

Accomack–Northampton Coastal Resources Technical Assistance Program



Virginia Coastal Zone Management Program

Accomack-Northampton Planning District Commission

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Fiscal Year 2014 Technical Assistance Annual Report

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Virginia Coastal Zone Management Program

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On the cover – Photograph of commercial and recreational users on Onancock Creek by Genevieve Walker-Switzer. The image portrays a common scene on Eastern Shore waterways where recreational and commercial users regularly coexist.



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1.0 Introduction

The Accomack-Northampton Planning District Commission (A-NPDC) was formed in 1970 to provide planning and housing services on the Eastern Shore of Virginia. A-NPDC is a regional commission consisting of Accomack and Northampton Counties and the Town of Chincoteague. Additionally, the A-NPDC assists 19 incorporated towns on the Eastern Shore.

The Eastern Shore of Virginia is a 70-mile long peninsula between the Atlantic Ocean and the Chesapeake Bay that has remained as one of the few remaining rural regions on the Atlantic seaboard. The region is unique for its vast wealth of coastal resources. The threats of development and constant changes to the region’s dynamic coastal environment put the socio-economic, natural, and built environments on the Eastern Shore at risk. As result, A-NPDC has championed several efforts focusing on ensuring a sustainable future for local economies and the environment.

In 2014, the A-NPDC continued to publish quarterly the Eastern Shore of Virginia Climate Adaptation Working Group (CAWG) Newsletter to synchronize efforts amongst local, state, and federal representatives of government, aquaculture, agriculture, and community organizations to better plan and mitigate risks associated with climate change and sea level rise. CAWG along with other A-NPDC efforts such as the Eastern Shore of Virginia Ground Water Committee are working to ensure a productive future for Eastern Shore residents and the natural environment.

During the 2014 Fiscal Year (FY2014), A-NPDC published the quarterly CAWG newsletter, offered coastal management training opportunities for local government staff, and coordinated public education efforts. The A-NPDC also continued to staff the Eastern Shore of Virginia Ground Water Committee, provide GIS services, conduct state and federal environmental reviews, and work with local governments and organizations to address coastal management issues. The A-NPDC’s focal project for FY2014 originally involved facilitating discussions between Accomack and Northampton Counties focusing on the development of the Eastern Shore Water Access Authority following legislation passed during the 2014 Virginia General Assembly, which enabled the counties with the authority to create such an entity. After conducting research on similar Access Authorities, preparing draft operating documents and presentations, and holding initial discussions with individual county representatives, it was requested that the A-NPDC not proceed with the planned activities. Being such, the A-NPDC conducted an additional focal project to help promote planting of native tree varieties and to celebrate the Eastern Shore’s oldest and largest native trees. The “Shore Big Trees” Program Outreach and Implementation Report

was completed to better position the Shore Big Trees program for applying and competing for grant funding. The expected outcome of these activities is expected to improve coastal management on the Eastern Shore of Virginia.

As part of the overall mission, the A-NPDC maintains a coastal program with the assistance and support of the Virginia Coastal Zone Management Program and the National Oceanic and Atmospheric Administration (NOAA).

2.0 Executive Summary

The A-NPDC staff published and distributed the CAWG Newsletter, and staff offered coastal management training opportunities for local government entities while coordinating public education efforts during FY2014. A-NPDC also continued to staff the Eastern Shore of Virginia Ground Water Committee which provided GIS services, conducted state and federal environmental review, and worked with local governments and organizations. The A-NPDC facilitated a draft governing the formation of the Eastern Shore Water Access Authority. Surveys and contacts were made over FY2014 to facilitate Shore Big Tree in order to aid in the creation of implementation plans for different local government bodies. Over \$445,066 in grant funds and staff time were leveraged to aid the completion of multiple projects related to the goals presented in the scope of work for FY2014.

3.0 Products

The following sections describe the activities completed during FY2014.

3.1 Climate Adaptation Working Group Newsletter Report

The Climate Adaptation Working Group (CAWG) is comprised of local government staff and officials that met twice during FY2014 to coordinate coastal management efforts, provide information and solicit input from localities on state and federal initiatives, and allow the exchange of information between localities. This task implements Executive Order 23, Goal 8. Newsletters were distributed quarterly to support the group and supplement local decision making processes related to sea level rise and climate change.

3.1.1 Quarterly Newsletters

In FY2014, the A-NPDC continues to serve as the lead agency of CAWG; which is comprised of local, state, and federal representatives of government, aquaculture, agriculture, and community organizations since 2012. The CAWG newsletters were distributed to several hundred residents and

stakeholders representing dozens of agencies/groups working in coastal management. Newsletters are comprised of dozens of research and news items and planning tools. The CAWG newsletters for FY2014 can be seen in **Appendix A – D**.

3.1.2 Leveraged Accomplishments

In FY2014, the CAWG Newsletter resulted in directly assisting and enhancing the following activities:

- ◆ Engaged over 30 partnering and participating agencies including local, state, and federal government agencies and local NGOs;
- ◆ Held two meetings;
- ◆ Engaged local residents during a presentation related to transportation infrastructure inundation due to sea level rise;
- ◆ Engaged local residents and stakeholders into the Hazard Mitigation Plan update for 2016;
- ◆ Coordinated with the NASA Wallops Flight Facility to incorporate local data into local adaptation planning efforts;
- ◆ Continued coordination with the Nature Conservancy to develop the Coastal Resilience Decision Support Tool; and
- ◆ Reviewed approximately 50 adaption-related projects.

3.2 Coastal Management Training Report

The A-NPDC coordinated fourteen training and outreach events during FY2014. The events are summarized in the following sections. This task implements Executive Order 23, Goal 10.

3.2.1 Southern Accomack County Ground Water Summit

On October 30, 2014, A-NPDC staff held the third of its Public Ground Water Summit series on behalf of the Ground Water Committee at the Eastern Shore Community College in Melfa. This summit focused on the communities within southern Accomack County including the town of Onancock, Onley, Accomac, Wachapreague, Melfa, Keller, Painter, and Belle Haven. Curt Smith of A-NPDC and Britt McMillan, Ground Water Consultant to the Committee, gave presentations summarizing specific ground water conditions to over 20 persons representing different stakeholder groups including town and county governments and planning commissions, private citizens, and businesses.

The workshop provided information on how the past environments on the Shore have influenced the public ground water supply with specific descriptions concerning the

Chesapeake Bay bolide impact, the southward progradation of the Susquehanna River and the Delmarva Peninsula and the influence of Carolina Bays on ground water. Additional explanation of past environments and how they affect water quality, resulting in high iron in some areas, sulfur smell in other areas, and hard carbonate waters, all on the Shore. The presentations provided insight into everything that is known and unknown regarding the region's sole source aquifers. The presentations were followed by lively discussions between the presenters and the audience.

The workshop was advertised in local newspapers, on the radio, and on the internet. County and town government leaders and planning commissioners were personally contacted to encourage their participation. Photos from the workshop and event materials are included in **Appendix E**.

3.2.2 Ground Water Presentation at Virginia Master Well Owner Network Workshop

On November 11, 2014 Curt Smith of A-NPDC presented an overview of regional ground water conditions and current management systems on behalf of the Ground Water Committee. Over 40 persons were in attendance. Agenda, sign-in sheet, and presentation materials can be found in **Appendix F**.

3.2.3 Coastal Resilience Presentation at Adaptive Planning for Flooding and Coastal Change Virginia Conference

On December 5, 2014, Curt Smith of A-NPDC presented the Eastern Shore's Resiliency efforts at the Coastal Change Virginia Conference to over 150 persons. This presentation informed planning professionals, academics, and other professionals of the different efforts made by the Eastern Shore in resiliency. The presentation included introducing the Climate Adaptation Working Group, Coastal Change Archive, the Hazard Mitigation Plan Update, the Transportation Infrastructure Inundation Vulnerability Assessment, and the NFWF planning tool. Presentation materials can be found in **Appendix G**.

3.2.4 Northern Eastern Shore Community Rating System Workshop

On February 11, 2015, the A-NPDC facilitated a workshop in Wachapreague focusing upon the Community Rating System. The workshops partnered with FEMA, Wetlands Watch, VDEM, and Homeland Security. Shannon Hulst-Jarbeau, Assistant Director of Wetlands Watch, and Mary-Carson Stiff, JD and Assistant Director of Wetlands Watch, are both

certified floodplain managers and led the sessions. These sessions focused on educating the community on how to lower their flood insurance rates from 5 – 45% through the voluntary community rating system program. The CRS offers flood insurance discounts in exchange for floodplain management actions at the local level. Information from this workshop has been incorporated into the 2016 Hazard Mitigation Plan Update. Presentation materials and a sign-in sheet can be found in **Appendix H**.

3.2.5 Southern Eastern Shore Community Rating System Workshop

On February 11, 2015, the A-NPDC facilitated a workshop in Eastville focusing upon the Community Rating System. This workshop was the second of two workshops presented on the same day using the same materials. Presentation materials were the same at the Northern and Southern Eastern Shore Community Rating System Workshops. The sign-in sheet can be found in **Appendix I**.

3.2.6 Ground Water Presentation at the Eastern Shore Master Gardener's Training

On March 25, 2015, Curt Smith of A-NPDC presented an overview of regional ground water conditions and current management systems on behalf of the Ground Water Committee to 16 persons. The presentation was included as part of the required training for the Eastern Shore Master Gardener's Program. Feedback received from the audience indicated that the information presented was highly informative and beneficial. Presentation materials can be found in **Appendix J**.

