking each element's rarity, each element occurrence is ranked to differentiate large, outstanding occurrences from small, vulnerable ones. In this way, protection efforts can be aimed not only at the rarest elements, but at the best examples of each. Species occurrences are ranked in terms of quality (size, vigor, etc.) of the population; the condition (pristine to disturbed) of the habitat; the viability of the population; and the defensibility (ease or difficulty of protecting) of the occurrence. Community occurrences are ranked according to their size and overall natural condition. These element occurrence ranks range from A (excellent) to D (poor). Sometimes these ranks are combined to indicate intermediate or somewhat unclear status, (e.g., AB or CD). In a few cases, especially those involving cryptic animal elements, field data may not be sufficient to reliably rank an occurrence. In such cases a rank of E (extant) may be given. A rank of H (historical) is used to indicate an historical occurrence that could not be relocated by recent survey. Element occurrence ranks reflect the current condition of the species' population or community. A poorly-ranked element occurrence can, with time, become highly-ranked as a result of successful management or restoration.

Element ranks and element occurrence ranks form the basis for ranking the overall significance of sites. Site biodiversity ranks (B-ranks) are used to prioritize protection efforts, and are defined in Table E-2.

Table E-2. Biodiversity ranks used to indicate site significance.

B1 Outstanding Significance: only site known for an element; an excellent occurrence of a G1 species; or the world's best example of a community type.

B2 Very High Significance: excellent example of a rare community type; good occurrence of a G1 species; or excellent occurrence of a G2 or G3 species.

B3 High Significance: excellent example of any community type; good occurrence of a G3 species.

B4 Moderate Significance: good example of a community type; excellent or good occurrence of state-rare species.

B5	General Biodiversity Significance: good or marginal occurrence of a community type or state-rare species.

The U.S. Fish and Wildlife Service (USFWS) is responsible for the listing of endangered and threatened species under the Endangered Species Act of 1973, as amended. Federally listed species (including subspecific taxa) are afforded a degree of legal protection under the Act, and therefore sites supporting these species need to be highlighted. USFWS also maintains a review listing of potential endangered and threatened taxa known as candidate species. Table E-3 illustrates the various status categories used by USFWS and followed in this report. The status category of candidate species is based largely on the Service's current knowledge about the biological vulnerability and threats to a species.

As of February 27, 1996, species formerly referred to as Category 2 (C2) candidates for listing as threatened or endangered are no longer considered "candidates" under the Endangered Species Act. The USFWS no longer maintains a formal, comprehensive list of such species. However, the Virginia Field Office of the USFWS intends to maintain an informal list of these and other "Species of Concern" that may warrant future consideration as candidates. These "Species of Concern" can be regarded as species for which the Service has insufficient scientific information to support a listing proposal. Former Category 1 (C1) species are now considered "candidates" (C) for listing. "Candidate" species are species for which the USFWS has enough scientific information to warrant a proposal for listing. The designation of Category 3 species (3A, 3B, 3C) has been discontinued. However, the USFWS will continue to maintain its files on these species in case new information indicates a need for reevaluation.

Table E-3. U.S. Fish and Wildlife Service species status codes, with abbreviated definitions

LE	Listed endangered
LT	Listed threatened
PE	Proposed to be listed as endangered
PT	Proposed to the listed as threatened
C	Candidate: status data supports listing of taxon as endangered or threatened
SOC	Species of Concern: no official status, evidence of vulnerability, but insufficient data exists.

In Virginia, two acts have authorized the creation of official state endangered and threatened species lists. One act (Code of Virginia ' 29.1-563 through 570), administered by the Virginia Department of Game and Inland Fisheries (DGIF), authorizes listing of fish and wildlife species, not including insects. The other act (Code of Virginia ' 3.1-1020 through 1030), administered by the Virginia Department of Agriculture and Consumer Services (VDACS), allows for listing of plant and insect species. In general, these acts prohibit or regulate taking, possessing, buying, selling, transporting, exporting, or shipping of any endangered or threatened species appearing on the official lists. Species protected by these acts are indicated as either listed endangered (LE) or listed threatened (LT). Species under consideration for listing are indicated as candidates (C).

(November 2000)

Appendix F. Dragon Run Watershed Management Plan

DRAGON RUN WATERSHED MANAGEMENT PLAN

NOVEMBER 2003

Photo credit: Teta Kain

This project was funded by the Virginia Coastal Program of the Department of Environmental Quality through Grants #NA17OZ1142-01 and #NA17OZ2355 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its subagencies.

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DRAGON RUN WATERSHED MANAGEMENT PLAN

NOVEMBER 2003

DRAGON RUN STEERING COMMITTEE,
MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

MARGARET DAVIS, CHAIR
WILLIAM F. HERRIN, VICE-CHAIR

DAVID FUSS
DIRECTOR, DRAGON RUN SPECIAL AREA MANAGEMENT PLAN
MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

This project was funded by the Virginia Coastal Program of the Department of Environmental Quality through Grants #NA17OZ1142-01 and #NA17OZ2355 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA or any of its subagencies.

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ACKNOWLEDGEMENTS

David Fuss, Director of the Dragon Run Special Area Management Plan, at the Middle Peninsula Planning District Commission, compiled this report for the Dragon Run Steering Committee. The Dragon Run Steering Committee members are:

County	***Elected Official***	***Landowner***	***Landowner***
Essex	M. “Prue” Davis	Dorothy Miller	M. Scott Owen
Gloucester	Rick Allen	Elizabeth DeHardit	Jerry Horner
King and Queen	Keith Haden	William F. Herrin	Russell Williams
Middlesex	Jack Miller	Robert Major	Davis Wilson

The Dragon Run Steering Committee wishes to thank its Advisory Group, who met monthly from March 2002 to October 2003 to develop this plan. The Steering Committee also wishes to thank Julie Bixby and the Virginia Coastal Program for providing funding and oversight for the project. Ancillary funding was provided by the Environmental Protection Agency’s Chesapeake Bay Program through the Virginia Department of Conservation and Recreation, via grant agreement number BAY-2002-20-SR. This report was printed with funds generated from the sale of Chesapeake Bay license plates through a Chesapeake Bay Restoration Fund Advisory Committee grant.

The current Steering Committee wishes to thank all of the former Steering Committee members, without whose hard work this project never would have materialized. The Steering Committee must also acknowledge the Dragon Run watershed’s landowners for their excellent stewardship of a precious resource. Without them, the watershed would no longer be pristine.

The Dragon Run Steering Committee

The Steering Committee would also like to thank all of the citizens who participated in any of the meetings that led to the production of this watershed management plan. Participants are listed below:

Lorna Anderberg
Mike Anderberg
Neal Barber
David Birdsall
Kay Bradley
Dick Brake
Craig Brann
David Clements
Anne Ducey-Ortiz
W.D. Edwards, Jr.
Frank Evans
Vladimir Gavrilovic
Robert E. Gibson
William Hester
Matt Higgins
Marv Hohenberger
Robert Hudgins
Eric Johnson
R.D. Johnson
Thomas Jordan
Paul Koll
Mary Ann Krenzke
Andy Lacatell
Lewie Lawrence
Carissa Lee
Beth Locklear
Clarence Major
Hubert Major
John E. Major
Hersey Mason, Jr.
David Milby
Warren Milby
William Milby
Elvin Miller
Nancy Miller
John D. “Buddy” Moore
John Munger
Anne Newsom
Gordon Page
Jimmie Pitts
Karen Reay
Willy Reay
Davis Rhodes
Wright Robinson
Garrie Rouse
William Saunders
Sidney Sheldon
Will Smith
Hugh Soles
Pat Tyrrell
Hoyt Wheeland
Rachel Williams
Cathy Wilson
Rebecca Wilson

Executive Summary

As one of the Chesapeake Bay watershed's most pristine waterways, the spring-fed Dragon Run flows forty miles along and through nontidal and tidal cypress swamp situated in portions of Essex, King and Queen, Middlesex, and Gloucester Counties. The Dragon Run plays a central role in the Middle Peninsula's culture and identity. Natural resources - forestry and farming - have been the bedrock of the watershed's economy. These land uses, together with extensive swamps and unique natural resources, are the main reasons that the Dragon Run remains wild and secluded.

The Dragon Run's unique character evokes strong feelings to protect the pristine watershed in both long-time residents and first-time visitors alike. Yet, opinions differ about how to address the threats of encroaching development and habitat fragmentation. An innate difference in point of view between property rights advocates and conservationists centers on how to maintain a pristine watershed into the future. Yet, substantial common ground exists for proactively preserving the Dragon Run for future generations that safeguards both natural resources and traditional uses of the land and water, including the property rights of landowners.

The Dragon Run Watershed Special Area Management Plan (SAMP), a partnership between the Virginia Coastal Program and the Dragon Run Steering Committee of the Middle Peninsula Planning District Commission, is designed to address both the differences of opinion and the common ground that exist concerning the future of the watershed. The Steering Committee believes that the best approach is to bring stakeholders to the table for proactive discussions of the issues. The Steering Committee and its Advisory Group, representing a broad cross-section of the community, have proactively developed a mission, goals, objectives, and action plans to address the priority issues facing the Dragon Run.

This watershed management plan for the Dragon Run watershed represents a body of work by citizens, stakeholders, and decision-makers to achieve a common vision for the future – the preservation of the traditional uses and unique resources in the pristine Dragon Run. It is a symbol of regional cooperation and coordination that crosses jurisdictional boundaries. It is not a static document. Rather, it is a modifiable guidebook that harnesses the passion and energy for the Dragon Run of those who live, work, and play in its watershed.

MISSION

To support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed.

GOALS

1. Establish a high level of cooperation and communication among the four counties within the Dragon Run Watershed to achieve consistency across county boundaries.
2. Foster educational partnerships and opportunities to establish the community's connection to and respect for the land and water of the Dragon Run.
3. Promote the concept of landowner stewardship that has served to preserve the Dragon Run Watershed as a regional treasure.

ACTIONS

Underway/Completed
1. Memorandum of Agreement
2. Establish Baseline Watershed Information
3. SAMP Project Awareness Campaign
Recommended
1. Land Use and Resource Preservation
A. Designate a Unified "Dragon Run Planning Area"
B. Implement Tools to Preserve Farm, Forest, and Natural Resources
C. Address Public and Landowner Access Issues
D. Control Invasive Species
2. Education and Landowner Stewardship
3. Encourage and Support Sustainable Economic Development
4. Monitor Plan Implementation

PART I

SECTION 1: Watershed Description

Section 1 describes the Dragon Run watershed's setting, its role in local history and culture, and its unique natural resources. The potential source of conflict is change in land ownership that threatens to fragment productive farm and forest land and natural habitat. The community's vision for the watershed is to preserve the traditional land uses – forestry, farming, hunting – and the unique natural resources. This section highlights both the differences of opinion on how to address the threat to the watershed and the common ground that defines the community's vision.

As one of the Chesapeake Bay watershed's most pristine waterways, the Dragon Run "encompasses some of the most extensive and unspoiled swamp forest and woodland communities in Virginia" (Belden, Jr. et al, 2001). Effectively bisecting Virginia's Middle Peninsula located between the York and Rappahannock Rivers, this fresh and brackish water stream (**Figure 1**) meanders forty miles along and through nontidal and tidal cypress swamp. The watershed is mainly undeveloped, almost entirely privately owned, and encompasses approximately 140 square miles (90,000 acres) of rural landscape – mostly forests, farms, and wetlands. The spring-fed Dragon Run flows through portions of Essex, King and Queen, Middlesex, and Gloucester Counties, emptying into the estuarine Piankatank River and ultimately the Chesapeake Bay.

Figure 1. The Dragon Run

The Dragon Run plays a central role in the Middle Peninsula's culture and identity. Its intriguing name is frequently borrowed by local enterprises and establishments and is often overheard in community conversations. Since European settlement in the early 1600's and Native American inhabitation up to 10,000 years before that, natural resources have been the bedrock of the watershed's economy. For older generations, forestry, farming, hunting, trapping and fishing were the primary ventures. Today, forestry and farming continue to generate wealth and drive the watershed's economy. Upholding an ancient tradition, hunters range over prime hunting grounds stalking prized game. These land uses, together with extensive swamps, are the main reasons that the Dragon Run remains wild and secluded.

The watershed's wilderness is both expansive and unique. The Dragon Run contains the northernmost example of the Baldcypress-Tupelo Swamp natural community in Virginia and the best example north of the James River (Belden, Jr. et al., 2001). Moreover, 14 rare species and 5 rare natural communities are found here (**Appendix A**). Based on his investigations of the watershed's aquatic communities, one researcher

observes that the Dragon Run is a “100 year old time capsule,” resembling coastal plain streams in the Chesapeake Bay region at the turn of the 20th century (Garman, 2003).

The Dragon Run’s unique character evokes strong feelings to protect the pristine watershed in both long-time residents and first-time visitors alike. Although development pressure in the watershed is currently low, the potential for significant land ownership changes (>25% in 10 years due to aging and absentee corporate landowners) threatens to disrupt the rural character and fragment productive farm and forest land. Likewise, habitat fragmentation jeopardizes the Dragon Run’s unique natural communities. Landowner opinions about how to address these threats vary widely, ranging from the belief that “the Dragon takes care of itself” by its wild nature and voluntary landowner stewardship to enacting and enforcing regulations with “teeth.”

The difference in point of view between property rights advocates and conservationists centers on how to maintain a pristine watershed into the future. Yet, as the Dragon Run Special Area Management Plan unfolds, the community is learning that substantial common ground exists for proactively preserving the Dragon Run for future generations that safeguards both natural resources and traditional uses of the land and water, including the property rights of landowners.

SECTION 2: Planning Approach

Section 2 describes the Dragon Run Steering Committee's planning approach. The Dragon Run Watershed Special Area Management Plan (SAMP), a partnership between the Virginia Coastal Program and the Dragon Run Steering Committee of the Middle Peninsula Planning District Commission, is designed to address both the differing viewpoints and the common ground that exist concerning the future of the watershed. The Steering Committee's approach to the SAMP is to stimulate and coordinate community involvement in the proactive development and implementation of goals, objectives, and action plans for a watershed management plan. The Steering Committee finds that the watershed approach is the most effective way to manage natural resources and traditional land uses. A Memorandum of Agreement describing the goals and objectives of the SAMP was signed by Essex, Gloucester, King and Queen, and Middlesex Counties and the Middle Peninsula Planning District Commission. The Steering Committee and its Advisory Group then developed watershed action plans designed to achieve those goals and objectives.

The Dragon Run Watershed Special Area Management Plan (SAMP), a partnership between the Virginia Coastal Program and the Dragon Run Steering Committee of the Middle Peninsula Planning District Commission, is designed to address both the differing viewpoints and the common ground that exist concerning the future of the watershed. The project began in January 2002 with a grant from the Virginia Coastal Program under authority of the National Oceanic and Atmospheric Administration (NOAA). Enabled by the federal Coastal Zone Management Act of 1972 as amended, SAMPs aim to protect significant coastal resources through a collaborative, multi-level planning process to develop and implement new enforceable policies.

One of the fundamental elements of a SAMP is that a strong regional entity must exist that is willing to sponsor the planning program. In the Dragon Run watershed's case, that regional entity is the Middle Peninsula Planning District Commission through its Dragon Run Steering Committee. Formed in 1985, the Dragon Run Steering Committee consists of landowners and local elected officials and is the key vehicle for cooperation and coordination among the four counties concerning watershed issues. The Steering Committee's approach to the SAMP is to stimulate and coordinate community involvement in the proactive development and implementation of goals, objectives, and action plans for a watershed management plan.

Another major element of a SAMP is that conflict exists concerning the area's proposed uses. The Steering Committee believes that the best approach is to proactively head off conflict before it grows by enabling stakeholders to openly discuss the issues. Potential conflicts in the Dragon Run watershed are: 1) the differences between conservation and property rights advocates; and 2) the private use of land versus the public use of the water. The Steering Committee finds that the watershed approach is the most effective way to manage natural resources and traditional land uses.

In this spirit, the Dragon Run Watershed SAMP (**Figure 2**) began with public planning forums in December 2001 and January 2002. Newspaper announcements were published and representatives from many sectors of the community were specifically invited. These planning forums led to two primary outcomes: 1) the development and confirmation of common themes for watershed issues; and 2) the establishment of a SAMP Advisory Group representing a broad cross-section of the community.

Building upon the foundation established by the planning forums, the SAMP Advisory Group developed a mission statement (see **Section 3**). The Advisory Group developed a list of three goals, each with several objectives. With minor modifications, the Steering Committee approved the goals and objectives, which were incorporated into a Memorandum of Agreement (**Appendix B**). Each county – Essex, Gloucester, King and Queen, and Middlesex - and the Middle Peninsula Planning District Commission signed the Agreement during the late summer and fall of 2002 and will consider the actions (see **Section 4**) recommended by the Steering Committee. The actions address the goals and objectives in the Memorandum of Agreement.

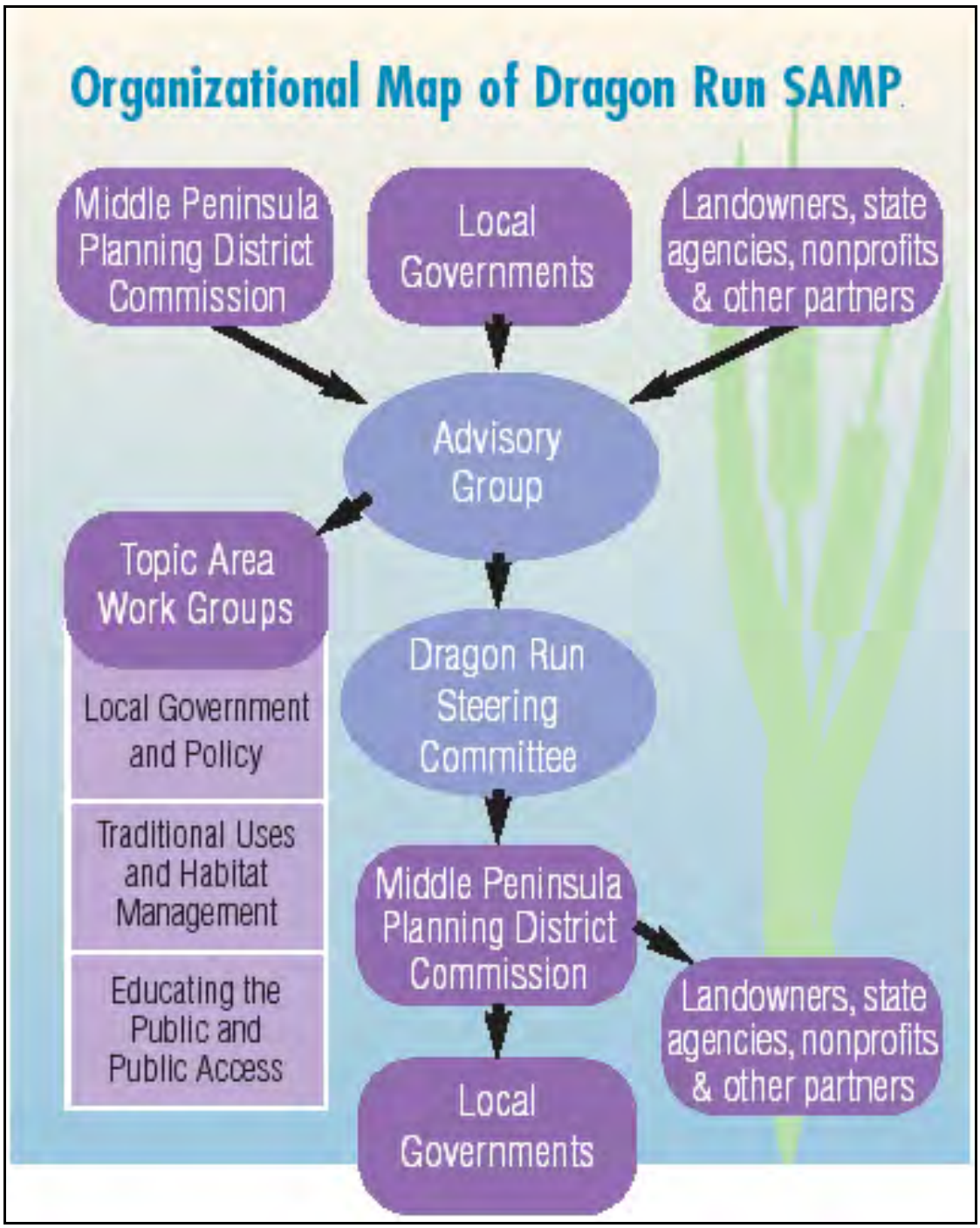

Figure 2. Organizational Map of the Dragon Run SAMP

SECTION 3: Goals and Objectives

Section 3 contains the mission, goals and objectives featured in the Memorandum of Agreement. This section serves as the basis for the proposed actions in Section 4.

MISSION
To support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed.

GOAL I
Establish a high level of cooperation and communication among the four counties within the Dragon Run Watershed to achieve consistency across county boundaries.

OBJECTIVE A
Develop a plan to address the inevitable future development pressure to change the traditional use of land in the Dragon Run Watershed.

OBJECTIVE B
Achieve consistency across county boundaries among land use plans and regulations in order to maintain farming and forestry and to preserve natural heritage areas by protecting plants, animals, natural communities, and aquatic systems.

OBJECTIVE C
Provide ongoing monitoring of existing plans and planning tools in order to assess traditional land uses and watershed health and take action necessary to preserve the watershed.

OBJECTIVE D
Comprehensively implement Best Management Practices (BMPs) for water quality, wildlife habitat, and soil conservation.

GOAL II
Foster educational partnerships and opportunities to establish the community's connection to and respect for the land and water of the Dragon Run.

OBJECTIVE A
Encourage experience-based education consistent with the Stewardship and Community Engagement goals of the Chesapeake 2000 Agreement.

OBJECTIVE B
Promote the community and economic benefits of the Dragon Run derived from its natural characteristics and traditional uses such as farming, forestry, hunting and fishing.

GOAL III
Promote the concept of landowner stewardship that has served to preserve the Dragon Run Watershed as a regional treasure.

OBJECTIVE A
Address the potential dilemma of preserving the watershed's sense of peace and serenity by protecting open space and reducing fragmentation of farms, forests, and wildlife habitat versus the landowners' rights in determining or influencing future land use.

OBJECTIVE B
Educate landowners about the regional importance of the Dragon Run.

SECTION 4: Actions

Section 4 explains and justifies the actions proposed to achieve the goals and objectives in Section 3. The proposed actions are:

Underway/Completed
1. Memorandum of Agreement
2. Establish Baseline Watershed Information
3. SAMP Project Awareness Campaign
Recommended
1. Land Use and Resource Preservation
A. Designate a Unified “Dragon Run Planning Area”
B. Implement Tools to Preserve Farm, Forest, and Natural Resources
C. Address Public and Landowner Access Issues
D. Control Invasive Species
2. Education and Landowner Stewardship
3. Encourage and Support Sustainable Economic Development
4. Monitor Plan Implementation

The actions in this **Section** address the Goals and Objectives in **Section 3**. Notations after each action indicate links to goals and objectives and responsibilities.

ACTIONS UNDERWAY OR COMPLETED

1. Memorandum of Agreement

The Middle Peninsula Planning District Commission entered into an agreement (**Appendix B**) with the Counties of Essex, Gloucester, King and Queen, and Middlesex to participate in the Dragon Run SAMP. The agreement established the signatories' acceptance of the goals and objectives of the SAMP (see **Section 3**) and willingness to consider the Steering Committee's recommendations for actions (**Section 4**).

This action addresses Goal I(B), II
Responsibility: Middle Peninsula Planning District Commission, Local Governments

2. Establish Baseline Watershed Information

The Dragon Run Steering Committee has identified the following studies that have been completed or are underway to help to establish baseline watershed information:

Title (citation)	Description
Natural Areas of the Chesapeake Bay Region: Ecological Priorities (Jenkins, 1974)	Natural area survey throughout the Chesapeake Bay watershed; Dragon Run ranks 2nd of 232 in importance
County comprehensive plans, land use policies and ordinances	Maps and narratives addressing environmental and land use policies
Dragon Run Access Plan (MPPDC, 1994)	Describes access to the Dragon Run and factors influencing its availability
Dragon Run Watershed Management Plan (DeHardit et al., 1996)	Evaluates watershed and land use issues; offers recommendations; not implemented
Dragon Run Land/Water Quality Preservation Project (MPPDC, 2001)	Comprehensive evaluation of water quality using historical and recent data
A Natural Heritage Inventory of the Dragon Run Watershed (Belden, Jr. et al., 2001)	Survey of rare species and natural communities for the main stem and adjacent wetlands
Dragon Run Management Framework (MPPDC, 2002)	GIS CD-ROM and report with 18 data sets; evaluates economic contributions of traditional uses
Dragon Run Watershed Land Use Policy Audit (MPPDC, 2003)	Evaluates existing land use policies; recommends improvements to protect natural resources and traditional uses
Living Resources Inventory of the Dragon Run (Garman et al., 2003)	Survey and analysis of fish and benthic macroinvertebrate communities
A Natural Heritage Inventory of 14 Headwater Sites in the Dragon Run Watershed (Belden, Jr. et al., 2003)	Survey of rare species and natural communities for headwaters

Title	Description
Virginia Dept. of Environmental Quality Water Quality Monitoring (ongoing)	Ambient water quality monitoring at U.S. 17 and Rt. 603
U.S. Geological Survey Gaging Station (ongoing)	Real-time gage height and discharge by volume at Mascot, Virginia

This action addresses Goal I(A,C)
Responsibility: Middle Peninsula Planning District Commission, universities, state and federal agencies

3. SAMP Project Awareness Campaign
Middle Peninsula Planning District Commission staff delivered presentations, brochures, and fact sheets to Boards of Supervisors, Planning Commissions, and community groups that explained key components of the SAMP project and critical watershed issues.

This action addresses Goal II(B), III(B)
Responsibility: Middle Peninsula Planning District Commission, Dragon Run Steering Committee

RECOMMENDED ACTIONS

1. Land Use and Resource Preservation
Currently, the watershed is 99% wetlands, forests, and farms (MPPDC, 2002) that support a variety of unique natural resources, including rare and threatened species (Belden, Jr. et al., 2001). To protect the unique natural resources and traditional land uses of the Dragon Run, it is crucial to work proactively to implement strong land use policies while development pressure and land use intensity are still low, rather than wait to react to intensifying development pressure (MPPDC, 2003). The Dragon Run Steering Committee **recommends** that counties proactively strengthen and better coordinate their land use policies within the watershed.

A. Designate a Unified "Dragon Run Planning Area"
All of the four counties share the goals of protecting traditional uses, rural character, and natural resources in the Dragon Run. Yet, none of the counties identifies the Dragon Run watershed as a distinct planning area. Based on the Dragon Run Land Use Policy Audit (MPPDC, 2003), the Dragon Run Steering Committee **recommends** a watershed approach to achieve better coordination of land use policies by designating the Dragon Run as a special planning area with a step-by-step implementation strategy.

Step 1	Adopt Watershed Management Plan
Step 2	Amend Comprehensive Plan
Step 3	Amend Zoning Ordinance

Step 1. Each county would adopt the Dragon Run Watershed Management Plan as an addendum to its comprehensive plan, requiring a simple amendment and a public hearing. This action would **not** require an amendment to the future land use maps. The purpose of Step 1 would be to formally acknowledge that the Dragon Run watershed deserves distinctive treatment.

By adopting the Watershed Management Plan, the counties would agree to the following policies:

- Recognize the overall value of maintaining the traditional rural character and forested and farmed landscape of the Dragon Run watershed
- Preserve the ecological integrity of the Dragon Run watershed
- Acknowledge the community and economic benefits of the Dragon Run watershed: for the production of agricultural and forest products; as a valued natural resource; for wildlife habitat; for maintaining water quality; and for scenic and aesthetic values
- Continue to fully enforce existing regulations and policies
- Protect forested and farmed land from fragmentation due to conversion to more intensive development
- Encourage a low-density, clustered pattern of development for new residential development in the watershed to protect open space and natural resources
- Seek techniques to protect open space in the watershed without infringing upon landowner rights to maintain an economic return from their property
- Identify land uses that are incompatible or competitive with traditional resource-based land uses (e.g. forestry, farming, hunting, fishing) and consider limiting them within the watershed
- Limit rezoning to more intense uses in order to protect the rural character and integrity of farming and forestry resources in the watershed
- Limit extension of public utilities and central water and sewer in the watershed
- Explore the feasibility of limiting major residential development in the watershed by aligning the Comprehensive Plan and Zoning Ordinance with provisions in the Subdivision Ordinance that limit major subdivisions
- Publish citizen stewardship materials that explain pertinent ordinances, policies, and regulations in easy-to-understand language

Step 2. Each county would create and map a specially designated “Dragon Run Planning Area” within its comprehensive plan. Placing detailed land use policies such as permitted uses, development density, and utility service into the plan text and the official Future Land Use map would stress that protection of the Dragon Run is an important priority in each county.

Specific goals, policies, and actions, based on a thorough review and analysis by the Dragon Run Steering Committee and its SAMP Advisory Group, would be summarized in a proposed “Model Comprehensive Plan Amendment for the Establishment of the Dragon Run Planning Area.” Considerable staff and public input (e.g. public hearings) would address inconsistencies in land use policies across jurisdictions.

Step 3. Each county would adopt a model "Dragon Run Protection Zone" within its zoning ordinance involving both zoning map and zoning text amendments. The Dragon Run Protection Zone would apply beyond the main channel to the entire watershed.

This step would require considerable staff and public input (e.g. public hearings) to devise a unified set of standards (e.g. permissible uses, acceptable densities, development standards) that integrates with the existing regulatory scheme and that meets the goals of the Special Area Management Plan (see **Section 3**).

This action addresses Goal I(A,B,C), III(A)
Responsibility: Middle Peninsula Planning District Commission, Dragon Run Steering Committee, Local Governments

B. Implement Tools to Preserve Forest, Farm, and Natural Resources

A variety of tools exist with which to preserve forest and farmland (**Figure 3**) and unique natural resources within the Dragon Run watershed. These tools are highly flexible, rely mostly upon voluntary actions, and can provide ecological and cultural benefits. The Dragon Run Steering Committee **recommends** the implementation of an appropriate combination of the following tools (see **Appendix C** for description):

Tool	**Responsibility**
Conservation Easements	Landowners, non-profits, state and local governments
Purchase of Development Rights (PDR)	Local governments
Purchase of Agricultural Conservation Easements	Non-profits and federal, state and local governments
Enforcement of Chesapeake Bay Preservation Act and Other Ordinances	Local governments
Agricultural and Forestal Districts	Local governments
Land Use Assessment	Local governments
Utilize Farm Programs and Forest Stewardship Plans	State and federal agencies; local governments; landowners
Sliding Scale Property Tax Rate	Local governments
Sliding Scale Zoning	Local governments
Local "Right-to-Farm"	Local governments
State Forest	Department of Forestry
Virginia Natural Area Preserves System	Landowners, Natural Heritage Program
Virginia Estuarine and Coastal Research Reserve System	Chesapeake Bay National Estuarine Research Reserve

The Dragon Run Steering Committee also **recommends** the conservation of natural heritage resources and associated conservation sites as designated by the Virginia Natural Heritage Program (DCR, 2003a).

This action addresses Goal I(A,B,C), III(A)

Figure 3. Farming in the Dragon Run watershed.

C. Address Public and Landowner Access Issues

Public access to the Dragon Run is limited because property adjacent to the navigable stream is almost entirely privately owned. In most cases, access must be arranged by landowner consent. While generally effective, this informal arrangement has sometimes frustrated landowners and recreation-seekers alike. Private landowners express frustration with trespassers and with users who do not practice “leave no trace” recreation. In contrast, those seeking recreation are hindered by sparse access to the pristine river.

Landowners have expended time and money to resolve trespassing and vandalism problems, ranging from posting signs to instituting a formal program requiring verbal or written permission prior to visitation. Liability is often cited as a landowner concern. Virginia’s landowner liability law (Code of Virginia §29.1-509), however, dismisses a landowner’s liability when recreational users access their property with permission, express or implied, if no fee is charged to the user. Furthermore, if a landowner grants an access easement to a government agency or authority, then the landowner is held harmless from all liability and the easement holder is responsible for providing and paying for the cost of all legal services required as a result of a claim or suit.

As demand for public access has increased, recreation-seekers have encountered access limitations. Land-based public access exists at three locations: 1) Rappahannock Community College in Glenns (hiking); 2) Virginia Coastal Reserve in Mascot (education); and 3) Friends of Dragon Run property in Mascot (hiking/birding) with parking on a Virginia Department of Transportation unpaved lot. Fishing spots are limited to traditional access points, such as bridges. Also, the boating distance between traditional access points equates to nearly an entire day, causing logistical problems for novice paddlers. Occasionally, the sheriff’s department must dispatch a rescue team to retrieve boaters who are lost in the dark. Organizations that offer guided paddling trips effectively manage access with trip planning and suitability, proper equipment and safety information, appropriate consideration for private property, and response to the unexpected (e.g. medical emergencies, cold water immersion).

The Dragon Run Steering Committee seeks to balance reasonable public access to publicly owned waters with private property rights, preservation of the watershed's sense of peace and seclusion, and the watershed's ecological integrity that are highly prized by landowners and visitors alike. The following is a list of **proposed** actions:

- Erect signage notifying boaters/recreationists of trespassing issues and the physical dangers of boating in a wilderness area
  Responsibility: Dragon Run Steering Committee
- Provide land-based access as an alternative to boat-based access
  Responsibility: Middle Peninsula Chesapeake Bay Public Access Authority, Virginia Coastal Reserve (Virginia Institute of Marine Science), Virginia Dept. of Forestry, local governments, non-profit organizations
- Supervise or manage public access sites
  Responsibility: Middle Peninsula Chesapeake Bay Public Access Authority, Virginia Coastal Reserve (Virginia Institute of Marine Science), Virginia Dept. of Forestry, Virginia Dept. of Transportation, local governments, non-profit organizations
- Assess recreational carrying capacity/access to determine appropriate recreational "load"
  Responsibility: Dragon Run Steering Committee

This action addresses Goal I(A,C), II(A), III(A)

D. Control Invasive Species

Recent state legislation establishing the policy-setting Virginia Invasive Species Council signifies an era of formal concern about invasive or non-native species and their impacts on the integrity of Virginia's native ecosystems. Invasive species are purposely or accidentally introduced from other regions or countries and often physically displace or consume native species because they have few competitors or predators. The Dragon Run Steering Committee **recommends** that a Dragon Run Invasive Species Initiative be established in the watershed.

This initiative could include the following elements:

1. Form Dragon Run Invasive Species Initiative with scientific and policy experts
   Responsibility: Dragon Run Steering Committee staff, state and federal agencies, universities, non-profit conservation organizations
2. Assess status of existing invasive species or potential for new invasive species
   Responsibility: Dragon Run Invasive Species Initiative
3. Encourage the creation of state-level policies by seeking representation on the Virginia Invasive Species Council's Advisory Committee
   Responsibility: Virginia Invasive Species Council, Dragon Run Invasive Species Initiative

4. Establish education program to reduce the potential for species introduction
   Responsibility: Dragon Run Invasive Species Initiative
5. Establish monitoring and control program
   Responsibility: Dragon Run Invasive Species Initiative

Examples of common or potentially devastating invasive species that could affect the relatively intact natural communities in the Dragon Run are: blue catfish (*Ictalurus furcatus*); common reed (*Phragmites australis*); zebra mussel (*Dreissena polymorpha*); Asiatic dayflower (*Murdannia keisak*); and Japanese stiltgrass (*Microstegium vimineum*). Blue catfish, common reed, Asiatic dayflower and Japanese stiltgrass occur in the Dragon Run. These invasive species should be monitored and, to the extent practicable, controlled or excluded from the watershed.

This action addresses Goal I(C), II, III(B)

2. Education and Landowner Stewardship

In order to enhance and solidify the community's connection to and respect for the land and water of the Dragon Run, public education must be a central element of the Special Area Management Plan. Education should target citizens and stakeholders and focus on the unique ecological and recreational values in the watershed, the community and economic benefits of traditional land uses, and the need to preserve both through exemplary stewardship and proactive planning for the watershed's future. The Dragon Run Steering Committee **recommends** that a comprehensive education program be established to communicate the regional importance of the Dragon Run watershed to its citizens and to demonstrate the link between decisions about land management and the watershed's integrity and quality.

Education Program Components	Responsibility
Hands-on Experiences	Dragon Run Steering Committee
Community Watershed Festival	Dragon Run Steering Committee
Watershed Stewardship Awards	Dragon Run Steering Committee
Watershed Boundary Signs	Dragon Run Steering Committee
Promote Use of Forest Stewardship Plans	Dragon Run Steering Committee; local governments; Dept. of Forestry
Promote Use of Farm Programs	Natural Resources Conservation Service; Virginia Cooperative Extension; Soil and Water Conservation Districts; Farm Service Agency; Virginia Farm Bureau
Promote Action-based Projects	Dragon Run Steering Committee; local governments; citizens

Hands-on Experiences
The Dragon Run Steering Committee **recommends** the use of hands-on experiences to produce an understanding and appreciation of the Dragon Run, targeting:

- State and federal legislators, Boards of Supervisors, Planning Commissions, and county staff
- Landowners, hunt clubs, land management consultants, and farmers and foresters who rent or lease land
- Chamber of Commerce, service clubs, civic and church groups, and non-profit organizations
- State and federal agency representatives
- Schools, 4-H Club, Scouts, class projects
- General public

The recommended approach encompasses a variety of methods and materials. Education would focus on field experiences that incorporate activities designed to address critical watershed issues (e.g. wetland and habitat values, biodiversity, water quality and quantity, riparian buffers).

This action addresses Goal II(A,B), III(B)

Community Watershed Festival
A component of the education program should be a community watershed festival as a celebration of the watershed's natural, cultural, and historic heritage. The festival would **not** serve as a promotional tool to attract visitors. Displays and activities highlighting natural and cultural heritage would be featured. The Dragon Run Steering Committee **recommends** the festival as a way to increase citizen awareness of watershed issues and as an opportunity to acknowledge citizens for exemplary watershed stewardship.

This action addresses Goal II(B), III(B)

Watershed Stewardship Awards
The Dragon Run Steering Committee **recommends** the establishment of watershed stewardship awards that would honor landowners and land managers who have demonstrated commendable stewardship within the watershed. Awards would be bestowed annually at the watershed festival for a variety of categories that may include: forestry; farming; hunting; commercial enterprises; conservation; education; planning; and science. The awards program should serve as an incentive to implement exemplary land stewardship practices.

This action addresses Goal II(B), III(B)

Watershed Boundary Signs
The Dragon Run Steering Committee **recommends** placing watershed boundary signs along frequently traveled highway and secondary roads to increase community awareness of the location and importance of the Dragon Run watershed. By indicating

the watershed boundary, the signs would alert citizens that they are in the watershed. Teamed with other educational efforts, the signs should lead to citizen awareness that their land management practices influence the health of the watershed.

This action addresses Goal II, III(B)

Promote Forest Stewardship Plans

The watershed is more than 80% forested and has intact riparian buffers. Since forested riparian buffers provide effective water quality protection and wildlife habitat, forested lands exhibit low nutrient input to adjacent streams relative to other land uses in the watershed (MPPDC, 2001). Therefore, forest stewardship plans have the potential to significantly influence the health and profitability of the watershed's forests. To benefit landowners and the local economy and to preserve the rural landscape and the natural resources in the watershed, the Dragon Run Steering Committee **recommends** promotion and implementation of forest stewardship plans prior to timber harvesting.

Forest stewardship plans are ecosystem management plans that combine ecological function with landowner goals to attain a vision for a particular property. The Department of Forestry's Forest Stewardship Plans leverage professional resources across disciplines to provide an inventory, recommendations and reference information that address landowners' specific goals and objectives, which may include: wildlife enhancement; aesthetics; recreation; water quality protection; forest regeneration; financial investment and incentives; and fire, pest, and disease control. The Virginia Department of Forestry prepares Forest Stewardship Plans for up to 200 acres at no cost to landowners. Beyond 200 acres, the Department charges fees, so it may be cost-effective for a consulting forester to develop a Forest Stewardship Plan.

This action addresses Goal I(A,B,D), II(B), III(A)

Promote Farm Programs

Agricultural lands make up 18% of the watershed and have the potential to contribute sediments, nutrients, and bacteria to ground and surface water. Existing state and federal farm programs (see **Appendix D** for description) can positively influence the health and profitability of the watershed by providing incentives for employing Best Management Practices or for taking marginal land out of agricultural production. To benefit farming operations, water quality, wildlife habitat, and the rural landscape and character of the watershed, the Dragon Run Steering Committee **recommends** promotion and implementation of programs, such as:

Program	**Responsibility**
Conservation Reserve Program (CRP)	Natural Resources Conservation Service
Conservation Reserve Enhancement Program (CREP)	Natural Resources Conservation Service, Soil and Water Conservation Districts, Farm Service Agency
Environmental Quality Incentives Program (EQIP)	Natural Resources Conservation Service

Program	Responsibility
Farm and Ranch Lands Protection Program	Natural Resources Conservation Service
FarmLink Program	Virginia Farm Bureau
Forest Land Enhancement Program (FLEP)	Natural Resources Conservation Service; Dept. of Forestry
Wetland Reserve Program	Natural Resources Conservation Service
Wildlife Habitat Incentives Program (WHIP)	Natural Resources Conservation Service

It should be noted that the existence and availability of these programs changes depending on funding. Also, Virginia Cooperative Extension provides considerable technical assistance to farmers and actively promotes these programs.

This action addresses Goal I(A,B,D), II(B), III(A)

Promote Action-based Projects

Action-oriented projects can sustain enthusiasm for watershed activities by involving community members in active resource stewardship. For example, James City County's program entitled "Protecting Resources in Delicate Environments" strives "to improve water quality…by teaching residents about the importance of watershed protection while providing residents and neighborhoods with specific watershed restoration and protection tools (James City County, 2003)." The Dragon Run Steering Committee **recommends** encouraging action-based projects, such as:

- Trash pickup (e.g. Adopt-a-Highway, Adopt-a-Stream)
- Development of nature trails
- Construction of rain gardens to capture roof runoff
- Stream bank stabilization
- Stream restoration

This action addresses Goal I(C,D), II(A), III(B)

3. Encourage and Support Sustainable Economic Development

While natural resource-based industries have been and continue to be at the core of the watershed's economy, external economic forces threaten to fragment these traditional uses and alter the rural landscape. The Dragon Run Steering Committee **recommends** that sustainable natural resource-based development be pursued to strengthen the region's economy and boost the quality of life, while supporting the traditional land uses that preserve the Dragon Run watershed and its resources.

Support Sustainable Forestry and Farming

Agriculture is Virginia's top sales industry, makes up 11.2% of Virginia's Gross State Product, and creates about 10% of the state's jobs (DACS, 2003). Similarly, forestry supports "one of the largest manufacturing industries in the state ranking first in employment, first in wages and salaries, and accounts for $1 out of every $8 of value added through manufacturing (DOF, 2003)." Forestry (**Figure 4**) and farming are key industries in the Dragon Run watershed.

Figure 4. Forestry in the Dragon Run watershed.

As the tax base expands with rapid population growth (>14.4% in 3 of 4 watershed counties), the demands for public services also grow, often at a faster rate than tax revenues. Many rapidly growing counties have found their ability to provide adequate public services outstripped by the rapid demand for those services.

In contrast, agricultural and forestal land have been shown to demand a low cost of public services ($0.23 relative to $1.00 generated in taxes in Northampton County, VA [American Farmland Trust, 2002]). Yet, farm and forest land continue to disappear at a rapid rate, giving way to suburban-style development.

For the natural resource-based industries to continue to thrive, the watershed communities **should** develop a regional capacity to produce value-added forest and farm products to capture additional value locally. With funding from the Virginia Coastal Program, the Dragon Run Steering Committee is sponsoring a study of potential sustainable economic development opportunities within the watershed. The study will involve local and regional experts in natural resource-based industries and demonstrate how sustainable natural resource-based development can generate wealth within the community.

This action addresses Goal I(A,B,C), II(B), III(A)
Responsibility: Dragon Run Steering Committee, local governments, business/industry

Encourage Sustainable Nature-based Tourism
Nature-based tourism and agritourism can help to diversify and strengthen the economy of a region that is rich in natural resources, such as the Middle Peninsula. Nature-based tourism is the fastest growing sector of the U.S. tourism industry and Virginia is one of the top 10 destinations for travelers (DGIF, 2002b). The Dragon Run Steering Committee **recommends** encouraging and supporting appropriate nature-based tourism and agritourism to benefit from these trends.

The Dragon Run watershed contains several sites on the newly established Virginia Birding and Wildlife Trail that is designed for car travel (DGIF, 2002a). In addition, the Virginia Ecotourism Association has developed a certification course using standards that avoid negative impacts on the resources that attract tourism. Supporting these initiatives in nature-based tourism could benefit the economy and, in turn, the natural resources of the watershed. For example, surveys along the Great Texas Coastal Birding Trail indicate that travelers spend ~$1,000 per person per trip, two-thirds of which flows directly into the local economy. More importantly, rural communities that are not able to promote their destinations are gaining economic stimulation from their assocation with the Trail. Meanwhile, the Trail increased awareness of the importance of the region's natural resources and the need to conserve them (DGIF, 2002b).

This action addresses Goal I(A,B,C), II(B), III(A)
Responsibility: Dragon Run Steering Committee, local governments, business/industry

4. Monitor the Implementation of the Watershed Management Plan

An important element of any planning effort is monitoring plan effectiveness. The Dragon Run Steering Committee **recommends** that a monitoring program be developed that assesses the results of watershed management plan implementation to ensure that the plan is effectively implemented.

The monitoring program should assess factors and parameters that are easily compared to the baseline information in the watershed management plan. Examples include: designation of watershed planning area; acres enrolled in farm and forest programs; land use/land cover; water quality; number of educational trips; invasive species; amount and type of public access; and number of action-based projects. Furthermore, the Dragon Run Steering Committee should coordinate and provide oversight for the monitoring program. For instance, the Steering Committee could draft an agreement with localities whereby the Committee reviews development applications in the watershed and offers advisory comments to the localities. Stable funding for staff support will continue to be a key component of Steering Committee activities.

The results of the monitoring program should be used to refocus efforts on actions that have not been fully implemented. The monitoring program may also highlight successes and identify new or unforeseen needs (e.g. funding for new projects).

This action addresses Goal I(C)
Responsibility: Dragon Run Steering Committee, local governments

HOW DO ACTIONS SUPPORT GOALS AND OBJECTIVES?

Actions in this **Section** support the goals and objectives stated in **Section 3** as shown in **Table 1**. For example, Recommended Action 1A: *Land Use: Designate a Unified "Dragon Run Planning Area"* (pp. 16-18) supports:

- Goal I (p. 12): Establish a high level of cooperation and communication between the four counties within the Dragon Run Watershed to achieve consistency across county boundaries.
  - Objective A: Develop a plan to address the inevitable future development pressure to change the traditional use of land in the Dragon Run Watershed.
  - Objective B: Achieve consistency across county boundaries among land use plans and regulations in order to maintain farming and forestry and to preserve natural heritage areas by protecting plants, animals, natural communities, and aquatic systems.
  - Objective C: Provide ongoing monitoring of existing plans and planning tools in order to assess traditional land uses and watershed health and take action necessary to preserve the watershed.
- Goal III (p. 13): Promote the concept of landowner stewardship that has served to preserve the Dragon Run Watershed as a regional treasure.
  - Objective A: Address the potential dilemma of preserving the watershed's sense of peace and serenity by protecting open space and reducing fragmentation of farms, forests, and wildlife habitat versus the landowners' rights in determining or influencing future land use.

Action [Section 4]	**Goal (Objective)** [Section 3]
Completed/Underway	
1	I (B); II
2	I (A, C)
3	II (B); III (B)
Recommended	
1A	I (A, B, C); III (A)
1B	I (A, B, C); III (A)
1C	I (A, C); II (A); III (A)
1D	I (C); II; III (B)
2	I (A, B, C, D); II (A, B); III (A, B)
3	I (A, B, C); II (B); III (A)
4	I (C)

Table 1. How actions support the Dragon Run SAMP's goals and objectives.

PART II

SECTION 5: Framework of Institutional and Regulatory Responsibility

Section 5 describes the responsibilities of federal, state, and local government agencies for mandatory and voluntary programs, policies, and regulations.

Neither the MPPDC nor its Dragon Run Steering Committee has regulatory authority. Rather, they serve to encourage and facilitate local-local and state-local government cooperation in addressing regional issues. Consisting of elected officials and citizens appointed by member local governments, the MPPDC and the Dragon Run Steering Committee offer recommendations and technical assistance to the localities. The MPPDC's purpose is "to promote the orderly and efficient development of the physical, social and economic elements of the Planning District by planning, and encouraging, and assisting governmental subdivisions to plan for the future" (MPPDC, 1972).

The Virginia Coastal Program is a system of state laws and policies administered by a network of core agencies and coastal localities that manage a variety of coastal resources. The Department of Environmental Quality (DEQ) serves as the lead agency for Virginia's networked Coastal Program and helps agencies and localities to develop and implement coordinated coastal policies.

Within the context of the SAMP, county governments are responsible for long-range planning of public facilities, utilities, transportation, and land use, and for developing, implementing, reviewing and updating the local Comprehensive Plan, Zoning Ordinance and other ordinances. Through Boards of Supervisors, Planning Commissions, and staff, counties process and review rezoning, conditional use permits, special exceptions, site plans, and subdivisions. Therefore, counties implement land use policies and regulations.

Counties also have responsibility for implementing the Chesapeake Bay Preservation Act (Bay Act). The Chesapeake Bay Local Assistance Department (CBLAD) is charged with oversight of local implementation of the Bay Act and the Chesapeake Bay Preservation Area Designation and Management Regulations. The Bay Act (§10.1-2100 et seq.) requires that localities protect water quality by establishing and protecting Chesapeake Bay Preservation Areas, including wetlands, shorelines, and a 100-foot buffer.

The Virginia Department of Conservation and Recreation (DCR) administers: 1) the Coastal Nonpoint Source Pollution Control Program under authority of Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990; 2) the Nonpoint Source Pollution Management Program under authority of Section 319 of the Clean Water Act of 1987; 3) the Virginia Stormwater Management Program; 4) the Erosion and Sediment Control Program; 5) the Nutrient Management Program; and 6) and the Chesapeake Bay and Tributary Strategies Programs. DCR's Natural Heritage Program reviews development proposals that might affect the state's natural heritage resources (e.g. rare species and natural communities). DCR's Shoreline Erosion Advisory Service offers assistance to landowners experiencing erosion problems.

The authority to issue National Pollutant Discharge Elimination System (NPDES) permits lies with the DEQ. Furthermore, the DEQ regulates air quality, waste management (e.g. landfills), ground water management, water withdrawal, and petroleum storage tanks. The DEQ is also responsible for setting state water quality

standards and preparing the 305(b) Water Quality Assessment Report and the 303(d) Report on Impaired Waters. Impaired waters do not meet water quality standards and usually require the development of a Total Maximum Daily Load (TMDL) report. The implementation of TMDLs may require regulations governing discharges and nonpoint source pollution to impaired waters.

The Virginia Department of Game and Inland Fisheries (DGIF) regulates hunting, freshwater fishing, and boating. Furthermore, the DGIF maintains public boating access sites. The DGIF also regulates threatened and endangered species.

The U.S. Army Corps of Engineers' Norfolk District Regulatory Branch (ACOE) regulates waters and wetlands under the authority of Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899.

The Virginia Marine Resources Commission's Habitat Management Division (MRC) regulates physical encroachment into bottomlands, tidal wetlands, and coastal primary sand dunes under Subtitle III of Title 28.2 of the Code of Virginia. The permit process is the joint responsibility of local wetlands boards, the MRC, the DEQ (Section 401 certification), and the ACOE. Additionally, the MRC regulates saltwater fishing.

The Virginia Department of Forestry (DOF) has authority to regulate forestry operations throughout the state. Silvicultural activities are exempt from most laws such as the Clean Water Act, the Chesapeake Bay Preservation Act, and Erosion and Sediment Control. In exchange for these exemptions, silvicultural activities must comply with Best Management Practices designated by DOF in *Virginia's Forestry Best Management Practices for Water Quality, 4th Edition* (2002). DOF has responsibility for inspecting forestry operations, reporting violations, and enforcing regulatory requirements.

The Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture administers: the Conservation Reserve Program; the Conservation Reserve Enhancement Program; the Environmental Quality Incentives Program; the Farm and Ranch Lands Protection Program; the Forest Land Enhancement Program; the Wetland Reserve Program; and the Wildlife Habitat Incentives Program. The NRCS helps private landowners conserve soil, water, and other natural resources through technical assistance, cost sharing, and financial incentives. The NRCS also provides assistance to local, state, and federal agencies.

SECTION 6: Watershed Characterization

Section 6 describes the watershed in detail to establish the Dragon Run's current status. Physical and environmental features are characterized. Land use policies and recreational and educational activities are assessed. This information is designed to serve as a baseline to which to compare the success or failure of the watershed management plan in achieving its goals and objectives. Finally, gaps in the baseline information are identified.

Physical and Environmental Factors

Located entirely within the coastal plain physiographic province, Virginia's Middle Peninsula is bracketed by the Rappahannock River to the north, the York River to the south, and the Chesapeake Bay to the east. The Dragon Run watershed is the Middle Peninsula's geographic centerpiece, expanding outward from its 40-mile fresh and brackish water stream that runs through Essex, Gloucester, King and Queen, and Middlesex Counties. The watershed encompasses 90,000 acres or 140 square miles and exhibits topography typical of coastal plain stream systems in Virginia (**Figure 5**). Watershed area by locality is shown in **Table 2**.

County	Area within Locality (acre)	% of Total Watershed	% of Locality within Watershed
Essex	18466.6	20.6	10.1
Gloucester	5671.7	6.3	3.1
King and Queen	46425.1	51.7	22.2
Middlesex	19207.7	21.4	16.3
Total	89771.1	100	

Table 2. Dragon Run watershed statistics by locality (from MPPDC, 2001).

The Dragon Run watershed, state hydrologic unit CO2, is a fourth-order stream system that is nontidal freshwater above the U.S. Route 17 bridge and tidal freshwater from the U.S. 17 bridge to its mouth at Meggs Bay (**Figure 6**). There it forms the Piankatank River, where it becomes estuarine, and eventually drains into the Chesapeake Bay (**Figure 7**). Underground springs, feeder swamps, and surface waters support streamflow in the Dragon Run. Significant tributaries include Dragon Swamp, Yonkers Swamp, Exol Swamp, Timber Branch Swamp, Briery Swamp, Holmes Swamp, White Marsh, Zion Branch, Carvers Creek, Mill Stream, and Meggs Bay (MPPDC, 2001).

Land cover data indicate that the watershed is 80.3-83.9% forested and wetlands, 15.1-18.4% agricultural, and 1.0-1.3 % commercial and residential (**Figure 8**) (MPPDC, 2002; DCR, 2003). The Dragon Run watershed lies within the transitional Oak-Pine vegetation region where dominant oaks share the forest with Virginia pine, shortleaf pine, and loblolly pine. Although loblolly pine originally appeared in the forest as scattered associates of oaks and other hardwoods, loblolly pine plantations are increasingly common.

Since the watershed is relatively intact, it contains many unique resources. For example, the Baldcypress-Tupelo Swamp community is extensive and is the northernmost example of this community type in Virginia and the best example north of the James River (Belden, Jr. et al., 2001). Natural heritage resources are abundant in the Dragon Run (**Figure 9**). Several rare natural communities occur in the Dragon Run, including Baldcypress-Tupelo Swamp, Tidal Baldcypress-Tupelo Swamp, Tidal

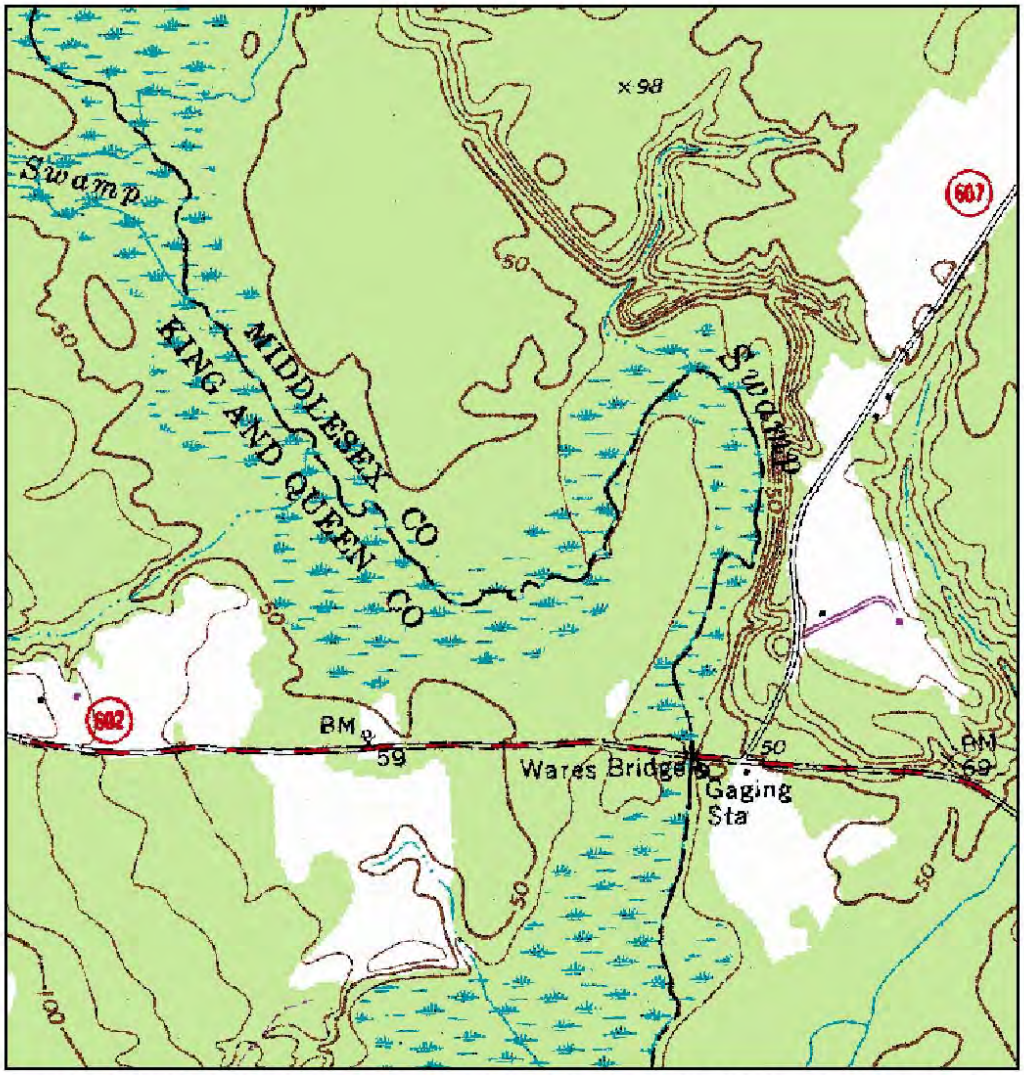

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Figure 5. U.S. Geological Survey topographic map of the Dragon Run watershed in Middlesex and King and Queen Counties.

Figure 6. Map of the Dragon Run watershed boundary showing villages and towns.

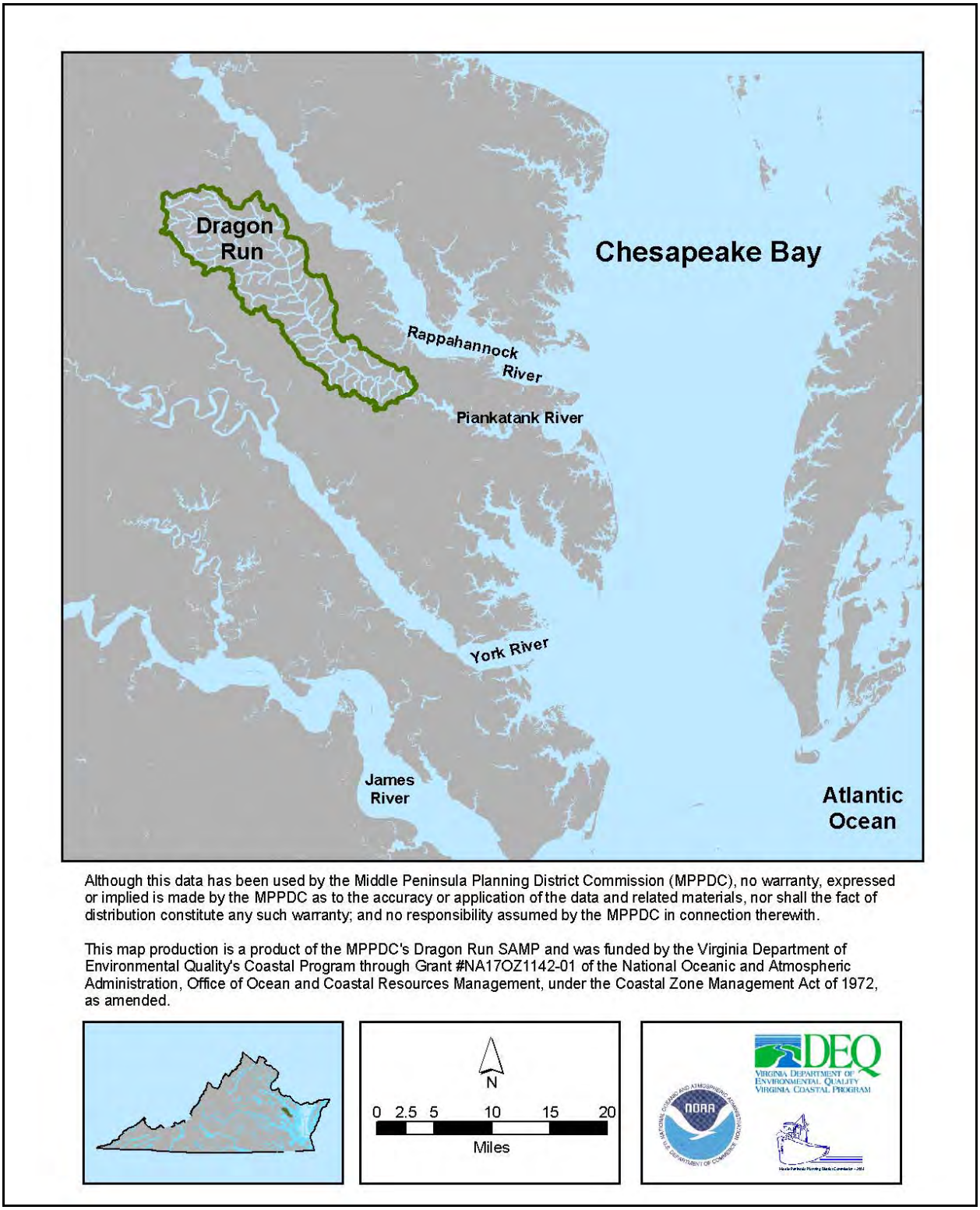

Figure 7. Map showing the Dragon Run watershed (in green) flowing into the Piankatank River and ultimately into the Chesapeake Bay.

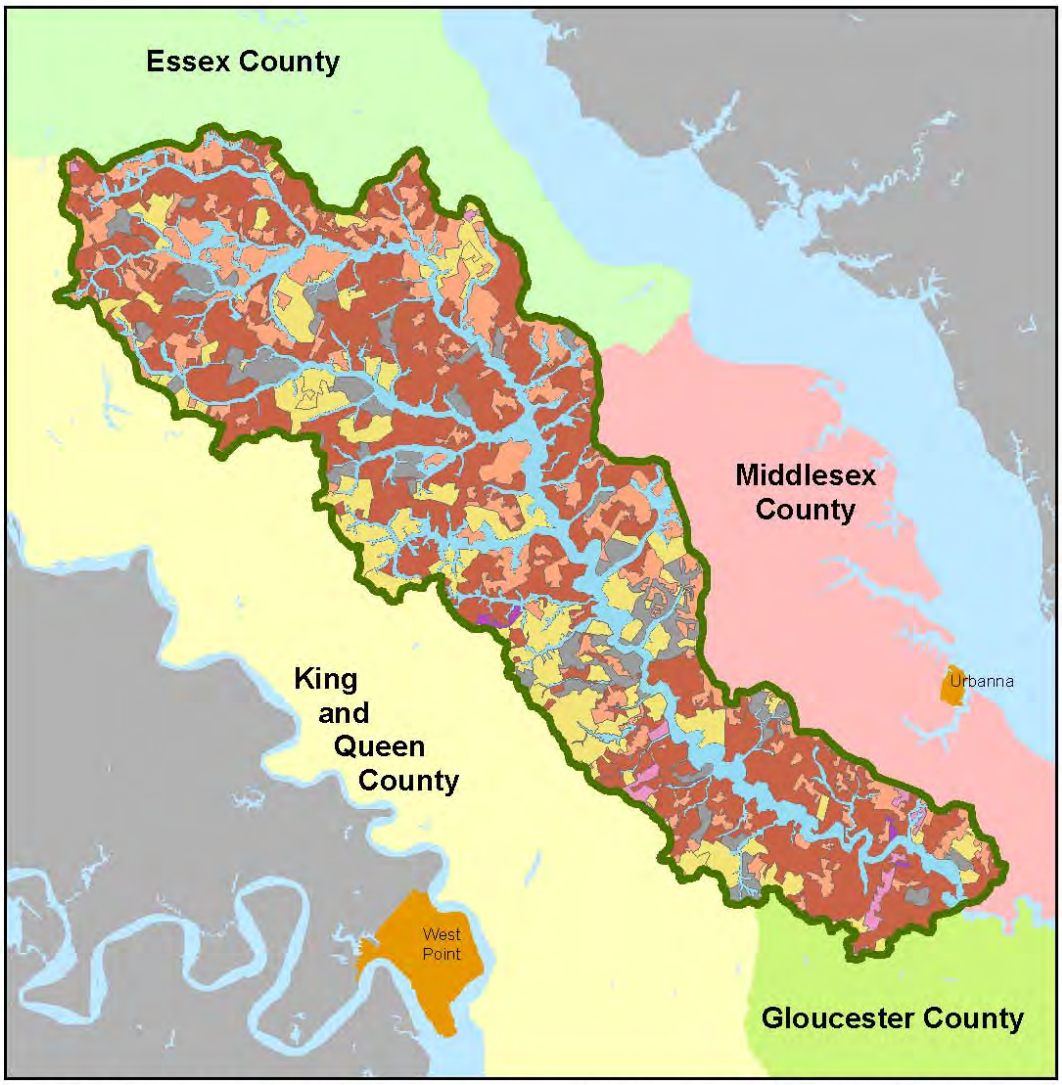

Figure 8. Land cover designations in the Dragon Run watershed.

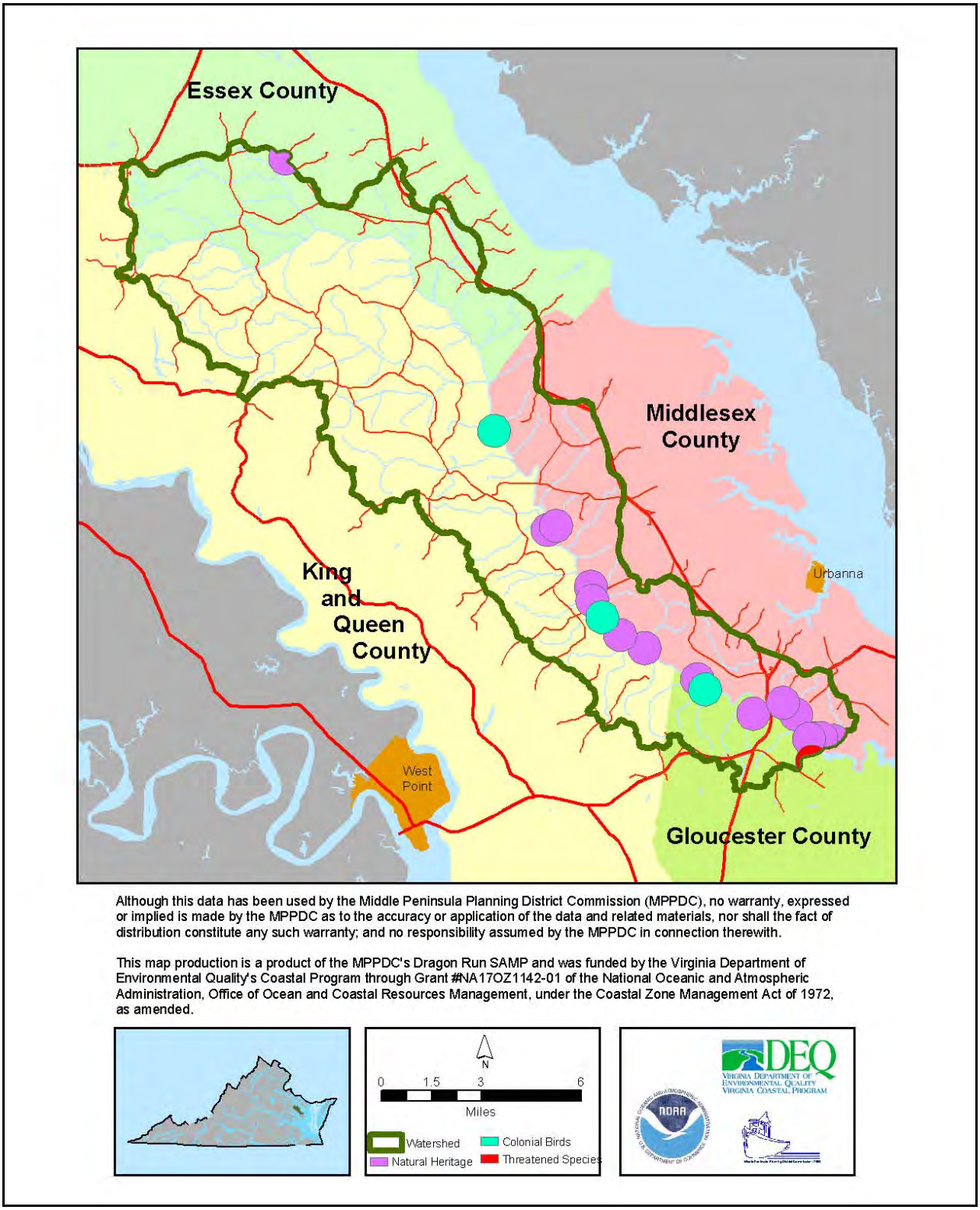

Figure 9. Occurrences of natural heritage resources in the Dragon Run watershed.

Baldcypress Woodland/Savanna, Fluvial Terrace Woodland, and Tidal Freshwater Marsh (see **Appendix A** for descriptions). The Baldcypress-Tupelo Swamp community (**Figure 10**) also harbors a number of rare plant and animal species. Rare animals include bald eagle, great purple hairstreak, blackwater bluet, robust baskettail, cypress sphinx, Selys' sunfly, fine-lined emerald and Southern pitcher-plant mosquito. Rare plants include cuckooflower, red turtlehead, Parker's pipewort, pineland tick-trefoil, river bulrush, Northern purple pitcher-plant, and cypress-knee sedge (Belden, Jr. et al., 2001; Belden, Jr. et al., 2003). The Dragon Run also harbors a number of rookeries for colonial water birds, such as egrets and herons. Other natural communities that occur in the Dragon Run include: Coastal Plain/Piedmont Bottomland Forest; Coastal Plain/Piedmont Acidic Seepage Swamp; and Coastal Plain Semipermanent Impoundment (Belden, Jr. et al., 2003).

Figure 10. Baldcypress-Tupelo Swamp community.

In addition to natural heritage resources, the Dragon Run supports a diversity of freshwater and estuarine fishes, aquatic macroinvertebrates, freshwater bivalves (primarily unionid mussels), and herptefauna (amphibians and reptiles) (McInich et al., 2003). At least forty-five fish species from nineteen families have been collected in the Dragon Run, representing a mixed assemblage of mostly lowland freshwater forms that is highly dynamic spatially and temporally. At least sixty-five macroinvertebrate species from fourteen orders and forty-seven families have been recorded from the Dragon Run.

The watershed contains only limited examples of invasive, or non-native, species, again emphasizing a relatively intact natural system. Currently, blue catfish, common reed, Asiatic dayflower and Japanese stiltgrass occur in the Dragon Run in limited quantities (**Figure 11**).

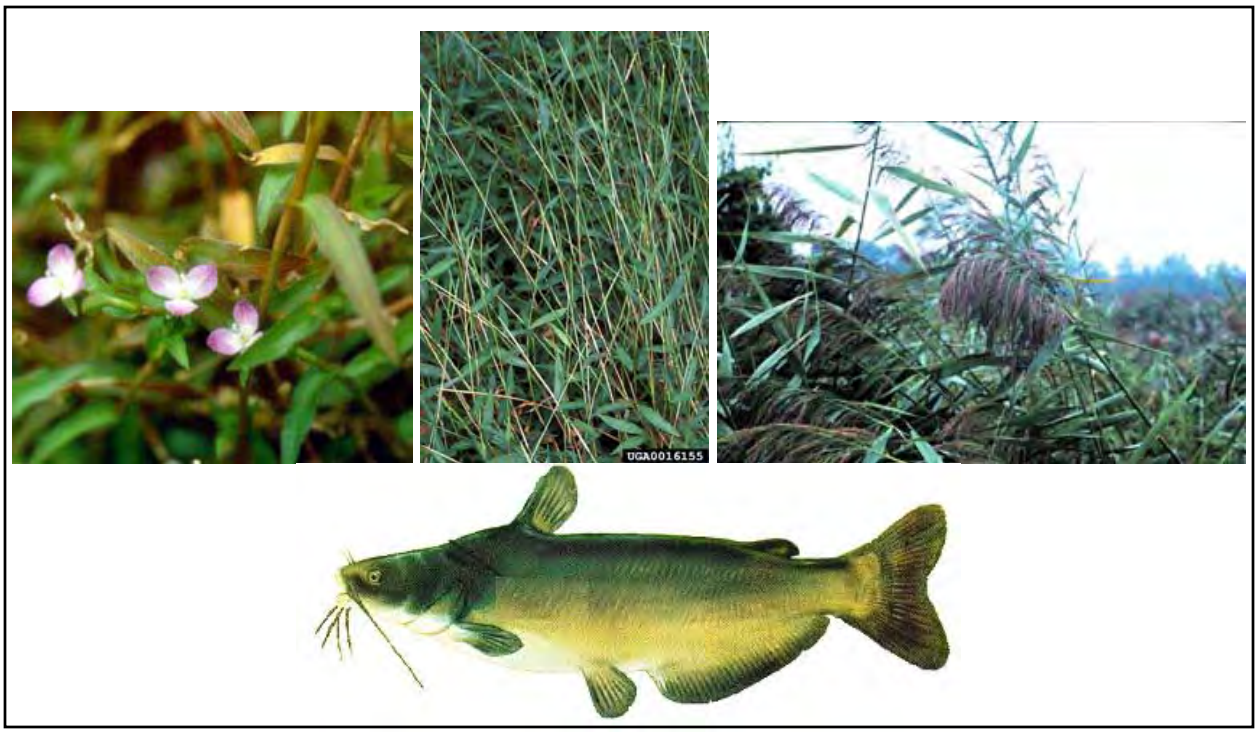

Figure 11. Invasive species of the Dragon Run - clockwise: Asiatic dayflower (Brent Steury, NPS); Japanese stiltgrass (Ted Bodner); Common reed (Joseph McCauley, USFWS); Blue catfish (www.landbigfish.com)

According to the National Wetland Inventory, wetlands along the Dragon Run (**Figure 12**) are Palustrine, mostly Forested Wetlands except for Emergent Wetlands in Meggs Bay. U.S. Route 17 is the approximate demarcation between tidal wetlands and non-tidal wetlands. The hydrologic regime of most Dragon Run wetlands is Seasonally Flooded, Seasonally Flooded-Saturated, or Temporarily Flooded (Belden, Jr. et al., 2001).

The U.S. Geological Survey (USGS) maintained a streamflow gaging station at Church View (Route 602) from 1943 to 1981 that received drainage from 60% of the watershed (84 square miles) and has maintained a streamflow gaging station at Mascot (Route 603) since 1981 that receives drainage from 75% of the watershed (105 square miles). Median daily streamflow at Mascot from 1981 to 1999 was 79 ft^3/sec and varied between 0.01-6050 ft^3/sec. Median daily streamflow at Church View from 1943 to 1981 was 57 ft^3/sec and varied from 0-3790 ft^3/sec. Compared to other coastal plain stream systems such as the Chickahominy River (New Kent County), the Mattaponi River (King William County), and Cat Point Creek (Richmond County), the Dragon Run exhibits lower median daily streamflow per square mile of drainage area. Base flow, fed primarily by groundwater discharge, accounts for two-thirds of the Dragon Run's total streamflow, with the remaining third attributable to surface water runoff. Of the annual precipitation, only one-third becomes streamflow, with two-thirds lost to evapotranspiration. Seasonally, streamflow is highest in the spring and lowest in the fall (MPPDC, 2001).

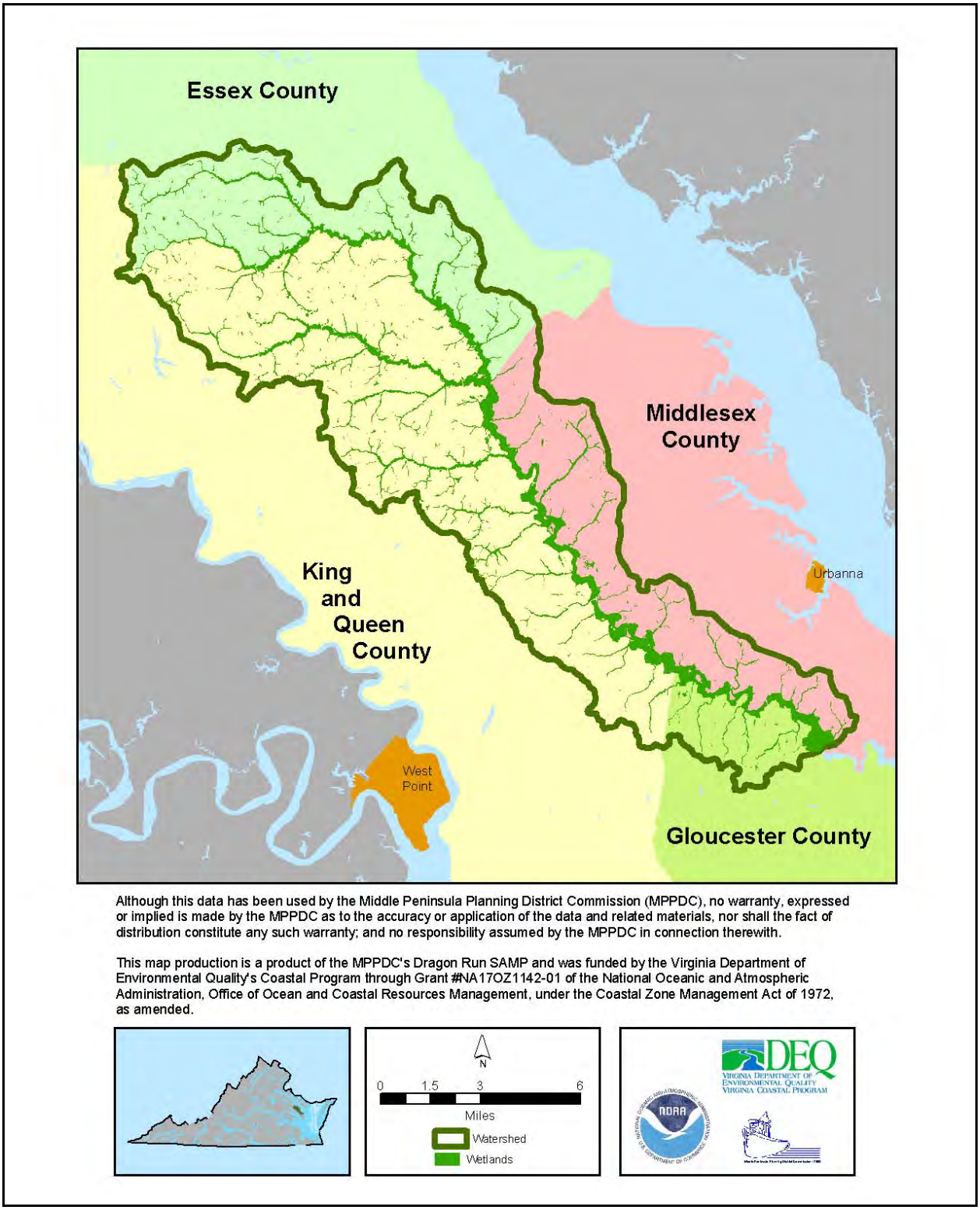

Figure 12. Wetlands in the Dragon Run watershed.

Geological features are described by the following excerpt from *A Natural Heritage Inventory of the Dragon Run Watershed* (Belden, Jr. et al., 2001):

Surficial deposits of riverine terraces bordering Dragon Run from the vicinity of the Essex-Middlesex county line to Meggs Bay belong to the Shirley Formation and the Sedgefield Member of the Tabb formation. The middle Pleistocene Shirley Formation consists of light- to dark-gray, bluish-gray and brown sand, gravel, silt, clay, and peat; the Sedgefield Member is of upper Pleistocene age and consists of pebbly to bouldery, clayey sand and fine to medium, shelly sand grading upward to sandy and clayey silt. Somewhat higher topography away from the waterway is underlain by the Chesapeake Group. This consists of fine to coarse quartzose sand, silt, and clay (variably shelly and diatomaceous) deposited in shallow waters of the upper Pliocene and lower Miocene periods. At still higher elevations, the Windsor Formation is found, consisting of gray and yellowish to reddish-brown sand, gravel, silt, and clay of lower Pleistocene or upper Pliocene age. At higher elevations southwest of Dragon Run, two other formations are prevalent, both of upper Pliocene age. The Bacons Castle Formation is characterized by gray, yellowish-orange, and reddish-brown sand, gravel, silt, and clay and the Moorings Unit by white, light gray, and grayish-yellow quartzose sand and clay to grayish-brown clayey silt and silty clay.

Watershed elevation ranges from 180 feet to near sea-level. Detailed soils information can be found in the *Soil Survey* for each county (Note: King and Queen County does not have a published *Soil Survey*). Many of these soils are considered prime farmland and are suitable for silviculture. Generally, soil associations are as follows:

Essex County

Emporia-Slagle-Atlee; Rumford-Suffolk-Emporia - somewhat excessively drained to moderately well drained loamy and sandy soils (Hoppe, 1989)

Middlesex County

Suffolk-Eunola-Remlik; Kempsville-Suffolk-Kinston; Emporia-Slagle-Nevarc - deep, well drained to poorly drained loamy or clayey soils (Newhouse et al., 1985); Pocaty-Kinston-Bibb - deep, very poorly to poorly drained organic and loamy soils that are flooded by fresh and brackish water (Newhouse et al., 1985)

Gloucester County

Suffolk-Eunola-Kenansville; Emporia-Hapludults-Wrightsboro - deep, well drained to moderately well drained loamy or clayey soils (Newhouse et al., 1980)

DCR's Shoreline Erosion Advisory Service identified five areas of streambank erosion in the lower Dragon Run (Vanlandingham, 2003). The lower Dragon Run undergoes an average of less than one foot per year of erosion that is mostly attributable to high water flow undercutting the stream bank during storms. These erosion "hot spots" are relatively few and small and are unlikely to cause impairment to the stream.

Water Quality

Water Quality Assessment

The primary water contaminant sources in the Dragon Run are point source discharges and nonpoint source pollution from precipitation (atmospheric deposition), residential land use, agricultural land use, and forested lands (MPPDC, 2002). According to the Virginia Department of Environmental Quality (DEQ), the Dragon Run generally exhibits

medium nutrient levels and is listed as “impaired” for pH, fecal coliform bacteria, mercury, and lead (DEQ, 2002). Based on agricultural, urban, and forested pollution loadings potential determined by DCR, however, the overall nonpoint source pollution potential rating is low for the Dragon Run (DCR, 2002).

Point source discharges, which are permitted and monitored by the Virginia Department of Environmental Quality, are relatively easy to quantify and, in turn, control or track. Point source discharges to the Dragon Run include: stormwater runoff from a wood treatment facility (arsenic, chromium, copper) at Pitts Lumber Company, Inc. to an intermittent stream adjacent to U.S. Route 17 in Middlesex County (Permit #VA0083011); discharge from a sewage treatment plant (biological oxygen demand, total suspended solids, ammonia nitrogen, total residual chlorine, pH, fecal coliform) at Rappahannock Community College to an intermittent stream near Glenns in Gloucester County (Permit #VA0028461); and discharge from a wellwater treatment plant (pH, total suspended solids) at the Miller’s Square Subdivision to an intermittent stream near Miller’s Tavern in Essex County (Permit #VA0075302). According to the Shoreline Sanitary Survey (Smither et al., 2003), there are 9 other indirect sources of pollution, including five animal pollution sources (Middlesex County near Saluda and Stormont and Gloucester County near Glenns); a solid waste dumpsite in Middlesex County near Stormont; and a potential pollution source in Middlesex County in Saluda. Furthermore, a network of water quality monitoring wells is maintained at the Browning-Ferris Industries landfill in King and Queen County.

Throughout the Chesapeake Bay, atmospheric deposition (e.g. precipitation) contributes a significant amount of the total nutrient loadings in coastal waters (MPPDC, 2001). Air quality is not currently monitored in the watershed.