3.2.7 Presentation at Virginia Municipal League Meeting: Sea Level Rise on the Eastern Shore

On April 30, 2015, Curt Smith of A-NPDC presented the Eastern Shore's Resiliency efforts in lieu of Sea Level Rise at a local meeting of the VA Municipal League in Wachapreague to 22 persons. The presentation included introducing the Climate Adaptation Working Group, Coastal Change Archive, the Hazard Mitigation Plan Update, and the Transportation Infrastructure Inundation Vulnerability Assessment (TIIVA). The audience expressed the most interest in and asked the most questions regarding TIIVA as it represented the most

direct impacts to transportation infrastructure and sea level rise. Presentation materials can be found in **Appendix K**.

3.2.8 Household Hazardous Waste Collection

On Saturday, May 2, 2015 99 Accomack and Northampton residents dropped off over 1.5 ton of household hazardous waste at the 11th Annual Household Hazardous Waste Collection. This year's collection was held concurrently at three locations at Accomack and Northampton County Convenience Centers in Chincoteague, Tasley, and Birdsnest making it easier for more residents to participate. A variety of hazardous materials were collected for proper disposal and recycling including aerosols, gasoline, kerosene, pesticides, insecticides, acids, fluorescent light bulbs, fertilizers, paint thinners, and asbestos shingles. Residents could dispose of 50 pounds at no cost, which was twice the allowance as previous years.

The Eastern Shore's landfills are not engineered to handle these hazardous wastes that often illegally enter the landfills or are improperly disposed of by pouring out onto the ground or into a water body. These actions not only increase landfill operating costs putting additional burdens on our local governments, but they also pose a serious health risk to Eastern Shore residents and the environment. All potable water used by Eastern Shore residents comes from the ground and is very susceptible to contamination from these hazardous wastes which tend to accumulate around everyone's homes over time. Hazardous wastes create unnecessary health and safety risks at home and every quantity brought in through the collection program ensures that that waste will not pollute our water resources on the Eastern Shore and endanger the quality of our water and public health.

NOAA and VCZM logos were displayed on all promotional and event materials. The agencies were also acknowledged in radio interviews leading up to the event and in media press releases following the event.

Event materials and photographs are included in **Appendix L**.

3.2.9 Central Accomack County Ground Water Summit

On Tuesday June 16, 2015, A-NPDC staff invited the public to a Public Ground Water Summit series on behalf of the Ground Water Committee at Metompkin Elementary School in Parksley. This summit was focused on the communities within central Accomack County including the towns of Accomac, Parksley, Bloxom, and Hallwood. Curt Smith of A-NPDC and Britt McMillan, Ground Water Consultant to the Committee, gave presentations summarizing specific ground water conditions to 10 persons representing different

stakeholder groups including town and county governments and planning commissions, private citizens, and businesses.

The workshop provided information on how the past environments on the Shore have influenced the public ground water supply with specific descriptions concerning the Chesapeake Bay bolide impact, the southward progradation of the Susquehanna River and the Delmarva Peninsula and the influence of Carolina Bays on ground water. Additional explanation of past environments and how they affect water quality, resulting in high iron in some areas, sulfur smell in other areas, and hard carbonate waters, all on the Shore. The presentations provided insight into everything that is known and unknown regarding the region's sole source aquifers. The presentations were followed by lively discussions between the presenters and the audience.

The workshop was advertised in local newspapers, on the radio, and on the internet. County and town government leaders and planning commissioners were personally contacted to encourage their participation. Photos from the workshop and event materials are included in **Appendix M**.

3.2.10 Local Watershed TMDL Working Group Meeting for Nassawadox, Little Mosquito, and Assawoman Creeks

On June 21, 2015 A-NPDC staff coordinated the TMDL working group to examine Nassawadox, Little Mosquito, and Assawoman Creeks. DEQ staff presented information regarding the TMDL planning process and facilitated discussions with the 24 persons in attendance. Participants were asked to provide local information that would better inform and supplement the land use data incorporated into the watershed models. A sign-in sheet can be found in **Appendix N**.

3.2.11 Presentation to Onancock Rotary Club: Sea Level Rise on the Shore

On July 21, 2015, Curt Smith of A-NPDC gave a presentation to over 20 persons of the Onancock Rotary Club in Onley, Virginia. The presentation summarized the region's historic, current, and future vulnerabilities to sea level rise. The presentation included introducing the Climate Adaptation Working Group, Coastal Change Archive, the Hazard Mitigation Plan Update, the Transportation Infrastructure Inundation Vulnerability Assessment, and the NFWF planning tool. The presentation is included in **Appendix O**.

3.2.12 VCZMP/Coastal PDC Meeting

The Coastal Planning District Commissions met at the A-NPDC in Accomack for a two day meeting. The first day involved updates, announcements, and presentations. Shep Moon and Beth Polak from VCZMP went over the Coastal Hazards strategy and the Working Waterfronts Strategy, respectively, for input and consideration for the other PDCs. Finally, Beth went over the economic benefits of natural resources. The second day of the meeting involved a site visit to Tangier to discuss and converse with Tangier officials regarding their unique situation and challenges involving coastal hazards and sea level rise. The agenda can be seen in **Appendix P**.

3.2.13 Local Watershed TMDL Working Group Meeting for Little Mosquito and Assawoman Creeks

On August 26, 2015 A-NPDC staff helped coordinate a working group meeting for a TMDL being developed for Little Mosquito and Assawoman creeks. The event was attended by 7 persons. Event materials are included in **Appendix Q**.

3.2.14 Local Watershed TMDL Working Group Meeting for Nassawadox Creek

On August 26, 2015 A-NPDC staff helped coordinate a working group meeting for a TMDL being developed for Nassawadox creek. The event was attended by 5 persons. A sign-in sheet is included in **Appendix R**.

3.3 Technical Assistance Report

The A-NPDC provided technical assistance to local, state, and federal organizations on numerous occasions including environmental review, GIS, and information services during FY2014. Technical assistance activities are summarized in the following sections. This task implements Executive Order 23, Goals 1, 4, and 10.

3.3.1 Partnerships

The A-NPDC partnered with over 50 government and NGO organizations during FY2014 to complete projects aimed to complete the Scope of Work. **Table 1** summarizes A-NPDC partnerships for FY2014.

Table 1
FY2014 Partnerships

ID	Agency/Group	Partnership Activity
1	34 Agencies, Governments, and NGOs	A-NPDC staff coordinated the Eastern Shore Climate Adaptation Working Group which brought together 33 partnering groups quarterly to address climate change and sea level rise in the region.
2	VIMS	A-NPDC staff partnered with VIMS research faculty to submit proposals for conducting geologic research on the Atlantic Coast with focus on conducting public outreach and coordination with local governments. The two proposals were submitted to the National Science Foundation but not selected for funding.
3	Christopher Newport University	A-NPDC staff assisted with the development of proposals to construct living erosion control structures on the Eastern Shore.
4	VA/MD/DE Sea Grant	A-NPDC staff contributed to the development of a water quality model for the Seaside of the Delmarva Peninsula.
5	The Nature Conservancy	A-NPDC staff partnered with TNC to leverage the Enhancing Coastal Resiliency on Virginia’s Eastern Shore project funded through the NFWF Hurricane Sandy Disaster Resilience Fund.
6	VIMS, VCZMP, Middle Peninsula PDC & Northern Neck PDC	A-NPDC served as partnering agency on the Rural Working Waterfronts Coalition and leveraged funding through VCZM to ensure and enhance working waterfronts in the VA coastal zone.
7	VCZMP and the VA Dept. of Conservation and Recreation	A-NPDC staff worked to coordinate the development and implementation of the Shore Big Trees Program. A-NPDC staff also maintained a native tree list to give to interested localities to plant their own native tree.
8	ESVA Environmental Education Council	A-NPDC staff served on the regional council to further environmental education efforts within the region
9	Eastern Shore Watersheds Roundtable	A-NPDC staff served on the Steering Committee of the ESVA Watersheds Network. The network is a local watershed group that began meeting annually in 2001 to address pollution reduction strategies for ESVA watersheds through public education and outreach, data sharing, and research communication.
10	Eastern Shore Disaster Preparedness Coalition	A-NPDC staff served on the regional coalition focused on disaster preparedness and emergency management. Local VCZMP products were incorporated into the group’s discussions and planning activities.
11	Eastern Shore Healthy Communities	A-NPDC staff served on the regional council focused on improving health within the region. VZMP products were incorporated into the group’s community development activities.
12	VA Department of Game and Inland Fisheries	A-NPDC staff partnered with VDGIF staff to produce the draft Eastern Shore chapter of the Virginia Wildlife Action Plan.
13	VA Department of Conservation and Recreation	A-NPDC partnered in the development of the Virginia Outdoors Plan by hosting and coordinating local public input sessions.
14	VDEM, FEMA, Homeland Security, &	A-NPDC partnered with VDEM, FEMA, Homeland Security, and

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	Wetlands Watch	Wetlands Watch to facilitate two workshops that educated the public on the Community Rating System (CRS). There were two workshops conducted, one in Accomack and one in Northampton.
15	Department of Environmental Quality	A-NPDC facilitated two workshops for DEQ on the TMDL's in Assawoman and Nassawadox Creek.

3.3.2 Leveraged Funds

The A-NPDC used NOAA/VCZMP grant funds to leverage services and complete projects aimed at improving coastal management on the Eastern Shore of Virginia. **Table 2** summarizes instances where NOAA/VCZM grant funds were leveraged during FY204. Over \$445,066 was leveraged in FY2014 utilizing NOAA /VCZMP grant funds.