More than 90% of residents in Gloucester, King and Queen, and Middlesex Counties use on-site wastewater treatment systems, commonly known as septic systems (MPPDC, 2001). When operated properly, conventional septic systems remove nutrients and fecal coliform. Conventional septic systems can pose potential environmental and health risks due to inappropriate design, poor maintenance, poor soils, or inefficient nitrogen removal. Driven by changes to Department of Health regulations for on-site wastewater treatment systems (12 VAC 5-610-10 et seq. effective July 2000), the popularity of “engineered” on-site wastewater treatment systems is increasing. These alternative systems, when properly maintained, can be effective at removing nutrients and fecal coliform in areas where conventional septic systems are ineffective. Regardless of the type, however, improperly maintained or failing septic systems pose significant environmental and health risks by contributing nutrients, pathogenic bacteria, and viruses to groundwater.

Forested lands, representing a significant land area, yield low nutrient input to streams relative to other land uses in the watershed. Best Management Practices (BMPs) are designed to minimize these inputs. For example, forested riparian buffers provide effective protection for water quality. The watershed currently exhibits intact riparian buffers.

By contrast, agricultural land use in rural and semirural areas in Virginia can be the source of significant sediments, fecal coliform bacteria, and nutrients such as nitrogen and phosphorus. Nitrogen is transported through the groundwater, whereas phosphorus is generally transported on soil particles in surface water. BMPs such as fencing cattle out of streams, conservation tillage, and expanded riparian buffers are designed to minimize these inputs.

Residential and commercial land uses typically contribute less nutrients and sediments than agriculture, but more than forestry. These residential and commercial contributions are mainly attributable to reduced or no riparian buffers, chemical application for landscaping, and stormwater runoff.

Water Quality Monitoring

Water quality data sets in the watershed are sparse in quantity, duration, and parameters measured. Existing data sets include: STORET, a database managed by the Virginia Department of Environmental Quality (DEQ); data collections during fish surveys by the Virginia Department of Game and Inland Fisheries (DGIF) and Virginia Commonwealth University (VCU); data collections by the Chesapeake Bay National Estuarine Research Reserve in Virginia at the Virginia Institute of Marine Science (VIMS); and a now-defunct volunteer water quality monitoring program in the watershed (MPPDC, 2001).

Two stations are currently sampled regularly by the DEQ. Station DRN003.40 is located at the U.S. Route 17 bridge and Station DRN010.48 is located at the Route 603 bridge near Mascot. Data are available from DRN003.40 for the period 1968-1974 and 1992-present and from DRN010.48 for the period 1992-present. Samples are evaluated bimonthly for nutrients, fecal coliform, suspended solids, dissolved oxygen, pH, salinity, and temperature and are occasionally evaluated for pesticides, toxic metals, and other harmful compounds (MPPDC, 2001). The data sets collected at these sampling stations were used by the DEQ to list the Dragon Run as “impaired” for pH and fecal coliform bacteria. Fish tissue samples were used by the DEQ to list the Dragon Run as “impaired” for mercury and lead. The Virginia Department of Health issued a health advisory for the Dragon Run for mercury contamination in largemouth bass (DOH, 2003). The DEQ attributes the pH impairment to natural causes, citing the acidic nature of water in swamps. The DEQ lists the cause of the fecal coliform and mercury and lead impairments as unknown. Potential sources of fecal coliform bacteria include: wildlife; failing septic systems; and livestock. Potential sources of metals include: atmospheric deposition; automobile and roadway deposits; and industrial operations.

Data collected by the DGIF in 1995-1996 and 1998 includes temperature, Secchi depth, pH, dissolved oxygen, conductivity, salinity, alkalinity, hardness, and total dissolved solids. Nutrient data are very limited and were frequently below detection limits. Dissolved oxygen at sampling stations with no or low flow frequently violated daily minimum standards to support aquatic life (MPPDC, 2001).

VIMS data from 2000-2001 measured temperature, salinity, total dissolved solids, pH, dissolved inorganic nitrogen, and fecal coliform bacteria. Of specific note, samples from Briery Swamp exhibited high nitrate and fecal coliform levels, indicating the presence of subsurface agricultural or wastewater drainage (MPPDC, 2001).

A weekly volunteer water quality monitoring program collected data throughout the watershed during the period 1994-1997, although monitoring was not continuous at all eight sites. Measurements included dissolved oxygen, Secchi depth, water and air temperature, pH, and water color. The findings indicated: low dissolved oxygen during warm temperatures and high dissolved oxygen during cold temperatures; low Secchi depth values during the summer associated with algal blooms and storm events; and acidic pH values in the upper Dragon Run with slightly more basic pH values in the tidal waters (MPPDC, 2001).

Impervious Cover

One key indicator of water quality status and stream health is the percentage of impervious surface in a watershed. The Dragon Run watershed exhibits a very low level of impervious cover and, in turn, is in good condition (e.g. natural heritage resources).

Impervious surfaces (e.g. paved streets and parking lots, rooftops) are hardened areas that do not allow infiltration of rainwater and promote runoff to streams. This runoff often occurs at a higher volume and velocity than normal stream flow and can lead to stream erosion and instability. Runoff also carries pollutants that are not absorbed by soil and plants and can lead to degraded water quality. The Center for Watershed Protection (2002) has developed a watershed vulnerability analysis that relies on an impervious cover model. The model indicates that watersheds are generally in good condition when impervious cover is less than 10%. From 10-25% impervious cover, watersheds are generally impacted, which means that they only partially support their intended uses (e.g. drinking, swimming, shellfish harvest). Above 25% impervious cover, watersheds generally do not support their intended uses at all.

Impervious cover can be estimated for the Dragon Run watershed. Based on the 1994 aerial photography, we learn that 1.3% of the watershed is commercial or residential development. Assuming 100% imperviousness, a highly conservative estimate, the watershed is approximately 1.3% impervious surface. The sparse road network is likely to add modestly to this estimate. Since the Dragon Run watershed exhibits less than 10% impervious cover, the Center for Watershed Protection's model (2002) predicts that it is in good condition, which is confirmed by the MPPDC's Dragon Run Watershed Land-Water Quality Preservation Project (MPPDC, 2001).

Recreation and Access

Significant recreational activities and opportunities exist in the Dragon Run watershed, including hunting, fishing, hiking, and boating. Educational opportunities and activities also exist. Meanwhile, access often requires landowner permission; public access is limited.

Hunting represents a significant recreational activity that generates at least $300,000 per year in the watershed. Seventeen hunt clubs lease approximately 42,000 acres, or 46%, of land in the watershed for hunting - mainly deer, turkey, and waterfowl (MPPDC, 2002). Hunt club leases provide income to landowners and offer hunting access to many acres of private lands.

Fishing is also a significant recreational activity in the Dragon Run. According to the DGIF, the Dragon Run's share of the state's fishing value is more than $1.6 million, including trip related expenses such as food and lodging and transportation (MPPDC, 2002). Fishing by boat is popular in the lower Dragon, while bank and fly fishing are more common in the upper Dragon. Fishermen regularly use the public, unpaved lot at Route 603 near Mascot, and a public boat ramp exists at Harcum in the Piankatank River (Gloucester County). Otherwise, landowner permission is generally required.

The Virginia Birding and Wildlife Trail for the Coastal Area, published in 2002 (DGIF, 2002a), describes two sites within the Dragon Run watershed. First, Rappahannock Community College (public), located in Glenns on State Route 33 in Gloucester County, offers wooded trails adjacent to a tributary to the Dragon Run. Second, the Friends of Dragon Run (private) offer a birding trail with views of the Dragon Run and the Baldcypress-Tupelo Swamp community. The site is located near Mascot on Route 603 with parking in a public, unpaved lot. It is important to note that the Friends' site and adjacent properties are privately owned.

Additionally, a 121-acre tract on Route 603 near Mascot is part of the Virginia Estuarine and Coastal Research Reserve System (public). The site can be accessed with permission and is used for research, long-term monitoring and education.

Besides the sites near Route 603, the Dragon Run Access Plan (MPPDC, 1994) indicates other traditional access sites in the watershed. Landowner permission is generally required at these sites, which include: Route 604 at the Essex/King and Queen county line (Byrd's Bridge); Route 602 at the Middlesex/King and Queen county line (Ware's Bridge); and U.S. Route 17 at the Middlesex/Gloucester county line (James Vincent Morgan Bridges).

Boating is also a significant recreational activity in the watershed. Motorized pleasure craft seasonally utilize the lower Dragon. Self-propelled boating is common from Route 602 to Meggs Bay. For example, waterfowl hunters often make short trips in canoes or jon boats, while guided and unguided paddling trips also occur. Several organizations offer guided paddling trips on the Dragon Run (**Figure 13**), including Gloucester County Parks and Recreation (2 trips/summer; ~30 people/summer); Chesapeake Bay Foundation (since 1995, 56 trips; 1080 people; for middle and high school students in Middlesex and Gloucester Counties); Rappahannock Community College (1 3-day trip/year; ~20 people); and Friends of Dragon Run (15-20 trips/year; ~200 people/year). Some outdoor outfitters offer guided trips by appointment.

Figure 13. Guided paddling trip on the Dragon Run.

Watershed Education

Limited watershed education efforts include workshops, field trips, and publications. Soil and Water Conservation Districts, Virginia Cooperative Extension, and the Natural Resources Conservation Service offer a variety of workshops, seminars, and publications related to watersheds, nonpoint source pollution, agriculture, and forestry. These programs mainly target those involved in agriculture and forestry activities. Rappahannock Community College and the Chesapeake Bay Foundation both lead students on paddle trips. The Friends of Dragon Run offer paddle trips to citizens and decision-makers. Finally, local governments provide publications explaining land use regulations. For example, King and Queen and Middlesex Counties distribute fact sheets about pertinent ordinances to new and prospective property owners.

Infrastructure and Planning

To effectively characterize the watershed's landscape and how it may change in the future, existing infrastructure and plans guiding future development must be assessed.

Future Land Use

Local comprehensive plans are intended to serve as the county's guide to its vision for the future. One of the most important elements of a comprehensive plan is future land use designation. In general, future land use throughout the Dragon Run watershed is primarily designated as rural in the comprehensive plans of the four counties. There exists, however, a wide range of specific land use designations within the watershed, ranging from industrial to commercial to town-like development, rural residential and rural preservation (**Figure 14**).

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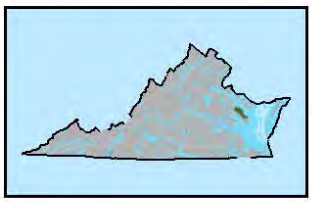

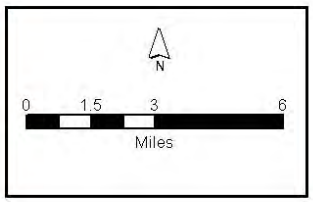

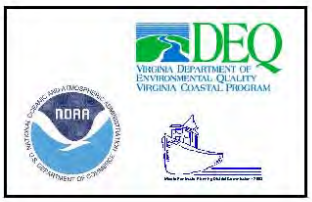

Figure 14. Future land use in the Dragon Run watershed.

Land use designations are tied to existing land uses, infrastructure, and anticipated growth patterns. It is clear through the comprehensive plans that localities expect that the majority of the watershed will remain rural, dominated by farming and forestry. Specific areas, like those along major roadways such as U.S. Route 17 and VA Route 33, are more suited to industrial and commercial development. Conversely, the swamps and streams of the Dragon Run do not lend themselves to development.

Zoning

Zoning is designed to regulate the use of land to ensure land use compatibility. Logically, then, zoning is the regulatory implementation of provisions in the comprehensive plan. Therefore, the Dragon Run watershed is zoned primarily in rural districts, with limited areas in conservation, industrial, commercial and residential districts (**Figure 15**).

The majority of the watershed is zoned for agricultural uses, with varying restrictions and allowances across county boundaries. Significant commercial and industrial zoning occurs along U.S. Route 17 throughout Gloucester and Middlesex Counties. Furthermore, the landfill in King and Queen County owned by Browning-Ferris Industries is zoned industrial. Both King and Queen and Middlesex Counties maintain the Dragon Run Conservation District along the main channel of the Dragon Run. King and Queen's Dragon Run Conservation District is not mapped.

Distinctions between major and minor subdivisions, density requirements, and permitted uses vary widely across zoning district types and among counties. As a result, on-the-ground conditions can and do vary considerably across county boundaries. For instance, the maximum number of lots permitted by right (e.g. minor subdivisions) in agricultural and conservation districts ranges from 2-6 lots.

Other Ordinances and Regulations

The counties also employ other ordinances and regulations. These include Chesapeake Bay Preservation Act provisions or ordinances, wetlands ordinances, erosion and sediment control provisions and ordinances, subdivision ordinances, and site plan review. Some of the major effects of these regulations include land use restrictions and development standards in Chesapeake Bay Preservation Areas and the prohibition of major subdivisions in agricultural zoning districts.

A major difference between the counties is how the Resource Management Areas (RMA) are defined. Gloucester County defines RMA as any area outside of the Resource Protection Area (RPA) countywide. Essex County effectively applies RMA restrictions countywide, while King and Queen and Middlesex Counties apply a buffer landward of the RPA.

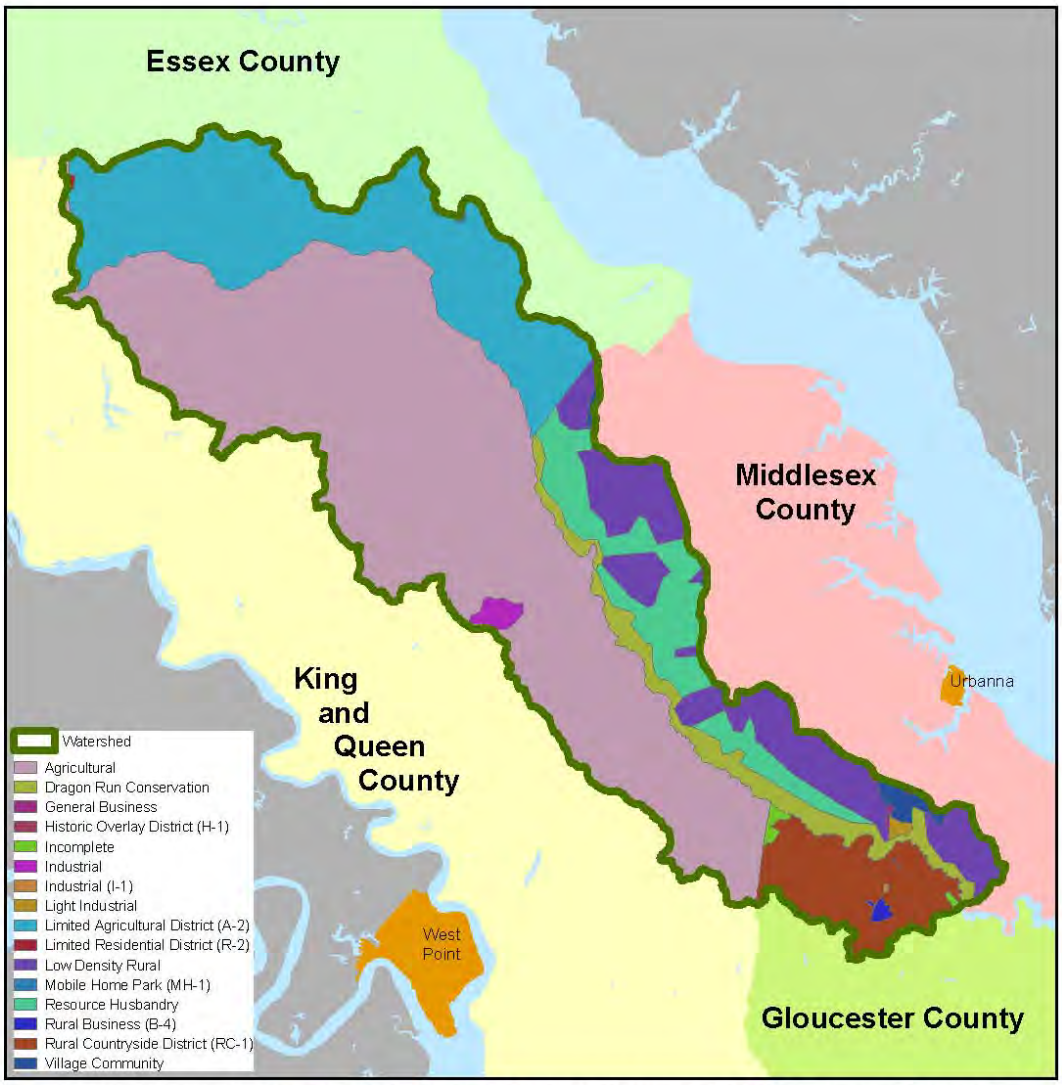

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Figure 15. Zoning classifications in the Dragon Run watershed.

Road Network

The road network within the watershed could be described as sparse (**Figure 16**), with few primary highways. The primary highways are U.S. Route 17, which runs north and south through Gloucester, Middlesex, and Essex Counties, and State Route 33, which runs east and west through King and Queen, Gloucester, and Middlesex Counties. Logically, these highways contain the most development within the watershed and are designated for that purpose in the comprehensive plans. These two highways intersect at Glenns in Gloucester County and Saluda in Middlesex County, which are both designated as rural business districts. A short length of State Route 198, a primary highway, runs east from Glenns in Gloucester County before leaving the watershed.

There is a sparse network of secondary roads, some of which serve as connectors along the road network. Route 603 and Route 602 both cross the middle Dragon Run and connect King and Queen and Middlesex Counties. Route 604 and Route 612 both cross the upper Dragon Run and connect Essex and King and Queen Counties. Route 684 serves as a connector between U.S. Route 17 and U.S. Route 360 in Essex County. Several other secondary roads serve as significant links within the road network. Examples of these are: Route 644 in Middlesex County; Routes 609, 610, 616, and 617 in King and Queen County; and Route 607 in Essex County. Finally, there is a network of unpaved logging, farm, and residential roads that access the more remote parts of the watershed.

Land Parcels

According to data collected in 2001, there are 3,073 parcels of land in the Dragon Run watershed (**Figure 17**) (MPPDC, 2002). The distribution of parcels is: Essex (25%); Gloucester (11%); King and Queen (38%); and Middlesex (26%). The land area within the watershed is distributed as follows: Essex (21%); Gloucester (6%); King and Queen (52%); and Middlesex (21%). Comparing the distribution of parcels to the distribution of land area within the watershed, we find that Essex, Gloucester, and Middlesex Counties have a higher percentage of parcels than of land area, meaning that they have smaller average parcel sizes than King and Queen County. King and Queen County has a much higher percentage of land area than of parcels, indicating a much larger average parcel size than the other three counties.

Land ownership is almost entirely private. A considerable amount of private land is owned by timber interests. For example, the single largest owner, John Hancock Life Insurance Company, owns approximately 26,000 acres (28.9% of the watershed). Much of this timber land is, in turn, leased to hunt clubs. Public ownership includes the College of William and Mary (121 acres) and the Virginia Department of Transportation (fee simple and prescriptive easements for roads and right-of-way).

Conservation

The Virginia Division of Natural Heritage has established conservation planning boundaries (**Figure 18**) around natural heritage resources - rare species and natural communities - based on their habitat needs to ensure their preservation. These conservation sites represent the ideal conservation scenario for these state and globally

Figure 16. Road network in the Dragon Run watershed.

Figure 17. Parcels of land in the Dragon Run watershed.

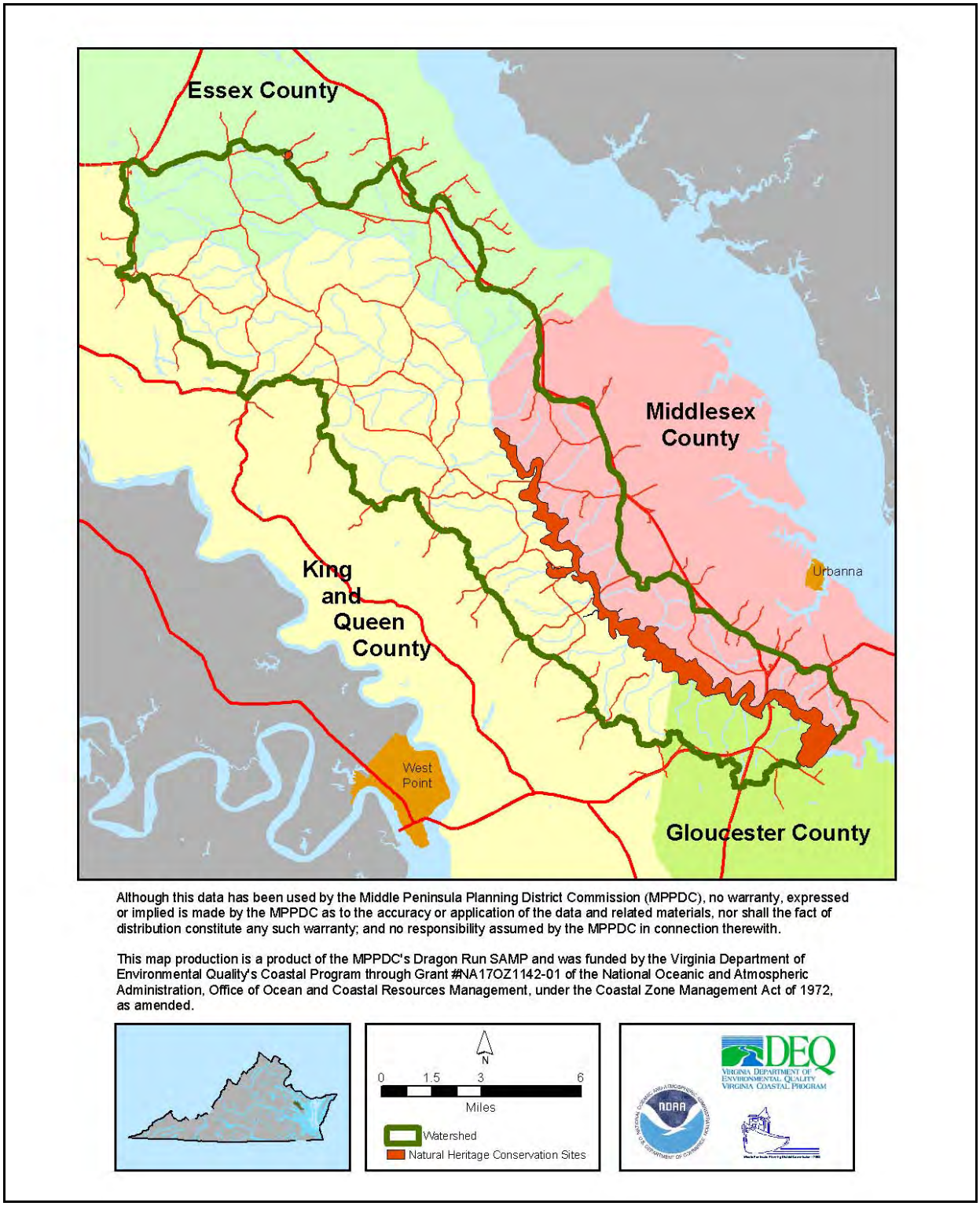

Figure 18. Natural heritage conservation sites for the Dragon Run watershed.

rare resources. Some of these resources have been conserved, either through fee simple purchase or purchase of conservation easements (**Figure 19).** Conservation easements are held on 235 acres by the Virginia Outdoors Foundation, 72 acres by Friends of Dragon Run, and 32 acres by the Chesapeake Bay Foundation.

Structures

Interpretation of digital orthophoto quadrangles from 1994 revealed that there were 1,311 structures or clusters of structures (e.g. barns and accessory buildings) in the Dragon Run watershed (**Figure 20**) (MPPDC, 2002). As expected, the majority of the structures are located along the primary highways and, to a lesser degree, along the secondary road network. It is likely that population growth and accompanying residential structures will continue to follow this pattern.

Sustainable Economic Development

Landowners find it increasingly difficult to sustain farm and forest operations. Virginia's River County, the Middle Peninsula's business development partnership, finds that sustainable economic development in the region is limited and the farming and forestry industries are suffering losses (VRC, 2002). Virginia's River Country indicates in its strategic plan that one of its priorities is to promote sustainable growth in resource-based industries (e.g. forestry, farming, nature-based tourism) to preserve natural resources from the pressures of development. In other words, the region has opportunities to develop the capacity to produce sustainable and value-added forest and agricultural products.

Buildout analysis

A buildout analysis offers an assessment of the potential number of lots allowed by land use regulations. Assessments may be based upon the number of lots allowed by right or upon the number of lots allowed by exception or by rezoning.

Based on a supplement to the *Dragon Run Land Use Policy Audit* (MPPDC, 2003), it is estimated that there is a potential for 3,916 parcels allowed by right (i.e. without the need for an exception or rezoning). This estimate is founded upon the number of lots and the minimum lot size permitted by right for minor subdivisions. The result represents a 27% increase in the potential number of parcels. An example of potential development under current land use policies in the watershed is featured in **Figure 21**.

As part of the *Dragon Run Management Framework* (MPPDC, 2002), a buildout analysis was completed based on both the potential number of lots allowed by right, by exception, or by rezoning. The analysis evaluated buildout based on both "build-compatible" values (i.e. wetlands) and "environmental" values (i.e. wetlands, topography [slope], floodplains, land cover, conservation easements, threatened and endangered species locations, and conservation species sites). An index was created based on these values and those that ranked low for development unsuitability were assessed for their development potential under current zoning designations. Based on zoning and subdivision rules, "theoretical lots" were then calculated within

Figure 19. Conservation easements in the Dragon Run watershed.

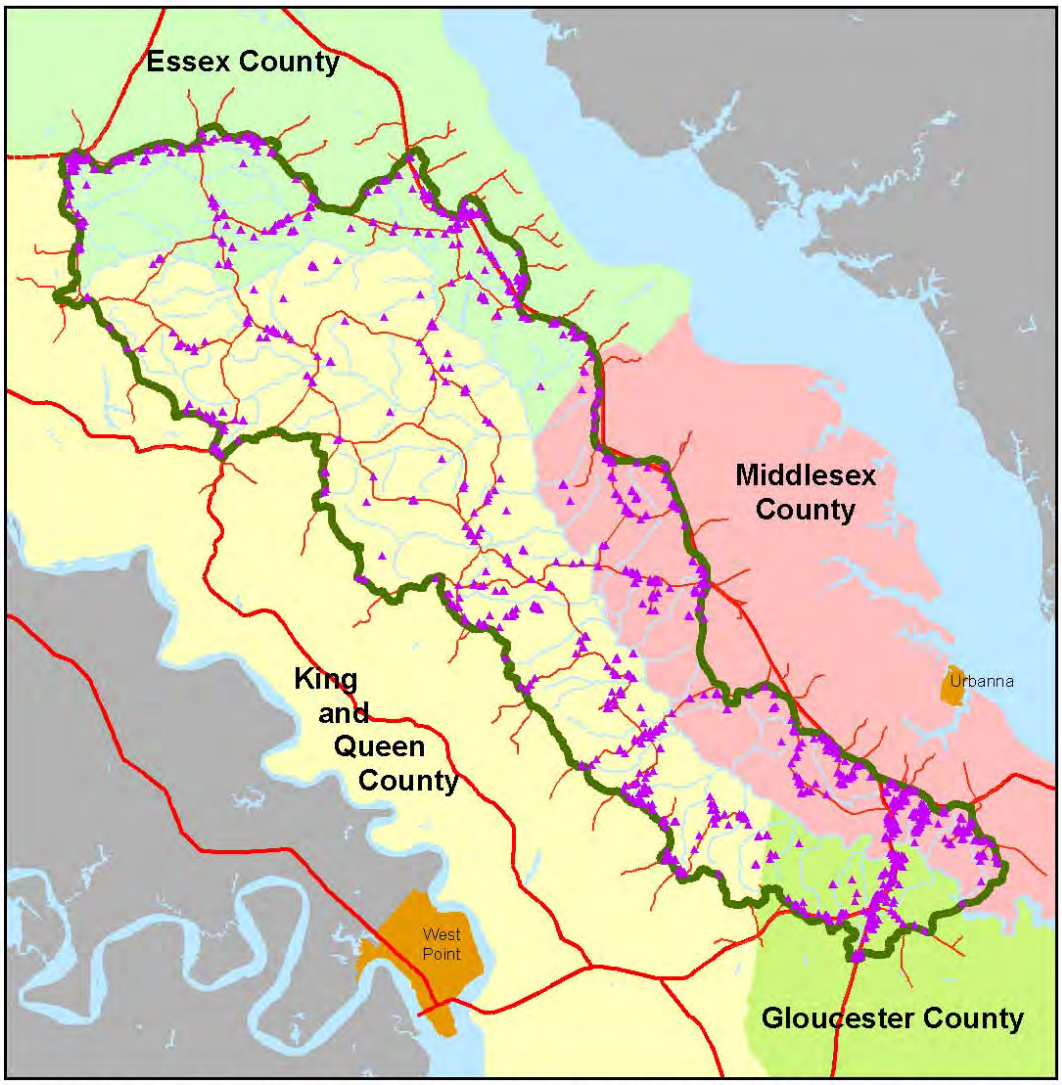

Figure 20. Structures in the Dragon Run watershed.

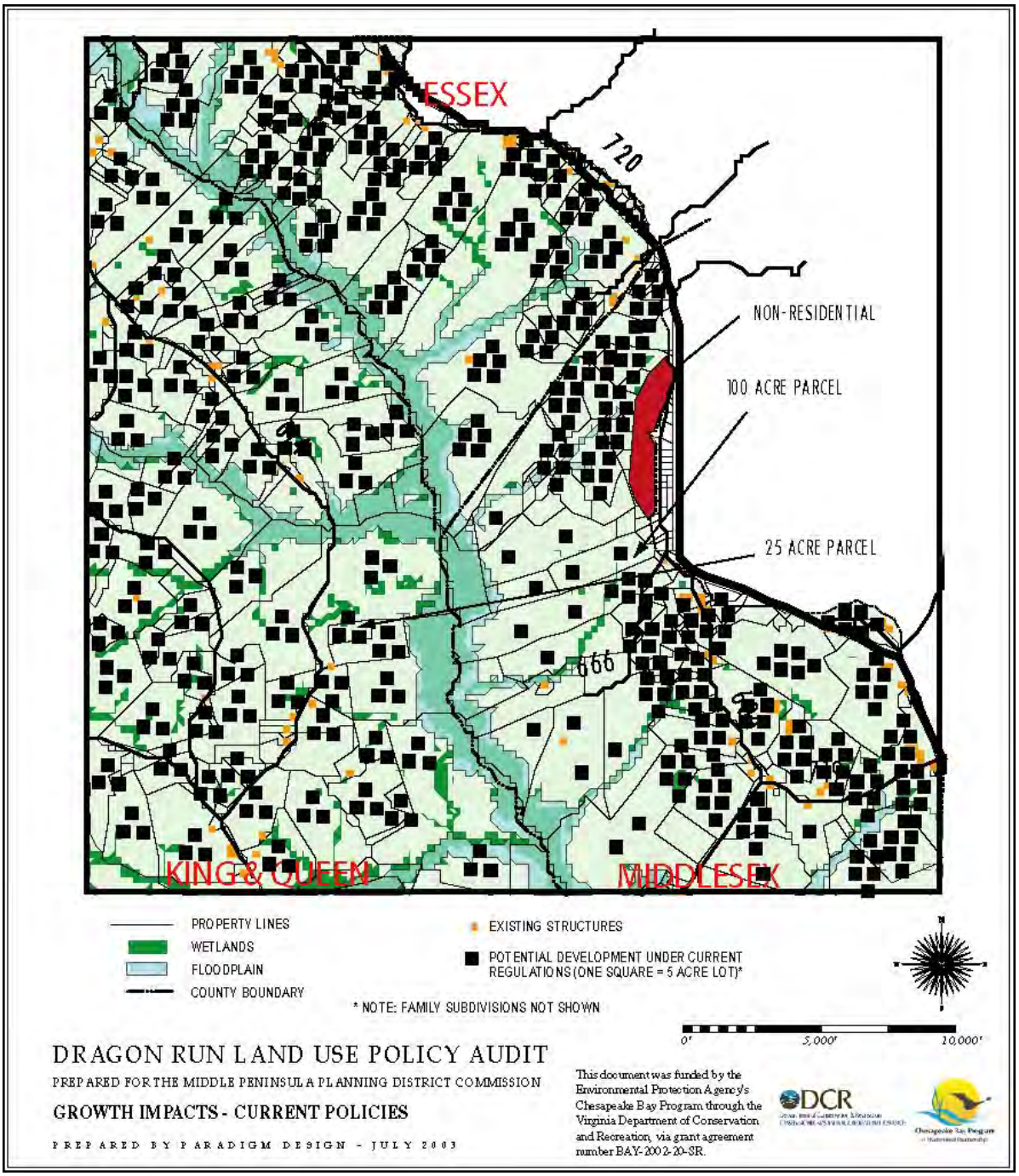

Figure 21. Potential development under current land use policies in the Dragon Run watershed (from MPPDC, 2003).

those areas that were ranked as suitable for development under both scenarios. The "build-compatible" analysis yielded a total of 40,851 theoretical lots that could be developed under current zoning, while the "environmental" analysis yielded 38,208 theoretical lots. The results of the analysis represent a 1,143% increase in the potential number of parcels based on "environmental" values and a 1,229% increase in the potential number of parcels based on "build-compatible" values.

Identified Data Gaps

Several gaps in the available data were identified. Two of these data gaps, fish communities and benthic macroinvertebrates including freshwater mussels, are being addressed by a research project being undertaken by Virginia Commonwealth University's Center for Environmental Studies (VCU). This project is anticipated to be completed during the fall of 2003. Its final report will also summarize previous data collection efforts by VCU and the Virginia Department of Game and Inland Fisheries.

Natural heritage information is available for the main channel of the Dragon Run and its adjacent swamps, but not for headwater streams and adjacent uplands. This data gap is being addressed by a natural heritage inventory of 14 sites in the upper reaches of the watershed being undertaken by the Department of Conservation and Recreation's Division of Natural Heritage. A technical report titled "A Natural Heritage Inventory of Fourteen Headwater Sites in the Dragon Run Watershed" will be completed by December 2003.

The status of invasive species in the Dragon Run is partially known. Efforts to gather more detailed information about invasive species, primarily common reed and blue catfish, are underway.

Other data gaps are not being addressed at this time. For example, there is scant information about migratory birds, other than highly specific research (e.g. bald eagle nesting assessment, colonial bird nesting assessment) and amateur observational records. The scope of a research project to comprehensively assess migratory bird activity in the watershed is tremendous and would require funding that is not available at this time.

Another data gap that is not currently being addressed is the source of water quality impairments (e.g. pH, fecal coliform, mercury, lead) for stream segments on the Virginia 303(d) list (DEQ, 2002). It is assumed that pH impairment is from natural sources (i.e. swamps are naturally acidic). Development of Total Maximum Daily Loads (TMDL) for impairments in Dragon Run stream segments are planned by the Virginia Department of Environmental Quality (DEQ) in 2010.

Finally, the effect of tax policies on the viability of farming and forestry operations is not fully understood in the watershed. The impact of tax incentive programs (e.g. land use taxation) and tax policies (e.g. taxation based on full development potential) on the sustainability of agriculture and silviculture has not been assessed.

SECTION 7: Resource Needs

Section 7 itemizes the resources needed to implement the actions in the watershed management plan. This section also identifies responsible parties and possible funding sources.

Table 3 lists Actions (**Section 4)** with responsibilities, estimates of funding needs, and possible funding sources.

ACTION	RESPONSIBILITY	FUNDING	FUNDING SOURCE
1. Land Use and Resource Preservation			
A. Designate a Unified "Dragon Run Planning Area"	MPPDC; Dragon Run Steering Committee; local governments	Minimal to moderate	MPPDC (VA Coastal Program); local governments
B. Implement Tools to Preserve Forest, Farm, and Natural Resources	Local, state, federal government; non-profits; landowners	Varies from minimal (local "right-to-farm") to considerable (PDR program)	Local, state governments; non-profits; EPA; Forest Legacy Program
C. Address Public and Landowner Access Issues	Dragon Run Steering Committee; local, regional, state gov'ts	Varies from low (signs) to considerable (land acquisition, site development)	VA Coastal Program; Public Access Authority
D. Control Invasive Species	Dragon Run Steering Committee; Invasive Species Initiative	Moderate	VA Coastal Program; DGIF; VMRC; DCR; U.S. Fish and Wildlife Service
2. Education and Landowner Stewardship	Dragon Run Steering Committee; local, state, federal gov'ts; citizens	~$20K/year; programmatic	VA Coastal Program; Dept. of Forestry; USDA/NRCS; DCR; EPA; US FWS
3.Encourage and Support Sustainable Economic Development	Dragon Run Steering Committee; local gov'ts; business	$18,000 in 2003-2004	VA Coastal Program
4. Monitor Plan Implementation	Dragon Run Steering Committee; local gov'ts	Minimal to moderate	MPPDC (VA Coastal Program); local gov'ts

Table 3. Resource needs for Dragon Run Watershed Management Plan.

SECTION 8: Progress Benchmarks

Section 8 serves as a monitoring framework for assessing the implementation of the watershed management plan.

Table 4 lists Actions from **Section 4** and their corresponding progress benchmarks, including responsible parties and anticipated completion time. This table serves as a monitoring plan framework.

ACTION	RESPONSIBILITY	BENCHMARK	COMPLETION
1. Land Use and Resource Preservation			
A. Designate a Unified "Dragon Run Planning Area"	MPPDC; Dragon Run Steering Committee; local governments	Adoption of phases of strategy in all four counties	Level 1 - September 2004; Levels 2 & 3 – 2005-2006?
B. Implement Tools to Preserve Forest, Farm, and Natural Resources	Local, state, federal government; non-profits; landowners	Use 1 or more tools to preserve 50 acres/year	Ongoing
C. Address Public and Landowner Access Issues	Dragon Run Steering Committee; local, regional, state gov'ts	Acquisition of 1 land-based site; erect trespassing signs at access points	December 2004
D. Control Invasive Species	Dragon Run Steering Committee; Invasive Species Initiative	Representation on Council; establish education materials	September 2004; ongoing
2. Education and Landowner Stewardship	Dragon Run Steering Committee; local, state, federal gov'ts; citizens	Establish festival and awards; perform 6 trips/year; post signs along major roadways; develop forest stewardship plans (5/year); enrollment in farm programs (100 acres/year); complete one action-based project/year	December 2004; ongoing
3. Encourage and Support Sustainable Economic Development	Dragon Run Steering Committee; local gov'ts; business	Complete sustainable economic development report; promote Coastal Birding Trail	September 2004; ongoing
4. Monitor Plan Implementation	Dragon Run Steering Committee; local gov'ts	Complete Table 4	As designated

Table 4. Benchmarks for monitoring the Dragon Run Watershed Management Plan.

SECTION 9: Conclusions

Section 9 reminds readers of the watershed management plan's purpose. This section recalls the plan's citizen-initiated beginnings and that it serves as a vision for the future of the Dragon Run watershed.

This watershed management plan for the Dragon Run watershed represents a body of work by citizens, stakeholders, and decision-makers to achieve a common vision for the future – the preservation of the traditional uses and unique resources in the pristine Dragon Run. It is a symbol of regional cooperation and coordination that crosses jurisdictional boundaries. It is the next logical step on the path towards protecting the Dragon Run watershed and preserving its cultural, historic, and natural heritage for future generations.

The plan's goals and objectives (**Section 3**) speak to the major issues at play in the watershed. Its actions (**Section 4**) attempt to address those issues. Together, they are a road map for the watershed.

The plan also captures the current status and state of knowledge of the watershed (**Section 6**). It highlights what we know and what we do not know. It also offers a mechanism for monitoring plan implementation by comparing the baseline watershed information to future results. Progress benchmarks are the basis for this monitoring (**Section 8**). The plan designates responsibility for plan implementation (**Sections 7 & 8**) and estimates costs and funding sources (**Section 7**).

The watershed management plan is not a static document. It is not an end in and of itself. It is a citizen-initiated vision for the future of the watershed that may be modified as situations change or as new information becomes available. It is a vision that harnesses the passion and energy for the Dragon Run (**Figure 22**) of those who live, work and play in its watershed.

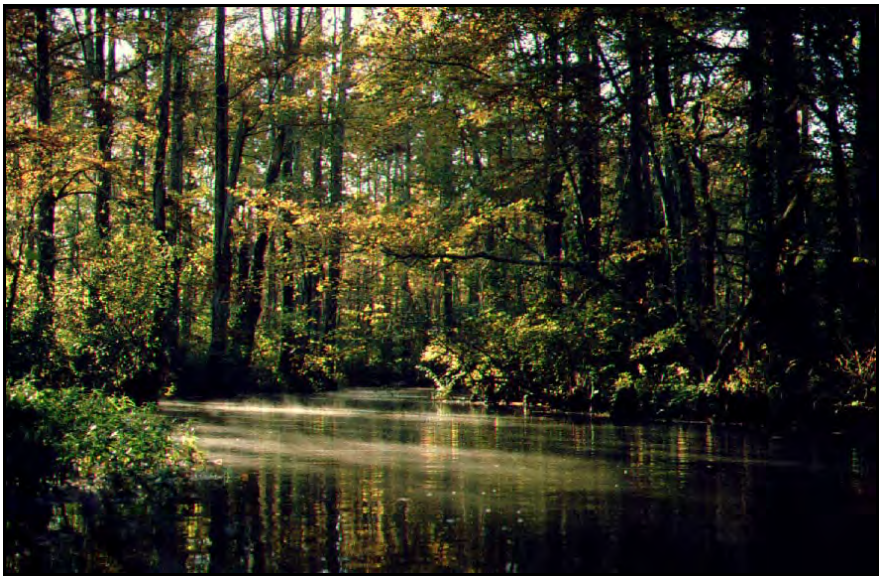

Figure 22. A misty morning on the Dragon Run (Credit: Teta Kain)

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APPENDIX A: Rare Species and Natural Communities

Table 4 indicates the rare species and natural communities that have been found in the Dragon Run watershed, according to the Virginia Division of Natural Heritage (Belden, Jr. et al., 2001; Belden, Jr. et al., 2003).

SCIENTIFIC NAME	COMMON NAME	STATUS
Animals		
Atlides halesus	Great purple hairstreak	S2, S3
Enallagma weewa	Blackwater bluet	S1
Epitheca spinosa	Robust baskettail	S2
Haliaeetus leucocephalus	Bald eagle	S2
Helocordulia selysii	Selys' sunfly	S2
Isoparce cupressi	Cypress sphinx	S1, S3
Somatochlora filosa	Fine-lined emerald	S2
Wyeomyia haynei	Southern pitcher-plant mosquito	S1
Plants		
Bolboschoenus fluviatillis	River bulrush	S2
Cardamine pratensis	Cuckooflower	S1
Carex decomposita	Cypress-knee sedge	S2
Chelone oblique	Red turtlehead	S1
Desmodium strictum	Pineland tick-trefoil	S2
Eriocaulon parkei	Parker's pipewort	S2
Sarracenia purpurea var. purpurea	Northern purple pitcher-plant	S2
**Hottonia inflata	Featherfoil	S3
**Ranunculus flabellaris	Yellow water crowfoot	S3
Natural Communities		
Baldcypress-Tupelo Swamp		
Fluvial Terrace Woodland		
Tidal Baldcypress-Tupelo Swamp		
Tidal Baldcypress Woodland/Savanna		
Tidal Freshwater Marsh		

S1 = Extremely rare; usually 5 or fewer occurrences in the state; or may have a few remaining individuals; often especially vulnerable to extirpation.