Table 2 FY2014 Leveraged Funds			
ID	Group/ Event	Activity	FY2010 Amount
1	Malcolm Pirnie, Inc.	Eastern Shore Ground Water Committee funds used to support consulting hydrogeologist to the Eastern Shore Ground Water Committee.	\$21,666
2	ESVA Transportation Infrastructure Inundation Vulnerability Assessment	Funds used to leverage VCZMP grant to conduct a sea level rise vulnerability assessment of regional transportation infrastructure.	\$25,000
3	Rural Chesapeake Bay/Seaside of VA Working Waterfront Coalition	Funds used to leverage VCZMP grant to develop Eastern Shore chapter within the first Virginia Working Waterfronts Plan.	\$7,000
4	FEMA/VDEM	Funds used to leverage a rewrite of the Eastern Shore Hazard Mitigation Plan.	\$133,000
5	DEQ	Funds used to leverage the Eastern Shore Septic Pumpout Program for qualifying low-moderate income property owners.	\$20,000
6	Accomack & Northampton Counties	Funds used to leverage an annual Household Hazardous Waste Collection.	\$14,000
7	Accomack County	Funds used to leverage the Eastern Shore GreenWorks Committee to oversee litter reduction strategies.	\$6,000
8	VIMS	Funds used to leverage VCZMP grant to VIMS with A-NPDC as sub-contractor to initiate the development of an interjurisdictional planning process focused around Chincoteague Inlet and adjacent properties.	\$26,000

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9	Skeo Solutions	Funds used to leverage a NFWF Technical Assistance Grant to Skeo Solutions for the completion of a survey identifying homes lacking adequate plumbing facilities on the Bayside of the Eastern Shore.	\$25,000
10	Virginia Tech Master Well Owner Network	Funds used to leverage a Household Well Sampling Program for nearly 150 residents.	Estimated \$25,000 in sample costs and in-kind hours
11	VCZMP/DMME/BOEM	Funding to coordinate a local stakeholder engagement process for establishing best management practices to reduce use conflicts with commercial and recreational users within the Virginia Wind Energy Area during construction and operation of offshore wind turbines.	\$22,400
12	VA Dept. of Historic Resources	Funds used to leverage a survey of 500 historic properties vulnerable to flooding and sea level rise on the Eastern Shore.	\$100,000
13	ESVA Climate Adaptation Working Group	A-NPDC staff coordinated a regional group focused on developing adaptation and outreach strategies for improving the Eastern Shore’s ability to prepare and manage climate change and sea level rise.	\$10,000 in-kind hours
14	Virginia Coastal Policy Center	VCZMP work was used to leverage a student internship from the College of William & Mary’s Law School and the Virginia Coastal Policy Center during the summer of 2015. The internship provided critical legal and regulatory research benefitting multiple stakeholders on the Eastern Shore.	\$10,000 in-kind hours

Total Leveraged Funds FY2014: \$445,066

3.3.3 Historical Searches

One historical search was performed by A-NPDC staff during FY2014. Historically, the A-NPDC has provided this service to numerous agencies and without local availability of DSS, local agencies on the Eastern Shore would be required to pay \$100 to \$150 per search. Each environmental review corresponds with a historical search. **Table 3** summarizes the historical searches.

Table 3			
FY2014 Historical Searches			
ID	Agency	Search Description	Outcomes
1	Eastern Shore of Virginia Housing Authority	Two searches was completed for Indoor Plumbing Rehabilitation near the Town of Painter.	No historic properties are affected by the proposed project.

3.3.4 Information Requests

The A-NPDC responded to 25 information requests from private, local, state, and federal organizations and private citizens during FY2014. These requests are summarized in **Table 4**.

Table 4				
FY2014 Information Requests				
ID	Date	Agency/Group	Contact	Request Description
1	2/20/2015	Waste Watchers of the Eastern shore	Jenny O'Neil	Print 50 copies of event flyers for non-profit volunteer litter control advocacy group
2	3/13/2015	University of Virginia	John Harbin	Provide climate adaptation resources for UVA planning student
3	3/26/2015	Northampton Co. Resident	Jennifer Alley	Request for regional ground water information and local resource contact information.
4	3/26/2015	VA Dept. of Environmental Quality	Tammy Stephenson	Request for A-NPDC meeting documents
5	4/17/2015	Accomack Co. Resident	Tim Claire	Used heating oil disposal inquiry
6	4/21/2015	Northampton Co. Resident	David Lindsey	EPA sole source aquifer justification inquiry
7	4/28/2015	Virginia Cooperative Extension	Theresa Long	Local groundwater temperature inquiry.
8	10/15/2013	Waste Watchers of the Eastern Shore	Jenny O'Neill	Print 50 copies of event flyers for non-profit volunteer litter control advocacy group
9	10/18/2013	Accomack Co. Resident	Pat Cody	LiDAR data inquiry

3.4 Ground Water Committee Report

The A-NPDC staffed the Eastern Shore of Virginia Ground Water Committee and managed the Ground Water Committee's consulting hydrogeologist during FY2014.

3.4.1 Summary of Accomplishments

A-NPDC staff coordinated ground water permit reviews with DEQ and local aspects of the ground water model update developed by USGS. A-NPDC staff also maintained and updated the Ground Water Committee web site and conducted educational programs including two public workshops and presentations to local government boards. During FY2014, the Ground Water Committee held 8 meetings, awarded the 2014 Eastern Shore Ground Water Award, commented on multiple regulatory actions, reviewed 3 ground

water withdrawal permits, maintained the *Eastern Shore of Virginia Ground Water Supply Protection and Management Plan*, conducted a Household Hazardous Waste Collection, and reviewed multiple environmental reviews and regulatory items.

Additional specific notable accomplishments of the Ground Water Committee in FY2014 are summarized in Table 5.

Table 5			
FY2014 Ground Water Committee Accomplishments			
Technical Documentation			
ID	Activity	Month	
1	Reviewed results of the Virginia Household Water Quality Program sample results.	Nov	
2	Reviewed report prepared by Virginia Tech and Abt Associates on Economic Impacts from Coastal Plain Aquifer Depletion in the Eastern Virginia Groundwater Management Area.	Nov	
3	Presented a summary of proposed groundwater resource related legislation in the General Assembly. Summary included descriptions of the proposed bills and joint resolutions as well as comments on the potential effects on the Eastern Shore.	Jan	
4	Incorporated results of the Virginia Household Water Quality Program into a GIS. Evaluated spatial variation in water quality across the Eastern Shore.	March	
5	Reviewed USGS CIR 1405 (2015) Understanding Nutrients in the Chesapeake Bay Watershed and Implications for Management and Restoration – the Eastern Shore.: Current USGS research on nutrient contribution from the Eastern Shore to the Chesapeake Bay. The research included estimates of nutrient (principally nitrogen) loading in groundwater to the Bay. The USGS reported that for some tributaries the major source of nitrogen is from groundwater. USGS findings and the basis supporting the report conclusions will be reviewed.	April	
6	Presented draft Annual Groundwater Use report for fiscal year 2014. The report presented seasonal and annual use trends as well as groundwater use by type (agricultural, public water, industrial/commercial).	Aug	
7	As part of the Sunripe Camp Groundwater Withdrawal Application, presented an analysis of the geophysical logs collected for the wells, comparing them to information in the Eastern Shore Model as well as information known for the Exmore Paleochannel. The geophysical logs demonstrated how the paleochannel may influence local groundwater flow.	Aug	
Implementation of Work Plan			
ID	Activity	Month	Outcome
1	Reviewed sample results of the Virginia Household Water Quality Program.	Nov	148 of the people submitting samples to the program voluntarily elected to share results with the groundwater committee, with participants nearly evenly divided between Accomack (76 samples) and Northampton (72 samples) Counties. The most common constituents exceeding groundwater quality standards were from a high salt content (dissolved solids) and high iron. Only %2 of the samples exceeded the nitrate drinking

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			water standard.
2	Reviewed an Economic Impact Analysis of Aquifer Depletion in the Eastern Virginia Groundwater Management Area conducted by Virginia Tech and Abt Associates for DEQ.	Nov	The report identified negative impacts from 1) the significant cost to develop alternative sources; 2) partially stranded assets; and 3) possible reduction in industrial production (and employment)
3	Reviewed regulatory Bills and Joint Resolutions under consideration in the General Assembly.	Jan	Bills and Joint Resolutions included: Adding subdivisions with individual wells to the groundwater permitting program; registration of all wells in a Management Area; JLARC review of the water resource program; and formation of Groundwater Committee to address over allocation in the EVGMA.
4	Presented results of the Virginia Tech Household Water Quality Sampling	Mar	Results of water quality samples were incorporated into a GIS based on 10-digit zip code to assess spatial distribution.
5	Reviewed final regulatory Bills and Joint Resolutions that passed under the General Assembly.	Mar	Bills and Joint Resolutions that passed were: Registration of all wells in a Management Area; JLARC review of the water resource program; and formation of Groundwater Committee to address over allocation in the EVGMA.
6	Provided detailed reviewed of USGS CIR 1405 (2015) Understanding Nutrients in the Chesapeake Bay Watershed and Implications for Management and Restoration – the Eastern Shore.	Apr	Presented results provided in the report and discussed implications on the Eastern Shore of Virginia. Of specific interest was identifying current vs legacy nitrogen loading to the groundwater and identifying vulnerable watersheds.
7	Review formation and mandate for the Eastern Virginia Groundwater Management Advisory Committee, established by the General Assembly in 2015. The goal is to create a clear, consistent and understandable framework for the management of the groundwater resource. The intent is to manage the resource so that it is productive and available to meet the human, industrial and environmental needs of the EVGMAC. Chairman Thornton has been selected to serve on the EVGMAC.	Aug	Groundwater Committee will continue to track progress and provide comments as appropriate to the Committee.
8	Review draft Annual Use Report. The Annual Use Report is a one page (2-sided) report summarizing groundwater use on the Shore for calendar year 2014. The report considers overall seasonal and annual trends in addition to trends by use (agricultural, public water, and industrial/commercial).	Aug	Consider adding additional 2-page reports to address important issues on the Shore, such as status of the Paleochannels, CAFOs on the Shore, and similar topics.
9	Review proposed FY2016 Work Plan. The	Aug	Overall Work Plan was supported by the

<p>routine components of the proposed Work Plan includes 1) promote methods to increase use of the Columbia aquifer and surface water irrigation ponds; 2) Monitor and review Federal and State activities related to groundwater on the Shore; 3) Coordinate and/or track independent research on the Shore; 4) update annual groundwater use; 4) represent the GW committee on State or Federal Committees; 5) Participate in two public meetings/workshops.</p> <p>Special studies are: 1) use the Eastern Shore Groundwater Model to evaluate groundwater availability on the Shore, and 2) support saltwater intrusion monitoring by the USGS.</p>		<p>Groundwater Committee. The special study to evaluate groundwater availability was approved by the Groundwater Committee. A summary, similar to the Annual Groundwater Use summary will be prepared presenting results of the groundwater availability evaluation.</p>
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The Ground Water Committee Report implements Executive Order 23, Goals 2 and 10.

The following sections summarize activities related to Committee organization; statutory, regulatory, and permit tracking/review; research and investigation; and implementation of ground water protection.

Committee Organization

Committee Officers elected for FY 2014 were Mr. Richard Hubbard as Chairman and Ms. Wanda Thornton as Vice Chairman.

In May 2015, John Salm replaced Peter Henderson as a committee member for Accomack County.

3.4.2 Monthly Progress Reports

October 15, 2014 Meeting

- A public workshop was held in place of the regular monthly meeting. The workshop is described in greater detail in section 3.2.1

November 18, 2014 Meeting

- The meeting minutes are included in **Appendix S**.

December, 2014 Meeting

- The Committee elected to not hold a meeting during this month.

January 20, 2015 Meeting

- The meeting minutes are included in **Appendix T**.

February, 2015 Meeting

- The committee cancelled the meeting this month.

March 17, 2015 Meeting

- The meeting minutes are included in **Appendix U**.

April 21, 2015 Meeting

- The meeting minutes are included in **Appendix V**.

May 13, 2015 Meeting

- The meeting minutes are included in **Appendix W**.

June, 2015 Meeting

- A Public Workshop was held in place of the regular monthly meeting. The workshop is described in greater detail in Section 3.2.9.

July, 2015 Meeting

- The Committee elected to not hold a meeting during this month.

August 18, 2015 Meeting

- The meeting minutes are included in **Appendix X**.

September 15, 2015 Meeting

- The meeting minutes are included in **Appendix Y**.

3.5 Eastern Shore Water Access Authority Development Facilitation

The A-NPDC originally set out to facilitate discussions between Accomack and Northampton Counties focusing on the development of the Eastern Shore Water Access Authority (ESWAA) following legislation passed during the 2014 Virginia General Assembly enabling the Counties with the authority to create such an entity. The A-NPDC had planned to develop and present a draft Operating Agreement and draft By-Laws to the Counties for their consideration and facilitate the discussion and development of operating guidelines. After conducting research on similar Access Authorities and holding initial discussions with individual county representatives, it was requested that the A-NPDC not proceed with the planned activities.

Initial discussions with the A-NPDC members and other elected officials included descriptions of the benefits accrued from the Middle Peninsula Public Access Authority including donated properties and utility for federal conservation and hazard mitigation programs.

3.6 Shore Big Tree Program Outreach and Implementation

The A-NPDC conducted a survey of local governments that allowed staff to gauge interest in Shore Big Tree. Exmore, Parksley, and Accomack County Public Schools all responded to outreach efforts and engaged an interest in the program. Though many others were contacted, only these showed any interest. Onley told the A-NPDC that they were not interested in participating in the program at

this time. In addition to the survey, the following entities were contacted separately as they had previously expressed interest in the program: Northampton County, Accomack County, Cape Charles, Eastern Shore Community College, NASA Wallops, and Chincoteague. A final report for the program that summarizes outreach activities, surveys, and implementation plans is included in **Appendix Z**.

3.7 Benefits Accrued from Prior VCZMP Grants Report

A report naming and describing A-NPDC projects funded by VCZMP in previous years will included in **Appendix AA**. The report highlights the projects that have produced measureable benefits in subsequent years and/or have served as a foundation for additional projects.

Appendix A

NOVEMBER 2014 CLIMATE ADAPTATION WORKING GROUP NEWSLETTER



Curtis Smith <csmith@a-npdc.org>

'Hillary Essig'

Thu 2:

FW: CAWG November 2014 Newsletter



Eastern Shore of Virginia Climate Adaptation Working Group



November 2014 Newsletter

The Eastern Shore of Virginia CAWG is a partnership between over 30 local, state, and federal government agencies and non-government organizations that meets quarterly to develop informational materials and planning tools to enhance our region's ability to prepare for changes resulting from sea level rise and climate change.

Below is a compilation of recent news, information, resources, and events pertaining to the citizens of the Eastern Shore.

Please feel free to forward this email to anyone who may be interested and have them contact Curt Smith at csmith@a-npdc.org to be added to the distribution list.

CAWG "Top 10" - Top stories & resources handpicked by Curt Smith. These links can also be found in the lists below.

1. [Water's Edge](#), Reuters, 9/4/14 and 9/17/14
2. Secure Commonwealth Panel Recurrent Flooding Subpanel
[Recommendations to the SCP on the Issue of Sea Level Rise and Recurrent Flooding in Coastal Virginia](#), 9/5/14
[Report: Virginia needs someone to lead efforts to deal with rising seas and flooding](#), Richmond Times Dispatch, 9/2/14
[Report proposes emergency management methods to deal with sea level rise](#), Bay Journal, 9/7/14
3. [Climate Change 2014: Synthesis Report](#), International Panel on Climate Change, 10/2014
[Effects of climate change 'irreversible,' U.N. panel warns in report](#), Washington Post, 11/2/14
[As it happened: IPCC report launch, Copenhagen](#), BBC News, 11/2014
[Statement by John P. Holdren on Approval of the IPCC's 5th Assessment Synthesis Report](#), The White House, 11/2/14
[The 10 things you need to know from the new IPCC climate report](#), Grist, 11/2/14
4. Cedar Island in the News
[Last Cedar Island house slips into sea](#), Bay Journal, 12/3/14
[Sea swallows the last house in doomed Virginia beach town](#), Grist, 12/9/14
[Geology and History of Cedar Island](#), Virginia Places
**Throwback article from 1998: [The swift retreat of Cedar Island Erosion: Once touted as an unspoiled hideaway by developers, this Virginia island is disintegrating. So are the homes. Many owners are leaving them to fall into the ocean and litter the beach](#), Baltimore Sun, 2/20/1998*
5. The Nature Conservancy – Enhancing Coastal Resilience on Virginia's Eastern Shore
[FACT SHEET: Building community resilience by strengthening America's natural resources and supporting green infrastructure](#), The White House
***Features ESVA Project
[White House acknowledges The Nature Conservancy's commitment to coastal resilience](#), The Nature Conservancy, 10/14/14
6. [The Challenge of Mitigating Virginia's Flooding and Sea Level Rise Impacts](#), Wetlands Watch, November 2014
[Flooding Fixes - Long Waits, Big Bucks...and a Lot of Jobs](#), Wetlands Watch blog, 11/17/14
[Report: The fix for flood-prone homes? About \\$431M](#), Virginian-Pilot, 12/1/14

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7. [Come High Water: Sea Level Rise and Chesapeake Bay](#), A special report by Chesapeake Quarterly and Bay Journal, October 2014
8. [Sea Level Rise: A Relentless Reality That Virginia Must Plan For Carefully](#), Mitchell, Stiles, and Hartley - Virginia News Letter, 8/14/14
9. [Tangier Island Is Disappearing](#), Business Insider, 9/10/14
10. [The old man and the rising sea](#), Washington Post, 12/2/14
***Features Assateague

Upcoming Public Events

1. None

Adaptation Resources & Planning Tools

A. Local Resources/Tools

1. The Nature Conservancy – Enhancing Coastal Resilience on Virginia’s Eastern Shore
[FACT SHEET: Building community resilience by strengthening America’s natural resources and supporting green infrastructure](#), The White House
***Features ESVA Project
[White House acknowledges The Nature Conservancy’s commitment to coastal resilience](#), The Nature Conservancy, 10/14/14
2. [Water’s Edge](#), Reuters, 9/4/14 and 9/17/14
3. [Come High Water: Sea Level Rise and Chesapeake Bay](#), A special report by Chesapeake Quarterly and Bay Journal, October 2014
4. Cedar Island in the News
[Last Cedar Island house slips into sea](#), Bay Journal, 12/3/14
[Sea swallows the last house in doomed Virginia beach town](#), Grist, 12/9/14
[Geology and History of Cedar Island](#), Virginia Places
*Throwback article from 1998: [The swift retreat of Cedar Island Erosion: Once touted as an unspoiled hideaway by developers, this Virginia island is disintegrating. So are the homes. Many owners are leaving them to fall into the ocean and litter the beach](#), Baltimore Sun, 2/20/1998
5. [The old man and the rising sea](#), Washington Post, 12/2/14
***Features Assateague
6. [As islands slowly submerge, residents rise up, refusing to desert their homes, heritage](#), Bay Journal, 10/26/14
***Features Tangier
7. [Effects of Global Climate Change at the Virginia Coast Reserve](#), The Nature Conservancy, June 2011 (had not been previously distributed in CAWG Newsletter)