S2 = Very rare; usually between 5 and 20 occurrences; or few occurrences with many individuals; often susceptible to becoming endangered.

S3 = Rare to uncommon; usually between 20 to 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances

** = No longer tracked by the Division of Natural Heritage; placed on watchlist due to an increased number of documented occurrences within the state since 2001

Table 4. Rare species and natural communities in the Dragon Run watershed.

The following descriptions of natural communities are taken from *The Natural Communities of Virginia* (Fleming et al., 2001).

Bald Cypress-Tupelo Swamps

Seasonally to semipermanently flooded forests of backswamps, sloughs, and low terraces of Coastal Plain rivers and large streams. These swamp forests are distributed throughout southeastern Virginia, north to Dragon Swamp (Gloucester, King and Queen, and Middlesex Counties). Habitats are deeply flooded (up to 1m) for part of the year; most retain at least some standing water throughout the growing season. Microtopography is often pronounced with small channels, swales, tree-base hummocks, and numerous bald cypress "knees." Tree canopies vary from mixed stands of bald cypress (Taxodium distichum), water tupelo (Nyssa aquatica), and swamp tupelo (N. biflora) to nearly pure stands of one species or another. The three dominants have complex competitive and successional relationships. As a rule, the two tupelos are less shade-tolerant than bald cypress and regenerate more readily by sprouting in cut-over stands. Thus, tupelos tend to become dominant when bald cypress stands are heavily logged. Green ash (Fraxinus pennsylvanica) and red maple (Acer rubrum) are occasional canopy associates and frequent understory trees. Carolina ash (F. caroliniana) is often dominant in the small tree and shrub layers, while vines of climbing hydrangea (Decumaria Barbara) are often abundant. Herb layers vary from sparse to rather lush. Most herbaceous plants of bald cypress-tupelo swamps are tolerant of muck soils and fluctuating water levels, or are capable of becoming established on tree hummocks, stumps, and logs. A few of the typical herbs are lizard's tail (Saururus cernuus), false nettle (Boehmeria cylindrical), Walter's St. John's-wort (Triadenum walteri), swamp beggar-ticks (Bidens discoidea), weak stellate sedge (Carex seorsa), giant sedge (Carex gigantean), taperleaf bugleweed (Lycopus rubellus), and pale mannagrass (Torreyochloa pallida). Although community types in this group are relatively common, high-quality specimens of the dominant trees are known to provide nesting habitats for the globally uncommon, state-rare eastern big-eared bat (Corynorhinus rafinesquii macrotis) and southern myotis (Myotis austroparius). Old-growth stands of bald cypress-tupelo swamp with trees up to 800 years old occur along the Blackwater River in Surry and Isle of Wight Counties. References: Fleming and Moorhead (1998), Parker and Wyatt (1975), Plunkett and Hall (1995).

Tidal Bald Cypress Forests and Woodlands

Coniferous or mixed swamp forests and woodlands occurring along the upper tidal reaches of rivers in southeastern Virginia. Examples are documented from the Dragon Swamp/Piankatank River (Gloucester, King and Queen, and Middlesex Counties), the Chickahominy River (Charles City, James City, and New Kent Counties), the James River (Isle of Wight and Surry Counties), and the wind-tidal Northwest River (City of Chesapeake). At some sites, these communities occur in ecotones between tidal marshes and non-tidal backswamps or uplands. Bald cypress (Taxodium distichum) dominates the open to very open canopy, with or without hardwood associates such as swamp tupelo (Nyssa biflora), water tupelo (Nyssa aquatica), and green ash (Fraxinus pennsylvanica). Stand structure and canopy cover range from closed forest to very open woodland. Shrub and herb layers are variable but generally contain a mixture of species characteristic of both marshes and swamps. Some well-developed tidal bald cypress forests appear floristically similar to palustrine bald cypress-tupelo swamps. Other stands have a nearly monospecific herb dominance by shoreline sedge (Carex hyalinolepis). In a unique, possibly fire-influenced, savanna-like stand on the Northwest River, the herbaceous dominants, in rough seasonal order, are silvery sedge (Carex canescens spp. Disjuncta), spikerushes (Eleocharis fallax and E. rostellata), marsh rattlesnake-master (Eryngium aquaticum var. aquaticum), and wild rice (Zizania aquatica var. aquatica). The environmental dynamics, compositional variation,

and state-wide distribution of this group are poorly known and need intensive study. Reference: Fleming and Moorhead (1998).

Fluvial Terrace Woodlands

A somewhat enigmatic group of communities occurring on flat, sandy terraces and islands along Coastal Plain rivers in eastern Virginia. These habitats are elevated well above the level of adjacent swamps and are characterized by xeric, sandy soils and open forest or woodland vegetation. Single occurrences have been documented along the Nottoway River (Sussex County), Chickahominy River (New Kent County), Dragon Swamp (Middlesex County), and Mattaponi River (Caroline County). At all four sites, hickories (Carya pallida and C. alba) are dominant trees, with drought-tolerant oaks (Quercus falcate, Q. nigra, Q. marilandica, Q. alba) present in smaller numbers. Shrubs occurring at all or most sites include sand post oak (Q. margarettiae), horse-sugar (Symplocos tinctoria), American holly (Ilex opaca var. opaca), and eastern red cedar (Juniperus virginiana var. virginiana). Typical herbs include sedges (Carex albicans var. australis, C. pensylvanica, and C. tonsa), Canada frostweed (Helianthemum canadense), butterfly-pea (Clitoria mariana), late goldenrod (Solidago tarda), and prickly-pear (Opuntia humifusa). The Dragon Run site is anomalous in the presence (despite low soil pH and base status) of several calciphiles such as eastern redbud (Cercis canadensis var. canadensis), wild columbine (Aquilegia canadensis), smooth rock-cress (Arabis laevigata var. laevigata), robin's-plantain (Erigeron pulchellus var. pulchellus), and elm-leaved goldenrod (Solidago ulmifolia var. ulmifolia). A full understanding of the status and compositional relationships of this group will require additional inventory and assessment.

Tidal Freshwater Marshes

A diverse group of herbaceous wetlands subject to regular diurnal flooding along upper tidal reaches of inner Coastal Plain river and tributaries. Freshwater marshes occur in the uppermost portion of the estuarine zone, where the inflow of saltwater from tidal influence is diluted by a much larger volume of freshwater from upstream. Strictly speaking, freshwater conditions have salt concerntrations <0.5 ppt, but pulses of higher salinity may occur during spring tides or periods of unusually low river discharge. The most common species are arrow-arum (Peltandra virginica), dotted smartweed (Polygonum punctatum), wild rice (Zizania aquatic var. aquatica), pickerelweed (Pontederia cordata), rice cutgrass (Leersia oryzoides), tearthumbs (Polygonum arifolium and P. sagittatum), and beggar-ticks (Bidens spp.). Locally, sweetflag (Acorus calamus) and southern wild rice (Zizaniopsis miliacea) may form large dominance patches. Species diversity and vegetation stature vary with salinity, duration of inundation, and disturbance; the most diverse marshes occupy more elevated surfaces in strictly freshwater regimes. Mud flats that are fully exposed only at low tide support nearly monospecific stands of spatterdock (Nuphar advena), although cryptic submerged aquatic species may also be present. Tidal freshwater marshes are best developed on sediments deposited by large meanders of the Pamunkey and Mattaponi Rivers, although outstanding examples also occur along the Potomac, Rappahannock, Chickahominy, and James Rivers. These communities provide the principal habitat for the globally rare plant sensitive joint-vetch (Aeschynomene virginica). Chronic sea-level rise is advancing the salinity gradient upstream in rivers on the Atlantic Coast, leading to shifts in vegetation composition and the conversion of some tidal freshwater marshes into oligohaline marshes. Tidal Freshwater Marshes are also threatened by the invasive exotic marsh dewflower (Murdannia keisak). Several communities in this group are chiefly restricted to the Chesapeake Bay drainage basin and are considered globally rare or uncommon. References: Parker and Wyatt (1975), Perry and Atkinson (1997), Perry and Hershner (1999), McCoy and Fleming (2000).

APPENDIX B: Memorandum of Agreement

Memorandum of Agreement

Between

Middle Peninsula
Planning District Commission

County of Essex, Virginia

County of Gloucester, Virginia

County of King and Queen, Virginia

County of Middlesex, Virginia

To Participate in the

Dragon Run Watershed
Special Area Management Plan

Memorandum of Agreement
Between

Middle Peninsula Planning District Commission
County of Essex, Virginia
County of Gloucester, Virginia
County of King and Queen, Virginia
County of Middlesex, Virginia

To Participate in the
Dragon Run Watershed Special Area Management Plan

1. PARTIES TO THE AGREEMENT

This Memorandum of Agreement (MOA) is between the following entities:

- Middle Peninsula Planning District Commission
- County of Essex, Virginia
- County of Gloucester, Virginia
- County of King and Queen, Virginia
- County of Middlesex, Virginia

2. ENABLING AUTHORITY

Counties of Essex, Gloucester, King and Queen, and Middlesex

Section 15.2-1300 of the Code of Virginia enables local governments to enter into cooperative agreements to exercise those powers that each may be enabled to exercise.

Middle Peninsula Planning District Commission

Section 15.2-4205 of the Code of Virginia enables the Middle Peninsula Planning District Commission to enter into cooperative agreements with local governments to exercise those powers that each may be enabled to exercise.

3. CONTEXT

The Dragon Run is a brackish water stream that flows forty miles through the Virginia Middle Peninsula counties of Essex, King and Queen, Middlesex, and Gloucester and eventually empties into the Piankatank River. The Dragon Run Watershed has been defined for the purposes of this Agreement as the Commonwealth Hydrologic Unit ID ‘CO2’ described by the Virginia Department of Conservation and Recreation from the streams’ headwaters down to and including Meggs Bay (see Appendix).

The Dragon Run's pristine nature can, in large part, be attributed to exemplary landowner stewardship and difficult access and is a central part of the region's culture and identity. Ecologically unique, the Dragon Run was ranked second of 232 ecologically significant areas throughout the Chesapeake Bay region by the Smithsonian Institution and is characterized by extensive tidal and nontidal cypress swamp, which is otherwise rare this far north. Furthermore, the Virginia Division of Natural Heritage recognizes the importance of the Dragon Run due to occurrences of one endangered animal species, five rare animal species, eight rare plant species, and five rare natural communities. Moreover, the Dragon Run Watershed supports a high quality of life for its residents. For example, recreational activities, such as hunting, fishing, and paddling, are popular in the Dragon Run.

The Middle Peninsula Planning District Commission, advised by the Dragon Run Steering Committee, obtained a Virginia Coastal Resources Management Program grant for the development of the Dragon Run Watershed Special Area Management Plan (SAMP). Each county in the watershed makes three appointments – one elected official and two landowners along the Dragon Run – to the Dragon Run Steering Committee. The SAMP Advisory Group, which reports to the Steering Committee, represents a cross-section of the community, including: Steering Committee members; local government elected officials and planning staff; landowners; state agencies; farming; forestry; education; non-profit organizations; and ecotourism.

4. PURPOSE AND TERMS OF THE AGREEMENT

The project's mission, as recommended by the SAMP Advisory Group to the Dragon Run Steering Committee, is to support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed.

Each of the signatory entities in this Memorandum of Agreement agrees to participate in the Special Area Management Plan to promote the distinctive treatment deserving of the Dragon Run Watershed through the support and efforts of local government, the fostering of educational partnerships and grassroots support and the involvement of landowners whose stewardship has served to preserve the wonder of the Dragon. The signatories will consider the recommendations of the Dragon Run Steering Committee's SAMP Advisory Group to achieve the following goals and objectives that it developed by consensus:

GOAL I
Establish a high level of cooperation and communication between the four counties within the Dragon Run Watershed to achieve consistency across county boundaries.

OBJECTIVE A
Develop a plan to address the inevitable future development pressure to change the traditional use of land in the Dragon Run Watershed.

OBJECTIVE B
Achieve consistency across county boundaries among land use plans and regulations in order to maintain farming and forestry and to preserve natural heritage areas by protecting plants, animals, natural communities, and aquatic systems.

OBJECTIVE C
Provide ongoing monitoring of existing plans and planning tools in order to assess traditional land uses and watershed health and take action necessary to preserve the watershed.

OBJECTIVE D
Comprehensively implement Best Management Practices (BMPs) for water quality, wildlife habitat, and soil conservation.

GOAL II
Foster educational partnerships and opportunities to establish the community's connection to and respect for the land and water of the Dragon Run.

OBJECTIVE A
Encourage experience-based education consistent with the Stewardship and Community Engagement goals of the Chesapeake 2000 Agreement.

OBJECTIVE B
Promote the community and economic benefits of the Dragon Run derived from its natural characteristics and traditional uses such as farming, forestry, hunting and fishing.

GOAL III
Promote the concept of landowner stewardship that has served to preserve the Dragon Run Watershed as a regional treasure.

OBJECTIVE A
Address the potential dilemma of preserving the watershed's sense of peace and serenity by protecting open space and reducing fragmentation of farms, forests, and wildlife habitat versus the landowners rights in determining or influencing future land use.

OBJECTIVE B
Educate landowners about the regional importance of the Dragon Run.

The Advisory Group's recommendations to achieve the goals and objectives will be delivered by the Dragon Run Steering Committee to the signatory entities for their consideration.

5. MODIFICATIONS

Modifications to this Memorandum of Agreement must be submitted in writing and approved by all parties to the Memorandum of Agreement.

6. EFFECTIVE DATE

The effective date of the Memorandum of Agreement shall be the date of the signing of the Memorandum of Agreement by the Counties of Essex, Gloucester, King and Queen, and Middlesex and the Middle Peninsula Planning District Commission.

7. DURATION AND TERMINATION OF THE AGREEMENT

The duration of this Memorandum of Agreement will be until such time as it is terminated upon agreement of all parties; however, any party to the Memorandum of Agreement may terminate its participation by written notice to all other parties.

8. MANNER OF FINANCING

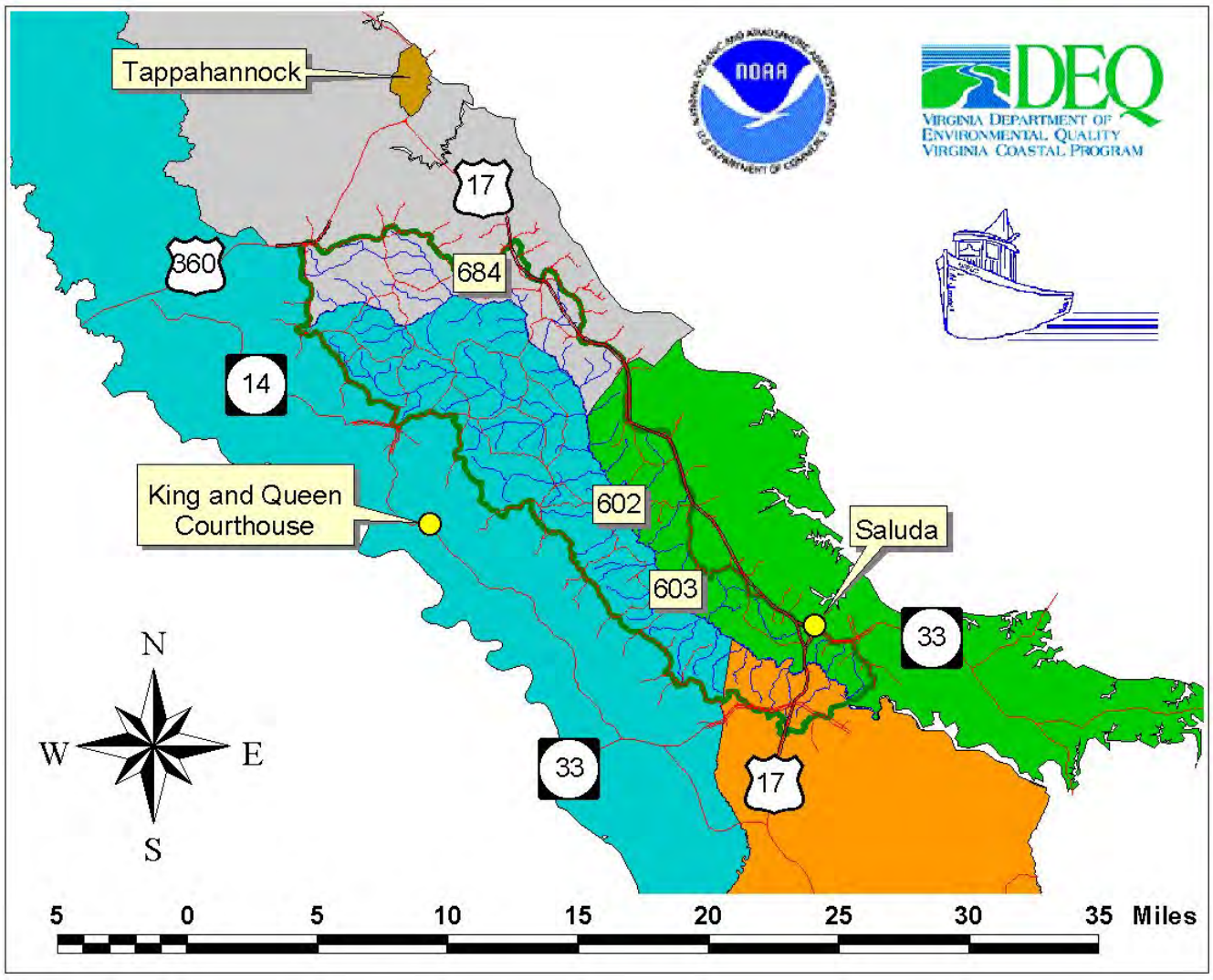
This Memorandum of Agreement will not require financing or budgeting from or by the signatory agencies; however, this clause will not preclude, under a separate document or agreement, grant funding or other financial assistance from one signatory to another for the purpose of carrying out the purposes of the Memorandum of Agreement.

9. OWNERSHIP OF PROPERTY

It is not the intent of the signatory parties that this Memorandum of Agreement will result in the purchase, ownership, holding or conveying of any real or personal property.

10. APPENDIX

Map of the Dragon Run Watershed - defined as Commonwealth Hydrologic Unit ID 'CO2' described by the Virginia Department of Conservation and Recreation from the streams' headwaters down to and including Meggs Bay.



LIST OF SIGNATORIES

Middle Peninsula Planning District Commission

County of Essex, Virginia

County of Gloucester, Virginia

County of King and Queen, Virginia

County of Middlesex, Virginia

SIGNATURE PAGE FOR THE MIDDLE PENINSULA PLANNING DISTRICT COMMISSION

IN WITNESS WHEREOF, the following individuals execute this agreement

Chairman, Middle Peninsula Planning District Commission

County Administrator, County of Essex, Virginia

County Administrator, County of Gloucester, Virginia

County Administrator, County of King and Queen, Virginia

County Administrator, County of Middlesex, Virginia

MIDDLE PENINULA PLANNING DISTRICT COMMISSION

By: Sadie E. Ingram

Date: 8-1-02

Attest:

Date: 8/1/02

SIGNATURE PAGE FOR THE COUNTY OF ESSEX, VIRGINIA

IN WITNESS WHEREOF, the following individuals execute this agreement

Chairman, Middle Peninsula Planning District Commission

County Administrator, County of Essex, Virginia

County Administrator, County of Gloucester, Virginia

County Administrator, County of King and Queen, Virginia

County Administrator, County of Middlesex, Virginia

COUNTY OF ESSEX, VIRGINIA

By: Margaret Davis

Date: AUGUST 20, 2002

Attest: Linda E. Simpson

Date: AUGUST 20, 2002

SIGNATURE PAGE FOR THE COUNTY OF GLOUCESTER, VIRGINIA

IN WITNESS WHEREOF, the following individuals execute this agreement

Chairman, Middle Peninsula Planning District Commission

County Administrator, County of Essex, Virginia

County Administrator, County of Gloucester, Virginia

County Administrator, County of King and Queen, Virginia

County Administrator, County of Middlesex, Virginia

COUNTY OF GLOUCESTER, VIRGINIA

By: _____

Date: 10-3-22

Attest: _____

Date: _____

SIGNATURE PAGE FOR THE COUNTY OF KING AND QUEEN, VIRGINIA

IN WITNESS WHEREOF, the following individuals execute this agreement

Chairman, Middle Peninsula Planning District Commission

County Administrator, County of Essex, Virginia

County Administrator, County of Gloucester, Virginia

County Administrator, County of King and Queen, Virginia

County Administrator, County of Middlesex, Virginia

COUNTY OF KING AND QUEEN, VIRGINIA

By: _____

Date: 9/9/02

Attest: K. Duane Gaber

Date: 9-9-02

SIGNATURE PAGE FOR THE COUNTY OF MIDDLESEX, VIRGINIA

IN WITNESS WHEREOF, the following individuals execute this agreement

Chairman, Middle Peninsula Planning District Commission

County Administrator, County of Essex, Virginia

County Administrator, County of Gloucester, Virginia

County Administrator, County of King and Queen, Virginia

County Administrator, County of Middlesex, Virginia

COUNTY OF MIDDLESEX, VIRGINIA

By: _____

Date: 10-2-02

Attest: Betty S. Collins

Date: 10-2-02

APPENDIX C: Description of Natural Resource Preservation Tools

Conservation Easements: According to the Virginia Conservation Easement Act (§10.1-1009 et seq.), a conservation easement "means a nonpossessory interest of a holder in real property, whether easement appurtenant or in gross, acquired through gift, purchase, devise, or bequest imposing limitations or affirmative obligations, the purposes of which include retaining or protecting natural or open-space values of real property, assuring its availability for agricultural, forestal, recreational, or open-space use, protecting natural resources, maintaining or enhancing air or water quality, or preserving the historical, architectural or archaeological aspects of real property." There are significant tax benefits associated with the donation of conservation easements. The terms of the easement are highly flexible and dictate the permissible uses of the land. The easement is attached to the deed for the property.

Purchase of Development Rights (PDR) or Purchase of Agricultural Conservation Easements (PACE): A voluntary land conservation program that pays landowners to protect the cultural and natural resource assets of their property. The purpose is to protect open-space, agricultural, historic, scenic, and natural resources. In particular cases, the purpose is to maintain the economic viability of farm and forest operations. The program allows landowners to enter into agreements to sell the development potential of qualifying property to the County while maintaining the right to continue to use, own, sell, mortgage, and bequeath the property. PDR programs accommodate a variety of conservation categories and generally protect land in perpetuity, while PACE programs are specifically geared to agricultural operations and sometimes offer a buyback option at the current fair market value after a specified period of time.

Chesapeake Bay Preservation Act: The Chesapeake Bay Preservation Act (§10.1-2100 et seq.) requires that "(i) the counties, cities, and towns of Tidewater Virginia incorporate general water quality protection measures into their comprehensive plans, zoning ordinances, and subdivision ordinances; (ii) the counties, cities, and towns of Tidewater Virginia establish programs, in accordance with criteria established by the Commonwealth, that define and protect certain lands, hereinafter called Chesapeake Bay Preservation Areas, which if improperly developed may result in substantial damage to the water quality of the Chesapeake Bay and its tributaries." Furthermore, the Act states that "Local governments have the initiative for planning and for implementing the provisions of this chapter, and the Commonwealth shall act primarily in a supportive role by providing oversight for local governmental programs, by establishing criteria as required by this chapter, and by providing those resources necessary to carry out and enforce the provisions of this chapter."

Agricultural and Forestal Districts: The Local Agricultural and Forestal Districts Act (§15.2-4400 et seq.) indicates that "It is state policy to encourage localities of the Commonwealth to conserve and protect and to encourage the development and improvement of their agricultural and forestal lands for the production of food and other agricultural and forestal products. It is also state policy to encourage localities of the Commonwealth to conserve and protect agricultural and forestal lands as valued natural and ecological resources which provide essential open spaces for clean air sheds, watershed protection, wildlife habitat, aesthetic quality and other environmental

purposes. It is the purpose of this chapter to provide a means by which localities may protect and enhance agricultural and forestal lands of local significance as a viable segment of the local economy and as an important economic and environmental resource." Agricultural/forestal districts qualify for reduction in property tax rate under land use assessment.

Land Use Assessment: Authorized by the Code of Virginia (§58.1-3229 et seq.), a land use assessment program provides for the deferral of real estate taxes on real estate that qualifies for agricultural, horticultural, forestry and/or open space uses. Assessed values under the program are generally less than those estimated at fair market value. The purpose of such a program is generally to encourage the preservation of land, the protection of natural resources, the supply of safe water, and the promotion of orderly land use planning and development.

Sliding Scale Property Tax Rate: Used in conjunction with a land use assessment program, local governments may reduce the tax rate on properties that agree to remain in their current use for up to 20 years. The sliding scale of tax rates is based upon the length of the agreement.

Sliding Scale Zoning: This zoning method targets land in agricultural zoning districts and is designed to preserve agricultural land and open space. Sliding scale zoning allows a range of density depending on the size of the original lot. As parcel size increases, the density of allowable dwelling units decreases, enabling the preservation of large contiguous tracts of land that can still be farmed or simply preserved as open space. Lots that have been created from a parent parcel cannot be subdivided.

Local "Right-to-Farm": Virginia's Right-to-Farm laws (§3.1-22.28 et seq.) make any agricultural or silvicultural operation a "by right" use in agriculturally zoned areas. Special use permits cannot be required for operations in these areas and these operations cannot be found guilty of nuisance. The local variation of Right-to-Farm triggers notification to new or potential purchasers of land in agricultural zones of daily farming activities and possible "inconveniences" (e.g. dust, odors, noise).

State Forest: The Virginia Dept. of Forestry (DOF) manages state forests by balancing a self-supporting operation with multiple benefits, such as timber management, recreation, aesthetics, wildlife, water quality, and stability of the local economy. Operations are funded by the sale of forest products, with twenty-five percent of this revenue returned to the county in which the state forest is located. Special demonstration, research, and recreation areas are sometimes featured in state forests.

Virginia Natural Area Preserves System: Administered by the Department of Conservation and Recreation's Division of Natural Heritage, the Virginia Natural Area Preserves System protects examples of some of the rarest natural communities and rare species habitats in the Commonwealth. Natural Area Preserves are managed for their rare plants, animals and natural communities. Natural Area Preserve dedication places legally binding restrictions on future activities on a property. Preserve ownership

includes the Department of Conservation and Recreation, local governments, universities, private citizens, and non-profit conservation organizations. Access ranges from low-intensity public access to owner permission.

Virginia Estuarine and Coastal Research Reserve System: The Virginia Estuarine and Coastal Research Reserve System (VECRRS), created in the Code of Virginia (28.2-1103 et seq.), protects estuarine and coastal lands for research and long-term monitoring that supports the Commonwealth's coastal resource management efforts. The Virginia Institute of Marine Science administers the Reserve System, which is coordinated with the Chesapeake Bay National Estuarine Research Reserve in Virginia. A 121-acre research reserve site is located in the Dragon Run watershed.

APPENDIX D: Description of Farm Programs

The **Conservation Reserve Program** (NRCS, 2003a) reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filterstrips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. Cost sharing is provided to establish the vegetative cover practices.

The **Conservation Reserve Enhancement Program (CREP)** (NRCS, 2003a) aims to improve Virginia's water quality and wildlife habitat by offering rental payments to farmers who voluntarily restore riparian buffers, filter strips and wetlands through the installation of approved conservation practices. CREP is an enhancement to the federal *Conservation Reserve Program*.

The Virginia CREP has two programs. The *Chesapeake Bay CREP* targets Virginia's entire bay watershed and calls for the planting of 22,000 acres of riparian buffer and filter strips as well as 3,000 acres of wetland restoration. The *Southern Rivers CREP* targets watersheds outside the bay drainage basin and will establish 8,500 acres of riparian buffer and filter strip plantings and 1,500 acres of wetland restoration.

The **Environmental Quality Incentives Program (EQIP)** (NRCS, 2003a) was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.

EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. These contracts provide incentive payments and cost-shares to implement conservation practices. Those engaged in livestock or agricultural production on eligible land may participate. EQIP activities are carried out according to an environmental quality incentives program plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice or practices to address the resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. The local conservation district approves the plan.

EQIP may cost-share up to 75 percent of the costs of certain conservation practices. Incentive payments may be provided for up to three years to encourage producers to carry out management practices they may not otherwise use without the incentive. However, limited resource producers and beginning farmers and ranchers may be eligible for cost-shares up to 90 percent. Farmers and ranchers may elect to use a certified third-party provider for technical assistance. An individual or entity may not receive, directly or indirectly, cost-share or incentive payments that, in the aggregate, exceed $450,000 for all EQIP contracts entered during the term of the Farm Bill.

The program targets watersheds, regions, and areas of special environmental sensitivity or other areas facing significant soil, water or related natural resources concerns. By encouraging voluntary landowner participation in these areas, EQIP supports the development and implementation of conservation plans in critical areas. Developed in cooperation with professional resource managers, the plans encompass both scientific management principles, and landowner objectives.

The **Farm and Ranch Lands Protection Program** (NRCS, 2003a) provides matching funds to help purchase development rights to keep productive farm and ranchland in agricultural uses. Working through existing programs, the U.S. Department of Agriculture (USDA) partners with State, tribal, or local governments and non-governmental organizations to acquire conservation easements or other interests in land from landowners. USDA provides up to 50 percent of the fair market easement value.

To qualify, farmland must: be part of a pending offer from a State, tribe, or local farmland protection program; be privately owned; have a conservation plan for highly erodible land; be large enough to sustain agricultural production; be accessible to markets for what the land produces; have adequate infrastructure and agricultural support services; and have surrounding parcels of land that can support long-term agricultural production.

The **FarmLink Program** (Virginia Farm Bureau, 2003) connects farmers who are looking to sell, but wish to see their farms remain active, with people who would like to farm. Currently, the "highest and best use" of most farmland is considered to be in housing lots and shopping malls. As farmers retire or move on, they are often forced to divide up their farmland to pay off debt. In other cases, the land is worth so much more as a "development" site that the farmer finds it impossible to turn this option down. The goal of the FarmLink Program is to curb this trend and maintain the state's agricultural heritage for generations to come.

Prospective farmers and farmers searching for options for their farms each fill out an application form. This information is entered into a database so that farms may be sorted by location, size, type and other features that a potential buyer might be seeking. When it appears that a match is possible, the buyer and seller are both contacted by the FarmLink coordinator. If the farm owner agrees to meet the potential buyer, they are connected. Because many people who are looking to farm cannot afford to buy a farm outright, sellers are asked to consider long-term leases and work-in options in addition to immediate sale.

The **Forest Land Enhancement Program** (FLEP) (NRCS, 2003a) was part of Title VIII of the 2002 Farm Bill. FLEP embodies a commitment to sustainable forest management to enhance the productivity of timber, fish and wildlife habitat, soil and water quality, wetlands, recreational resources, and aesthetic values of forest land. It also establishes a coordinated and cooperative Federal, State, and local sustainable forestry program for

the establishment, management, maintenance, enhancement, and restoration of forests on nonindustrial private forest land.

FLEP is a voluntary program designed to provide technical, educational, and cost-share assistance to promote sustainability of non-industrial private forest. State forestry agencies develop State Priority Plans that provide details for how the FLEP funds will be utilized, including minimum acres, maximum acres, aggregate payment, use for technical, educational and cost-share assistance, and all other factors for the program. Landowners are required to have a forest management plan to be eligible for cost-share. The practices to be cost-shared and the cost-share rate are described in the State Priority Plan.

The cost-share practices are limited to the treatment of 1,000 acres per year on non-industrial private forest (NIPF) with an aggregate payment not to exceed $100,000 for the life of this Farm Bill. A waiver for the treatment of up to 5,000 acres is available if significant public benefit is shown. There is no limit to the amount of forest land owned by an individual as long as the person qualifies as an NIPF owner.

The **Wetlands Reserve Program** (NRCS, 2003a) is a voluntary program offering landowners the opportunity to protect, restore, and enhance wetlands on their property. The USDA Natural Resources Conservation Service (NRCS) provides technical and financial support to help landowners with their wetland restoration efforts. The NRCS goal is to achieve the greatest wetland functions and values, along with optimum wildlife habitat, on every acre enrolled in the program. This program offers landowners an opportunity to establish long-term conservation and wildlife practices and protection.

The **Wildlife Habitat Incentives Program (WHIP)** (NRCS, 2003a) is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. NRCS provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the participant generally last from 5 to 10 years from the date the agreement is signed.

Appendix G. Chinese Lespedeza Management Guide

Ecology and Management of Sericea Lespedeza

Lance T. Vermeire
Rangeland Research Associate

Terrence G. Bidwell
Professor and
Extension Rangeland Specialist

Jim Stritzke
Professor and
Extension Weed and Bush Control Specialist

Oklahoma Cooperative Extension Fact Sheets are also available on our website at:
http://osufacts.okstate.edu

Sericea lespedeza (*Lespedeza cuneata*) (Figure 1) is an introduced perennial legume, relatively free of insect and disease problems. It is very competitive and highly tolerant of a variety of conditions, which are among the reasons it has become an invasive and noxious weed in Oklahoma. Sericea was planted in the past to control soil erosion and provide forage for livestock and wildlife. From these plantings, it has been spread by animals and movement of hay contaminated with sericea seed to native prairies, shrublands, forests and introduced pastures. Normal management practices such as grazing, burning and applying 2,4-D herbicide do not control sericea lespedeza. Sericea lespedeza should be officially classified as a noxious weed in Oklahoma.

Sericea has been found growing in all parts of Oklahoma, except the Panhandle, and has been designated a noxious weed in southeastern Kansas because of its ability to invade and decrease grass production on rangelands and introduced pastures. It has had a negative impact on forage production for livestock, food and cover for wildlife and biological diversity.

Mature sericea plants are 18 to 40 inches tall with coarse stems and leaves composed of three spatula-shaped leaflets with squared-off ends (Figure 2). Sericea often is confused with desirable native legumes, especially slender lespedeza, which looks very similar to sericea lespedeza. Note the tips of slender lespedeza (*Lespedeza virginica*) leaflets are more rounded and do not have a conspicuous point at the end of the leaf (Figure 3). Pure stands of sericea may produce 430 to 850 pounds of seed per acre per year with about 350,000 seeds in each pound. Seedlings are not very competitive, but, once established, are long-lived.

Sericea will tolerate soils ranging from very acidic to slightly alkaline, but prefers a pH of 6.0 to 6.5. It does best on clayey and loamy soils that are deep, fertile, and well-drained, but will also grow on poor sites. Sericea uses water less efficiently than many other warm-season plants and does best when annual precipitation is 30 inches or more, which explains why it is a greater problem in eastern Oklahoma. However, sericea occurrence has been reported on Conservation Reserve Program (CRP) lands and rangelands in western Oklahoma.

Figure 1. Sericea lespedeza.

History in the United States

Sericea lespedeza was first brought to the United States from Japan in the 1890s. Agronomists soon learned it was tolerant of drought, acidity and shallow soils of low fertility. Because of this, sericea first was used as a protective cover for poor sites. Two varieties of sericea were developed for improved quality and to resist nematodes. These varieties were used on strip mines, highway right-of-ways, dams and waterways. Sericea also was promoted for use in wildlife food plots during the 1950s.

Forage Quality

Sericea lespedeza has high levels of crude protein, negated by high concentrations of a class of chemical compounds called tannins. Tannins bind proteins, leaving them unavailable for digestion. They also reduce the palatability and digestibility of forages. The level of tannins in sericea increases with maturity of the plant, high air temperatures, and low rainfall. New varieties of sericea have been developed with lower tannin concentrations, but tannin levels are still high and forage production is 15 percent lower than that of high tannin varieties.

Animal performance of goats and sheep grazing sericea is variable, but grazing trials with steers and heifers in Alabama suggest higher daily gains can be achieved on native grasses in Oklahoma with much less intensive management.

Competitive Effects

Once established, sericea lespedeza will reduce or eliminate competing vegetation. Sericea restricts the amount of light other plants can use because it is tall and produces multiple branches with dense foliage. More water also is used to produce each pound of sericea forage because it is less efficient in water use than most warm-season plants. In addition to competing for light, water, and nutrients, sericea produces allelopathic chemicals (toxins) that inhibit seed germination and growth of other plants. Some of these toxins are produced by the roots, while others come from plant residues, mainly leaves. Root extracts from sericea have been shown to reduce germination of bermudagrass by 9 percent and forage production of bahiagrass, bermudagrass, rye, ryegrass, and tall fescue by as much as 15, 24, seven, 11 and 15 percent, respectively. Reports of influences of sericea root exudates are variable for germination and production of forage species.

Sericea is a legume, but furnishes very little nitrogen to surrounding plants, and is negated by the effects of the toxins it produces. Rather than providing nitrogen for other plants, sericea actually makes it necessary to add nitrogen fertilizer to maintain production of introduced forages. The shoots of grass exposed to the toxins of sericea residue have lower nitrogen content and overcoming the loss of production caused by the toxins requires nitrogen fertilization.

Much of the research on the competitiveness of sericea lespedeza has been conducted with introduced forages in greenhouses. Because studies involving introduced forages often occur in controlled environments and focus on individual factors of competition, the combined negative effects on native plants in the uncontrolled environment of native prairies and forests are probably much greater. For example, in one study, sericea seeded with switchgrass quickly dominated the area and switchgrass was eliminated by the third year.

Wildlife and Plant Community Diversity

Sericea lespedeza has been promoted for use in wildlife food plots and revegetation of roadsides and bare ground, but its value for these purposes is not supported by research or practical experience. Deer will not utilize sericea unless it is kept short by mowing or grazing. Quail occasionally consume the seeds and some wildlife species will use sericea for thermal cover during the summer. Cover, however, is lacking when sericea is dormant because it reduces many desirable native plants. The exclusion of other plant species by sericea also reduces the diversity of plant foods needed to support wildlife. Wildlife are adapted to the native plants of an area and are much better served by them for food and cover.

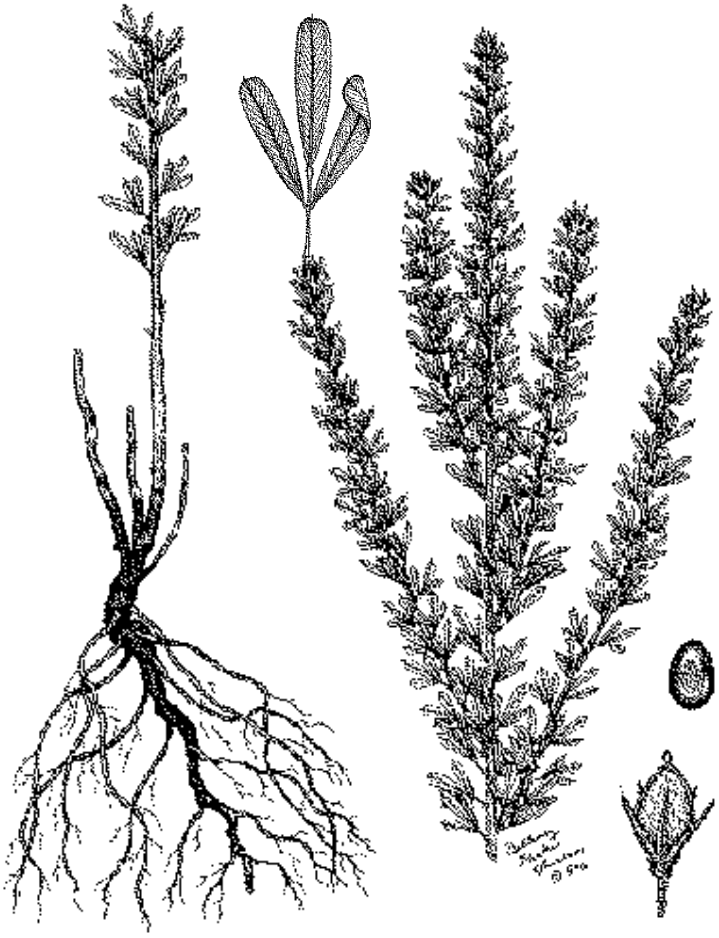


Figure 2. Sericea lespedeza.

Control

The best control approach is early detection, isolation of infested areas and control of individual plants with herbicides like Remedy and Ally. Once established, an integrated approach to control will be necessary to minimize the damage. Conventional management practices of prescribed grazing and prescribed fire have not been effective in preventing the spread of sericea in rangelands, introduced pastures and forests.

It is difficult to give grasses a competitive edge with season-long and rotational grazing because cattle will select grasses and leave the sericea plants because of low palatability. If grasses are over-utilized, the invasion of sericea will be hastened. Some suppression of sericea has been observed after mowing or burning followed by intensive early stocking (IES) with stocker cattle. Livestock will consume the seeds and deposit them elsewhere in manure, so it is advisable to temporarily fence these infested areas to exclude livestock until the sericea has been controlled. This is particularly important during late summer and fall when the plants are flowering and producing seed. Goats may provide control, since they have been known to eat sericea.

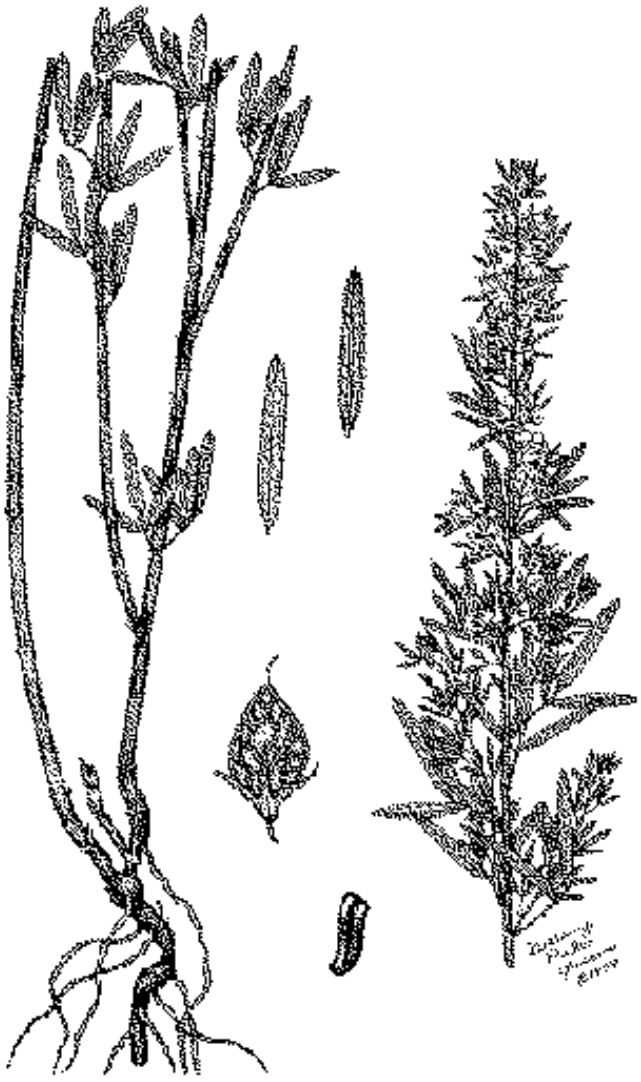


Figure 3. Slender lespedeza.

Spring burning removes the old dead growth of sericea, but has no negative effect on established plants. In fact, fire probably increases seed germination by scarifiying the seed and thus promote the establishment of new plants. Seeds of sericea germinate in early April through June. Seedlings establish when moisture conditions are favorable; thus, burning most likely will result in a denser stand of sericea if control measures are not implemented. However, the increased seed germination following fire should improve the effectiveness of a control program that involves spraying in July with Remedy or spraying in September with Ally.

Mowing will reduce the vigor of sericea plants if they are cut closely multiple times each year. Plants should be mowed each time they reach a height of 12-18 inches. The most damaging time to cut sericea is late in the growing season when the plants are trying to build root reserves for the next year's growth. However, mowing will not kill sericea and may damage desirable grasses, depending on the timing and frequency of cutting. In addition, a large sericea seed bank will remain in the soil, ready to germinate when conditions are suitable.

None of the commonly used herbicides for broad-leaved weed control have provided good control of sericea lespedeza. Amber, 2,4-D, Grazon P+D, and Weedmaster have been ineffective on established stands of sericea. In studies conducted at three locations in 1988 and 1989, sericea was not controlled by 2,4-D at rates up to 2 lb/acre and minimal kill was achieved with 1 quart/acre of Grazon P+D or Weedmaster. Sericea was, however, adequately controlled with 1 pt/ac of Remedy (better than 93 percent in five of the studies and 79 percent in the sixth study). In additional studies in 1995, excellent control of sericea was obtained with 1 pt/ac of Remedy applied in June and July and Ally applied in September (Table 1). Currently, the maximum labeled rate for Ally is 0.3 oz/acre. Broad-leaved plants like western ragweed also are controlled with a June application of Remedy. It is critical the sericea plants be actively growing at the time of herbicide application or the treatment will not be effective.

Table 1. Chemical costs and average control (stem reduction) of sericea lespedeza using two herbicides applied at different times and rates at four sites in 1995.

Herbicide	Rate/Acre	Cost $/Acre[1]	Month of Application		
			June	July	Sept.
			Reduction (%)		
Remedy	1.0 pt.	10.50	100	100	88
Remedy	1.5 pt.	15.75	100	100	92
Ally	0.3 oz.	6.15	68	92	94
Ally	0.5 oz.[2]	10.25	85	97	99

1 Chemical costs as of March 1997. Cost of application or surfactants not included.
2 Currently, the maximum labeled rate of Ally is 0.3 oz/acre.

Since areas infested with sericea often have an enormous supply of seed in the soil, follow-up treatments will be required. Seedlings emerge after the mature plants are killed and by the third or fourth year, sericea will dominate the area again.

Preliminary results indicate mowing before application of Ally or Remedy can increase the level of control. Combining a single mowing in June or July with a herbicide treatment in July or September provided 100 percent control of sericea seedlings. Using fire to encourage seed germination before spraying may be helpful in diminishing the seed supply in the soil, reducing the amount of follow-up treatment needed.

A combination of grazing management, fire, mowing and herbicide offers the most effective control of sericea lespedeza. An example of how these techniques may be used together is as follows:

1) Use light or moderate stocking, allowing fuel to accumulate for a prescribed burn.
2) Burn in spring to encourage germination of sericea seed and remove old growth.
3) After fire, intensively early stock (IES) areas until mid-June.
4) Apply Remedy at 1 pt/acre in mid-July.
5) Apply Ally in September to areas missed by Remedy.
6) During September and October, exclude livestock from areas with sericea stands.
7) Thereafter, spot treat sericea with Remedy or Ally as needed.

Summary

While sericea lespedeza unfortunately has been promoted as an “improved” forage and a protective cover, it is currently a major weed problem in Oklahoma’s rangelands, forests, and introduced pastures. It is a noxious weed and requires aggressive control. Its adaptability, high seed yield, production of toxic chemicals and general competitiveness combine to make sericea lespedeza a serious threat to native plant communities, introduced forages, wildlife habitat and livestock production. An integrated approach to control, using grazing management, prescribed fire, mowing and herbicide, may offer the greatest success. Control of sericea can be expensive, so treatment costs and production losses are minimized by early detection and control.

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Appendix H. Managed Hunting Samples

Special Managed Waterfowl Hunt: KEY IDEAS

WHY CONDUCT A WATERFOWL HUNT ON A NATURAL AREA?

- Historical use: prior to acquisition and/or management by the state as a natural area; private interests hunted ducks and geese here regularly.

- VIMS is now responsible for regulating and managing the use of portions of the property by the public. These uses must be compatible with the objectives for which the property was acquired by the state in the first place.

- Virginia law provides that anyone can hunt waterfowl in public waters during established seasons and using legal methods so long as they are not within 500 yards of an existing licensed waterfowl blind. Therefore, if VIMS does not license, establish, and use (for the purpose of hunting) waterfowl blinds along the shoreline at Goodwin Islands Reserve, then any member of the public has the opportunity to obtain a license and build a stationary hunting blind in the public waters surrounding the Reserve. Where stationary blinds are not built, anyone could legally hunt from licensed floating blinds (boats) in the waters adjacent to the Reserve.

- The result of VIMS not establishing and managing the use of shore blinds at portions of Goodwin Islands Reserve is expected to be the rapid licensing and construction of blinds, and the frequent use of these blinds in the public waters surrounding the Reserve, making it a *de facto* waterfowl hunting area from November through January of every year. This unregulated use would not be in the interest of VIMS and visitor/researcher safety would be of high concern.

The Department of Conservation and Recreation, Division of Natural Heritage allows managed waterfowl and deer hunting at selected Natural Area Preserves. The information that follows are examples of information that DCR-DNH distributes to potential and/or registered hunters participating in these hunts.

---------- Natural Area Preserve
Managed Deer Hunt Rules and Regulations

1. All hunters must sign in at the check-in kiosk when arriving at the Preserve and sign out when leaving.

2. All hunters in the party must possess a valid DCR hunting permit. Each permit will bear the name of the Chief-of-Party, who will be responsible for providing the name and Virginia Hunting License number of each party member on their hunting permit.

3. Each hunter must have on his/her person proof of successfully completing a Hunter Education Course (certificate or copy of certificate).

4. Hunters hunting alone must be 16 years of age by the date of the hunt. Youth hunters aged 12-15 must be accompanied by an adult at all times. Both the youth and the adult must possess a DCR hunting permit and proof of completing a Hunter Education Course.

5. Hunters must have all necessary state licenses and abide by all state and DCR regulations.

6. Allowable weapons are shotguns with rifled slugs or buckshot.

7. All deer targeted must be within the Preserve boundaries, which are marked by conspicuous white signs and yellow boundary paint.

8. A limit of two (2) deer per hunter, per day, one of which must be antlerless, may be harvested. **The objective of the hunt is to reduce the size of the deer herd. Therefore, the harvesting of antlerless deer is strongly encouraged.**

9. All deer harvested should be tagged immediately at the point of kill.

10. Hunters are asked to voluntarily provide the following data for harvested deer:
    - sex
    - weight (dressed)
    - number of points (bucks), lactation status, pregnancy & number of young (does)
    - general health and condition

Additional notes:

Data sheets will be available at the check-in kiosk. Scales for weighing deer will not be provided. It is requested that hunters bring their own scales to provide this key harvest statistic. If necessary and only if scales are unavailable, hunters should estimate the field dressed weights of harvested deer in order to complete the data sheet.

Hunter Information Summary Sheet
2004 Lottery Deer Hunt
---------- Natural Area Preserve

Dates: December 6-11, 2004 (Monday - Saturday)
December 13-18, 2004 (Monday - Saturday)

Type of Hunt:
●This is a **lottery** hunt.
●A non-refundable $5.00 State Park Reservation fee will be required at the time of application in order to enter the lottery. Applications and payment must be received by **5:00 PM on Friday, October 8, 2004**. Make checks payable to *Treasurer of Virginia*. Telephone applications and payment by credit card is also acceptable.
●Each selected applicant will be assigned one (1) hunt day during the 2-week hunting period. Selected applicants will be notified within two (2) weeks of the random drawing.
●Each selected applicant may request up to five (5) permits for their assigned hunt day, for a party of up to five hunters. For each member of the hunting party, a $10.00 Natural Area Preserve hunting permit fee must be remitted.
●Hunting permit fee payments must be received by Friday, November 5, 2004. Hunting permit fees must be made by personal check, payable to *Natural Area Preservation Fund*, and mailed to the Department of Conservation and Recreation, 217 Governor Street, Richmond, VA, 23219 – Attention: ---------- Deer Hunt

Participation Requirements:
All members of the hunting party:
1. Must possess all necessary state licenses.
2. Must possess issued hunt permit from DCR.
3. **Must show proof of having completed a Hunter Education Course**.
4. Must be 16 years of age or older to hunt alone. Hunters 12-15 years of age may hunt as a member of the party, but must be under the direct supervision of a hunting adult.
5. Must abide by and meet all rules and regulations, including but not limited to, weapons and ammunition restrictions/specifications and blaze orange requirements (vest and hat).

How to Participate:
●By filling out a lottery application and returning it to the State Parks Reservation Center – along with a non-refundable $5.00 application fee. Applications may also be made by telephone with application fees paid by credit card (call 1-800-933-PARK).
Applications must be received by 5:00 PM on October 8, 2004.
●Selected hunters will be notified by October 22, 2004. Each hunter must render payment of the Natural Area Preserve fee ($10.00 per hunter) to: DCR-Division of Natural Heritage, 217 Governor Street, Richmond, Virginia 23219. Payment must be received by November 5, 2004 or the hunt date will be forfeited and offered to hunters on a stand-by list. Payment should be by personal check made out to *Natural Area Preservation Fund*. Please specify -------- Deer Hunt on the memo line.
●The selected applicant will be considered the Chief-of-Party and will be responsible for all payment to DCR and distributing permits to hunt party members.

●Once payment is made, the Chief-of-Party will be sent an information packet, including maps and hunting permits.

Allowable Weapons:
Allowable weapons are shotguns with rifled slugs or buckshot.
Hunters may ground hunt or use portable tree stands with approved safety belts.

Hunt Zones:
Hunters may hunt anywhere within the preserve boundaries (299 acres). All deer targeted must be within the preserve boundaries. There will only be 1 hunting party on any given day (the hunting party consisting of the successful applicant and up to four other hunters if the applicant chooses).

Allowable Harvest:
A limit of two (2) deer per hunter, one of which must be antlerless, may be harvested. The objective of the hunt is to reduce the size of the herd. Therefore, the harvesting of does is strongly encouraged.

Additional Harvest Information:
All deer harvested must be tagged immediately. Field dressing of deer should occur at the point of kill.

Hunter's will be required to provide the following information for harvested deer:
●sex
●weight **(either live or dressed; hunter's must provide scale)**
●number of antler points, lactation status, pregnancy (as applicable)
●general health and condition.
Data sheets will be available at the Hunter Check-in Kiosk.

Disabled Hunters:
Hunting at ------- NAP requires traversing rough terrain (thick underbrush, sand dunes, drainage ditches, wetlands).

Scouting and Additional Information:
To arrange a scouting date or for additional information, call: -----

Appendix I. Public Use Guide

What can the public do on rivers that are navigable for title purposes?
The three activities that the courts have traditionally mentioned are navigation, fishing, and commerce. The public can fish, from the river or from the shore below the "ordinary low water line." (Note that the fish and wildlife are owned by the state in any case.) But the courts have ruled that any and all non-destructive activities in these areas are legally protected.

What about getting to and from the river?
Normally there is no right to cross private land to get to or from a river. For example, there is no right to walk across a farmer's field to get from a public highway to a river.

However, the state has a duty to maintain public access routes to rivers under certain conditions, as part of its public trust duties. Courts have found it unlawful for a state to close off an existing public access route when there are no other public access routes nearby.

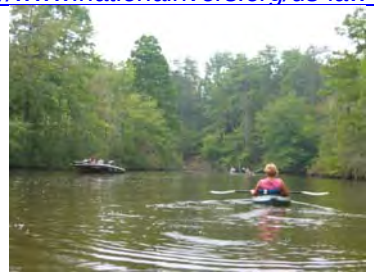
What about river pollution and leaving trash?
Local, state and federal regulations limit or prohibit water pollution. Hefty fines can apply.

Balancing private property and public rights through a Code of Conduct in the Dragon Run
The sense of being invaded by trespassers strikes a deep emotional chord in many a landowner who has a river flowing through his property. Some Dragon Run landowners tend to lump all river users together - those who canoe quietly down the middle of the river, those who stand quietly below the ordinary low water line to fish, those who stay on or near the river but litter and make noise, and those who proceed well away from the river onto private land. However, the right of the public for the use of title navigable waterways soundly exists in the Public Trust Doctrine. This right may be compared to the right to use a public roadway. Individuals have the right to use the roadway in its defined boundaries, but not drive through adjacent private yards or throw litter out of the window as they are passing through.

Additionally, while public roadways are generally well defined, the line between navigable and non-navigable waterways becomes increasingly vague as one travels further from the natural and ordinary Dragon Run mainstem, thereby increasing the potential for conflict between landowners and users.

Ultimately, the practice of responsible recreation coupled with an awareness of the public and private rights, including its vagueness in some locations, is the key to reducing conflict.

Acknowledgement: Adapted from *Who Owns the River?* From the National Rivers Website:
http://www.nationalrivers.org/us-law-who-



Virginia Coastal Zone MANAGEMENT PROGRAM

This work was funded by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant # NA06NOS4190241 Task 95 of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended. The views expressed are those of the author(s) and do not necessarily reflect the views of NOAA or any of its subagencies.

Public Use Guide

Mission: To support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed.

Saluda Professional Center
125 Bowden Street
P.O. Box 286
Saluda, VA 23149-0286
Phone: (804) 758-2311
Fax (804) 758-3221
sstamp@mppdc.com
www.mppdc.com/dragon.shtml

DRAGON RUN SPECIAL AREA MANAGEMENT PROGRAM

What is the Dragon Run Special Area Management Program (SAMP)?
This partnership between the Virginia Coastal Zone Management Program and the Dragon Run Steering Committee of the Middle Peninsula Planning District Commission is designed to address both the differing viewpoints and common ground that exist concerning the future of the watershed.

What is the Dragon Run Steering Committee?
Formed in 1985, the Dragon Run Steering Committee consists of landowners and local elected officials and is the key vehicle for cooperation and coordination among the four counties concerning watershed issues.

What counties are in the watershed?
The counties of Essex, Gloucester, King and Queen, and Middlesex contain the watershed.

STEERING COMMITTEE

Essex County – Prue Davis (Chair)(S), Fred Hudson (P), Dorothy Miller (L), M. Scott Owen (L)
Gloucester County – Charles "Rick" Allen (S), Dr. Eric Weisel (P), Terry DuRose (L), Dr. Willy Reay (L)
King and Queen County – Keith Haden (S), Kempton Shields (P), Robert Gibson (L), William "Frank" Herrin (L)
Middlesex – John D. "Jack" Miller (S), John England (P), R. D. Johnson (L), William Bagby (L)

(S) denotes Supervisor
(P) denotes Planning Commissioner
(L) denotes Land Interest

Staff – Sara Stamp

PUBLIC RIGHTS FOR USE OF THE DRAGON RUN

Which rivers are owned by the public?
The U.S. Supreme Court has held that the bed and banks under all rivers, lakes, and streams that are navigable, for title purposes, are owned by the states, held in trust for the public through the Public Trust Doctrine. Title in this context means ownership. In Virginia, this public-trust ownership extends up to the ordinary low water line, (or ordinary low water mark,) encompassing what is commonly referred to as the submerged and submersible land, as opposed to the upland.

What does navigability, for title purposes, mean?
Through various court cases, federal courts have articulated the following test, which is known as the federal test of navigability for title purposes:

* Navigability is determined as of the date of statehood
* Waters must be navigable in their natural and ordinary condition;
* The waterway must be usable for transportation conducted in customary modes of trade and travel on water; and
* The waterway must be capable of or susceptible to use as a highway for the transportation of people or goods.

The courts have determined that the use or potential for use by almost any type of watercraft is sufficient to determine this type of navigability.

Do shallows, rapids, and other obstacles make a river non-navigable for title purposes?
No. The courts make no requirements that a river be uniformly deep, or flat, or that navigation be practical going upstream as well as downstream. The presence of rapids, even numerous rapids and waterfalls, or blockages does not disqualify a river.

What if the river is only physically navigable during the wet season of the year?
It still qualifies as navigable for title purposes. But a normally dry creek bed or "wash" that is only temporarily navigable during extreme weather does not qualify. (If it's normally dry because of upstream dams, then it does qualify. The legal test is based on the river's natural condition.)

What if the current property owner's deed reads to the middle of a river, or seems to surround and include the river?

If the physical characteristics of the river are such that it meets the federal test of title navigability, it is public land up to the ordinary low water line. Since a deed can only convey interests actually owned by the seller, and since the bed and banks of all navigable rivers passed to the states at the time of statehood, it is likely that the state is the true owner. The state's ownership is a "prior existing right" and is frequently mentioned as such on deeds. Somewhere along the chain of property transactions, a deed may have been changed to include the riverbed. If this happened it was likely done incorrectly.

Appendix J. Federal and State Natural Resource Laws

Federal and State Natural Resource Laws

LEGISLATION	CITATION	RESPONSIBLE AGENCY
Presidential Order on Introduction of Exotic Species	Executive Order # 11987	Office of the President
U.S. Noxious Weed Law	7 USC 2802-2814	U.S. Department of Agriculture (USDA)
U.S. Clean Water Act	33 USC 1344	U.S. Army Corps of Engineers (ACOE), U.S. Environmental Protection Agency (EPA)
U.S. Anadromous Fish Conservation Act	16 USC 757a-757g	National Marine Fisheries Service (NMFS)
U.S. Clean Air Act	42 USC 7401-7671q	EPA
National Environmental Policy Act	42 USC 4321-4307d	all Federal agencies
Lacey Act (exotics)	18 USC 42	U.S. Department of Interior (DOI)
U.S. Endangered Species Act	16 USC 1531-1544	U.S. Fish & Wildlife Service (FWS), NMFS
U.S. Fish & Wildlife Coordination Act	16 USC 661-668s	many
U.S. Migratory Bird Treaty Act	16 USC 701-712	FWS
U.S. Aquatic Nuisance Prevention & Control Act	16 USC 4701-4751	FWS, NMFS
VA Commercial Fishing Law / Recreational Fishing Law	VA Code 28.2-100 – 1001	VA Marine Resources Comm. (VMRC)
VA Wetlands Act	VA Code 28.2-1300 – 1320	VMRC
VA Historic Resources Law	VA Code 10.1-2200 – 2216	VA Department of Historic Resources (VDHR)
VA Antiquities Act	VA C ode 10.1-2300 – 2306	VDHR
VA Endangered Species Act	VA Code 29.1-563 – 570	VA Department of Game & Inland Fisheries (VDGIF)
VA Fish & Wildlife Law	VA Code 29.1-100 et seq.	VDGIF
VA Endangered Plant & Insect Species Act	VA Code 3.1-1020 – 1030	VA Department of Agriculture and Consumer Services (VDACS)
VA Noxious Weed Law	VA Code 3.1-296.11 - 296.21	VDACS

Federal and State Natural Resource Laws (continued)

LEGISLATION	CITATION	RESPONSIBLE AGENCY
VA Chesapeake Bay Preservation Act	VA Code 10.1-2100 - 2115	Chesapeake Bay Local Assistance Dept. (CBLAD)
VA Water Quality Improvement Act of 1997	VA Code 10.1-2118 – 2128.B.	VDCR
VA Water Control Law	VA Code 62.1-44.2 - 44.34	VA Department of Environmental Quality (VDEQ)
VA Ground-water Management Act	VA Code 62.1-44.84 - 44.104	VDEQ
VA Environmental Quality Act	VA Code 10.1-1200 - 1221	VDEQ
VA Waste Management Act	VA Code 10.1-1400 - 1457	VDEQ
VA Open Space Land Act	VA Code 10.1-1700 - 1705	VA Outdoors Foundation (VOF)
VA Erosion & Sediment Act	VA Code 10.1-560 - 571	VDCR
VA Natural Area Preserves Act	VA Code 10.1-202 - 217	VDCR
VA Conservation Easement Act	VA Code 10.1-1009 - 1016	VDCR

Appendix K. Glossary Of Technical Terms And Abbreviations

GLOSSARY OF TECHNICAL TERMS AND ABBREVIATIONS

ac – acre(s).
acidic – having a pH value < 7.0, often indicating moderate or low fertility.
alluvial – of or pertaining to deposition of sediment by a stream.
alluvium – unconsolidated sand, silt, clay, or gravel deposited by running water.
asl – above sea level
aspect – the direction a slope faces (e.g., a north aspect).
basal area – the cross-sectional area of a tree at breast height; extrapolated to a larger area, basal area is an estimated measure of how much of a site is occupied by trees.
basic – as applied to soils, having high levels of base cation (e.g., calcium and magnesium) saturation, typically indicating high fertility; as applied to rocks, having high concentrations of iron, magnesium, and calcium.
biological resource management – those components of natural areas stewardship pertaining to or impinging on vegetation, natural communities, or habitat for rare species. Examples of biological resource management include invasive species control, habitat restoration, and monitoring of species population status.
biomass – the total weight of all living organisms in a biological community; in vegetation science, usually the total weight of all above-ground plant parts.
bryophyte – a non-vascular green plant; includes mosses, hornworts, and liverworts
colluvial – of or pertaining to colluvium.
colluvium – unconsolidated earth materials deposited on steep slopes by direct gravitational action and local unconcentrated run-off.
community – as applied to plants, any unit of vegetation regardless of rank or development; an aggregation of plants on the landscape; in broader terms, any assemblage of organisms that co-occur and interact.
cover – the percentage of the ground covered by the vertical projection of above-ground plant parts.
DCR – Virginia Department of Conservation and Recreation.
dbh – diameter at breast height (4.6 ft above the ground); the standard position at which woody stems are measured in forestry procedures.
dedication – dedication of a natural area is the strongest form of protection that can be afforded a natural area in Virginia and involves recording a legally binding Deed of Dedication with the property deed. The Deed of Dedication states the preservation purpose of the property, designates the property as Open-Space Land, restricts land uses which are incompatible, and formally places the site in Virginia's Natural Area Preserve System. Dedication is perpetual, and although ownership of the property can be transferred, the dedication will remain in effect.
density – the number of plants per unit area; used more specifically in this study as a measure of the number of woody stems ≥ 1in in diameter at breast height per hectare.
DGIF – Virginia Department of Game & Inland Fisheries.
dip slope – a side slope determined by and approximately aligned with the angle of the underlying bedrock plane.
DNH –Virginia Department of Conservation & Recreation, Division of Natural Heritage.
DOF – Virginia Department of Forestry.

dominant – of or pertaining to an organism or taxon that by its size, abundance, or coverage exerts considerable influence on a community's biotic and abiotic conditions.
dry-mesic – intermediate between dry and moist but well drained; submesic to subxeric.
duff – the matted, partly decomposed organic surface layer of forest soils.
EO – element occurrence. A site that supports a population of a rare plant or animal or an exemplary stand of an ecological community. EOs are sites tracked in the natural heritage database by the Division of Natural Heritage.
EO rank – the viability of a particular EO, graded from A to D.
ecological community - an assemblage of co-existing, interacting species, considered together with the physical environment and associated ecological processes, that usually recurs on the landscape.
ecological community group – a level in the hierarchical ecological community classification used by DNH (Fleming et al. 2001). An ecological community group consists of ecological communities with similar topographic, edaphic, physiognomic, and gross floristic traits. This level is comparable to the level at which many natural community classifications define their basic units, *e.g*., Basic Oak-Hickory Forests. Ecological community groups are not defined at a single, standard scale. Because community groups differ in their extent on the landscape, some are very broadly defined and have large geographic coverage (*e.g*., Chestnut Oak Forests), while others are very narrow in concept and distribution (*e.g*., Granitic Flatrocks). Ecological community types are nested within an ecological community group.
ecological community type – an abstract unit of vegetation representing concrete plant communities sharing a similar structure and floristic composition, and occurring under similar environmental conditions; more or less equivalent to the "association" used in traditional vegetation studies and the U.S. National Vegetation Classification. Ecological community types are the next finest level in the community classification hierarchy after ecological community groups.
ecotone – a transitional area where characteristics of adjacent communities or environments intermingle or intergrade.
ecosystem – a complete interacting system of organisms and their environment, applicable at any spatial scale.
edaphic – of or pertaining to the influence of soils on living organisms, particularly plants.
endemic – geographically restricted; a species or taxonomic group restricted to a particular geographic region.
environmental gradient - a spatially varying aspect of the environment (*e.g*., elevation, slope position, soil pH) that is expected to be related to species composition.
ericaceous – of the Heath Family (*Ericaceae*).
ericad – a plant of the Heath Family (*Ericaceae*); for example, blueberries (*Vaccinium* spp.), rhododendrons (*Rhododendron* spp.), and mountain-laurel (*Kalmia latifolia*).
exotic – an introduced, non-native species.
fire management – all activities associated with the management of fire-prone land, including the use of fire to meet land management goals and objectives - a unique and distinct component of natural areas stewardship combining elements of both biological and operations management. Fire management activities include both prescribed fire implementation and wildfire management.

fire management plan – statement, for a specific area, of fire policy, objectives, and prescribed action.
flora – all the vascular plants that make up the vegetation of a specified area.
floristic – of or pertaining to the flora of an area and the geographic patterns of distribution represented by its taxa.
floristics – the study of a flora and the geographic distributions of its taxa.
floodplain – a nearly level alluvial plain that borders a stream and is subject to inundation (non-tidal) under flood-stage conditions.
foliose lichen - a lichen typically lying flush to its substrate, but removable such that the lower surface is visible; foliose lichens are often attached to rocks and other substrates by numerous fine structures called rhizines.
forb – a broad-leaved herbaceous plant.
forest – an ecosystem dominated by trees (≥ 20ft tall) producing a more or less closed canopy, typically with 60-100% cover; some forests may temporarily have < 60% canopy cover following disturbances such as windthrow, disease, etc.
fruticose lichen – a lichen that grows erect or pendent, with thalli that have no clearly distinguishable upper and lower surfaces; includes species that are branched and shrubby, as well as those that form unbranched stalks.
ft – foot (feet).
geomorphic – of or pertaining to processes that change the form of the earth (e.g., volcanic activity, running waters, glaciers).
graminoid – grasses and grass-like plants (e.g., sedges and rushes).
groundwater – water occurring below the earth's surface in bedrock and soil.
heath - a plant of the Heath Family (*Ericaceae*); an Ericad; for example, blueberries (*Vaccinium* spp.), rhododendrons (*Rhododendron* spp.), and mountain-laurel (*Kalmia latifolia*).
herb – a vascular plant lacking woody tissue at or above ground level.
herbivory – the consumption of plants by animals.
hibernacula – over-wintering den sites used by animals such as bats, snakes, and insects.
humus – decomposed organic matter that has lost all trace of the structure and composition of the vegetable or animal matter from which it was derived.
hydric –wet and poorly drained.
hydrology – the science that deals with the circulation, distribution, movement, and chemistry of the waters of the earth.
in – inch(es).
invasive species – any species of plant, animal, or other organism (e.g. microbes) that is both non-native (exotic) to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.
integrated pest management – is the maintenance of destructive agents, including insects, at tolerable levels by the planned use of a variety of preventative, suppressive, or regulatory tactics and strategies that are ecologically and economically efficient and socially acceptable. The methods used in pest management must be ecologically based, involve a combination of tactics from insecticides to “doing nothing” appropriate to the situation and the biota and be a part of an overall management plan for the ecosystem being considered.
interstice – an intervening space or crevice.

interstitial – of or pertaining to interstices.
Jurassic – the second period of the Mesozoic era (following the Triassic), from approximately 190 to 135 million years ago.
liana – a woody vine.
lichen – a symbiotic association between a fungus and one or more species of algae and/or blue-green algae; although not based on genetic relationships, lichen species, for the aid of identification, are divided into foliose, fruticose, crustose, and umbilicate groups based on their growth strategies.
lithologic – of or pertaining to the physical characteristics of a rock.
lithology – the description of rocks on the basis of physical characteristics such as color, mineralogical composition, and grain size.
liverwort - a nonvascular, chlorophyll-containing plant closely related to mosses and hornworts, but differing in reproductive structures; liverworts have two dominant growth forms, one which resembles moss with overlapping leaves, the other forming prostrate leafless bodies.
m – meter(s).
macroinvertebrate – an animal lacking a backbone (invertebrate) and visible without the aid of magnification.
mafic – geologically, containing large amounts of dark-colored silicate minerals rich in magnesium and iron, e.g., pyroxene, amphibole, and biotite mica; examples include igneous and metamorphic rocks such as amphibolite, basalt, diabase, gabbro, and greenstone; also applied to soils with high levels of magnesium and iron that are derived from these formations.
mesic – of intermediate moisture conditions (i.e., moist and well-drained).
mesophyte – a plant characteristic of mesic environments.
mesophytic – of or pertaining to plants or vegetation adapted to environments of moist, well-drained sites.
Mesozoic – an Era of geologic time, from the end of the Paleozoic to the beginning of the Cenozoic, or about 225 to 65 million years ago; includes the Triassic, Jurassic, and Cretaceous periods.
metabasalt – metamorphosed basalt, a fine-grained igneous rock composed largely of plagioclase feldspar, pyroxene, and volcanic glass.
metamorphic – altered in mineral composition, chemical composition, and structure by heat, pressure, and hot fluids at some depth below the earth's surface; applied to rocks of igneous and sedimentary origin.
metasedimentary – consisting of sedimentary rock that shows evidence of having been subject to metamorphism; examples include quartzite (= metasandstone) and metasiltstone.
mi – mile(s).
microclimate – the local climate of a small site; this may vary from the climate of the larger, surrounding area due to aspect, tree cover, elevation, wind exposure, and other local factors.
microhabitat – within a habitat, a subdivision or precise location that has distinctive environmental characteristics; e.g., a tree-base hummock in a flooded swamp.
microtopography – the fine-scale variation in topography within a habitat; e.g., the pattern of vertical rock faces, shelves, and crevices on a cliff.

monospecific – consisting wholly or largely of a single species.
moss - a nonvascular chlorophyll-containing plant closely related to liverworts and hornworts, but differing in reproductive structures.
muscovite – a mineral of the mica group that is common in gneisses and schists; also known as "white mica."
natural community - those ecological communities which have experienced only minimal human alteration or have recovered from anthropogenic disturbance under mostly natural regimes of species interaction and disturbance. No portion of Virginia's landscape, however, has altogether escaped modern human impacts – direct or indirect – and only a few small, isolated habitats support communities essentially unchanged from their condition before European settlement.
natural heritage resources – as defined in the Virginia Natural Area Preserves Act these are "…the habitat of rare, threatened, or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest." (Code of Virginia, section 10.1-209, et seq.).
non-vascular – lacking a structural system of tissue (xylem and phloem) that conducts water and soluble nutrients; non-vascular plants include mosses, lichens, and liverworts.
oligotrophic – infertile; nutrient-poor.
operations management – those components of natural areas stewardship pertaining to or impinging on non-biological features of natural area preserves. Examples of operations management activities include public access facilities development and maintenance, boundary line marking, sign installation, law and regulation enforcement, and ensuring visitor safety.
overstory – the uppermost layer of trees forming the canopy of a forest or woodland.
Paleozoic – the era of geologic time from 600 to 230 million years ago.
patch-dominant – a species that exerts dominance by forming dense but spatially discrete colonies; such a species typically varies from abundant to completely absent within a given habitat.
pathogen – an organism that causes disease in another organism.
pH – a value on the scale 0 to 14 that gives a measure of the acidity or alkalinity of a medium.
physiognomic – of or pertaining to vegetative form and structure.
physiognomy – the form and structure of vegetation.
phytogeography – the study of the geographic distribution of plants and vegetation , with an emphasis on environmental determinants of distribution.
Pleistocene – the first Epoch of the Quaternary Period of geologic time, from approximately two million to ten thousand years ago.
prescribed burn plan – a written statement defining the objectives to be attained as well as the conditions of temperature, humidity, wind direction and speed, fuel moisture, and soil moisture, under which a fire will be allowed to burn. A prescription is generally expressed as acceptable ranges of the prescription elements, and the limit of the geographic area to be covered.
prescribed fire – a management ignited wildland fire that burns under specified conditions where the fire is confined to a predetermined area and produces the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

pyrophytic – of or pertaining to plants or vegetation adapted to environments in which fire is an important ecological process.
quartzite –metamorphosed sandstone.
rare species – species believed to be sufficiently rare or threatened in Virginia to merit an inventory of their status and locations by DNH.
recruitment – generally, the trees involved in natural supplementation of a forest stand; more specifically, trees that have entered a particular category (age or size class) during a given period.
refugia – sites where plants or vegetation that formerly had much wider distributions have survived locally through periods of unfavorable conditions in a region.
regolith – all unconsolidated earth materials above solid bedrock.
rhizomatous – having a horizontal, creeping, perennial rootstock that produces smaller roots and vegetative shoots.
riparian – of the area beside a stream, especially a river.
rill – a small streamlet or rivulet.
ruderal vegetation – vegetation resulting from succession following anthropogenic disturbance of an area; generally characterized by unnatural combinations of species (primarily native though including small to substantial numbers of exotics) and relatively short persistence in the absence of additional disturbance.
sandstone – a medium-grained sedimentary rock composed of rounded sand grains cemented together by silica, iron oxide, or calcium carbonate.
saturated – wet for extended periods during the growing season, but never or rarely flooded by surface water; usually applied to wetlands maintained by seepage inputs or perched water tables.
schist – a metamorphic rock containing abundant, visible platy minerals (*e.g.*, mica), giving it a pronounced foliation and cleavage.
sedimentary – formed from the deposition and compression of mineral and rock particles, and sometimes material of organic origin; examples of sedimentary rocks include sandstone, shale, and limestone.
seep – a small area of groundwater discharge, either non-forested or shaded by trees rooted in adjacent, upland habitats; seeps generally support characteristic herbaceous wetland species but are too small or narrow to support hydrophytic woody vegetation.
seepage swamp – a large area of groundwater discharge supporting wetland forest or shrubland vegetation.
seral – of or pertaining to an intermediate or transitional stage in plant succession.
serotinous cone – the cone of a pine that remains closed for a period of time, sometimes years, following maturation; the opening of such cones are often triggered by the heat of fires; a reproductive adaptation that ensures seed dispersal under optimal conditions.
site operations – in the context of natural areas management, those activities that deal with boundaries, facilities, access, signage, public safety, and other human use issues.
smoke management – application of fire intensities and meteorological processes to minimize degradation of air quality during prescribed fires.
snag – a standing dead tree.
sp. – a species.
spp. - species (plural).

spring ephemeral – a plant that completes its reproductive cycle early in the growing season, typically before or during the period in which trees leaf out; such species usually die back and become dormant during unfavorable summer months when habitats are characterized by high temperatures and deep shade.
ssp. – subspecies, a taxonomic rank below species.
stewardship – in the context of natural areas management, the combination of three primary components – biological resource management, site operations, and fire management – with the objective of perpetuating occurrences of natural heritage resources and preserving inherent biological diversity.
stratigraphy – the arrangement of bedrock strata, particularly their geographic position and chronological order of sequence.
stratum – a distinct vertical layer of vegetation defined by relative height (e.g., overstory, understory) and/or by a specific range of heights.
sub-canopy – the understory tree layer immediately below the overstory.
submesic – somewhat moist but well drained, or intermediate between dry and moist; dry-mesic.
subxeric – somewhat dry and drought-prone; intermediate between submesic and xeric.
succession – natural change in the composition and structure of a plant community over time in the absence of disturbance.
successional – of or pertaining to the process of succession.
surface substrate – a collective term for the abiotic materials (e.g., leaf litter, rocks, dead wood) that constitute the ground cover of a site.
terrestrial – of or pertaining to upland (non-wetland) environments.
Triassic – the earliest period of the Mesozoic Era, from approximately 225 million to 190 million years ago.
umbilicate lichen - a leaf-like lichen attached to rocks by a single cord; umbilicate lichens, especially those of the genus *Umbilicaria*, are often referred to as "rock tripes."
understory – collective term for the small trees and shrubs growing beneath the canopy in a forest or woodland.
var. – variety, a taxonomic rank below species.
vascular – having a structural system of tissue (xylem and phloem) that conducts water and soluble nutrients; vascular plants include ferns and flowering plants.
vegetation – the plant life of an area, including its floristic composition, structure, biomass, and phenology.
watch-list species – species of uncommon or uncertain status in Virginia. More information is needed on these species, which may or may not be of high conservation concern at this time; these species are monitored for general population trends.
woodland – vegetation dominated by trees (≥ 20 ft tall) producing an open canopy, typically with 5-60% cover; such vegetation with canopy cover from 5 to 25% is referred to as a sparse woodland; some woodlands may have > 60% canopy cover following elimination or reduction of natural disturbances (e.g., fire).

Appendix 9: Final Working Draft Thurston Haworth Recreation Area Management Plan

THURSTON HAWORTH RECREATION AREA MANAGEMENT PLAN

Prepared by:

MIDDLE PENINSULA CHESAPEAKE BAY PUBLIC ACCESS AUTHORITY

In cooperation with:

Virginia Coastal Zone Management Program (Department of Environmental Quality)
National Oceanic and Atmospheric Administration
Dragon Run Steering Committee
The Nature Conservancy

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Middle Peninsula Chesapeake Bay Public Access Authority
P.O. Box 286
Saluda, Virginia 23149
804-758-2311

Executive Summary

The Thurston Haworth Land Management Plan (THLMP) provides guidance in managing the 167-acre Thurston Haworth Recreation Area in King and Queen County, Virginia. The Middle Peninsula Chesapeake Bay Public Access Authority (MPCBPA) purchased the Thurston Haworth Recreational Area with grants from the Virginia Coastal Zone Management Program at the Department of Environmental Quality, in order to protect coastal resources and provide public access within the Dragon Run watershed, a tributary of the Chesapeake Bay. The process of developing the plan was designed to give maximum consideration to input by stakeholders to include local government officials, private organizations, and concerned citizens.

Section One provides an overview of the property and describes the process leading to development of this comprehensive management document. MPCBPAA staff met with stakeholders early in 2008 and collected input about the types of activities envisioned on the site.

Ultimately, MPCBPAA staff devised three alternatives to address proposed uses and concerns with respect to management of significant natural and cultural resources and development of future recreational facilities. MPCBPAA staff articulated stakeholder input (for full report on stakeholder input, see Appendix 3) in this document by grouping suggested uses into three alternatives. The emphasis of Alternatives 1-3 range from a focus on recreational usage and infrastructure development (Alternative 1) to a greater emphasis on natural resources preservation (Alternative 3). For instance, whereas horseback riding is a permitted use in all of the alternatives, Alternative 1 would allow for more intensive development of trail infrastructure to possibly include water troughs, jumps, and hitching posts. Additionally, more miles of trails could be constructed to accommodate future horseback riders in the area, giving Alternative 1 a *recreational emphasis*. Conversely, Alternative 3 would provide the same or fewer miles of trails but offer no infrastructure improvements, allowing the user to experience his or her natural surroundings and giving Alternative 3 a *natural resource emphasis*.

After careful consideration of management alternatives, the Authority decided to blend Alternatives 2 and 3. A blending of alternatives is designed to offer balanced recreational use with conserving the area's unique natural and ecological characteristics. Specifically, this alternative seeks to increase multi-use recreational opportunities while protecting significant natural resources and improving land health.

The Authority plans to implement the following:

1. Establish recreational "use zones" to geographically separate activities that have a high potential for conflict and limit recreational access to conservation areas. Use zones include, but are not limited to hunting, hiking, horseback riding, and nature viewing;

2. Expand existing trail networks and create a limited number of new trails within these zones to establish linkages and accommodate compatible uses;

3. Install interpretive and directional signs and kiosks to enhance the recreational and educational experience of visitors and control visitation in high-use areas where there is an elevated potential for conflict;

4. Regulate maintenance of trails and facilities to enhance user experiences and minimize erosion;

5. Construct a new footbridge across the Dragon Run;

6. Establish one or more multi-purpose, water access sites;

7. Establish larger “resource protection zones” and “special management areas” to demonstrate best management practices for managing timber and other natural resources in these areas, to include the re-planting of native tree and plant species and mixed-hardwood forests;

8. Protect wildlife and improve wildlife habitat by creating corridors and open areas for movement;

9. Maintain forested buffers along streams to preserve water quality and protect riparian resources; and

10. Identify areas that contain important riparian, wildlife, archeological, paleontological, or soil resources and limiting recreational usage in these areas.

Section Two describes objectives and management strategies for a number of recreational activities advocated by stakeholders, including horseback riding, biking, hiking, hunting, and education/interpretive activities. The section should not be interpreted to serve as a comprehensive recreational facilities plan, nor will all of these uses be permitted under the preferred management alternative. Rather, this section merely describes the range of recreational activities possible within the Thurston Haworth Recreational Area and articulates objectives and strategies for managing facilities designed to accommodate those activities.

Section Three contains appendices including the maps of the tract, the listing the names of stakeholders and the report on stakeholder input gathered during the meetings held in early 2008.

SECTION ONE: MANAGEMENT ALTERNATIVES AND ENVIRONMENTAL CONSEQUENCES

Introduction and Legislative Authorization

The Middle Peninsula Chesapeake Bay Public Access Authority (MPCBPAA) has prepared this Thurston Haworth Land Management Plan (THLMP) to provide guidance in managing the 167-acre Thurston Haworth Recreational Area located in King and Queen County in eastern Virginia. (Maps 1 and 2)

Management guidelines developed in this THLMP apply to the Thurston Haworth Recreation Area and do not address management of other Authority holdings or private lands. Virginia State Code, 15.2-6600 through 15.2-6625, known as the Middle Peninsula Chesapeake Bay Public Access Authority Act, directs the Authority to develop appropriate acquisition and site management plans for public access usage.

Establishment of the Middle Peninsula Chesapeake Bay Public Access Authority

In 2003, the Virginia General Assembly approved House Bill 619, creating the institutional framework for Middle Peninsula local governments to address public access on a regional basis and enabling the creation of the Middle Peninsula Chesapeake Bay Public Access Authority (MPCBPAA). The MPCBPAA began officially on June 13, 2003, upon the signing of the Operating Agreement by elected officials and local government administrators from member jurisdictions in the Middle Peninsula. These include the counties of Essex, Gloucester, King and Queen, King William, and Mathews and the towns of Tappahannock, Urbanna, and West Point. The MPCBPAA is a political subdivision that serves the public access needs of the encompassed communities along more than 1,000 square miles of the Virginia coastal zone. It was enabled to identify, acquire, and manage water access opportunities that could be used by the general public for passive and active activities. The MPCBPAA frequently partners with state and federal agencies, non-governmental organizations, and private citizens to promote land acquisition and the enhancement of public access in the Middle Peninsula region. Since its inception, the MPCBPAA has leveraged almost $3 million for public access acquisitions and improvements.