B. State & Regional Resources/Tools

1. Virginia Climate Change & Resiliency Update Commission
[Politicians wait as water keeps rising](#), Virginian Pilot, 9/14/14
[McAuliffe names Virginia’s first climate change chief](#), Virginian Pilot, 12/6/14
[Kaine sees climate change as a key issue for Congress](#), Daily Press, 12/5/14
[Sen. Tim Kaine Provides Keynote at William & Mary Coastal Policy Conference](#), W&M Law School, 12/9/14
[Virginia to appoint climate resiliency coordinator and teams to tackle climate change](#), Bay Journal, 12/10/14
2. Virginia Joint Commission on Sea Level Rise and Recurrent Flooding
[New state fund proposed for flooded areas](#), Daily Press, 12/1/14
3. Secure Commonwealth Panel Recurrent Flooding Subpanel
[Recommendations to the SCP on the Issue of Sea Level Rise and Recurrent Flooding in Coastal Virginia](#), 9/5/14
[Report: Virginia needs someone to lead efforts to deal with rising seas and flooding](#), Richmond Times Dispatch, 9/2/14
[Report proposes emergency management methods to deal with sea level rise](#), Bay Journal, 9/7/14
4. [Virginia Accomplishments Since the 2008 Climate Action Plan Release](#), VIMS CCRM, December 2014
5. [Virginia Hurricane Storm Surge Tool](#), VA Department of Emergency Management
[State to track storm surge](#), Free Lance-Star, 10/1/14
6. [Surging Seas Risk Finder: Virginia](#), Climate Central
[Flooding from storm surge would threaten D.C. infrastructure, report says](#), Washington Post, 9/10/14
[Maryland faces worse climate-driven flooding, report warns](#), Baltimore Sun, 9/16/14
7. [The Challenge of Mitigating Virginia’s Flooding and Sea Level Rise Impacts](#), Wetlands Watch, November 2014
[Flooding Fixes - Long Waits, Big Bucks...and a lot of Jobs](#), Wetlands Watch blog, 11/17/14
[Report: The fix for flood-prone homes? About \\$431M](#), Virginian-Pilot, 12/1/14
8. [Encroaching Tides: How Sea Level Rise and Tidal Flooding Threaten U.S. East Coast and Gulf Coast Communities over the Next 30 Years](#), Union of Concerned Scientists, 2014
[Sea Level Rise and Tidal Flooding: Forthcoming Report on Encroaching Tides Signals a New Chapter for Many Coastal Communities](#), The Equation, 10/2/14
[Sea Level Rise Making Floods Routine for Coastal Cities](#), Climate Central, 10/8/14
9. [Overview of Virginia’s Climate Change Preparations](#), Georgetown Climate Center, Online resource for adaptation measures undertaken in VA
[State and Local Adaptation Plans](#), Online Interactive Viewer, Georgetown Climate Center
10. [Online Tools Help Planners Visualize and Plan for Sea Level Rise](#), Hampton Roads PDC, 10/8/14
11. [Chesapeake Bay Region Streams are Warming](#), USGS, 12/8/14

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11. [Chesapeake Bay Region Streams are Warming](#), USGS, 12/8/14
12. [MARCO Receives LCC Grant to Disseminate Coastal Resiliency Science and Tools](#), MARCO, 11/25/14
13. [Graduate Fellow Incorporates Climate Change into Policy](#), VA Sea Grant, 10/14
14. [Virginia Coastal Policy Clinic Gets New VASG Correspondent](#), VA Sea Grant, 10/2/14
15. [Sea Level Rise: A Relentless Reality That Virginia Must Plan For Carefully](#), Mitchell, Stiles, and Hartley - Virginia News Letter, 8/14/14
16. [Living Shoreline Implementation: Challenges & Solutions](#), VA Center for Coastal Resource Management, Summer 2014 Newsletter
17. [When Stormwater is Compounded by Climate Change](#), Presentation by Sean Williamson, University of Maryland Environmental Finance Center, 9/25/14
18. [Coastal Resiliency: Adapting to Climate Change in Hampton Roads](#), Hampton Roads PDC, July 2013
19. [Increased flooding the new normal on Delaware's coast](#), Delaware Online, 10/9/14
20. [Reducing Coastal Risk on the East and Gulf Coasts](#), Committee on the USACE Water Resources Science, Engineering, and Planning: Coastal Risk Reduction, 2014
[Barrier Islands Feeling the Effects of Climate Change](#), New York Times, 9/29/14

C. National Resources/Tools

1. [2014 Climate Change Adaptation Roadmap](#), US Department of Defense, 10/14
[Climate change threatens national security, Pentagon says](#), Washington Post, 10/13/14
[Pentagon: Climate Change Poses 'Immediate Risks'](#), Climate Central, 10/13/14
2. [U.S. Climate Resilience Toolkit](#), NOAA
[Building Resilience: Getting Started](#), NOAA video
3. [FEMA State Mitigation Plan Review Guide Highlights of Key Concepts](#), FEMA, Draft for External Review 9/8/14
[FEMA: Plan for Climate Change or Risk Emergency Funding](#), Triple Pundit, 10/20/14
4. [Enhancing Climate Resilience on America's Natural Resources](#), Council on Climate Preparedness and Resilience, 10/14
5. [Coastal County Comparison: Online Land-Cover Imagery Comparison at County Level for 1996-2010](#), NOAA
6. [NASA/USGS Coastal Resilience Data Challenge](#)
[USGS Release: NASA-USGS Climate Data App Challenge: An Invitation for Innovation](#), 12/11/14
7. [USGS iCoast – Did the Coast Change?](#), USGS, 2014
8. [Explaining Extreme Events of 2013 from a Climate Perspective](#), American Meteorological Society, 2014
[New report finds human-caused climate change increased severity of 2013 heat waves in Asia, Europe and Australia](#), NOAA, 9/29/14
9. [Plum Island Estuary LTER: Studying how marshes respond to sea-level rise](#) – National Science Foundation, 9/8/14
10. [Preparing Our Communities for Climate Impacts: Recommendations for Federal Action](#), Georgetown Climate Center, 2014
11. [Losing Ground](#), Pro Publica, 2014
12. [New online tools help farmers use climate data](#), South Dakota State University, 6/26/14
13. [2014 National Climate Assessment Resources for Educators](#), NOAA, 2014
14. [NOAA Coastal Services Journal](#), Fall/Winter 2014

D. Global Resources/Tools

1. [Climate Change 2014: Synthesis Report](#), International Panel on Climate Change, 10/2014
[Effects of climate change 'irreversible,' U.N. panel warns in report](#), Washington Post, 11/2/14
[As it happened: IPCC report launch, Copenhagen](#), BBC News, 11/2014
[Statement by John P. Holdren on Approval of the IPCC's 5th Assessment Synthesis Report](#), The White House, 11/2/14
[The 10 things you need to know from the new IPCC climate report](#), Grist, 11/2/14
2. [Timelapse: Landsat Satellite Images of Climate Change](#), Time, 8/14
3. [Travel Through Deep Time With This Interactive Earth](#), Smithsonian, 9/30/14
4. [Climate Change: Vital Signs of the Planet: West Antarctic melt rate has tripled](#), NASA, 12/2/14

Adaptation Research Articles & News Items

A. Sea Level Research Articles & News Items

1. [Study tracks global sea levels over the last five ice ages](#), University of Southampton, 9/25/14
2. [Crazy weather traced to Arctic's impact on jet stream](#), New Scientist, 9/25/14
3. [Changing Antarctic waters could trigger steep rise in sea levels](#), Australian Research Council's Centre of Excellence for Climate System Science, 10/1/14
4. [Sea level rise over past century unmatched in 6,000 years, says study](#), The Guardian, 10/13/14
5. [15 years from now, our impact on regional sea level will be clear](#), The Conversation, 10/12/14
6. [Rising sea levels of 1.8 meters in worst-case scenario](#), University of Copenhagen, 10/13/14
7. [Sea level and global ice volumes from the Last Glacial Maximum to the Holocene](#), Lambeck et. al, 9/12/14
8. [Polar ice sheets' effects on sea level sends chills down mid-Atlantic coast](#), Bay Journal, 12/1/14
9. [Land subsidence leaves Chesapeake region with sinking feeling](#), Bay Journal, 12/4/14

B. Climate Change Research Articles & News Items

Atmospheric Warming and Impacts to Terrestrial and Aerial Ecology

1. [Climate Change and Drought in Ancient Times](#), University of Tubingen, 11/8/14
2. [Shifting Climate Has North Dakota Farmers Swapping Wheat For Corn](#), NPR, 8/13/14
3. [Crop Diversity Is Key to Agricultural Climate Adaptation](#), Scientific American, 8/18/14
4. [Climate change altering outdoor lifestyles](#), Delaware Online, 8/20/14
5. [How species will, or won't, manage in a warming world](#), Science News, 7/11/14
6. [Snow foolin': Blizzards still likely despite global warming](#), USA Today, 8/27/14
7. [Empty nests of the North: "Massive chick deaths" in seabird colonies; climate, oceanic changes blamed](#), Environmental Health News, 8/27/14
8. [Winged Warnings: Built for survival, birds in trouble from pole to pole](#), Environmental Health News, 8/27/14
9. [Prehistoric proof of climate's see-saw sensitivity](#), Daily Climate, 8/24/14
10. [Study resolves discrepancy in Greenland temperatures during end of last ice age](#), Oregon State University, 9/4/14
11. [Climate smart agriculture requires three-pronged global research agenda](#), UC-Davis, 9/3/14
12. [Dwindling chances to stay below 2°C warming](#), Center for International Climate and Environmental Research, 9/21/14
13. [Dwindling wind may tip predator-prey balance](#), University of Wisconsin-Madison, 9/19/14
14. [Is this the end of autumn as we know it?](#), BBC News, Oct 2014
15. [Past climate change and continental ice melt linked to varying CO2 levels](#), Phys.org, 10/14/14
16. [Past Climate Change Was Caused by the Ocean, Not Just the Atmosphere](#), New Rutgers Study Finds, Rutgers, 10/23/14
17. [Southern birds may be moving into your winter backyard](#), ScienceNews, 10/23/14
18. [Climate variability has an opposing impact on marine life and tree growth](#), Swiss Institute for Forest, Snow, and Landscape Research, 7/11/14
19. [Thunderstruck: Lightning Will Increase With Warming](#), Climate Central, 11/13/14
20. [UK researchers show Little Ice Age was global, with implications for current Global Warming](#), University of Gloucestershire, 11/18/14
21. [Colorado mastodon bones show ancient warmer Earth](#), Washington Post, 11/28/14
22. [Study finds early warning signals of abrupt climate change](#), University of Exeter, 12/8/14