The MPCBPAA recognizes that shorelines are high priority natural areas. As the Middle Peninsula becomes more densely populated and development along the waterfront intensifies, it is critical that localities conserve public access sites for all types of recreational activities. These activities associated with Chesapeake Bay rivers, embayments, tidal creeks, lakes, and marshes are vital to the citizens, economy, and natural maritime heritage of the Commonwealth. Sustainability and expansion of sites across the region are critical due to the scarcity of prime water access sites and the time required to develop new sites. The MPCBPAA continues to acquire and manage fee simple or public access rights on parcels, such as the Thurston Haworth Recreation Area, thereby creating and/or enhancing access points to Middle Peninsula waterways.

Ecological Value of the Dragon Run Watershed

As one of the Chesapeake Bay's most pristine watersheds, the Dragon Run meanders approximately 40 miles through vast, untouched swamp forest and woodland communities (Belden et al. 2001). At 89,771 acres, it envelops remote portions of four Eastern Virginia counties – Essex, King and Queen, Middlesex, and Gloucester and is connected, by its creation of the Piankatank River, to the Chesapeake Bay (Dragon Run Steering Committee 2003a). The watershed is mainly undeveloped and composed almost entirely of expansive, privately-owned floodplains, baldcypress swamps, upland forest systems, and open agricultural fields. Approximately 80% of the watershed is forested, compared to a statewide average of less than 70% (Middle Peninsula Planning District Commission 2002; Dragon Run Steering Committee 2003b; Virginia Department of Conservation and Recreation 2003). Only about 15% of the watershed is open to agricultural uses; however, the majority of the Dragon Run is zoned for agriculture, with varying restrictions and allowances across county boundaries. Additionally, about 4% of the watershed is open water, and only 1% is urbanized (Middle Peninsula Planning District Commission 2002; Dragon Run Steering Committee 2003b; Virginia Department of Conservation and Recreation 2003).

The Dragon Run watershed plays an important ecological role as part of a 225,000 acre forested block between the Pamunkey and Rappahannock Rivers (The Nature Conservancy 2003). This block represents the largest relatively non-fragmented forest in the lower Chesapeake Bay (Belden et al. 2001). The Dragon supports five rare, natural communities, including the non-tidal baldcypress-tupelo swamp, tidal baldcypress-tupelo swamp, tidal baldcypress woodland, fluvial terrace woodland, and the tidal freshwater marsh (Belden et al. 2001; Fleming et al. 2001; Belden et al. 2003; Dragon Run Steering Committee 2003a, b; Fleming et al. 2006). The baldcypress-tupelo swamp represents the northernmost non-tidal and tidal occurrence of the natural community along the eastern coast of the United States (Belden et al. 2001; The Nature Conservancy 2001; Dragon Run Steering Committee 2003a, b). While harvest of mature baldcypress trees occurred historically, it is no longer active. As a result, many trees in the Dragon Run watershed range from 150 to more than 400 years of age.

The Dragon's habitat has been estimated to support between 14 and 25 state and globally rare plants and animals (Belden et al. 2001; Belden et al. 2003; Dragon Run Steering Committee 2003a, b). Rare plants include the cuckoo flower, cypress-knee sedge, yellow water buttercup, pinebarren ticktrefoil, red turtlehead, and river bulrush (Belden et al. 2001; Fleming et al. 2001; The Nature Conservancy 2001; Belden et al. 2003; Dragon Run Steering Committee 2003a, b; Fleming et al. 2006). The piebald white tail deer, masked bobwhite, tiger salamander, great purple hairstreak, southern pitcher-plant mosquito, cypress sphinx, Selys' sundragon, blackwater bluet, fine-lined emerald, and robust baskettail are just some of the rare animals that have been observed in Dragon Run (Belden et al. 2001; The Nature Conservancy 2001; Belden et al. 2003; Dragon Run Steering Committee 2003a, b). The heavily-protected bald eagle, which was delisted from the Federal List of Endangered and Threatened Wildlife and Plants on June 28, 2007, also has been sited frequently throughout the watershed.

In addition to rare natural communities, plants, and animals, the Dragon Run supports a diversity of freshwater and estuarine fishes, aquatic macroinvertebrates, and freshwater bivalves

(McIninch et al. 2003). At least 45 fish species and 6 macroinvertebrate species have been recorded to-date. Based on his investigations of the watershed's aquatic communities, one researcher observed that the Dragon Run is a "100 year-old time capsule" similar to coastal plain streams of the Chesapeake Bay in the early 1900's (Garman 2003). If permanently protected as a non-fragmented ecosystem, the watershed will continue to support numerous plant and wildlife populations. Additional acquisitions, such as like the Thurston Haworth Recreation Area, are necessary to further conservation efforts by linking a network of currently-protected forest and swamp lands with acreage adjacent to them.

The importance of the Dragon Run watershed is supported by its identification as a high priority site for protection efforts in several comprehensive conservation plans. In "Natural Areas of the Chesapeake Bay Region: Ecological Priorities" (Jenkins 1974), a comprehensive report published by the Smithsonian Institute that ranked 232 areas in the Chesapeake Bay watershed based on their ecological value, the Dragon Run watershed was ranked second overall and first in Virginia due to its swamp forests, hardwoods, and organismal diversity. The Nature Conservancy, which at any point in time owns and manages between 500 and 4,000 acres in the watershed, designated the Dragon Run an "Aquatic Portfolio", a "10-Year Action Site", and a "Significant Conservation Area" with an abundance of native fish species and excellent water quality in "The Chesapeake Rivers Site Conservation Plan" (2001) and its "Chesapeake Bay Lowlands Ecoregional Plan" (2003). Additionally, the Virginia Conservation Lands Needs Assessment developed by the Virginia Department of Conservation and Recreation, Division of Natural Heritage, which identifies priority cores, corridors, and stream conservation units in Virginia, ranked 58% of the watershed as a priority area for habitat conservation. The Virginia Natural Heritage Program and NatureServe have classified Dragon Run as a high priority area for acquisition and protection. The "Virginia Outdoors Plan" also identifies Dragon Run as an exceptional area for outdoor recreation, particularly for its kayaking and canoeing opportunities and its abundance of natural heritage resources (Virginia Department of Conservation and Recreation 2007).

Recognizing the importance of the Dragon Run watershed locally and regionally, the Virginia Coastal Zone Management Program, the Dragon Run Steering Committee, and the Middle Peninsula Planning District Commission entered into a partnership to address the future of the watershed. From this collaboration, the Dragon Run Watershed Special Area Management Plan (SAMP) was developed in 2001. The Dragon Run SAMP advocates for a comprehensive approach to addressing the future of the watershed that balances land use regulations, voluntary agriculture and forestry program participation, education, outreach, and land conservation. Three of the four counties in the watershed have adopted the Dragon Run SAMP as an amendment to their comprehensive plans. Special zoning overlays are currently being developed for each county that will strengthen natural resource protection in the watershed.

Purpose of and Need for Action

The purpose of this THLMP includes developing a thorough, practical management document, for the public, that defines management policies and actions and describes management goals and objectives for the Thurston Haworth Recreation Area.

The planning process for the THLMP began on February 12, 2008 with the first of seven stakeholder meetings to discuss the strengths, weaknesses, opportunities, and threats for the Thurston Haworth Recreation Area. Stakeholders (identified in Appendix 2) were introduced to the Coastal and Estuarine Land Conservation Program (CELCP) at the National Oceanic and Atmospheric Administration (NOAA) and were asked to brainstorm a list of uses they would like to see or not see on the property, following established CELCP regulations. The guiding principle was the need to allow for a range of passive and low-impact uses associated with land- and water-based ecosystems while protecting the surrounding habitat core and maintaining traditional uses in the Dragon Run watershed. Staff incorporated the input from the stakeholders into a report shown in Appendix 3.

In addition to landowner stakeholders, the MPCBPAA received guidance from a variety of sources to assist in the development of the THLMP, including enabling legislation, CELCP federal guidelines, input from MPCBPAA members, resource experts, Dragon Run SAMP representation and land management agencies. This plan represents the collaboration and communication of many diverse groups including local citizens, non-governmental organizations, and a number of local, state, and federal government agencies.

Thurston Haworth Recreation Area History

According to the deed, the Thurston Haworth Recreation Area lies along the north line of State Route 608 in King and Queen County and contains 167.19 acres of land (Map 1). The property has 1000 feet of roadside frontage, approximately 10 acres of which is suitable for rural residential development. Of its 167 acres, 69 acres are palustrine forested wetland and greater than 88 acres are raw timberland forest. Significant stream frontage how much?? also secures public access to the waterways within and adjacent to the Dragon Run. Historically, the site has been managed for commercial grade saw timber, primarily loblolly pine. The site is characterized by sandy, loamy soils with relatively level topography (Map 2). According to the "Soil Survey of King and Queen County, Virginia", developed by the Natural Resources Conservation Service and the U.S. Department of Agriculture, in cooperation with Virginia Polytechnic Institute and State University (2007), the soils adjacent to the Dragon Run, in the flood plain, and further upland on the Thurston Haworth Recreation Area consist of an Emporia-Slagle-Rumford complex and a State Fine Sandy Loam. Both soil types are well drained, well suited for farmland, and moderately suited for woodland. Overall, they support forest growth dominated by loblolly pine, Virginia pine, sweetgum, southern red oak, and yellow poplar. The Thurston Haworth Recreation Area is located within a high priority habitat core and corridor, as identified in the Virginia Conservation Lands Needs Assessment, making it a priority for habitat conservation and acquisition.

Thurston Haworth Recreation Area Restrictions

The acquisition of all 167.19 acres of the Thurston Haworth Recreation Area was funded by a Coastal and Estuarine Land Conservation Program grant from the National Oceanic and Atmospheric Administration under the Coastal Zone Management Act of 1972, as amended. The grant was administered by the Virginia Coastal Zone Management Program at the

Department of Environmental Quality and is subject to the terms of such grant. Specifically, the deed conveyed to the MPCBPAA contains the following language:

> "This property has been acquired with funds from a Federal financial assistance award. Title to the property conveyed by this deed shall vest in the Middle Peninsula Chesapeake Bay Public Access Authority subject to disposition instructions from NOAA or its successor agencies. The property shall be managed for conservation purposes and shall be consistent with the purposes for which it was entered into through the Coastal and Estuarine Land Conservation Program. The Middle Peninsula Chesapeake Bay Public Access Authority shall not dispose of, encumber its title or other interests in, or change the use of this property without approval of NOAA or its successor agencies."

Acquisition of the Thurston Haworth Recreation Area supports the MPCBPAA's guiding principle to provide access opportunities to the waterways of Virginia's Middle Peninsula. It also upholds the CELCP mission to protect coastal and estuarine lands considered important for their ecological, conservation, recreational, historical or aesthetic value. Additionally, conservation of the property supports the Virginia Coastal Zone Management Program's commitment to protect geographic areas of particular concern in the coastal zone, as well as the goals of the Dragon Run SAMP (see http://www.mppdc.com/projects/factsheet2.pdf) to protect the natural resources and maintain traditional uses, while protecting property rights. The Thurston Haworth Recreation Area will be managed in a manner that encourages long-term, passive and low-impact public access, resource protection, and sustainable traditional uses that adhere to CELCP federal guidelines. The following language in the CELCP Final Guidelines from June 2003 defines those uses which are or are not consistent with the purposes for which the Thurston Haworth Recreation Area was entered into the program:

> "Activities that may be considered to be consistent with conservation purposes include: resource protection; restoration and enhancement, such as vegetative erosion control or restoration of natural water flow to the area; recreational activities, such as: hiking, hunting, and fishing; access for swimming, canoeing, kayaking; and research and educational activities. Construction of facilities on a minor scale, such as restrooms or boardwalks, to facilitate these activities and/or for the purpose of minimizing harm to coastal resources due to public access and recreation may be allowed depending on the proposed use of the property and the site environment.
>
> Activities that are considered to be inconsistent include: active agricultural or aquaculture production; shoreline armoring or other hard erosion control structures; construction or expansion of roads, buildings or facilities except as noted above, or such facilities for active recreation as sports facilities, water parks, playgrounds, or similar uses."

Management of the Thurston Haworth Recreation Area will be consistent with the CELCP Final Guidelines from June 2003 to protect the unique ecological characteristics of the property and the surrounding habitat core for the enjoyment of present and future generations. Adherence to CELCP guidelines will ensure that traditional uses in the watershed, such as fishing, hunting, and forestry management and current passive and low-impact recreational trends and opportunities are also maintained to the maximum extent possible.

Management Use and Alternatives

Through an integrated planning process involving stakeholder participation, the MPCBPAA staff developed several alternatives for managing the Thurston Haworth Recreation Area‘s natural, cultural, and recreational resources. The ultimate objective of these alternatives is to preserve and protect the unique ecological characteristics of the Thurston Haworth Recreation Area for the enjoyment of present and future generations, while maintaining current recreational trends and opportunities to the maximum extent possible. Each alternative emphasizes a combination of proposed uses based on a thorough consideration of the following factors:

• The level of impact proposed uses and alternatives are likely to impose on the health and integrity of the area’s natural and cultural resources;

• The potential for conflict between uses as well as the nature of the anticipated conflict;

• The extent to which alternatives and uses advance the guiding principles and resource protection concerns of the MPCBPAA, including, but not limited, to how well each fulfills the purpose of the Thurston Haworth Recreation Area acquisition and addresses the need for the project; and

• The extent to which alternatives and uses meet all local, state and federal laws and regulations controlling the use of the property.

The emphasis of each of the management alternatives is described in detail below and summarized in Chart #1. When considered as a whole, the emphasis of these alternatives, as well as the objectives and implementation strategies associated with them, reflect the range of uses to which the Thurston Haworth Recreation Area could be put. These uses range from intensive management of the area’s natural resources to intensive and extensive development of recreational opportunities, meaning both the *type of facilities* developed and the *number of facilities* or *total acreage* devoted to a particular activity. For instance, whereas horseback riding is a permitted use in all of the alternatives, Alternative 1 would allow for more intensive development of trail infrastructure to possibly include water troughs, hitching posts and other equestrian amenities. Additionally, more miles of trails could be constructed to accommodate future horseback riders in the area, giving Alternative 1 a *recreational emphasis*. Conversely, Alternative 3 would provide the same or fewer miles of trails but offer no infrastructure improvements, allowing the user to experience his or her natural surroundings and giving Alternative 3 a *natural resource emphasis*.

Chart 1: Management Alternatives: Recreational vs. Natural Resource Emphasis

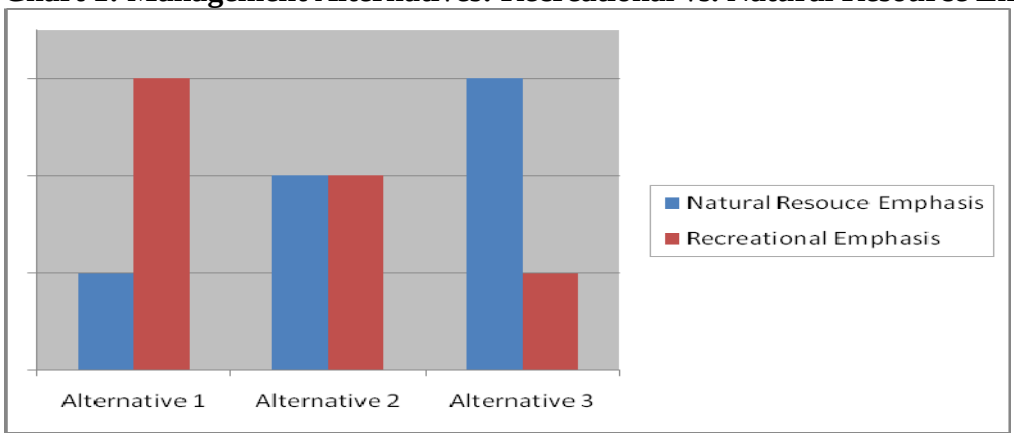


Chart 1 illustrates an important principle that guided the conception of these alternatives: Recreational opportunities vary inversely with natural resource management imperatives. Specifically, the emphasis of the alternatives, meaning the amount of land reserved for recreational purposes and/or the variety or recreational opportunities provided, decreases from Alternative 1 to Alternative 3 as natural resource management and environmental protection concerns are increasingly emphasized.

At first glance, Chart 1 appears to suggest that natural resource management and the provision of recreational opportunities are mutually exclusive. This, of course, is not necessarily the case. Although some recreational activities conflict with resource protection imperatives, other types of recreation enhance resource management strategies and vise versa. Nevertheless, these alternatives reflect the belief that only a certain number of activities and uses are possible within an area the size of the Thurston Haworth Recreation Area, and that small public lands cannot provide as many public benefits or meet as many expectations as larger holdings.

Description of Alternatives

The emphasis, objectives, and implementation measures for each of the alternatives are described below.

Alternative 1

Emphasis:
The emphasis of this alternative is to maximize multiple-use, recreational opportunities while conserving and protecting natural resources to the maximum extent possible.

Objectives:
Objectives for this alternative attempt to satisfy the increasing demand for a variety of recreational opportunities in the area. A variety of multi-use, recreational activities will be permitted except in specific areas where these activities conflict with the need to protect significant natural and cultural resources.

Recreational activities will be concentrated in certain areas or "zones" to limit conflict among user groups and mitigate dispersed recreational impacts. Traditional activities such as hunting, fishing, and hiking will be preserved and enhanced to give users a more enjoyable experience. Opportunities for additional activities such as mountain biking, horseback riding, limited-access paddling, and educational/interpretive activities will be created by improving existing facilities and developing new infrastructure.

A small number of "no impact" or "special management" areas will be identified to establish sound natural resource management practices and limit certain recreational activities that are incompatible with these practices. In addition, certain recreational activities may not be permitted within environmentally sensitive areas.

Implementation:
Implementation of this alternative will require the creation and expansion of recreational facilities to include the following actions:

1. Establishing recreational "zones" to geographically separate activities that have a high potential for conflict and limit recreational access to a small number of resource conservation areas;

2. Expanding existing trail networks and creating new trails within these zones to establish linkages and accommodate compatible uses wherever possible;

3. Installing interpretive, directional, and informational signs and kiosks to enhance the recreational and educational experience of visitors, demarcate site boundary to prevent trespass, and control visitation in high-use areas where there is an elevated potential for conflict;

4. Providing regular maintenance of trails and facilities, including access roads and parking lots, to enhance user experiences and minimize erosion;

5. Constructing one or more new boardwalks with kayak launch or similar feature to provide access the Dragon Run;

6. Establishing several "no impact zones" or "special management areas" to demonstrate best management practices for managing timber and other natural resources in these areas.

Alternative 2

Emphasis:
The emphasis of this alternative is to increase multi-use recreational opportunities while protecting significant natural resources and improving land health.

Objectives:
Objectives for this alternative attempt to balance the increasing demand for recreational opportunities with the need to conserve natural resources and restore areas that have been impacted by development. Resource management and recreational activities will be concentrated

in certain areas or “zones” to minimize conflict and mitigate dispersed impacts to significant natural and cultural resources.

Traditional recreation such as hunting, fishing, and hiking will be preserved and expanded as long as they do not conflict with ongoing natural resource management activities. Additional opportunities such as horseback riding, mountain biking, limited access paddling, and environmental/interpretive activities will be created with a bias towards low- to moderate impact recreational uses.

This alternative will enhance the experience of visitors while limiting access to a larger number of “no impact” and “special management” areas as well as areas containing important species and natural communities. Active monitoring of land health and user impacts will be needed to determine if resource management activities and efforts to preserve the unique natural characteristics of the area are compatible with recreational usage of the Thurston Haworth Recreation Area. Monitoring will also determine the extent to which timber harvesting and multi-use recreational activities impact ecological resources.

Implementation:
Implementation of this alternative will require the expansion of recreational facilities and natural resource protection areas to include the following actions:

1. Establish recreational “use zones” to geographically separate activities that have a high potential for conflict and limit recreational access to conservation areas. Use zones include, but are not limited to hunting, hiking, horseback riding, and nature viewing;

2. Expanding existing trail networks and creating a limited number of new trails within these zones to establish linkages and accommodate compatible uses;

3. Installing interpretive and directional signs and kiosks to enhance the recreational and educational experience of visitors, demarcate site boundaries to prevent trespass, and control visitation in high-use areas where there is an elevated potential for conflict;

4. Providing regular maintenance of trails and facilities, including access roads and parking lots, to enhance user experiences and minimize erosion;

5. Constructing one or more new boardwalks with kayak launch or similar feature to provide access the Dragon Run;

6. Establishing larger “no impact zones” and “special management areas” to demonstrate best management practices for managing timber and other natural resources in these areas;

7. Protecting wildlife and improving wildlife habitat by creating corridors and open areas for movement;

8. Maintain forested buffers along streams to preserve water quality and protect riparian resources.

9. Monitoring for and managing invasive species on site

Alternative 3

Emphasis:
The emphasis of this alternative is to maximize the conservation of natural resources on the Thurston Haworth Recreation Area while maintaining recreational opportunities to the greatest extent possible.

Objectives:
The objectives for this alternative give natural resource considerations priority over the creation of multi-use recreational opportunities. Resource management practices will attempt to restore land health and preserve the natural character of the area while enhancing low-impact recreational opportunities.

Traditional recreation such as hunting, fishing, and hiking will be preserved but limited to areas where these activities are compatible with resource management strategies. Recreational usage of environmentally sensitive areas or areas where significant ecological resources exist will be restricted or prohibited. Educational and interpretive opportunities will be expanded to expose visitors to the unique natural and cultural characteristics of the Thurston Haworth Recreation Area and efforts to preserve the area for the enjoyment of future generations. A limited number of opportunities for biking, horseback riding, and/or limited-access paddling may be created if evidence suggests that developing these new facilities will not significantly impact environmental resources or natural resource management.

This alternative will seek to educate visitors about resource management activities taking place in “special management” areas, environmentally sensitive areas, and places where land managers are re-establishing native, natural communities. Aggressive monitoring of environmental indicators will be needed to determine if resource management activities are improving wildlife habitat, preserving and enhancing water quality, and restoring the health of land impacted by development. Monitoring will also determine the extent to which traditional activities such as timber harvesting, hunting, and fishing affect biological diversity and wildlife populations, as well as the nature of those impacts.

Implementation:
1. Confining recreational activities to appropriate areas and restricting or prohibiting recreational access to environmentally sensitive areas by creating “recreation buffer zones”.

2. Maintaining existing trail networks and creating a limited number of new trails where appropriate to establish linkages and accommodate compatible uses;

3. Installing interpretive and directional signs and kiosks to enhance the recreational and educational experience of visitors, demarcate site boundaries to prevent trespass, and control visitation in high-use areas where there is an elevated potential for conflict;

4. Providing regular maintenance of trails and facilities to enhance user experiences and minimize erosion;

5. Constructing one or more new boardwalks with kayak launch or similar feature to provide access the Dragon Run;

6. Establishing one or more multi-purpose, water access sites;

7. Identifying areas that contain important riparian, wildlife, archeological, paleontological, or soil resources and limiting recreational usage in these areas.

8. Establishing "no impact" and "special management areas" throughout the Thurston Haworth Recreation Area to demonstrate best management practices for restoring land health in these areas;

9. Using a high percentage of native tree and plant species to restore areas impacted by development;

10. Protecting wildlife and improving wildlife habitat to the maximum extent possible by creating corridors and open areas for movement;

11. Maintain forested buffers along streams to preserve water quality and protect riparian resources.

12. Monitoring and managing invasive species on site

Environmental Considerations

None of the alternatives described above are inherently detrimental to the area's natural and cultural resources. Although Alternatives 1 and 2 offer some potential for impacts to natural resources by allowing for increased recreational use and some timber extraction activities, adverse effects can be controlled through implementation of sound management practices. In Alternative 3, timber removal and "thinning" operations will be limited to only what is necessary to conserve and best manage natural resources, and only low-impact recreational opportunities consistent with these objectives will be permitted.

Nevertheless, the MPCBPAA shall implement active management practices to fully protect natural resources and minimize impacts associated with increased usage. As deemed necessary by the Authority, management practices will address issues associated with recreational usage such as on-site sewage disposal, trash pick-up at parking lots and trailheads, and maintenance of trails and facilities. Additionally, the MPCBPAA will seek to procure personnel and equipment from resources, such as the Coastal Program Technical Assistance and NOAA funds, to implement natural resource management strategies and conduct research. The condition of the area's natural environment will depend on how well these facilities are maintained and how effectively management tasks are carried out.

Selected Alternative

At the October 2008 meeting of the Authority, the MPCBPAA discussed and weighed the merits of each of the alternatives. The Board carefully considered the emphasis, objectives, and implementation strategies for each alternative and considered input provided at an earlier stakeholder meeting by concerned citizens, resource specialists, and other interested parties. The MPCBPAA selected Alternative 2, but planned to implement when appropriate specific strategies from Alternative 3. This "blending" of Alternatives 2 and 3 allows the MPCBPAA to pursue an approach to land management that emphasizes specific conservation strategies and passive recreational activities to be determined as the implementation process evolves.

The Authority will:

1. Establish recreational "use zones" to geographically separate activities that have a high potential for conflict and limit recreational access to conservation areas. Use zones include, but are not limited to hunting, hiking, horseback riding, and nature viewing;

2. Expand existing trail networks and create a limited number of new trails within these zones to establish linkages and accommodate compatible uses;

3. Install interpretive and directional signs and kiosks to enhance the recreational and educational experience of visitors and control visitation in high-use areas where there is an elevated potential for conflict;

4. Regulate maintenance of trails and facilities to enhance user experiences and minimize erosion;

5. Construct a new footbridge across the Dragon Run

6. Establish one or more multi-purpose, water access sites;

7. Establish larger "resource protection zones" and "special management areas" to demonstrate best management practices for managing timber and other natural resources in these areas, to include the planting of native tree and plant species and mixed hardwood forests;

8. Protect wildlife and improve wildlife habitat by creating corridors and open areas for movement;

9. Maintain forested buffers along streams to preserve water quality and protect riparian resources; and

10. Identifying areas that contain important riparian, wildlife, archeological, paleontological, or soil resources and limiting recreational usage in these areas.

The Middle Peninsula Chesapeake Bay Public Access Authority will cooperate with all appropriate local, state, and federal authorities and agencies to implement the preferred

management system and ensure that the process is collaborative and establishes practices that are consistent with the goals of the Thurston Haworth Recreation Area acquisition.

To the maximum extent possible, the MPCBPAA will seek agreements with adjacent landowners to allow maintenance vehicles to right to access the property, including possible easements or right-of-way agreements.

SECTION TWO: OUTDOOR RECREATION OPPORTUNITIES AND MANAGEMENT

Introduction

This section describes the range of current and proposed recreational activities that may take place on the Thurston Haworth Recreation Area, as well as the objectives and strategies for managing these activities in the future.

Recreation Opportunities

The Thurston Haworth Recreation Area provides attractive settings for a variety of opportunities for passive and low-impact, dispersed, non-motorized outdoor recreation and nature appreciation. A number of natural attributes add to the attractiveness of the Thurston Haworth Recreation Area for visitors, including: natural beauty and tranquility; spectacular views, especially along the Dragon Run; unusual geological formations; variety in terrain, flora and fauna; and wildlife viewing opportunities. Recreational activities must be managed to ensure compatibility with wilderness conditions and to ensure uses are not detrimental to natural and cultural resources and are consistent with visitor expectations.

A detailed inventory of some potential recreational activities suggested by stakeholders is available in Appendix 3 of this document. This inventory includes activities such as walking, bicycling, horseback riding, bow hunting, fishing, paddling, educational outreach, scientific research, habitat management, and nature observation.

A survey of trails and facilities revealed that a number of unmarked and unmapped trails and routes used by local residents currently traverse the Thurston Haworth Recreation Area (Map 3). The existing informal trail system may be redesigned and enhanced to provide access to most of the property for low levels of use. However, concerns exist with respect to the ability of the informal trail network to sustain increased levels of use that could develop as a result of designating the area a public access site. Stakeholders have also voiced concerns about the potential conflicts between trail users including hikers, hunters, horseback riders, and mountain bikers.

In addition to the current recreational opportunities shown in Map 3, a number of facilities improvements should be made to accommodate proposed recreational activities and potentially expand current opportunities including horseback riding, hiking, mountain biking, hunting, fishing, and sightseeing.

Recreation Objectives

The following broad outdoor recreation objectives provide direction to the variety of possible recreation activities available to visitors:

1. Maintaining the remote, roadless, non-motorized wilderness qualities of the Thurston Haworth Recreation Area while allowing for a range of compatible, low-impact, public recreation opportunities that may be conducted from dawn until dusk. These may include activities such as

walking, hiking, horseback riding, bicycling, fishing, paddling, nature observation, photography, educational outreach, scientific research, and habitat and wildlife management;

2. Ensuring that recreational uses are managed and monitored for potential impacts to the natural, cultural, and historic values of the site, including wildlife ranges and populations;

3. Conserving traditional uses of the Dragon Run Watershed, such as fishing, hunting and forestry;

4. Ensuring public access to these the Thurston Haworth Recreation Area is not pre-empted by future possible commercial recreation activities, such as leased hunting lands;

5. Enhancing visitor awareness and appreciation of the natural and cultural values of the Thurston Haworth Recreation Area, as well as recreational practices and user safety;

6. Ensuring that recreation uses and management of the property are compatible with conservation values, the surrounding ecosystem and habitat corridor, and the purposes for which the site was entered into CELCP. The MPCBPAA will collaborate with the Virginia Department of Conservation and Recreation and the Virginia Department of Game and Inland Fisheries to maximize the potential for a networked system of multi-use and single-use trals, while minimizing negative impacts to the surrounding environment from increased recational usage. The MPCBPAA reserves the right, should the surrounding ecosystem suffer abuse or discernable negative impacts from any recreational use, user or user group, to restrict or prohibit that use, user, or user group.

7. Managing recreational activities to minimize conflicts between various user groups, to include prohibiting bicycle use on horseback riding trails and visa versa;

8. Providing educational materials on the public and private rights associated with using waterways and waterfront properties;

9. Ensuring that the public access site boundaries are demarcated effectively to prevent trespass on adjacent private properties; and

10. Providing accessible outdoor recreational opportunities for the disabled population when economically and logistically feasible.

Prohibited Activities

The following activities have been deemed to be prohibited either due to restrictions by the CELCP guidelines, hunting regulations or the MPCBPAA's overall objectives for the site:

- Active Agricultural Production
- Active Aquaculture Production
- Shoreline Armoring or Hard Erosion Control
- Construction or Expansion of Roads

- Construction of Buildings or Facilities (**Exceptions: Minor Infrastructure, such as Restrooms or Footbridges**)
- Construction of Playgrounds, Water Parks, Sports Facilities, or Similar Use Areas
- Leasing or Renting of the Property Unless Previously Authorized By the National Oceanic and Atmospheric Administration
- Target Shooting
- Any Form of Hunting Except For Archery
- Hunting During Non-Hunting Season (March–August Annually, Excluding About April 1–May 15 For Turkey Season)
- Camping
- Open Fires
- Use of Any All-Terrain, Off-Road, or Cross-Road Vehicle on the Property

Recreation Activities

This section describes activity-specific objectives and management strategies. The objectives and strategies for each of the recreational activities described below supports one or more of the broad objectives outlined in the preceding section.

Hiking and Nature Walking

Objective:
To ensure the continued use of the area for non-motorized public recreation and offer a primitive, informal backcountry trail network for high-quality hiking experiences in a wilderness setting while protecting the natural environment from possible deterioration as a result of these activities.

Strategies:
• Permit public recreation opportunities that are non-motorized, including hiking and crosscountry skiing;

• Install signage or permanent blazes to demarcate trails effectively and discourage off-trail usage. Signage also may be established to mark the mileage along different trails and to inform travelers about trails where passive foot travel is the only permissible use, where access is limited or not permitted, or where other users, such as horseback riders or bicyclists, may be utilizing trail facilities;

• Maintain a pack-in/pack-out policy with all waste to protect the integrity of the local ecosystem and surrounding habitat corridor; and

• Maintain and improve foot trails to increase the capacity of trails to withstand long-term use and recover from disturbance;

• Use/enhance natural routes wherever possible when developing trail facilities, and limit superfluous cutting of vegetation to protect the habitat and minimize erosion;

• Ensure that all signboards provide information on the public/ private rights regarding trespass, hazards of recreating in an undeveloped nature of the area, site specific information (prohibited activities, user code of conduct, etc), and a site specific map.

• Potentially construct a small boardwalk and interpretive signage, leading out to the cypress knee swamp, which will provide educational opportunities and more effectively manage or limit access in a sensitive area of the property;

• Potentially develop a single use

• Encourage all visitors who walk dogs on the property to maintain them on a leash or within manageable calling distance. Visitors must remove all fecal matter produced by their canine when exiting the property.

Horseback Riding

Objective:
To provide recreational horseback riding so as to minimize impacts on the natural environment and wildlife habitat as well as minimize conflicts between certain user groups.

Strategies:
• Promote a traditional, local public recreational use that is non-motorized and passive to low-impact in nature;

• Potentially enhance established and create new multi-use trails and natural routes to provide an extensive trail network that affords excellent horseback riding opportunities;

• Provide sufficient parking space to accommodate vehicles towing horse trailers;

• Develop signage at trailheads to inform horseback riders about trails where horses are permitted;

• Potentially design and develop trails and other facilities to be used by recreational horseback riding groups so the potential exists for small group excursions;

• Limit the number of horses per group and/or the number of groups per season;

• Prohibit bicycle use on designated horseback riding trails to eliminate the potential for conflict; and

• Specify management activities and usage levels for horseback riding that includes (a) requirements for packing in weed-free, pellet feed for horses; (b) specifications for locating any permanent support facilities, such as corrals or loading/unloading facilities, outside of public access site boundaries; (c) a requirement to limit commercial horse use to designated trails and

day trips, to the greatest extent possible; and (d) a requirement to establish mechanisms for monitoring the impacts of horse use on trail infrastructure.

Biking

Objective:
To permit bicycle use on the Thurston-Haworth Recreation Area multi-use trail system, while minimizing, to the maximum extent possible, environmental impacts associated with increased recreational usage and potential conflicts with other user groups.

Strategies:
• Restrict bicycle use to existing roads and designated areas and monitor for impacts;

• Develop signage to inform bikers about trails where bike use is permitted and sections of trails where hikers may also be using trail facilities;

• Adjust use levels or areas of use based on impacts over time; and

• Prohibit horseback riding use on designated bike trails to eliminate the potential for conflict.

Parking Facilities

Objective:
To provide adequate parking space and associated facilities at trailheads for recreational users.

Strategies:
• Post a sign-in sheet for all visitors to the property, which is accessible and visible and located adjacent to the hunting sign-in sheet. Develop parking area(s) and monitor use to determine future requirements parking facilities at trailheads;

• Provide sufficient parking space to accommodate school or church buses and vehicles towing horse trailers;

• Prevent vehicle access within area boundaries, except as provided for in the management plan with respect to (a) nature viewpoints for special observation and research; and (b) intensive recreation zones that may be required at a future date to accommodate special events; (c) accessible recreation opportunities for the disable population;

• Install restroom facilities and trash receptacles at parking areas to reduce environmental impacts associated with increased recreational usage; and

• Post signboards at parking areas to provide information on the public/ private rights regarding trespass, hazards of recreating in an undeveloped nature of the area, site specific information (recreation opportunities, prohibited activities, user code of conduct, etc), and a site specific map.

Recreational Guiding

Objective:
To provide an opportunity for ecologically-sound, guided nature tours that is consistent with the deed on the property, objectives of the MPCBPAA, and the purposes for which the Thurston-Haworth Recreation Area was entered into CELCP. Local ecotour guides, who are knowledgeable about and wish to protect the pristine nature of Dragon Run, offer the general public, especially school children, an opportunity to experience the watershed first-hand. Such experiences cultivate an understanding of and appreciation for the surrounding ecosystem; its conservation, historic, cultural, and aesthetic values; and its relationship to the Chesapeake Bay.

Strategies:

• Develop a public access site use permit system that can be monitored closely by the MPCBPAA. It will offer a defined number of local commercial and non-profit guides the opportunity to provide nature tours of the Thurston-Haworth Recreation Area;

• Require that all guides develop a business plan that is compatible with the THLMP, that can be updated and approved on a periodic basis, and that is consistent with the CELCP Final Guidelines from June 2003, the deed to the property, and the mission of the MPCBPAA. The MPCBPAA reserves the right to require that a defined portion of the proceeds from a commercial tour be donated to the MPCBPAA for continued habitat management activities;

• Monitor the level of use by guided tours, the effects that guides and nature tour groups have on the local environment, and visitor experiences. Adjust the public access site use permit system, where applicable, to control environmental impacts from concentrated visitor use;

• Enforce a pack-in/pack-out policy with all waste to protect the integrity of the local ecosystem and surrounding habitat corridor; and

• Partner with a local college or university in the Middle Peninsula, such as Rappahannock Community College, to institute an Ecotour Guide Certification Curriculum similar to that which is currently being developed by Eastern Shore Community College. Utilize, to the maximum extent possible, the certification format designed by ESCC, and revise as needed to create a Dragon Run watershed-specific curriculum. Develop an Ecotour guide logo for marketing use by certified guides. Once the Ecotour Guide Certification Curriculum is established, require that all guides, who wish to provide nature tours on properties owned by the MPCBPAA, including Thurston-Haworth, successfully complete the certification curriculum. Additionally, mandate that all certified Dragon Run watershed ecotour guides take a recertification course every five years to ensure the viability of this industry, standards of service, sustainability, and quality.

Managed Bow Hunting

Objective:
To provide the general public with safe and managed bow hunting opportunities for small and large game.

Strategies:
• Establish appropriate hunting areas for use during hunting seasons;

• Cooperate and consult with the Virginia Department of Game and Inland Fisheries to establish a system for managed hunting, including the creation of hunting "zones," and to control access to active hunting areas during the hunting season;

• Prepare a Hunting Management Plan that can be used as a decision-making tool for managing public hunting opportunities;

• Require hunter registration with the MPCBPAA and post a hunting sign-in sheet at the entrance to the site;

• Establish signage to be used during bow hunting season at the entrance to the site;

• If funding permits, provide blaze orange vests during hunting season;

• Consider user group perspectives when designating hunting areas; and

• Subject all hunting activities to local, state and federal regulations.

Trail Use and Maintenance

Objectives:
To maintain the informal nature of the trail network within the area, thereby minimizing concentrated trail usage impacts.

Strategies:
• Prepare a trail inventory and trail management plan that can be used as a decision-making tool for managing public trail use; and

• Develop kiosks and signage to show users the location of different recreational trails and inform visitors of allowable uses on specific trails.

Ecosystem and Surrounding Habitat Corridor Protection

Aesthetic Value

Although not a recreational activity in the strictest sense, aesthetic values enhance the experiences of recreational users by improving scenery within and adjacent to area boundaries and increasing opportunities for visitors to experience solitude and quietness.

Scenery is fundamental to a visitor's experience on the property. As with forested areas, swamps, wetlands, and the Dragon Run, activities occurring adjacent to and around the Thurston-Haworth Recreation Area also contribute to the scenery. The MPCBPAA recognizes

that development activities may occur on adjacent lands and may affect the viewscape and experiences of visitors to Thurston-Haworth. The MPCBPAA also acknowledges that resource development on adjacent properties may enhance the landscape of the Thurston-Haworth Recreation Area and protect the integrity of the local ecosystem and surrounding habitat corridor.

Objective:

To retain aesthetic features and natural resources within the local community and Dragon Run watershed to ensure the integrity and sustainability of the resources occurring on the Thurston-Haworth Recreation Area and to protect the rural, natural quality of the property.

Strategies:

- Work within local and regional land use planning processes to protect the natural, historic, cultural, and aesthetic values of the area directly adjacent to and in the vicinity of public access site boundaries. This includes reducing noise levels, managing for waste within property boundaries, and minimizing impacts on scenic values and water and air quality;

- Locate and design all public access site structures in harmony with the visual setting and the character of the surrounding natural landscapes;

- Work with local communities to plan public access site facilities, such that they align with the character and traditional uses of the area and blend with the natural setting; and

- Work with the public, government agencies, and non-governmental partners in the Dragon Run watershed to develop a visual landscape plan for lands adjacent to and outside of the public access site boundaries.

Habitat and Wildlife Management

Objective:

To protect the unique ecological characteristics, wildlife and plant diversity, and rural, undeveloped, non-motorized, pristine nature of the Thurston Haworth Recreation Area and the surrounding habitat corridor for the enjoyment of present and future generations. Monitoring the recreational uses on the property, as well as effectively managing and/or enhancing the natural resources, trails, and facilities currently established, will ensure the integrity and sustainability of the entire ecosystem. This section of the THLMP will briefly articulate a few strategies that the MPCBPAA may employ in its management of the habitat and faunal communities of the Thurston Haworth Recreation Area. It will identify appropriate local, state, and federal authorities and agencies, as well as regional non-governmental organizations, to help implement the selected management activities. Additionally, it will ensure that the process is collaborative and establishes practices that are consistent with the goals of the Thurston Haworth Recreation Area acquisition and the THLMP. Please note that the following list of partners, with whom the MPCBPAA looks to collaborate to implement the THLMP, is by no means complete. Furthermore, this section should not be interpreted to serve as a comprehensive habitat and

wildlife management plan. The MPCBPAA looks to develop, at a later date, a separate plan with the input of the appropriate agencies that is compatible with the THLMP and can be used as a decision-making tool to manage the habitat and wildlife of the Thurston Haworth Recreation Area.