Ocean/Water Resources and Impacts to Aquatic Ecology

1. [Great mollusc meltdown leaves French all at sea](#), The Independent, 8/8/14
2. [Ocean's Rising Acidification Eating Away at Shellfish That Coastal Tribes Depend On](#), Indian Country Today, 8/14/14
3. [Scientists warn of dangers from ocean acidification](#), Boothbay Register, 8/17/14
4. [Climate change means more bugs, slimy ponds](#), USA Today, 8/19/14

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5. [Long Island Sound becoming more acidic, scientists say](#), *Newsday*, 8/23/14
6. [Mussels don't stick around in acidic ocean water](#), *Daily Climate*, 9/9/14
7. [While the Arctic is melting the Gulf Stream remains](#), *Bjerknes Centre for Climate Research*, 9/28/14
8. [Warmer Atlantic widens a tropical invader's East Coast hunting ground](#), *Daily Climate*, 9/29/14
9. [Fish failing to adapt to rising carbon dioxide levels in ocean](#), *The Guardian*, 10/5/14
10. [Icebergs once drifted to Florida, new climate model suggests](#), *Phys.org*, 10/12/14
11. [OCEANS: A 'very young field' of research tries to measure looming costs of ocean acidification](#), *Climate Wire*, 10/21/14
12. [Groundwater warming up in synch](#), *ETH Zurich*, 10/11/14
13. [Watery 'Dead Zones' Getting Worse, Says Study](#), *Epoch Times*, 11/10/14
14. [Climate change expected to expand majority of ocean dead zones](#), *Smithsonian*, 11/10/14

C. Hazard Mitigation & Climate Adaptation Planning & Policy Items
(information on impacts to economies & the built environment)

1. [Marine economy sinks as ocean acidity rises](#), *Climate News Network*, 8/6/14
2. [Changing Climate Makes City Stormwater Management Harder, Health Risks Higher](#), *Gotham Gazette*, 9/2/14
3. [Climate change major threat to human health](#), *World 3 News*, 8/31/14
5. [9 years after Katrina, New Orleans aims to turn environmental weaknesses into economic strengths](#), *NOLA.com*, 8/9/14
6. [App aims to map Hampton Roads' flooding hot spots](#), *Virginian Pilot*, 9/10/14
7. [Climate change concerns weigh on Cape home-buying decisions](#), *Boston Globe*, 9/13/14
8. [Sea level rise: Not just a beach risk](#), *Delaware Online*, 9/17/14
9. [Record-breaking floods predicted next 20 years](#), *Delaware Online*, 9/16/14
10. [A Coastal Paradise Confronts Its Watery Future](#), *New England Public Radio*, 9/17/14
11. [Climate change report identifies 'the most vulnerable'](#), *Oxford University*, 9/19/14
12. [Norfolk sea level rise takes shine off waterfront homes](#), *Virginian Pilot*, 9/28/14
13. [Sink or swim: designing for climate change](#), *The Guardian*, 10/1/14
14. [NEW BERN: Panel: Effects of rising sea levels likely to vary along NC coastline](#), *News & Observer*, 9/29/14
15. [For concrete, climate change may mean a shorter lifespan](#), *Boston Globe*, 10/12/14
16. [A Retreat From Weather Disasters](#), *New York Times*, 10/21/14
17. [Officials work to find profitability in sea level rise](#), *Virginian-Pilot*, 10/22/14
18. [Hurricane Sandy Anniversary: Changing Global Climate Means More Superstorms Like Sandy](#), *International Business Times*, 10/28/14
18. [hurricane sandy anniversary: Changing global climate means more superstorms like sandy](#), *international business times*, 10/28/14
19. ["Nobody Is Truly Ready" For Rise of Seas](#), *Climate Central*, 11/10/14
20. [Poquoson takes action to outpace rising sea levels](#), *Virginian-Pilot*, 11/16/14
21. [Toll and Titley: The threat in Hampton Roads](#), *Virginian-Pilot*, 11/30/14
22. [Scientists prepare to issue sea-level rise forecasts for NC coastline](#), *Raleigh News & Observer*, 12/14/14

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Appendix B

FEBRUARY 2015 CLIMATE ADAPTATION WORKING GROUP NEWSLETTER

Reply Reply All Forward



Curtis Smith <csmith@a-npdc.org>

'Hillary Essig'

Thu 24

FW: CAWG February 2015 Newsletter



Eastern Shore of Virginia Climate Adaptation Working Group



February 2015 Newsletter

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1. The Nature Conservancy – Enhancing Coastal Resilience on Virginia's Eastern Shore
[Community Leader Workshop #1 Materials](#) including workshop agenda, presentations, handouts, and photos
[Coastal Resilience Project Homepage](#) includes general information about the NFWF project including the project fact sheet, original proposal abstract and narrative, a link to project resources, and additional general project information.
2. [VA island town seeks a lifeline to save its road](#), *Bay Journal*, 12/31/14 ***Features Saxix
3. [Accomack County/Wallops Island Joint Land Use Study](#)
[Findings Brochure](#)
[Recommendations Brochure](#)
4. [North Atlantic Coast Comprehensive Study: Resilient Adaptation to Increasing Risk](#), *US Army Corps of Engineers*, 1/15
[Main Report](#)
[Appendix D \(Includes Virginia\)](#)
[Press Release - Coastal risk: Corps of Engineers releases planning guide for future storms, flooding](#), *USACE*, 1/28/15
5. [Center for Coastal Resources Management Portal for Northampton County](#)
6. [Hog Island: Ghost island in the Atlantic](#), *Baltimore Sun*, 1/2/15
7. USGS – Hurricane Sandy Response: [Linking the Delmarva Peninsula's Geologic Framework to Coastal Vulnerability](#)
[Linking Coastal Processes and Vulnerability—Assateague Island Regional Study](#), *USGS*, 2014
8. [Cedar Island vacation homes vanish, vanquished by rising water](#), *Bay Journal*, 2/2/15
9. [VIMS geologists use sediment cores as a window to the past](#), *Daily Press*, 1/1/15 ***Features Seaside Barrier Islands
10. [In major shift, Obama administration will plan for rising seas in all federal projects](#), *Washington Post*, 1/30/15

Upcoming Public Events

1. [VA Weather and Climate Series – Session 2: Climate Change in VA](#), Feb. 24 at VIMS Gloucester Point
2. [Environment Virginia Symposium, Lexington, VA, March 31 – April 2, 2015](#)

3. [2015 Climate Leadership Conference, Washington DC](#) – February 23-25, 2015

Adaptation Resources & Planning Tools

A. Local Resources/Tools

1. The Nature Conservancy – Enhancing Coastal Resilience on Virginia’s Eastern Shore
[Community Leader Workshop #1 Materials](#) including workshop agenda, presentations, handouts, and photos
[Coastal Resilience Project Homepage](#) includes general information about the NFWF project including the project fact sheet, original proposal abstract and narrative, a link to project resources, and additional general project information.
2. [Center for Coastal Resources Management Portal for Northampton County](#)
3. [Accomack County/Wallops Island Joint Land Use Study Findings Brochure](#)
[Recommendations Brochure](#)
4. VA Coastal Policy Clinic - Adaptive Planning for Flooding and Coastal Change in Virginia: Next Steps for the Commonwealth Conference, December 2014
[Conference Videos and Presentations](#)

B. State & Regional Resources/Tools

1. Virginia Climate Change & Resiliency Update Commission.
No new updates. Report with recommendations due June 30, 2015.
2. Virginia Joint Commission on Sea Level Rise and Recurrent Flooding
No new updates.
3. Secure Commonwealth Panel Recurrent Flooding Subpanel
[Recommendations to the SCP on the Issue of Sea Level Rise and Recurrent Flooding in Coastal Virginia](#), 9/5/14
No new updates.
4. USGS – [Hurricane Sandy Response: Linking the Delmarva Peninsula’s Geologic Framework to Coastal Vulnerability](#)
[Linking Coastal Processes and Vulnerability—Assateague Island Regional Study](#), USGS, 2014
5. [Encroaching Tides: How Sea Level Rise and Tidal Flooding Threaten U.S. East Coast and Gulf Coast Communities over the Next 30 Years](#), *Union of Concerned Scientists*, 2014
[Flooding could become daily problem in N.C. by 2045](#), *Virginian-Pilot*, 1/31/15

C. National Resources/Tools

1. [North Atlantic Coast Comprehensive Study: Resilient Adaptation to Increasing Risk](#), *US Army Corps of Engineers*, 1/15
[Main Report](#)
[Appendix D \(Includes Virginia\)](#)
[Press Release - Coastal risk: Corps of Engineers releases planning guide for future storms, flooding](#), *USACE*, 1/28/15
2. [U.S. Fish and Wildlife Service Strategic Plan for Responding to Accelerating Climate Change](#), 2014
3. [National Park Service Climate Change Action Plan 2012-2014](#)
4. [U.S. Dept. of Interior Climate Adaptation Plan](#), 2014
5. [NOAA Storm Surge Resources](#)
6. [NASA, NOAA Find 2014 Warmest Year in Modern Record](#), *NASA*, 1/16/15
7. [NASA Launches Groundbreaking Soil Moisture Mapper](#), *NASA*, 1/31/15
8. [Climate Change: Vital Signs of the Planet: Rivers are draining Greenland quickly](#), *NASA*, 1/12/15

D. Global Resources/Tools

1. None

Adaptation Research Articles & News Items

A. Sea Level Research Articles & News Items

1. [Sea level report shows increasing pace of change along coast](#), *WRAL*, 1/1/15
2. [NOAA establishes ‘tipping points’ for sea level rise related flooding](#), *NOAA*, 12/18/14
3. [Greenland Meltwater Contributes to Rising Sea Levels](#), *City College of New York*, 1/12/15
4. [VIMS geologists use sediment cores as a window to the past](#), *Daily Press*, 1/1/15
5. [Rising sea level swallowing red knot’s migration stopovers](#), *Bay Journal*, 1/4/15
6. [Study: Sea level rise accelerating more than once thought](#), *Associated Press*, 1/14/15
7. [New Research May Solve Puzzle in Sea Level’s Rise](#), *New York Times*, 1/14/15
8. [Tales of Ancient Sea Rise Told for 10,000 Years](#), *Climate Central*, 1/25/15

B. Climate Change Research Articles & News Items

Atmospheric Warming and Impacts to Terrestrial and Aerial Ecology

1. [Climate models disagree on why temperature ‘wiggles’ occur](#), *Duke University*, 1/26/15
2. [Study: Global warming ‘doubles risk’ of extreme weather](#), *BBC News*, 1/26/15
3. [Global warming doubles risk of extreme La Niña event, research shows](#), *University of Exeter*, 1/26/15
4. [Global warming won’t mean more stormy weather](#), *University of Toronto*, 1/29/15

Ocean/Water Resources and Impacts to Aquatic Ecology

1. [Melting Ice and Warmer Temperatures Linked to Massive Oxygen Loss in the World’s Oceans](#), *Science World Report*, 1/29/15
2. [Climate change may be pushing fish north](#), *Asbury Park Press*, 2/11/15

C. Hazard Mitigation & Climate Adaptation Planning & Policy Items

(information on impacts to economies & the built environment)

1. [As waters continue to rise, Navy seeks comprehensive plan](#), *Bay Journal*, 12/16/14
2. [VA island town seeks a lifeline to save its road](#), *Bay Journal*, 12/31/14
3. [Bay region lags in preparing for rise in coastal flooding](#), *Bay Journal*, 12/15/14
4. [As rising sea level chomps at Cape Canaveral, NASA uses nature-friendly solution](#), *Tampa Bay Times*, 2/11/15
5. [Hop Island: Ghost island in the Atlantic](#), *Baltimore Sun*, 1/2/15
6. [The Sea Also Rises](#), *Baltimore Magazine*, 1/5/15
7. [Rescuing farmland after a flood](#), *Illinois University*, 1/13/15
8. [Buyer beware: Check if the property is in a flood zone](#), *Virginian-Pilot*, 1/24/15
9. [House panel agrees to prioritize climate change](#), *The Hill*, 1/28/15
10. [In major shift, Obama administration will plan for rising seas in all federal projects](#), *Washington Post*, 1/30/15
11. [Cedar Island vacation homes vanish, vanquished by rising water](#), *Bay Journal*, 2/2/15
12. [Fort Lauderdale innovative Program Aims to Protect Community Against Local Flood Hazard](#), *South Florida News*, 1/20/15

Appendix C

MAY 2015 CLIMATE ADAPTATION WORKING GROUP NEWSLETTER

Curtis Smith <csmith@a-npdc.org>
FW: CAWG May 2015 Newsletter

'Hillary Essig'

Thu 2:47



Eastern Shore of Virginia Climate Adaptation Working Group



May 2015 Newsletter

The Eastern Shore of Virginia CAWG is a partnership between over 30 local, state, and federal government agencies and non-government organizations that meets quarterly to develop informational materials and planning tools to enhance our region's ability to prepare for changes resulting from sea level rise and climate change.

Below is a compilation of recent news, information, resources, and events pertaining to the citizens of the Eastern Shore.

Please feel free to forward this email to anyone who may be interested and have them contact Curt Smith at csmith@a-npdc.org to be added to the distribution list.

CAWG "Top 10" – Top stories & resources handpicked by Curt Smith. These links can also be found in the lists below.

1. The Nature Conservancy – Enhancing Coastal Resilience on Virginia's Eastern Shore
[Community Leader Workshop Summary Report](#) – published on April 16. Site also contains additional workshop materials.
[Coastal Resilience Project Homepage](#) includes general information about the NFWF project including the project fact sheet, original proposal abstract and narrative, a link to project resources, and additional general project information.
2. [Flood Protection Pay-Offs: A Local Government Guide to the Community Rating System](#). *Wetlands Watch*, 3/15
3. [Ocean Acidification Impacts Online Viewer](#). *Natural Resources Defense Council*, 2015
[Ocean acidification spells trouble for shellfish industry](#). *CBS News*, 2/11/15
[US oyster, clam farms face economic blow from acidification: study](#). *Reuters*, 2/23/15
[US Oysters, Scallops Getting Cooked by Acidic Seas](#). *Discovery News*, 2/23/15
4. [An extreme event of sea-level rise along the Northeast coast of North America in 2009–2010 \(Goddard et al. 2015\)](#). *NOAA Summary*, 2/24/15
5. [Near Worst Case Storm Surge Inundation Map Viewer](#). NOAA
This web map displays a seamless national map of near worst case storm surge flooding (inundation) scenarios using the National Weather Service SLOSH model maximum of maximums (MOM) product for different hurricane wind categories at high tide.
6. [The drowning islands of Virginia](#). *MSNBC*, 1/14/15
7. [Battlefield conversions: Hunters see climate changing their traditions](#). *ClimateWire*, 4/7/15
8. [Green and Blue Highways Symposium: Environmental Sustainability Best Practices for Transportation](#) – Presentations from May 6, 2015 workshop
9. [U.S. Liable in New Orleans-Area Flooding](#). *New York Times*, 5/1/15
10. [Loss of coastal marshes to sea level rise often goes unnoticed](#). *Bay Journal*, 4/8/15

Upcoming Public Events

1. Central Accomack County Ground Water Summit – June 16, 2015 6:30-8:00pm at Metompkin Elementary School, Parksley

Adaptation Resources & Planning Tools

A. Local Resources/Tools

1. The Nature Conservancy – Enhancing Coastal Resilience on Virginia’s Eastern Shore
[Community Leader Workshop Summary Report](#) – published on April 16. Site also contains additional workshop materials.
[Coastal Resilience Project Homepage](#) includes general information about the NFWF project including the project fact sheet, original proposal abstract and narrative, a link to project resources, and additional general project information.
2. [Accomack County/Wallops Island Joint Land Use Study](#)
 No new updates.
3. [Chincoteague National Wildlife Refuge Comprehensive Conservation Plan](#)
 No new updates.

B. State & Regional Resources/Tools

1. Virginia Climate Change & Resiliency Update Commission
 No new updates. Report with recommendations due June 30, 2015.
2. Virginia Joint Commission on Sea Level Rise and Recurrent Flooding
 No new updates.
3. Secure Commonwealth Panel Recurrent Flooding Subpanel
[Recommendations to the SCP on the Issue of Sea Level Rise and Recurrent Flooding in Coastal Virginia](#), 9/5/14
 No new updates.
4. [Flood Protection Pay-Offs: A Local Government Guide to the Community Rating System](#), *Wetlands Watch*, 3/15
5. [An extreme event of sea-level rise along the Northeast coast of North America in 2009–2010](#) (Goddard et al, 2015), *NOAA Summary*, 2/24/15
6. [Green and Blue Highways Symposium: Environmental Sustainability Best Practices for Transportation](#) – Presentations from May 6, 2015 workshop
7. [AT RISK: The Story of Virginia’s Rising Seas and Sinking Cities](#), *Old Dominion Univ. Student Newspaper*, 4/14/15

C. National Resources/Tools

1. [Near Worst Case Storm Surge Inundation Map Viewer](#), NOAA
 This web map displays a seamless national map of near worst case storm surge flooding (inundation) scenarios using the National Weather Service SLOSH model maximum of maximums (MOM) product for different hurricane wind categories at high tide.
2. [Ocean Acidification Impacts Online Viewer](#), *Natural Resources Defense Council*, 2015
[Ocean acidification spells trouble for shellfish industry](#), *CBS News*, 2/11/15
[US oyster, clam farms face economic blow from acidification: study](#), *Reuters*, 2/23/15
[US Oysters, Scallops Getting Cooked by Acidic Seas](#), *Discovery News*, 2/23/15

D. Global Resources/Tools

1. None.

Adaptation Research Articles & News Items

A. Sea Level Research Articles & News Items

1. [From the extreme to the mean: Acceleration and tipping points of coastal inundation from sea level rise](#), *Sweet*, 2014 - *Earth’s Future* - Wiley Online Library
2. [Residents can only watch as sea slowly devours their towns](#), *Bay Journal*, 3/4/15
3. [Atlantic Ocean overturning found to slow down already today](#), *Potsdam Institute for Climate Impact Research*, 3/23/15
4. [Loss of coastal marshes to sea level rise often goes unnoticed](#), *Bay Journal*, 4/8/15
5. [The drowning islands of Virginia](#), *MSNBC*, 1/14/15