Strategies:

- Ensure that all trails and facilities developed protect the local ecosystem and surrounding habitat corridor;

- Develop "Special Management Areas" to demonstrate best management practices for managing timber and other natural resources on Thurston Haworth. These activities, which will be coordinated with VDOF, may include the re-planting of native tree and plant species and mixed-hardwood forests, thinning of timber stands and surrounding vegetation, and/or prescribed burns;

- Encourage a partnership with the Dragon Run SAMP, VIMS, or CBLAP to develop workshops that educate local government agencies, officials, non-governmental organizations, and the public in the Dragon Run watershed about the Chesapeake Bay Preservation Act, Chesapeake Bay Preservation Areas, Resource Protection Areas, and Resource Management Areas;

- Offer opportunities to VIMS, VDCR, USFWS, the Virginia Department of Environmental Quality, CBNERRVA, Virginia Department of Health, TRSWCD, and TRC&D to conduct water quality monitoring or other natural resource education/research on the site;

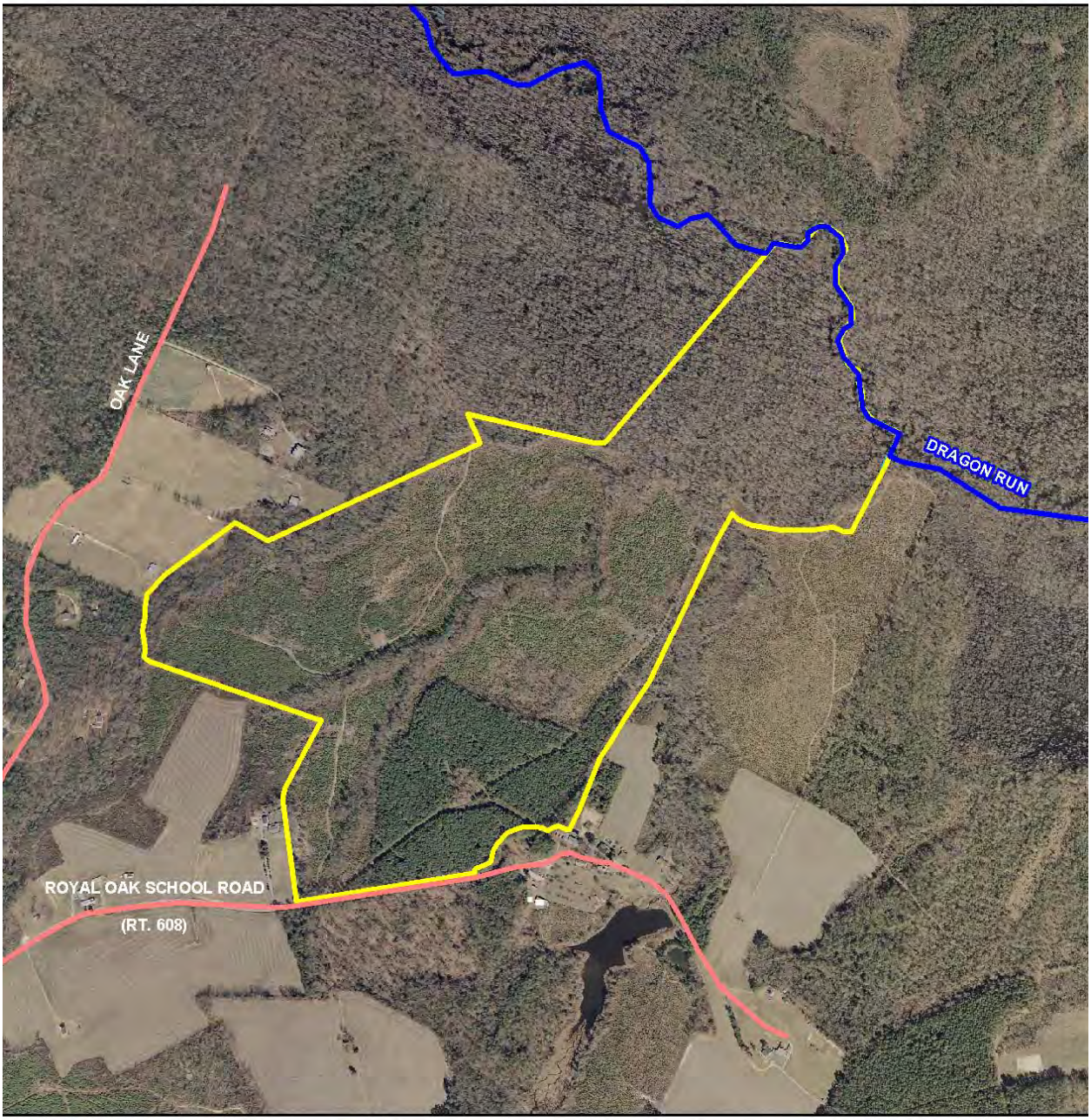
- Consult with VDCR to ensure effective management of native and migratory wildlife populations on Thurston Haworth. Identify any threatened or endangered species on the property and develop a collaborative management plan or recovery plan to ensure the protection of these organisms; and

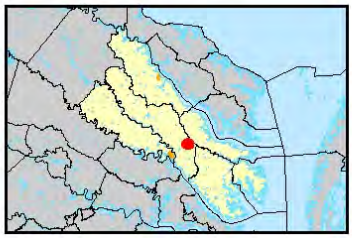
- Monitor for invasive plant, insect, and/or faunal species on the Thurston Haworth Recreation Area. If appropriate, develop a management plan to control for growth and distribution of invasives.

SECTION THREE: APPENDICES

Appendix 1: Maps

MAP 1: AERIAL IMAGE OF THE THURSTON-HAWORTH RECREATION AREA





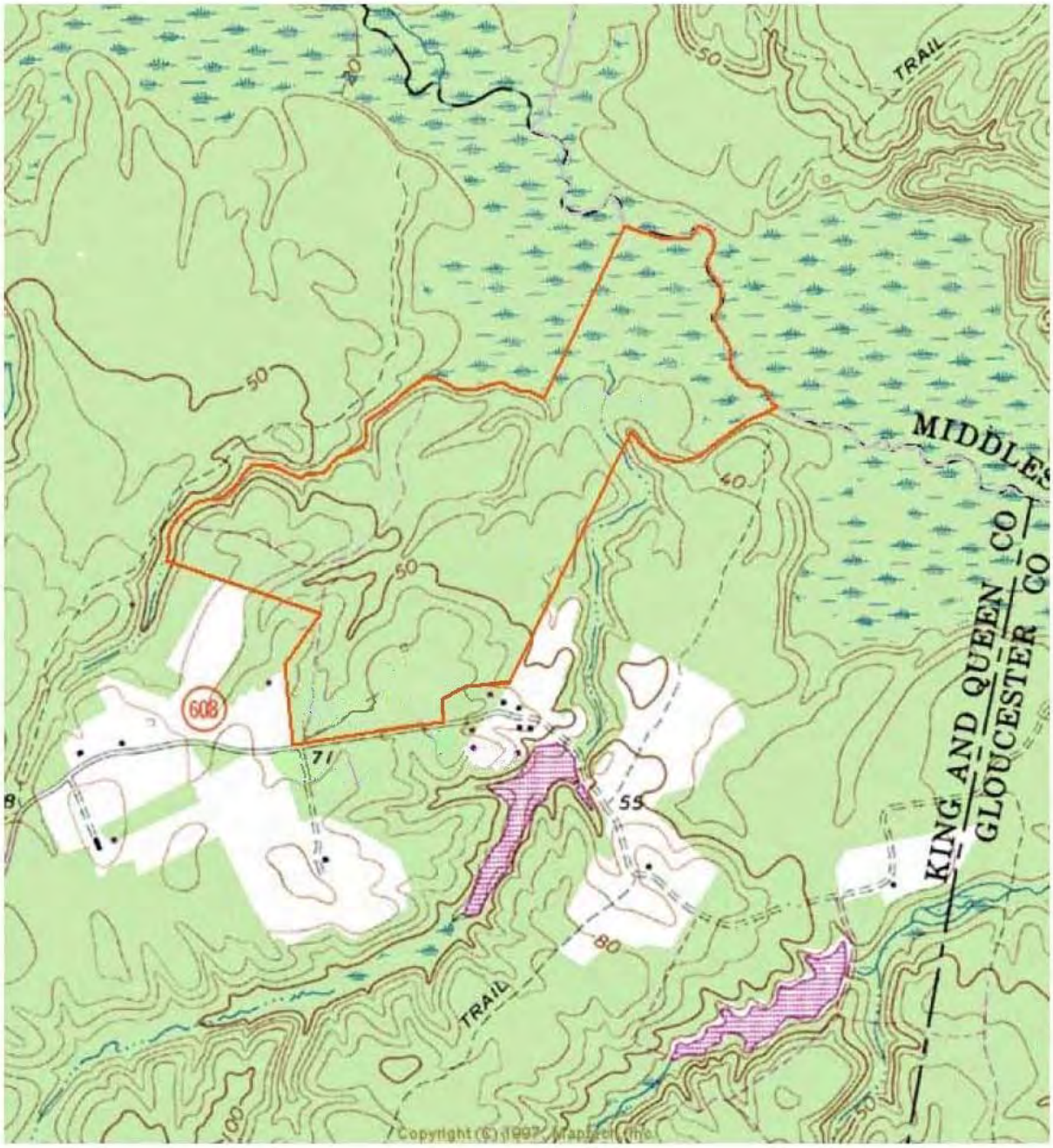
Thurston-Haworth: yellow
Roads: pink

N

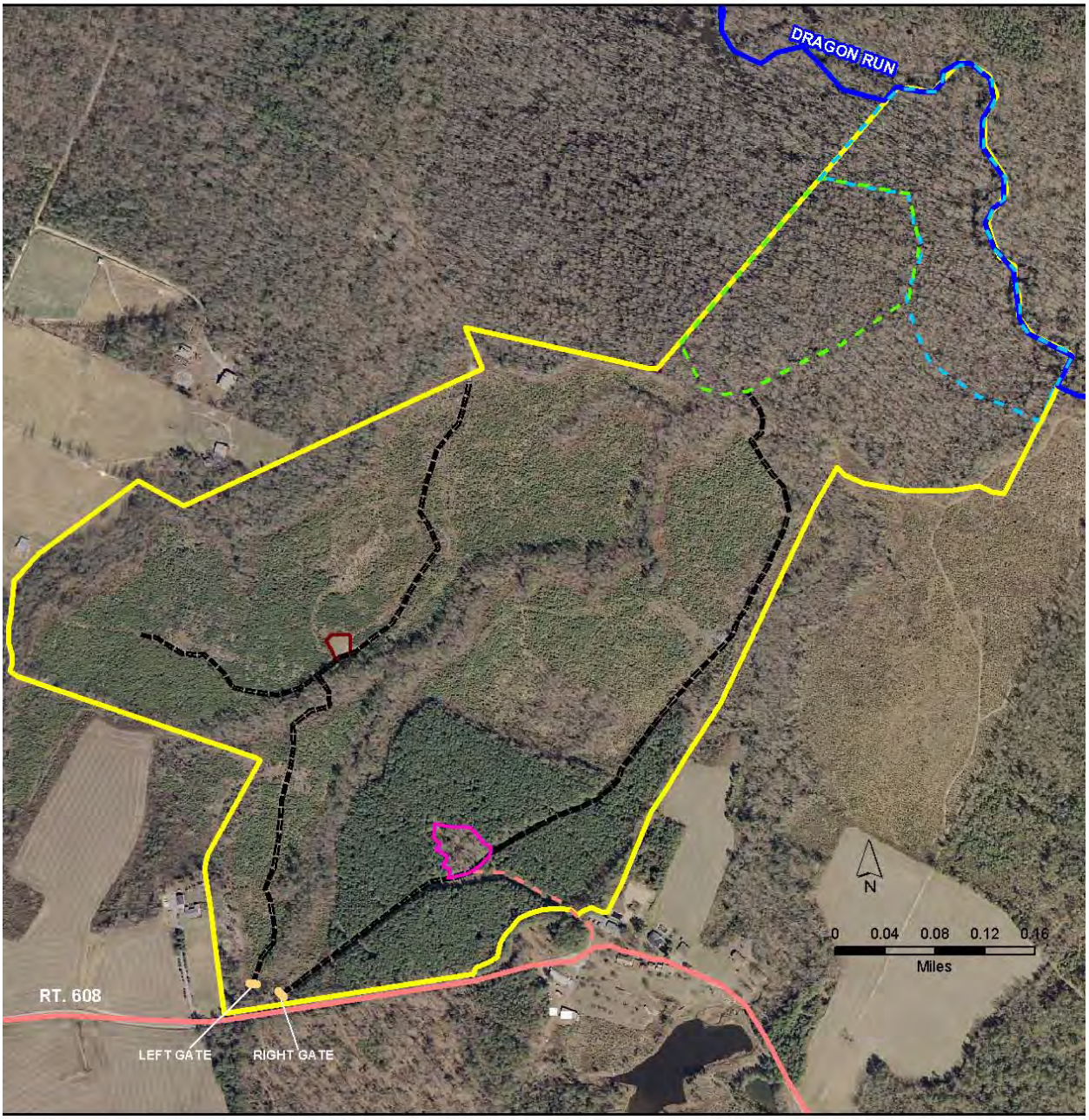
0 0.07 0.14 0.21 0.28
Miles

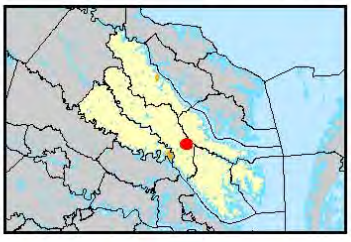
Virginia Coastal Zone
MANAGEMENT PROGRAM

MAP 2: USGS TOPOGRAPHIC MAP OF THE THURSTON-HAWORTH RECREATION AREA



MAP 3: THURSTON-HAWORTH EXISTING TRAILS AND FACILITIES





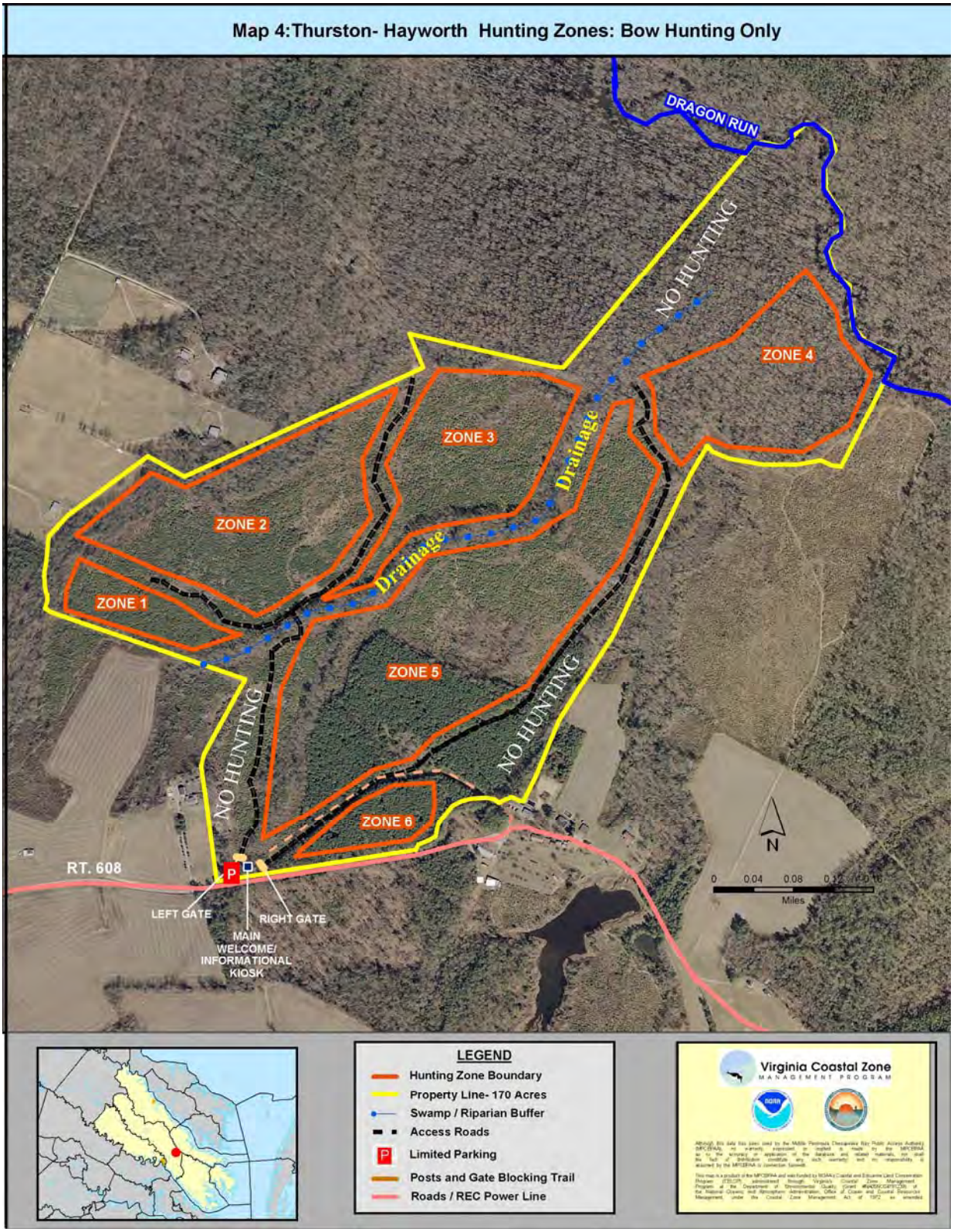
LEGEND

- Established Trails
- Roads / Rappahannock Electric Cooperative Power Line
- Entrance Gate
- Former Home Site
- Former Logging Deck
- Swamp / Riparian Buffer
- Cypress Knee Swamp

Virginia Coastal Zone MANAGEMENT PROGRAM

Although the data has been used by the Middle Peninsula Chesapeake Bay Public Access Authority (MPCBPAA), no warranty, expressed or implied is made by the MPCBPAA as to the accuracy or applications of the database and related materials, nor shall the fact of distribution constitute any such warranty, and no responsibility is assumed by the MPCBPAA in connection herewith.

This map is a product of the MPCBPAA and was funded by NOAA's Coastal and Estuarine Land Conservation Program (CELCP), administered through Virginia's Coastal Zone Management Program at the Department of Environmental Quality (Grant #NA09NOS4191208) of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resources Management, under the Coastal Zone Management Act of 1972, as amended.


Map 4:Thurston- Hayworth Hunting Zones: Bow Hunting Only
DRAGON RUN
NO HUNTING
ZONE 4
ZONE 3
Drainage
ZONE 2
Drainage
ZONE 1
ZONE 5
NO HUNTING
NO HUNTING
ZONE 6
RT. 608
P
LEFT GATE
RIGHT GATE
MAIN WELCOME/ INFORMATIONAL KIOSK
N
0 0.04 0.08
Miles
LEGEND
Hunting Zone Boundary
Property Line- 170 Acres
Swamp / Riparian Buffer
Access Roads
Limited Parking
Posts and Gate Blocking Trail
Roads / REC Power Line
Virginia Coastal Zone
MANAGEMENT PROGRAM

Appendix 2: Stakeholders List**

Stakeholders in the land management plan development process (2008)

NAME	ORGANIZATION
Ron Hachey	Former King and Queen County Administrator
Pete McDuff	King and Queen County Board of Supervisors–Shanghai District
Cora Armstrong	King and Queen County School Board
Andy Lacatell	The Nature Conservancy
Kelly Price	Virginia Coastal Zone Management Program
Galon Hall	VA Department of Game and Inland Fisheries
David Slack	VA Department of Forestry
Willy Reay	Chesapeake Bay National Estuarine Research Reserve in Virginia at the VA Institute of Marine Science
May Sligh	VA Department of Conservation and Recreation
Lewis Lawrence	Middle Peninsula Planning District Commission
Sara Stamp	Dragon Run Special Area Management Plan Director
Mike Willis	Top Knot Hunt Club
Stacy Hammond	Top Knot Hunt Club
Bobby Fletcher	Shacklefords Hunt Club
Edward Milby	Shacklefords Hunt Club
Tom Gregory	Friends of Dragon Run
Teta Kain	Friends of Dragon Run
Margaret Gerdts	Northern Neck Chapter of the Audubon Society
Christine Breddy	Middle Peninsula Trails Partnership
Angie Leigh	Middle Peninsula Trails Partnership
Nancy Paschall	Middle Peninsula Trails Partnership
Frank Herrin	Dragon Run Steering Committee
Robert Gibson	Dragon Run Steering Committee / Local Landowner
Charles Adkins	Local Landowner
Jeanette Adkins	Local Landowner
John Thurston	Local Landowner
Ernie Langston	Local Landowner
John Lindsey	Local Landowner
Laura Lindsey	Local Landowner
Jimmy Viars	Local Landowner
Juli Viars	Local Landowner
Nick Lalich	Local Landowner
Gary Neal	Local Landowner
Lori Neal	Local Landowner

****The stakeholders listed in this table have served an advisory role to the Middle Peninsula Chesapeake Bay Public Access Authority in the development of the Thurston-Haworth Land Management Plan. They have not approved the THLMP, nor does the fact that they are listed in any way constitute an endorsement by any of the individuals of the information contained herein.****

Appendix 3: Stakeholder Input Report

During early 2008, staff collected input from a variety of stakeholders regarding potential uses:

Foot Travel

Objective:

To offer a traditional, non-motorized backcountry network of single-use and multi-use trails for high-quality walking, hiking, cross-country skiing, and nature observation experiences, while protecting the natural environment, surrounding habitat corridor, and natural resources therein from degradation as a result of these passive and low-impact activities. The trail network will be designed, to the maximum extent possible, to accommodate users with special access needs.

Strategies:

- Use/enhance natural routes wherever possible when developing trail facilities, and limit superfluous cutting of vegetation to protect the habitat and minimize erosion;

- Maintain and improve foot paths to increase the capacity of trails to withstand long-term use and recover from disturbances;

- Install signage or permanent blazes to demarcate trails effectively and discourage off-trail usage. Signage also may be established to mark the mileage along different trails and to inform travelers about trails where passive foot travel is the only permissible use, where access is limited or not permitted, or where other users, such as horseback riders or bicyclists, may be utilizing trail facilities;

- Ensure that signage and kiosks provide information on the undeveloped nature of the area;

- Provide signage on the trails and public use guides attached to both the main welcome/informational kiosk by Route 608 and the all-visitor sign-in sheets in the parking lot that dictate appropriate user conduct when visiting a public access facility. Travelers by foot should use caution when accessing the trail system, be respectful of all other users on the property, and stop or slow down when approaching all non-foot traffic, including horseback riders and bicyclists. Additionally, walkers/hikers/etc. should remain alert when accessing the multi-use trails in order to avoid any animal fecal matter present;

- Develop one or more single-use trail(s) reserved for passive foot travel only. These trails will provide a setting that is free from conflict with non-foot traffic and fecal matter that may be deposited by horses on the multi-use trails;

- Potentially construct a small footbridge and interpretive signage, leading out to the cypress knee swamp, which will provide educational opportunities and more effectively manage or limit access in a sensitive area of the property;

- Maintain a pack-in/pack-out policy with all waste to protect the integrity of the local ecosystem and surrounding habitat corridor; and

- Encourage all visitors, who walk dogs on the property, to maintain them on a leash or within manageable calling distance. Visitors must remove all fecal matter produced by their canine when exiting the property. The MPCBPAA looks to provide informational brochures about the benefits of cleaning up after one's pet in the kiosk(s) at the property entrance.

Horseback Riding

Objective:

To provide recreational horseback riding opportunities, which are managed, to the maximum extent possible, to minimize impacts to the natural environment and potential conflicts with other users (foot travelers, bicyclists, bow hunters, etc.).

Strategies:

- Promote a traditional, local public recreational use that is non-motorized and passive to low-impact in nature;

- Enhance established and create new multi-use trails and natural routes to provide an extensive trail network that affords excellent horseback riding opportunities;

- Design multi-use trails and other facilities to be used for small group excursions on horseback;

- Provide sufficient parking in the lot at the entrance to the property, separate from the small, non-trailered vehicle area, to accommodate vehicles towing horse trailers. A comment drop box may be made available in the parking lot, so that the MPCBPAA can solicit feedback from the public about their visit to Thurston-Haworth, the established trail system and facilities, and any use conflicts that occurred;

- Develop signage at trailheads to inform horseback riders of trails where horses are permitted, sections of the property where horse access is limited or not permitted (such as the "Wildlife and Habitat Protection Areas" and in the Riparian Buffer), and trails where other users, such as nature observers, bicyclists, and hunters also may be present. Signage may be developed to caution all users on multi-use trails that horse manure may be present;

- Establish signage on the trails and public use guides at the entrance to the property that dictate appropriate conduct on the multi-use trails, especially when multiple conflicting uses, such as horseback riding, bicycling, and walking, are occurring concurrently. Horseback riders should use caution when accessing the trails, be respectful of all other users on the property, and stop or slow down, to the greatest extent possible, when approaching foot travelers and bicyclists; and

- Specify management activities and usage levels for horseback riding that include:

    1. Condition that all horses on the property be accompanied by a report of an official negative Coggins Test or negative Competitive Enzyme Linked Immunoadsorbent Assay (C-ELISA) Test for Equine Infectious Anemia (EIA), conducted within 12 months prior to the horse's visit to Thurston-Haworth. The report must be displayed in the front windshield of each rider's automobile and be available for inspection by MPCBPAA staff or a certified State Veterinarian (Virginia Department of Agriculture and Consumer Services veterinarian employed by the Commissioner of Agriculture and Consumer Services) upon request;

    2. Signage at the parking lot or in another location at the entrance to Thurston-Haworth to encourage riders to use an apparatus to collect horse fecal matter, such as a "Bun-Bag™", "Horse Diaper", or "Equidae Manure/Urine Catcher™". This may minimize impacts to the water quality of the Dragon Run and the local habitat. All horse fecal matter deposited in the parking lot must be removed immediately by the horse's rider. Horseback riders are also encouraged to move their horse's manure off of the trails during the ride in order to enhance the experience for all users of the multi-use trail system;

    3. Opportunities for horse manure composting in specific bins in the trailered-vehicle area of the parking lot. A well-maintained manure composting system serves a public benefit by creating a valuable, biodegradable fertilizer source for visitors to use, a potential revenue source for sustainable habitat management, and a more enjoyable experience for all who utilize the multi-use trail networks. Composting also serves an ecological benefit by (a) minimizing the volume of horse fecal matter on the property; (b) greatly increasing the temperature of the fecal pile, thereby reducing the growth of fecal coliform bacteria, flies, and parasitic worms that breed within separate fecal piles; (c) reducing odors produced by the manure; and (d) decreasing the volume of manure-contaminated runoff that can contaminate the pristine nature of the Dragon Run and local ground water supply;

    4. Stipulations to limit horse use to designated trails and day trips; and

    5. Requirement to establish mechanisms for monitoring the impacts of horse use on trail infrastructure.

Bicycling

Objective:

To permit bicycle use on the Thurston-Haworth Recreation Area multi-use trail system, while minimizing, to the maximum extent possible, environmental impacts associated with increased recreational usage and potential conflicts with other user groups.

Strategies:

- Maintain the passive to low-impact nature of bicycling by restricting the activity to existing and planned multi-use trails and natural routes;

- Develop signage to inform bicyclists about trails where bicycling is permitted, trails where access is limited or not permitted, and sections where other users, such as nature observers, hikers, horseback riders, and hunters may also use trail facilities;
- Establish signage on the trails and public use guides at the main entrance gates that dictate appropriate conduct on the trails when multiple conflicting uses, such as bicycling, horseback riding, and walking are occurring simultaneously in the same area. Bicyclists should use caution when accessing the trails, especially when horses are near; be respectful of all other users on the property; alert other users to their presence well in advance of contact; and stop or slow down when approaching other users; and

- Monitor for impacts to the surrounding habitat and wildlife communities, and adjust bicycling levels or areas of use based on impacts over time.

Paddling

Objective:

To develop one or more put-in site(s) at the land/water interface, which are accessible by land or water, that provide paddling and non-motorized boating experiences on the Dragon Run.

Strategies:

- Offer one to several put-in locations on the northeastern portion of the property, which borders the Dragon Run, to permit kayaking, canoeing, and other forms of non-motorized boating and paddling. Gasoline-powered motorboats will be prohibited;

- Clear downed vegetation directly adjacent to the land/water interface that may hinder paddler access to certain portions of the Dragon Run;

- Provide sufficient parking spaces in the lot at the entrance to the property, separate from the small, non-trailered vehicle area, to accommodate vehicles towing kayak trailers; and

- Monitor paddling usage over time and determine activity levels. If appropriate, the single-use trail for passive foot travel, which the MPCBPAA looks to establish from the northeast corner of the main-multi-use trail loop out to the Dragon Run, may be augmented to enhance access to paddlers, who will be hand-carrying their boats to the water. The trail will be designed, to the greatest extent possible, following established natural routes and to accommodate users with special access needs.

Bow Hunting

Objective:

To provide the general public with a safe and managed hunting opportunity for multiple game species. Currently, the only form of hunting that will be permitted on the property is bow. Early Archery Season lasts approximately October 1–November 15, and Late Archery Season runs approximately December 1–January 1. It is the responsibility of all bow hunters on Thurston-Haworth to contact the Virginia Department of Game and Inland Fisheries (VDGIF) to determine the exact dates of archery season annually. The MPCBPAA reserves the right, if appropriate, to expand bow hunting and the conceptual hunting zone system (Map 4) to include other forms, such as modern firearms or muzzleloading firearms.

Strategies:

- Cooperate and consult with the VDGIF to establish an appropriate system for managed hunting, which ensures access to bow hunting areas during early and late archery seasons is monitored effectively. This may include the creation of hunting "zones", as outlined on Map 4, which will be designed to conserve the core ecosystem and surrounding habitat corridor. Each zone may be color-coded and trees at the edge of a zone painted with blazes to notify a user when he/she is crossing between zones;

- Consult with local bow hunters and hunt clubs when designing hunting zones and/or areas;

- Subject all bow hunting activities to local, state and federal regulations;

- Install signage in the parking lot, in the main welcome/informational kiosk by Route 608, and on the gates leading onto the property, which alert users when archery season is in effect. Also post a map in the parking lot, which indicates the location of each hunting zone on the property;

- If funding permits, provide re-usable blaze orange safety vests at both entrances to the parking lot to enhance user visibility on the property, especially during archery season;

- Create a hunter registration system, similar to the developed for the Browne Tract, which requires all bow hunters on the Thurston-Haworth Recreation Area, including those who have already registered to hunt the Browne Tract, to register with the MPCBAA and receive a unique hunter identification number. The MPCBPAA will provide each registered hunter with a welcome packet, which includes hunter safety rules and regulations and a map of the property with the general hunting zones defined;

- Post hunting sign-in sheets in the parking lot, which are accessible and visible, no matter which gate one uses to access the property. This will provide a hunter/hunting party the opportunity to sign up for a specific zone on a particular day. Zones will be established as a general guide for hunting areas. They may be color-coded and will be accessible on a first-come first-serve basis for all bow hunters and hunting parties. Bow hunting parties may consist of no more than three persons, and only one hunting party is permitted in each zone at any one time. Once a hunter establishes his claim to a specific zone, he may use it that day from dawn until dusk. However, if the bow hunter wishes to move to a different zone,

he will be required to return to the parking lot and sign back in to the new zone. This proposed system will geographically separate bow hunters and reduce possible conflict. It will also manage visitation in high-use areas, where an elevated potential for safety issues or conflict among different user groups exists, by ensuring that all users on the property know where hunting is occurring at all times. The MPCBPAA will monitor usage in each hunting area on a regular basis to determine the efficacy of the zone system, make changes to or improve the system where needed, and account for any conflicts that might arise; and

- Establish a food plot in each bow hunting zone. Depending on the vegetation planted, plots should provide a sustainable food source and foraging ground for different game species, including deer, rabbit, turkey, and quail. Defining the location of a food plot in each zone also will help manage the distribution of bow hunters on the property and will identify to other users where hunting may be expected to occur during archery season, depending on the game species the food plots are designed for. Only vegetation native to Thurston-Haworth and the Dragon Run watershed will be selected for growth in the plots.

Parking Facilities

Objective:

To provide adequate parking facilities for vehicles of all sizes, including those with trailers.

Strategies:

- Design a parking lot at the entrance to the Thurston-Haworth Recreation Area. The lot will have two entry points – one just inside the right gate and the other just inside the left gate. It will be divided into two clearly-marked sections: one for small vehicles without trailers and the other for larger vehicles, including school and church buses, which may or may not be towing trailers.

- Post a sign-in sheet for all visitors to the property, which is accessible and visible, no matter which parking lot entrance one uses. Monitor usage levels to Thurston-Haworth to determine future parking and trail facility requirements. Ensure that the all-visitor sign-in sheet is located adjacent to the hunting zone sign-in sheet but is easily distinguishable from it. Providing both sign-in sheets in the same area will ensure that all users on the property know at all times where and when hunting is occurring;

- Install wooden posts that traverse both the left and right paths of the main multi-use trail loop directly past the parking lot entrances. The posts will prohibit motorized vehicle access past the lot and reduce environmental impacts from such access. Users with special access needs should contact the MPCBPAA prior to visiting the property for more information; and

- Establish signage and/or a kiosk that provides information about the recreational opportunities offered on Thurston-Haworth; educates visitors about the unique natural and cultural characteristics of the area; and offers public use guides that dictate appropriate user conduct when visiting a public access facility. A comment drop box also may be made

available by the all-visitor and hunting zone sign-in sheets to encourage feedback from the public about their visit to Thurston-Haworth, the established trail system and facilities, and any use conflicts that occurred.

Ecotourism* / *Guided Nature Tours

Objective:

To provide an opportunity for ecologically-sound, guided nature tours that is consistent with the deed on the property, objectives of the MPCBPAA, and the purposes for which the Thurston-Haworth Recreation Area was entered into CELCP. Local ecotour guides, who are knowledgeable about and wish to protect the pristine nature of Dragon Run, offer the general public, especially school children, an opportunity to experience the watershed first-hand. Such experiences cultivate an understanding of and appreciation for the surrounding ecosystem; its conservation, historic, cultural, and aesthetic values; and its relationship to the Chesapeake Bay.

Strategies:

- Develop a public access site use permit system that can be monitored closely by the MPCBPAA. It will offer a defined number of local commercial and non-profit guides the opportunity to provide nature tours of the Thurston-Haworth Recreation Area;

- Require that all guides develop a business plan that is compatible with the THLMP, that can be updated and approved on a periodic basis, and that is consistent with the CELCP Final Guidelines from June 2003, the deed to the property, and the mission of the MPCBPAA. The MPCBPAA reserves the right to require that a defined portion of the proceeds from a commercial tour be donated to the MPCBPAA for continued habitat management activities;

- Monitor the level of use by guided tours, the effects that guides and nature tour groups have on the local environment, and visitor experiences. Adjust the public access site use permit system, where applicable, to control environmental impacts from concentrated visitor use;

- Enforce a pack-in/pack-out policy with all waste to protect the integrity of the local ecosystem and surrounding habitat corridor; and

- Partner with a local college or university in the Middle Peninsula, such as Rappahannock Community College, to institute an Ecotour Guide Certification Curriculum similar to that which is currently being developed by Eastern Shore Community College. Utilize, to the maximum extent possible, the certification format designed by ESCC, and revise as needed to create a Dragon Run watershed-specific curriculum. Develop an Ecotour guide logo for marketing use by certified guides. Once the Ecotour Guide Certification Curriculum is established, require that all guides, who wish to provide nature tours on properties owned by the MPCBPAA, including Thurston-Haworth, successfully complete the certification curriculum. Additionally, mandate that all certified Dragon Run watershed ecotour guides take a recertification course every five years to ensure the viability of this industry, standards of service, sustainability, and quality.

Special Access Opportunities

Objective:

To provide the general public opportunities to access Thurston-Haworth for certain passive and low-impact uses that otherwise would be prohibited due to the constraints imposed by the THLMP. These special access opportunities, which may include visitation to the property outside of the regularly-scheduled operating hours from dawn until dusk, will be regulated closely by the MPCBPAA and may require a specific permit. The MPCBPAA reserves the right to terminate any or all special access events that are not compatible with the conservation values of the surrounding ecosystem and habitat corridor or that are not consistent with the deed to the property, objectives of the MPCBPAA, or the purposes for which Thurston-Haworth was entered into CELCP.

Strategies:

- Provide opportunities for evening kayak excursions. These nighttime trips must be pre-approved by the MPCBPAA and may be led only by the MPCBPAA Board, its staff, or MPCBPAA-approved Dragon Run watershed nature guides. If and when an Ecotour Guide Certification Curriculum is established by the MPCBPAA, all guides, who wish to provide evening nature tours on Thurston-Haworth, will be required to successfully complete the certification curriculum; and

- Offer an educational "Evening Workshop Series" led by the MPCBPAA Board, its staff, or MPCBPAA-approved Dragon Run watershed nature guides. This series will introduce the public to different passive activities, such as moth watching, night photography, or meteor shower observation, that are conducted typically outside of the regularly-scheduled Thurston-Haworth operating hours of dawn until dusk.

Ecosystem and Surrounding Habitat Corridor Protection

Although not a recreational activity in the strictest sense, protecting the core ecosystem of Thurston-Haworth and its surrounding habitat corridor enhances the experiences of all users. This is accomplished by improving scenery within and adjacent to property boundaries, protecting the health and quality of the habitat and plant and faunal communities which comprise the Thurston-Haworth Recreation Area ecosystem, and by increasing opportunities for visitors to experience solitude and natural beauty in a wilderness setting.

Aesthetic Value

Scenery is fundamental to a visitor's experience on the property. As with forested areas, swamps, wetlands, and the Dragon Run, activities occurring adjacent to and around the Thurston-Haworth Recreation Area also contribute to the scenery. The MPCBPAA recognizes that development activities may occur on adjacent lands and may affect the viewscape and experiences of visitors to Thurston-Haworth. The MPCBPAA also acknowledges that resource

development on adjacent properties may enhance the landscape of the Thurston-Haworth Recreation Area and protect the integrity of the local ecosystem and surrounding habitat corridor.

Objective:

To retain aesthetic features and natural resources within the local community and Dragon Run watershed to ensure the integrity and sustainability of the resources occurring on the Thurston-Haworth Recreation Area and to protect the rural, natural quality of the property.

Strategies:

- Work within local and regional land use planning processes to protect the natural, historic, cultural, and aesthetic values of the area directly adjacent to and in the vicinity of public access site boundaries. This includes reducing noise levels, managing for waste on property boundaries, and minimizing impacts on scenic values and water and air quality;

- Design all public access site structures in harmony with the visual setting and the character of the surrounding natural landscapes;

- Work with local communities to plan public access site facilities, such that they align with the character and traditional uses of the area and blend with the natural setting; and

- Work with the public, government agencies, and non-governmental partners in the Dragon Run watershed to develop a visual landscape plan for lands adjacent to and outside of the public access site boundaries, which are part of the habitat corridor.

Habitat and Wildlife Management

Objective:

To protect the unique ecological characteristics, wildlife and plant diversity, and rural, undeveloped, non-motorized, pristine nature of the Thurston-Haworth Recreation Area and the surrounding habitat corridor for the enjoyment of present and future generations. Monitoring the recreational uses on the property, as well as effectively managing and/or enhancing the natural resources, trails, and facilities currently established, will ensure the integrity and sustainability of the entire ecosystem. This section of the THLMP will briefly articulate a few strategies that the MPCBPAA may employ in its management of the habitat and faunal communities of the Thurston-Haworth Recreation Area. It will identify appropriate local, state, and federal authorities and agencies, as well as regional non-governmental organizations, to help implement the selected management activities. Additionally, it will ensure that the process is collaborative and establishes practices that are consistent with the goals of the Thurston-Haworth Recreation Area acquisition and the THLMP. Please note that the following list of partners, with whom the MPCBPAA looks to collaborate to implement the THLMP, is by no means complete. Furthermore, this section should not be interpreted to serve as a comprehensive habitat and wildlife management plan. The MPCBPAA looks to develop, at a later date, a separate plan that

is compatible with the THLMP and can be used as a decision-making tool to manage the habitat and wildlife of the Thurston-Haworth Recreation Area.

Strategies:

- Collaborate with the Virginia Department of Game and Inland Fisheries (VDGIF), the Virginia Department of Conservation and Recreation (VDCR), Virginia Department of Forestry (VDOF), U.S. Fish and Wildlife Service (USFWS), The Nature Conservancy (TNC), and the Dragon Run Steering Committee (DRSC) to ensure that all trails and facilities developed protect the local ecosystem and surrounding habitat corridor;

- Develop "Special Management Areas" to demonstrate best management practices for managing timber and other natural resources on Thurston-Haworth. These activities, which will be coordinated with VDOF, VDGIF, VDCR, and TNC, may include the re-planting of native tree and plant species and mixed-hardwood forests, thinning of timber stands and surrounding vegetation, and/or prescribed burns;

- Coordinate with VDGIF, VDOF, VDCR, USFWS, DRSC, TNC, Virginia Coastal Zone Management Program, Virginia Institute of Marine Science (VIMS), and potentially VDCR's Chesapeake Bay Local Assistance Programs (CBLAP), Chesapeake Bay National Estuarine Research Reserve in Virginia (CBNERRVA), the Three Rivers Soil and Water Conservation District (TRSWCD), and the Tidewater Resource, Conservation, and Development Council (TRC&D) to identify areas, such as the cypress knee swamp and the riparian buffer adjacent to Dragon Run, that contain important riparian, soil, vegetative, or other natural resources. Establish "Wildlife and Habitat Protection Areas" to limit or prohibit recreational usage in these locations, while providing opportunities for habitat improvement projects;

- Encourage a partnership with CBLAP to develop workshops that educate local government agencies, officials, non-governmental organizations, and the public in the Dragon Run watershed about the Chesapeake Bay Preservation Act, Chesapeake Bay Preservation Areas, Resource Protection Areas, and Resource Management Areas;

- Collaborate with VDCR, USFWS, the Virginia Department of Environmental Quality, CBNERRVA, Virginia Department of Health, TRSWCD, and TRC&D to develop water quality monitoring opportunities on the Dragon Run;

- Consult with VDGIF, USFWS, VIMS, and the VA Department of Agriculture and Consumer Services (VDACS) to ensure effective management of native and migratory wildlife populations on Thurston-Haworth. Identify any threatened or endangered species on the property and develop a collaborative management plan or recovery plan to ensure the protection of these organisms; and

- Collaborate with regional representatives from VDGIF, VDCR, USFWS, VIMS, TNC, the Invasive Species Advisory Committee of the Virginia Invasive Species Working Group, and VDACS to monitor for invasive plant, insect, and/or faunal species on the Thurston-

Haworth Recreation Area. If appropriate, develop a management plan to control for growth and distribution of invasives.

Proposed Use List Matrix:

PROPOSED USE	TIME OF USE **Y**-yearly, **S**-seasonal	REVENUE POTENTIAL **Y**- yes	IMPACT ON RESOURCES **L**-low, **M**- med	POLITICAL IMPLICATIONS **Y**- yes
Walking	**Y**	**Y**	**L**	
Hiking	**Y**		**L**	
Cross-Country Running	**Y**	**Y**	**L**	
Cross-Country Skiing	**S**	**Y**	**L**	
Horseback riding	**Y**	**Y**	**L-M**	
Dog Sledding	**S**	**Y**	**M**	
Bicycling	**Y**	**Y**	**L-M**	
Paddling	**S**		**L**	
Wading	**S**		**L**	
Fishing	**S**		**L-M**	
Hunting (archery)	**S**	**Y**	**L-M**	**Y**
Hunter safety	**S**	**Y**	**L**	
Nature / Wildlife Observation	**Y**		**L**	
Photography	**Y**		**L**	
Education/ School Groups	**S**		**L-M**	**Y**
Ecotourism / Guided Nature Tours	**Y**	**Y**	**L-M**	
How-to Workshops	**Y**	**Y**	**L**	
Special Access or Evening Events	**Y**	**Y**	**L-M**	
Scientific Research	**Y**		**L-M**	**Y**
Forest and Habitat Management	**Y**	**Y**	**M**	
Research Forest Practices	**Y**	**Y**	**M**	**Y**
Restoration of Species	**Y**		**L**	
Riparian Buffer Demonstration	**S**		**L**	
Water Quality Monitoring	**Y**		**L**	
Parking	**Y**		**L-M**	

Appendix 4: References

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Appendix 10: Biodiesel Resolutions for Each of the Watershed Counties

AG ITEM #: 07-131.5
11/13/07 SB MEETING
OLD BUSINESS

A resolution implementing increased use and production of biodiesel

WHEREAS, the Dragon Run is a uniquely valuable and sensitive watershed located in the Middle Peninsula of Virginia in parts of Essex, King and Queen, Middlesex, and Gloucester Counties; and

WHEREAS, The Middle Peninsula Planning District Commission (MPPDC)'s Dragon Run Watershed Special Area Management Plan (SAMP) project's mission is to support and promote community-based efforts to preserve the cultural, historic and natural character of the Dragon Run, while protecting property rights and the traditional and current uses of agriculture, forestry and outdoor recreation; and

WHEREAS, two independent studies conducted for the SAMP indicate that one promising path to achieve Dragon Run preservation goals is to provide sustainable natural resource-based economic benefit to the watershed community centered around the use and production of biodiesel that is made from the oil extracted from soybeans grown by farmers in the watershed; and

WHEREAS, the use of biodiesel , an alternative, domestically produced non-petroleum fuel , increases the energy security of the United States while reducing the annual trade deficit; and

WHEREAS, the use of biodiesel reduces emissions of ozone-forming compounds and other compounds that have been shown to be toxic to human health; and

WHEREAS, Virginia Clean Cities is a locally based non-profit organization that is contracted by the MPPDC through the SAMP program to provide technical support and monitor biodiesel developments, activities and grant funding opportunities throughout the Commonwealth.

NOW THEREFORE, BE IT RESOLVED that the Gloucester County School Board directs the division superintendent, staff, teachers and other appropriate

personnel to learn more about the advantages of biodiesel and to support and encourage the use of biodiesel blends in school buses and other diesel-powered vehicles and equipment; and

BE IT FURTHER RESOLVED to amend– if necessary – the process used to procure fuel to enable the purchase of biodiesel blends and to seek an agreement – if necessary – from the county that will permit the School Division rather than the county to receive payments from a biodiesel buy-down fund; and

BE IT FURTHER RESOLVED to adopt a voluntary schedule to convert to a minimum blend of B5 (5 percent biodiesel mixed with 95 percent petroleum diesel) as soon as possible, but no later than April of 2008, and to gradually increase this blend level up to a B20 blend as soon as practical, but no later than April of 2009; and

BE IT FUTHER RESOLVED to educate other potential users in the community and encourage watershed -wide support for and promotion of biodiesel blends as a way to reduce the use of imported petroleum fuel and to support a strong local soybean market; and

BE IT FURTHER RESOLVED to direct the Division Superintendent to appoint one or more representatives to participate in the Dragon Run Biodiesel Partnership and support to the extent practical the Dragon Run Biodiesel Partnership Action Plan; and

BE IT FURTHER RESOLVED to use the technical support offered by the SAMP until September 2008 and other free resources and technical assistance offered by Virginia Clean Cities to help further these goals.

ADOPTED by the Gloucester County School Board, of Virginia, this 13th day of November, 2007.

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accommodate changes in the price differential between biodiesel and petroleum diesel. (See Appendix C for an example of how varying the blend can sustain use of biodiesel for just pennies even when the differential cost is large.)

- **Biodiesel Education and marketing programs**

In order for biodiesel to have a significant, lasting and favorable impact on preservation of the Dragon Run, support for the use of biodiesel will have to extend throughout the supply chain from producer to end users, and across the spectrum of users from large government fleets to single private cars and trucks. (See Appendix D for a summary of discussions about biodiesel educational, marketing and promotional opportunities. See Appendix E for the Clean School Bus USA project work plan and timeline. The complete documents are web accessible from links provided in the appendices.)

Partner Signature: _____ Date: 11/13/07

Partner title or name of organization: SUPERINTENDENT
Gloucester Co. Public SCHOOLS

Middlesex County Public Schools

Administrators

Donald R. Fairheart, MBA
Superintendent

Cynthia A. Pitts
Assistant Superintendent

School Board Member

Dr. Richard Shores
Chairman

Elizabeth B. Hurd
Vice-Chairman

James W. Goforth
Elliott Reed
Jacqueline Taylor

A Resolution Implementing Increased Use and Production of Biodiesel Fuel

WHEREAS, the Dragon Run is a uniquely valuable and sensitive watershed located in the Middle Peninsula of Virginia in parts of Essex, King and Queen, Middlesex, and Gloucester Counties; and

WHEREAS, The Middle Peninsula Planning District Commission (MPPDC)'s Dragon Run Watershed Special Area Management Plan (SAMP) project's mission is to support and promote community-based efforts to preserve the cultural, historic and natural character of the Dragon Run, while protecting property rights and the traditional and current uses of agriculture, forestry and outdoor recreation; and

WHEREAS, two independent studies conducted for the SAMP indicate that one promising path to achieve Dragon Run preservation goals is to provide sustainable natural resource-based economic benefit to the watershed community centered around the use and production of biodiesel that is made from the oil extracted from soybeans grown by farmers in the watershed; and

WHEREAS, the use of biodiesel , an alternative, domestically produced non-petroleum fuel , increases the energy security of the United States while reducing the annual trade deficit; and

WHEREAS, the use of biodiesel reduces emissions of ozone-forming compounds and other compounds that have been shown to be toxic to human health; and

WHEREAS, Virginia Clean Cities is a locally based non-profit organization that is contracted by the MPPDC through the SAMP program to provide technical support and monitor biodiesel developments, activities and grant funding opportunities throughout the Commonwealth.

2911 General Puller Hwy · P. O. Box 205 Saluda · Virginia 23149 · (804) 758-2277 · (804) 758-3727

NOW THEREFORE, BE IT RESOLVED that the **Middlesex County School Board** directs the division superintendent, staff, teachers and other appropriate personnel to learn more about the advantages of biodiesel and to support and encourage the use of biodiesel blends in school buses and other diesel-powered vehicles and equipment; and

BE IT FURTHER RESOLVED to amend– if necessary – the process used to procure fuel to enable the purchase of biodiesel blends and to seek an agreement – if necessary – from the county that will permit the School Division rather than the county to receive payments from a biodiesel buy-down fund; and

BE IT FURTHER RESOLVED to adopt a voluntary schedule to convert to a minimum blend of B5 (5 percent biodiesel mixed with 95 percent petroleum diesel) as soon as possible, but no later than April of 2008, and to gradually increase this blend level up to a B20 blend as soon as practical, but no later than April of 2009; and

BE IT FUTHER RESOLVED to educate other potential users in the community and encourage watershed -wide support for and promotion of biodiesel blends as a way to reduce the use of imported petroleum fuel and to support a strong local soybean market; and

BE IT FURTHER RESOLVED to direct the Division Superintendent to appoint one or more representatives to participate in the Dragon Run Biodiesel Partnership and support to the extent practical the Dragon Run Biodiesel Partnership Action Plan; and

BE IT FURTHER RESOLVED to use the technical support offered by the SAMP until September 2008 and other free resources and technical assistance offered by Virginia Clean Cities to help further these goals.

ADOPTED by the School Board of Middlesex County, Virginia, this 12th day of November, 2007.

Dr. Richard Shores, Chairperson Richard J. Shores

Mrs. Elizabeth Hurd, Vice-Chairperson Elizabeth N. Hurd

Mr. Jim Goforth, Member Mr. Jim Goforth

Mr. Elliot Reed, Member Elliot Reed

Mrs. Jacqueline Duke Taylor, Member Mrs. Jacqueline Duke Taylor

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COPY

A resolution implementing increased use and production of biodiesel

NOV 8 2007

WHEREAS, the Dragon Run is a uniquely valuable and sensitive watershed located in the Middle Peninsula of Virginia in parts of Essex, King and Queen, Middlesex, and Gloucester Counties; and

WHEREAS, The Middle Peninsula Planning District Commission (MPPDC)'s Dragon Run Watershed Special Area Management Plan (SAMP) project's mission is to support and promote community-based efforts to preserve the cultural, historic and natural character of the Dragon Run, while protecting property rights and the traditional and current uses of agriculture, forestry and outdoor recreation; and

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WHEREAS, the use of biodiesel , an alternative, domestically produced non-petroleum fuel , increases the energy security of the United States while reducing the annual trade deficit; and

WHEREAS, the use of biodiesel reduces emissions of ozone-forming compounds and other compounds that have been shown to be toxic to human health; and

WHEREAS, Virginia Clean Cities is a locally based non-profit organization that is contracted by the MPPDC through the SAMP program to provide technical support and monitor biodiesel developments, activities and grant funding opportunities throughout the Commonwealth.

NOW THEREFORE, BE IT RESOLVED that the King and Queen County School Board directs the division superintendent, staff, teachers and other appropriate personnel to learn more about the advantages of biodiesel and to support and encourage the use of biodiesel blends in school buses and other diesel-powered vehicles and equipment; and

BE IT FURTHER RESOLVED to amend– if necessary – the process used to procure fuel to enable the purchase of biodiesel blends and to seek an agreement – if necessary – from the county that will permit the School Division rather than the county to receive payments from a biodiesel buy-down fund; and

BE IT FURTHER RESOLVED to adopt a voluntary schedule to convert to a minimum blend of B5 (5 percent biodiesel mixed with 95 percent petroleum diesel) as soon as possible, but no later than April of 2008, and to gradually increase this blend level up to a B20 blend as soon as practical, but no later than April of 2009; and

BE IT FUTHER RESOLVED to educate other potential users in the community and encourage watershed -wide support for and promotion of biodiesel blends as a way to reduce the use of imported petroleum fuel and to support a strong local soybean market; and

BE IT FURTHER RESOLVED to direct the Division Superintendent to appoint one or more representatives to participate in the Dragon Run Biodiesel Partnership and support to the extent practical the Dragon Run Biodiesel Partnership Action Plan; and

BE IT FURTHER RESOLVED to use the technical support offered by the SAMP until September 2008 and other free resources and technical assistance offered by Virginia Clean Cities to help further these goals.

ADOPTED by the King and Queen County School Board, of Virginia, this 17th day of October, 2007.

Louise H Carlton
School Board Chairperson

Division Superintendent

Lisa H. Weakland
School Board Clerk

A RESOLUTION
IMPLEMENTING INCREASE USE
AND
PRODUCTION OF BIODIESEL

WHEREAS, the Dragon Run is a uniquely valuable and sensitive watershed located in the Middle Peninsula of Virginia in parts of Essex, King and Queen, Middlesex, and Gloucester Counties; and

WHEREAS, The Middle Peninsula Planning District Commission (MPPDC)'s Dragon Run Watershed Special Area Management Plan (SAMP) project's mission is to support and promote community-based efforts to preserve the cultural, historic and natural character of the Dragon Run, while protecting property rights and the traditional and current uses of agriculture, forestry and outdoor recreation; and

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WHEREAS, the use of biodiesel, an alternative, domestically produced non-petroleum fuel, increases the energy security of the United States while reducing the annual trade deficit; and

WHEREAS, the use of biodiesel reduces emissions of ozone-forming compounds and other compounds that have been shown to be toxic to human health; and

WHEREAS, Virginia Clean Cities is a locally based non-profit organization that is contracted by MPPDC through the SAMP program to provide technical support and monitor biodiesel developments, activities and grant funding opportunities throughout the Commonwealth.

NOW THEREFORE, BE IT RESOLVED that the Essex County School Board directs the division superintendent, staff, teachers and other appropriate personnel to learn more about the advantages of biodiesel and to support and encourage the use of biodiesel blends in school buses and other diesel-powered vehicles and equipment; and

BE IT FURTHER RESOLVED to amend- if necessary - the process used to procure fuel to enable the purchase of biodiesel blends; and

BE IT FURTHER RESOLVED to adopt a voluntary schedule to convert to minimum blend of BS (5 percent biodiesel mixed with 95 percent petroleum diesel) as soon as possible, but no later than April of 2008, and to gradually increase this blend level up to a B20 blend as soon as practical but no later than April of 2009; and

BE IT FURTHER RESOLVED to educate other potential users in the community and encourage watershed-wide support for and promotion of biodiesel blends as a way to reduce the use of imported petroleum fuel and to support a strong local soybean market; and

BE IT FURTHER RESOLVED to direct the Division Superintendent to appoint one or more representatives to participate in the Dragon Run Biodiesel Partnership and support to the extent practical the Dragon Run Biodiesel Partnership Action Plan; and

BE IT FURTHER RESOLVED to use the technical support offered by the SAMP until September 2008 and other free resources and technical assistance offered by Virginia Clean Cities to help further these goals.

ADOPTED by the Essex County School Board, of Virginia, this 12th day of November, 2007.

Appendix 11: Meetings' Agendas and Minutes for June and July 2008

Dragon Run Conservation Estate Planning Initiative
June 18th, 2008

Regional Boardroom – Middle Peninsula PDC
Saluda
10:00 AM

AGENDA

1. Welcome and Introductions

2. Discussion of purpose for communicating
   a. Varying goals
   b. Maximizing conservation potential
   c. Identifying gaps and needs

3. Dragon Run Conservation Estate Planning target landowner list

4. Future Strategies
   a. Education (landowners, CPAs, attorneys, real estate, etc)
   b. Continued collaboration

5. Adjourn

Dragon Run Conservation Estate Planning Initiative Meeting

June 18, 2008

Minutes

Welcome and Introductions

Those in attendance included Cornelia Christian (Conservation Partners), Frank Herrin (Friends of Dragon Run), Sara Stamp (MPPDC) and Pat Tyrrell (Tidewater RC&D).

Discussion of purpose for communicating

Sara Stamp provided an overview of the Dragon Run Estate Planning Initiative and identified the goals of the program as including:

1. Potential better coordination between stakeholders in the conservation estate process in the Dragon Run watershed
2. The creation of a conservation hub in the watershed

The roundtable forum format of the meeting provided opportunity for the participating organizations to provide input.

The partners reviewed a copy of a map of conservation holdings in the Dragon Run Watershed and discussed the Targeted Stakeholder list. Ms. Stamp noted that parcels that were targeted are large, forested/wetlands/ag land, near the mainstem of the Dragon Run.

Friends of Dragon Run President, Frank Herrin noted that although the organization can hold easements, they are not a tool that the

organization is currently interested in utilizing due to the long-term liability of ongoing maintenance.

Amongst other topics, landowner education (both for the general watershed population and for targeted landowners) was identified as the highest priority for present action.

The partners present decided that there should be a second meeting discussing similar topics and strategies as several key partners backed out of the meeting at the last minute.

Dragon Run Conservation Estate Planning Initiative
July 30th, 2008

Regional Boardroom – Middle Peninsula PDC
Saluda
10:00 AM

AGENDA

1. Welcome and Introductions

2. Discussion of purpose for communicating
   a. Varying goals
   b. Maximizing conservation potential
   c. Identifying gaps and needs

3. Dragon Run Conservation Estate Planning target landowner list

4. Future Strategies
   a. Education (landowners, CPAs, attorneys, real estate, etc)
   b. Continued collaboration

5. Adjourn

Dragon Run Conservation Estate Planning Initiative Meeting

July 30, 2008

Minutes

Welcome and Introductions

Those in attendance included Andy Lacatell (TNC), Cornelia Christian (Conservation Partners), Frank Herrin (Friends of Dragon Run), Becky McCoy (CPA), Bill Lewis (attorney), Kelly Price (VA CZMP), Prue Davis (ECCA & MPLT), Al Willett (Friends of Dragon Run), Sara Stamp (MPPDC) and Pat Tyrrell (Tidewater RC&D).

Discussion of purpose for communicating

Sara Stamp provided an overview of the Dragon Run Estate Planning Initiative and identified the goals of the program as including:

1. Potential better coordination between stakeholders in the conservation estate process in the Dragon Run watershed
2. The creation of a conservation hub in the watershed

The roundtable forum format of the meeting provided opportunity for the participating organizations to provide input.

TNC:

The Nature Conservancy's goals – protect large forest block in watershed and restore part of it to old growth; protect bald cypress community using easements and acquisition; protect water quality and aquatic system of Dragon (which also protects key species); not about protecting open space or farmland, but that is a secondary benefit

Process – Since 2003, protected about 4500 acres through acquisitions, many of which have been transferred to public bodies; some purchased, eased and sold back to private; easements on private land;
Maximizing conservation potential – aim to protect around 45,000 acres
Thinks there may be a limited role for donated easements
Gaps and Needs – gaps in general understanding about role that easements have played in estate planning; not enough folks doing conservation work on the ground in region

Becky McCoy–
Consulting work with landowners; using easements to reduce tax burden
Gaps – would be easier if people did this as part of estate planning instead of late in the game; educational part with professionals and people educating people about this need; people banking on estate taxes going away; tax burden leads to sale of land

Bill Lewis
Sees more perspective of people looking for tax relief or looking for monetary motivation; conservation is a secondary driver; 2010 tax fall back are going to have a significant impact; people don't realize that they have taxable estate and many won't realize until owner dies and heirs must come up with taxes;

Cornelia
Education is number one priority for landowners and professionals

Who is doing what
ECCA – continuing education
Becky – continuing education
Difficult to cover lower Middle Peninsula
Difficult to get the professionals there and get the word out

ECCA
Trying to use social functions to provide education

Andy
No issues with collaboration

Cornelia
Need to find a holder for smaller pieces, would be good to have alternatives with smaller pieces
Other parts of the state, counties will hold

Becky
Helping to lower cost to landowners to put an easement on their land

Conservation Partners – will front easement costs

MPLT will take small pieces
Williamsburg land conservancy will also hold small pieces

Monitoring is going become a sub-industry of easement stewardship services

There is a need for more easement monitoring funds

Advertising, invitation, follow-up,
Educate public and that may drive them to get their attorneys to learn
Northern Neck Bar Association could help put something together with speakers
Northern Neck Land Conservancy successful
FODR – majority of membership live in watershed, but are not landowners with large lands; most don't have expertise to volunteer to monitor
Land trust may need to take role of fundraising to pay for monitoring vs providing volunteers to monitor
FODR may have people who will be willing to be trained and certified to monitor lands in the Dragon Run and partner with MPLT
General education needed for general assembly and need for funding for land conservation

<u>Other needs and next steps</u>
Collaborative, co-hosted landowner event (January-February)
Targeted invitation for the list, preemptive personal phone call
Continuing education event for professionals (April – May)
Conduct planning meeting in mid November to plan for these events

Appendix 12: Conservation Estate Planning Brochure

What are the benefits of estate planning?

Tax benefits: Donors receive tax benefits for conservation easements in Virginia because undeveloped land provides significant public benefit in the form of agriculture, forestry, clean water, scenic views, wildlife habitat, etc. – benefits that would be lost if the land were developed. The state of Virginia currently is one of the most generous in terms of tax incentives for conservation easement donations. The state offers a tax credit that can be sold if the donor has limited income liability. There are additional federal charitable income tax deductions and estate & gift tax benefits.

Most importantly, peace of mind: Conservation easements provide assurance that your land will be protected into the future. You donate an easement to permanently protect the things you love about your land. By establishing an easement, you are giving up something you didn't really want in the first place – the right to damage what is special about your land.

What are the costs of creating an easement?

Establishing an easement can be a complex process with some up front costs, such as appraisals and attorney fees. To do an easement correctly, expect the process to take anywhere from a few months to over a year for more complex properties. There are, however, organizations to assist landowners with this process.

I am interested! What steps do I take next?

Contact one of several organizations operating in the Middle Peninsula area that can assist you with conservation estate planning:

Middle Peninsula Land Trust- (888) 887-0909
The Nature Conservancy- (804) 644-5800 x18
Friends of Dragon Run- (804) 785-6403
Conservation Partners, LLC- (540) 464-1899
Essex Co Countryside Alliance- (804) 267-3209

Virginia Coastal Zone MANAGEMENT PROGRAM

This work was funded by the Virginia Coastal Zone Management Program at the Department of Environmental Quality through Grant # **NA07NOS4190178 Task 95** of the National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management, under the Coastal Zone Management Act of 1972, as amended. The views expressed are those of the author(s) and do not necessarily reflect the views of NOAA or any of its subagencies.

Estate Planning & Conservation Tools

Dragon Run WATERSHED

Mission: To support and promote community-based efforts to preserve the cultural, historic, and natural character of the Dragon Run, while preserving property rights and the traditional uses within the watershed.

Saluda Professional Center
125 Bowden Street
P.O. Box 286
Saluda, VA 23149-0286
Phone: (804) 758-2311
Fax (804) 758-3221
sstamp@mppdc.com
www.mppdc.com/dragon.shtml

DRAGON RUN SPECIAL AREA MANAGEMENT PROGRAM

What is the Dragon Run Special Area Management Program (SAMP)? A partnership between the Virginia Coastal Zone Management Program and the Dragon Run Steering Committee of the Middle Peninsula PDC, is designed to address both the differing viewpoints and common ground that exist concerning the future of the watershed.

What is the Dragon Run Steering Committee? Formed in 1985, the Dragon Run Steering Committee consists of landowners and local elected officials and is the key vehicle for cooperation and coordination among the four counties concerning watershed issues.

What counties are in the watershed? The counties of Essex, Gloucester, King and Queen, and Middlesex contain the watershed.

STEERING COMMITTEE

Essex County – Prue Davis (Chair)(S), Fred Hutson (P), Dorothy Miller, M. Scott Owen
Gloucester County – Michelle Ressler (S), Eric Weisel (P), Terry DuRose, Willy Reay
King and Queen County – Pete McDuff (S), Annie Pollard (P), Robert Gibson, Frank Herrin (Vice Chair)
Middlesex –Jack Miller (S), John England (P), R. D. Johnson, Bill Bagby

(S) denotes Supervisor
(P) denotes Planning Commissioner

Staff – Sara Stamp

ESTATE PLANNING, CONSERVATON TOOLS AND COMMUNITY FOUNDATIONS

What is estate planning?
Estate planning begins with the identification of all the assets and liabilities of the estate. Its purpose is to leave detailed instructions pertaining to the distribution of assets and settlement of liabilities after the owner's death. Estate planning is versatile and may use various instruments and strategies depending upon the needs and circumstances of the estate. The goals need not be limited to asset distribution and tax avoidance. The wealth of an estate may be used to achieve other specified objectives: education, start-up capital for a new business, donation to community or charitable organization, or conservation. Goals may encompass broader horizons such as preserving a certain character to the land, certain uses and management regimes.

What types of land conservation estate planning tools exist?
Conservation Easements: An easement is a permission or restriction that attaches to a property in the form of deed covenants. It represents the permanent, legal conveyance of an agreed upon set of property rights to another party. A common permissive easement is the right of a utility company to run cable across one's property. A restrictive easement might preclude a property owner from further subdividing their land. A conservation easement may prohibit or limit certain land use activities such as residential development to preserve wildlife habitat.

Conservation easements are flexible and can be structured to meet the goals of both the landowner and the party to which the easement is being granted. The use restrictions contained in the easement are permanently attached to the title, otherwise ownership is unaffected. As with any property, it may be sold, bequeathed or donated to charitable causes. All uses permitted by zoning and not restricted by the easement may continue. The use of a conservation easement does not require the owner to permit public access.

Life Instruments: These are easements or deed restrictions that come to force after the owner's death or some other specified time. The current owner may continue to live on and use the property.

Right of First Refusal: A legal document entered into by the landowner and a second party whereby notice is given to the second party when the landowner intends to sell property or change land use. The second party may exercise the right to purchase the land at market value or refuse this right. This instrument serves primarily to notify and preserve purchase or lease options for the second party with no diminishment of land value or other cost associated with this instrument.

Community Foundations: These are 501(C)3 non-profit corporations that may receive charitable gifts, invest, manage and distribute them for community improvement.

Conservation Registry: The Registry shows appreciation and recognizes the landowner with the presentation of a plaque or framed certificate that could also serve the aims of the larger public relations effort to build momentum and strengthen the sense of community interest.

Appendix 13: Targeted Landowner List

MAP_PIN	COUNTY	OWNER
59-A-66	Essex	ABRAMS W J JR
1623-63L 1147	King and Queen	ADKINS, DAVID & CARLSON, JUDITH A.
17-A-6	Middlesex	ASHLEY LOGGING CO INC
1623-137R 1225	King and Queen	ASHLEY LOGGING CO. INC.
11-A-29	Middlesex	ASHLEY LOGGING COMPANY INC
11-A-28	Middlesex	BAGBY LAWRENCE
6-A-59	Middlesex	BAGBY MARTHA R
52-A-70	Essex	BAYTON NATHAN R JR
1624-50R 328A	King and Queen	BJT & SON LLC
04-76	Gloucester	BLUFORD, THOMAS EST
1624-35R 625B	King and Queen	BOWMAN, JEANNE CARLTON ET ALS
26-A-140	Middlesex	BRISTOW CHAS F & MARGARET ET ALS
50-A-22	Essex	BROOKS ALAN J & FREDERICK LEE
1623-138R 1281	King and Queen	BROOKS, FRANK O. JR & LAURA ANNE
1623-159R 699	King and Queen	BROOKS, WILLIAM LESLIE JR.
1623-159R 698	King and Queen	BROOKS, WILLIAM LESLIE JR. & MARY
11-A-1	Middlesex	CALHOUN JEANETTE C LIVING TR
12-A-22	Middlesex	CARLTON & EDWARDS INC C/O W D EDWARDS JR
04-83	Gloucester	CARTER, CHARLES EDWARD
1624-35R 617	King and Queen	CAUTHORNE PROPERTIES LLC
1623-136R 1171	King and Queen	COATES, JOSEPH L. ET ALS
1623-138L 1353	King and Queen	COLLINS, LUCY
1623-137R 1263	King and Queen	COMMONWEALTH OF VA
04-34A	Gloucester	COMMONWEALTH OF VIRGINIA BOARD FOR COMMUN
59-A-6	Essex	DAVIS MARGARET H ET AL
04-84	Gloucester	DEC, INC
04-88	Gloucester	DEHARDIT, WILLIAM M & DEHARDIT, ELIZABETH J
03-3	Gloucester	DRAGON RUN LTD
03-41	Gloucester	DRAGON RUN LTD
26-A-40	Middlesex	DRAGON RUN LTD
26-A-163C	Middlesex	DRAGON RUN LTD C/O PITTS LUMBER CO
26-A-39	Middlesex	DRAGON RUN LTD C/O PITTS LUMBER CO
51-A-58	Essex	DURHAM WILLIAM F ADM ET AL
25-A-6	Middlesex	EDWARDS JAMES R & REBECCA M
1624-35R 615	King and Queen	ELLIS, MARGARET WARNER TODD
1624-35L 615A	King and Queen	ELLIS, WILLIAM F. III
1624-35L 615B	King and Queen	ELLIS, WILLIAM F. III & MICHELLE A.
1624-35R 615C	King and Queen	ELLIS, WILLIAM FRANKLIN JR. & MARGARET W. TODD
03-39D	Gloucester	ENGLE, GARY E & ENGLE, MARGARET E
35-A-3	Middlesex	ESTATE ASSURANCE SYSTEM INC
11-A-17	Middlesex	FARM 606 LLC
12-A-2	Middlesex	FARM 606 NORTH LLC
1623-161R 1296A	King and Queen	FORESTREE 96 LIMITED PARTNERSHIP
11-A-29A	Middlesex	FRIENDS OF DRAGON RUN INC
52-A-54	Essex	GARRETT LLC ET AL
1623-137R 1219	King and Queen	GIBSON, ROBERT E.
1623-157L 646	King and Queen	GIBSON, ROBERT E. & NETTIE C.
1623-139L 723	King and Queen	GLENN, P. C. ESTATE
1623-158L 693	King and Queen	GRAY, LOUISE EUBANK
25-A-3	Middlesex	GRIFFITH PAMELA B
11-A-9	Middlesex	H & W PROPERTIES

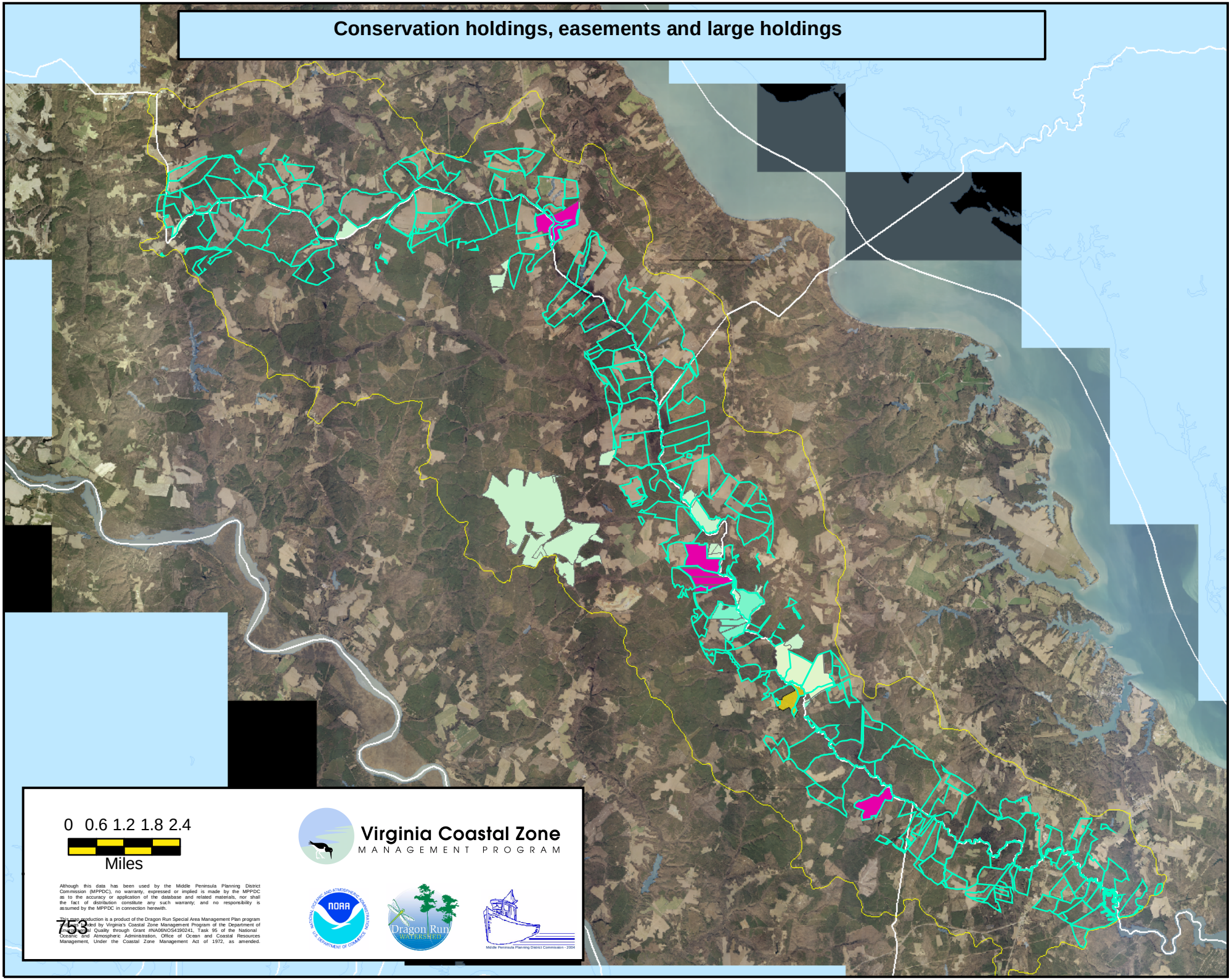
49-A-60	Essex	HAILE JAMES C SR
1623-136R 1134	King and Queen	HALL, SANDRA HOWELL
6-A-12	Middlesex	HAWAII ERS TIMBERLAND L L C C/O HANCOCK FORES
6-A-56	Middlesex	HAWAII ERS TIMBERLAND L L C C/O HANCOCK FORES
63-A-5	Essex	HAWAII ERS TIMBERLAND LLC
1624-50L 269	King and Queen	HENLEY, W. T. III & KATHLEEN P.
05-1	Gloucester	HUDGINS, ROBERT C
59-A-7	Essex	HUNDLEY IDELL B
53-A-107	Essex	HUNDLEY MARY F
52-A-78B	Essex	HUNDLEY T LARKIN TRUST
52-A-78	Essex	HUNDLEY T LARKIN TRUST
1623-138L 1287	King and Queen	JAMES, RAYMOND E.
04-85	Gloucester	JESSIE, BETTY R
49-A-61	Essex	JOHN HANCOCK MUTUAL LIFE INS CO
50-A-12	Essex	JOHN HANCOCK MUTUAL LIFE INS CO
59-A-68	Essex	JOHN HANCOCK MUTUAL LIFE INS CO
49-A-62	Essex	JOHN HANCOCK MUTUAL LIFE INS CO
25-A-4	Middlesex	JOHN HANCOCK MUTUAL LIFE INS CO C/O HANCOCK
1624-35R 616	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1624-35R 627	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1624-35R 628	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1623-159R 749	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1624-35L 600	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1623-158L 687	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1623-158R 678	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1624-50R 309	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1624-50L 384	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1624-35R 629	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1623-63L 1146	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1623-63L 1145	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1623-139L 1302B	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1623-137R 1221	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1623-161R 1303	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1623-160R 706	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1623-138L 1357	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
1623-63L 1138	King and Queen	JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
35-A-14	Middlesex	JOHNSON ERIC A & BARBARA M R/S
26-A-136	Middlesex	LATIMORE CARY JR
6-A-51	Middlesex	LEE VIRGINIA C ESTATE C/O STUART C LEE
6-A-54	Middlesex	LEE WAYNE C ET AL
1624-50L 288	King and Queen	LEE, STUART C. ET ALS
50-A-16	Essex	LEWIS RICHARD GORDON ET AL
49-A-60C	Essex	LEWIS RICHARD GORDON ET AL
1623-158R 685	King and Queen	LONGEST, T. O' NIEL JR. TRUSTEE
1623-158R 690	King and Queen	LONGEST, THOMAS O. JR. & DEBORAH F.
50-A-31	Essex	LOUDON FARM CORP
1624-50R 313	King and Queen	LUMPKIN, ALBERT H. & ESTHER
35-A-4	Middlesex	MAJOR CLARENCE E ET AL C/O LILY F MAJOR
26-A-137	Middlesex	MAJOR JOHN HUBERT & JOSEPHINE M
1623-158L 657	King and Queen	MAJOR, JOSEPH E. JR. & DIANNE L.
16-A-2	Middlesex	MALLEY GEORGE T & SALLY E CO TRUST C/O JOHN M
52-A-19A	Essex	MALLOY WALTER N SR

6-A-57	Middlesex	MCCALLUM RONALD A & ROBERTA M R/S
59-A-1	Essex	MIDDLE PENINSULA CHESAPEAKE BAY
11-A-11	Middlesex	MILBY LOUISE M TTEE J WARREN MILBY C/O WILLIAM
01-7	Gloucester	MILBY, LOUISE M FAMILY LIMITED PARTNERSHIP
02-10	Gloucester	MILBY, LOUISE M FAMILY LIMITED PARTNERSHIP
03-39B	Gloucester	MILBY, LOUISE M FAMILY LIMITED PARTNERSHIP
04-26	Gloucester	MILBY, LOUISE M FAMILY LIMITED PARTNERSHIP
04-82	Gloucester	MILBY, WILLIAM H LIVING TRUST
03-39A	Gloucester	MILBY, WILLIAM H LIVING TRUST
05-2	Gloucester	MILBY, WILLIAM H, LUMBER CO INC
04-81	Gloucester	MILBY, WILLIAM H, LUMBER CO INC
1624-50R 327	King and Queen	MITCHELL, ROBERT MASON
1624-50L 270	King and Queen	MOODY'S LOGGING INC.
27-A-63	Middlesex	MOORE J M
03-2	Gloucester	MORRISON, BENJAMIN A & MORRISON, CAROLYN D
52-A-9	Essex	MOTLEY SUSAN S
1623-161R 1296	King and Queen	NELSON, REGINALD H. IV
1623-157L 643	King and Queen	NORMAN, LEWIS L. & PHYLLIS T.
04-74	Gloucester	PARRISH, RAYMOND A & PARRISH, HAZEL R
04-24	Gloucester	PERRY, DONALD A
1623-139L 1297	King and Queen	PETER, STEVEN R.
6-A-60	Middlesex	PIEDMONT FARMS
11-A-2	Middlesex	PIEDMONT FARMS C/O W H CARLTON ET AL
11-A-2	Middlesex	PIEDMONT FARMS C/O W H CARLTON ET AL
03-47	Gloucester	PIERCE, WILLIAM FORREST ESTATE
51-A-51	Essex	POTOMAC SUPPLY CORPORATION
17-A-56	Middlesex	POWELL JEFFREY ALAN ETAL
17-A-57	Middlesex	POWELL LARRY J & SANDRA L R/S
1625-42R 464	King and Queen	POWERS, JOHN B. & EDITH L.
02-9	Gloucester	PRYOR, NANNIE LORIENE & PRYOR, EDDIE A
01-4	Gloucester	RHOADS, WILLIAM M & PARMENTER, JED L
01-5	Gloucester	RHOADS, WILLIAM M & PARMENTER, JED L
17-A-10A	Middlesex	RICHARDSON WILLIAM L
03-40	Gloucester	RICHLAND FARMS INC
01-6	Gloucester	ROANE, DOSWELL F & ROANE, ALEASE C
25-A-22	Middlesex	RUSSELL ROBERT M JR & WESLY J & J C C/O WESLEY
02-8	Gloucester	SCOTT, GLORIA WALLER
04-74A	Gloucester	SHELDON, OSCAR C
1623-158L 656	King and Queen	SMITH, H. LEON & SAVAGE-SMITH, TRINA
04-20	Gloucester	SOLES, HUGH S & SOLES, ALVERDA HAZZARD
53-A-108	Essex	SOUTHLAND FARM LLC
1623-138L 1295	King and Queen	STEWART, LOIS EMMA
49-A-64	Essex	SZABO ISTVAN L ET UX
1623-159R 696	King and Queen	TALIAFERRO, WILLIAM L. ET ALS
1623-160R 712	King and Queen	TALIAFERRO, WILLIAM L. ET ALS
60-A-108	Essex	TFL PARTNERS LP
50-A-19	Essex	TFL PARTNERS LP ET AL
50-A-21	Essex	TFL PARTNERS LP ET AL
17-A-10B	Middlesex	THE NATURE CONSERVANCY
26-A-37	Middlesex	UNKNOWN
11-A-45	Middlesex	UNKNOWN
17-A-10	Middlesex	UNKNOWN

18-A-43	Middlesex	UNKNOWN
50-A-11	Essex	UNKNOWN
6-A-11	Essex	UNKNOWN
55-A-2	Essex	UNKNOWN
56-A-2A	Essex	UNKNOWN
1623-159R 695	King and Queen	WALDEN, MARTHA LENA ET ALS
1625-42R 231A	King and Queen	WALKER, CARROLL LEE
51-A-99	Essex	WALTER WILLIAM V ET UX
17-A-58	Middlesex	WALTON SARAH C TRUSTEE
17-A-59	Middlesex	WALTON SARAH C TRUSTEE
1623-160R 702	King and Queen	WALTON, WILLIAM BERNARD TRUSTEE
1623-158L 665	King and Queen	WYATT, DOROTHY M. & EVELYN M.

Appendix 14: Priority Conservation Area Map

Conservation holdings, easements and large holdings



0 0.6 1.2 1.8 2.4

Miles

Virginia Coastal Zone
MANAGEMENT PROGRAM

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NOAA

Dragon Run WATERSHED

Middle Peninsula Planning District Commission - 2004

Appendix 15: Essex County Countryside Alliance Newsletter Article

As one of the Chesapeake Bay watershed's most pristine waterways, the Dragon Run "encompasses some of the most extensive and unspoiled swamp forest and woodland communities in Virginia" (Belden, Jr. et al, 2001). Effectively bisecting Virginia's Middle Peninsula located between the York and Rappahannock Rivers, this fresh and brackish water stream meanders forty miles along and through nontidal and tidal cypress swamp. The watershed is mainly undeveloped, almost entirely privately owned, and encompasses approximately 140 square miles (90,000 acres) of rural landscape – mostly forests, farms, and wetlands. The spring-fed Dragon Run flows through portions of Essex, King and Queen, Middlesex, and Gloucester Counties, emptying into the estuarine Piankatank River and ultimately the Chesapeake Bay.

The Dragon Run plays a central role in the Middle Peninsula's culture and identity. Its intriguing name is frequently borrowed by local enterprises and establishments and is often overheard in community conversations. Since European settlement in the early 1600's and Native American inhabitation up to 10,000 years before that, natural resources have been the bedrock of the watershed's economy. For older generations, forestry, farming, hunting, trapping and fishing were the primary ventures. Today, forestry and farming continue to generate wealth and drive the watershed's economy. Upholding an ancient tradition, hunters range over prime hunting grounds stalking prized game. These land uses, together with extensive swamps, are the main reasons that the Dragon Run remains wild and secluded.

The watershed's wilderness is both expansive and unique. The Dragon Run contains the northernmost example of the Baldcypress-Tupelo Swamp natural community in Virginia and the best example north of the James River (Belden, Jr. et al., 2001). Moreover, at least 14 rare species and 5 rare natural communities are found here. Based on his investigations of the watershed's aquatic communities, one researcher observed that the Dragon Run is a "100 year old time capsule," resembling coastal plain streams in the Chesapeake Bay region at the turn of the 20th century (Garman, 2003).

The Dragon Run's unique character evokes strong feelings to protect the pristine watershed in both long-time residents and first-time visitors alike. Although development pressure in the watershed is currently low, the potential for significant land ownership changes (>25% in 10 years due to aging and absentee corporate landowners) threatens to disrupt the rural character and fragment productive farm and forest land. Likewise, habitat fragmentation jeopardizes the Dragon Run's unique natural communities. Landowner opinions about how to address these threats vary widely, ranging from the belief that "the Dragon takes care of itself" by its wild nature and voluntary landowner stewardship to enacting and enforcing regulations with "teeth."

The Dragon Run Watershed Special Area Management Plan (SAMP), a partnership between the Virginia Coastal Zone Program and the Dragon Run Steering Committee of the Middle Peninsula Planning District Commission, is designed to address both the differences of opinion and the common ground that exist concerning the future of the

watershed. The difference in point of view between property rights advocates and conservationists centers on how to maintain a pristine watershed into the future. Yet, as the Dragon Run Special Area Management Plan SAMP unfolds, the community is learning that substantial common ground exists for proactively preserving the Dragon Run for future generations that safeguards both natural resources and traditional uses of the land and water, including the property rights of landowners.