B. Climate Change Research Articles & News Items

Atmospheric Warming and Impacts to Terrestrial and Aerial Ecology

1. [A ‘megadrought’ will grip U.S. in the coming decades, NASA researchers say](#), *Washington Post*, 2/12/15
2. [Study finds climate change may dramatically reduce wheat production](#), *Kansas State Univ.*, 2/18/15
3. [NAU researcher works to understand forces of abrupt environmental change](#), *Northern Arizona Univ.*, 2/18/15
4. [The climate is starting to change faster](#), *Pacific Northwest National Laboratory – US DOE*, 3/9/15
5. [Study: Past warming increased snowfall on Antarctica, affecting global sea level](#), *Oregon State Univ.*, 3/16/15
6. [Climate change does not cause extreme winters](#), *ETH Zurich*, 3/27/15
7. [Battlefield conversions: Hunters see climate changing their traditions](#), *ClimateWire*, 4/7/15
8. [Global Warming More Moderate Than Worst-Case Models](#), *Duke Environment*, 4/21/15
9. [Researchers find 200-year lag between climate events in Greenland, Antarctica](#), *Oregon State Univ.*, 4/29/15
10. [Antarctic ice core reveals how sudden climate changes in North Atlantic moved south](#), *National Science Foundation*, 4/29/15

Ocean/Water Resources and Impacts to Aquatic Ecology

1. [Monster hurricanes struck U.S. Northeast during prehistoric periods of ocean warming](#), *National Science Foundation*, 2/11/15
2. [Scientists Find Tropical Cyclone Size Controlled By Relative Sea-Surface Temperatures](#), *Stony Brook Univ.*, 3/17/15
3. [Climate change could disturb marine life for millennia](#), *Yahoo News UK*, 3/30/15

C. Hazard Mitigation & Climate Adaptation Planning & Policy Items

(information on impacts to economies & the built environment)

1. [Massachusetts may cut coastal building](#), *Boston Herald*, 2/25/15
2. [Commentary: IPCC Sea-level rise scenarios not for purpose for high-risk coastal areas](#), *Univ. of Southampton*, 2/26/15
3. [Virginia shoreline protection project to begin at Naval Air Station Oceana](#), *BOEM*, 2/27/15
4. [Adapting to climate change will bring new environmental problems](#), *Univ. of East Anglia*, 3/15
5. [Coastal property values could erode if nourishment subsidies end](#), *Duke Univ.*, 3/25/15
6. [Rise in government insurance rates to mirror rising waters, flood debt](#), *Washington Post*, 3/28/15
7. [NC coastal official says locals can lead response to sea-level rise](#), *Raleigh News & Observer*, 4/3/15
8. [Addressing Affordability and Long-Term Resiliency Through the National Flood Insurance Program](#), *Environmental Law Reporter*, 4/15
9. [How Flood Insurance Could Drive Americans From Coasts](#), *Climate Central*, 4/7/15
10. [Best strategy in Blackwater’s sea level battle may be sounding the retreat](#), *Bay Journal*, 4/13/15
11. [Sea-Level Rise Poses Hard Choice for Two Neighborhoods: Rebuild or Retreat?](#), *Take Part*, 4/21/15
12. [Delaware braces for climate change](#), *Delaware Online*, 4/28/15
13. [NC sea-level forecast is a cause for relief this time](#), *Raleigh News & Observer*, 4/29/15
14. [NOAA study finds marshes, reefs, beaches can enhance coastal resilience](#), *NOAA*, 4/29/15
15. [U.S. Liable in New Orleans-Area Flooding](#), *New York Times*, 5/1/15
16. [A how-to on how to value your community’s beaches](#), *USACE Engineer Research & Development Center*, 4/15/15
17. [That ‘more realistic’ sea-level report? Not good news for NC](#), *Raleigh News & Observer*, 5/5/15

Contact

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Appendix D

AUGUST 2015 CLIMATE ADAPTATION WORKING GROUP NEWSLETTER



Eastern Shore of Virginia Climate Adaptation Working Group



August 2015 Newsletter

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CAWG "Top 10" – Top stories & resources handpicked by Curt Smith. These links can also be found in the lists below.

1. [Washington D.C., Sinking Fast, Adding to Threat of Sea-Level Rise](#), Univ. of Vermont, 1/14/15
[Past and present sea levels in the Chesapeake Bay Region, USA](#), Geological Society of America, 7/28/15
[Pleistocene relative sea levels in the Chesapeake Bay region and their implications for the next century](#), GSA Today, August 2015
[Why sea level is rising so fast on Delmarva](#), WBOC, 7/29/15
2. [Researchers study the impact of saltwater intrusion on tidal wetlands](#), Virginia Commonwealth University, 7/28/15
 *Study conducted in New Kent County
3. Virginia Joint Commission on Sea Level Rise and Recurrent Flooding
 The Commission met on July 21, 2015 ([Agenda](#)) and were presented the following:
[Enhancing Coastal Resilience on Virginia's Eastern Shore](#)
[The Community Rating System: Saving Money and Shorelines](#)
[Presentation by the Department of Conservation and Recreation](#)
4. [Adapting to Climate Change in Coastal Parks: Estimating the Exposure of Park Assets to 1 m of Sea-Level Rise](#), National Park Service, 2015
[Press Release: Interior Department Releases Report Detailing \\$40 Billion of National Park Assets at Risk from Sea Level Rise](#)
[Findings for Assateague Island National Seashore](#)
[\\$135M in Assateague assets at risk from climate change](#), DelmarvaNow.com, 7/1/15
[Outer Banks national seashores could lose \\$2 billion to rising seas](#), Raleigh News & Observer, 6/24/15
[NPS: sea level rise puts cape at risk](#), Carteret County News-Times, 7/4/15
5. [Saltmarsh mallow could help battle against sea water](#), American Farm, 9/30/14
 *Recent research on ESVA highlights dual benefits for sea level rise adaptation and economic development
6. [Summer Temperature Trends](#), Climate Central, 6/17/15
 *Maps illustrate average of just over 0.5°F for eastern Virginia.
7. [\\$38 million Prime Hook Refuge restoration begins](#), Delaware Online, 7/13/15
[Prime Hook refuge shows signs of renewal](#), Cape Gazette, 8/3/15

Accomack – Northampton Coastal Resources Technical Assistance Program

8. [A rising tide of concern](#), *Virginia Business*, 6/29/15
9. [A bird's-eye view of the Eastern Shore – and what ails it](#), *Richmond Times Dispatch*, 7/12/15
10. [Accelerated warming of the continental shelf off northeast coast](#), *Woods Hole Oceanographic Institute*, 6/11/15
[Scientists detect mysterious warming in US coastal waters](#), *Climate News Network*, 6/28/15

Upcoming Public Events

1. North Accomack County Ground Water Summit – October, 2015 Time and Location TBD
2. [2015 Water Resources Conference of the Virginias](#) – October 5 & 6, Roanoke, VA

Adaptation Resources & Planning Tools

A. Local Resources/Tools

1. The Nature Conservancy – Enhancing Coastal Resilience on Virginia's Eastern Shore
[Community Leader Workshop Summary Report](#) – published on April 16. Site also contains additional workshop materials.
[Coastal Resilience Project Homepage](#) includes general information about the NFWF project including the project fact sheet, original proposal abstract and narrative, a link to project resources, and additional general project information.
2. [Accomack County/Wallops Island Joint Land Use Study](#)
*No new updates.
3. [Chincoteague National Wildlife Refuge Comprehensive Conservation Plan](#)
*No new updates.
4. [Saltmarsh mallow could help battle against sea water](#), *American Farm*, 9/30/14
*Recent research on ESVA highlights dual benefits for sea level rise adaptation and economic development.
5. [Accomack wants NASA to study Chinc. channel silting](#), *Eastern Shore News*, 6/19/15
6. [A bird's-eye view of the Eastern Shore – and what ails it](#), *Richmond Times Dispatch*, 7/12/15
7. [With each superstorm, new clues to predicting surges surface](#), *Bay Journal*, 8/5/15

B. State & Regional Resources/Tools

1. Virginia Climate Change & Resiliency Update Commission
No new updates. Report with recommendations due June 30, 2015.
2. Virginia Joint Commission on Sea Level Rise and Recurrent Flooding

The Commission met on July 21, 2015 ([Agenda](#)) and were presented the following:

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- [The Community Rating System: Saving Money and Shorelines](#)
- [Presentation by the Department of Conservation and Recreation](#)

3. Secure Commonwealth Panel Recurrent Flooding Subpanel
[Recommendations to the SCP on the Issue of Sea Level Rise and Recurrent Flooding in Coastal Virginia](#), 9/5/14
*No new updates.
4. [Governor McAuliffe Announces Virginia Moving Forward in Natural Disaster Resilience Competition](#), 7/8/15
*Accomack County included in Virginia's application
5. [Climate Resiliency Outcomes Management Strategy 2015-2025](#), *Chesapeake Bay Program*
6. [Tidewater Rising Resiliency Design Challenge](#), *Wetlands Watch*
[Summary Report](#)
7. [Dutch Dialogues Virginia: Life at Sea Level](#)
8. [VIMS Center for Coastal Resources Management July 2015 Newsletter](#)
9. [Hampton Roads Sea Level Rise Pilot Project Summer Update](#), *Old Dominion University*
10. [North Carolina Sea Level Rise Assessment Report](#), *NC Dept. of Environment & Natural Resources*, 3/15
[The Changing Carolina Coast: Managing The Threat Of Rising Water](#), *WUNC*, 6/1/15

C. National Resources/Tools

1. [Actions to Build Resilience to Climate Change Impacts in Vulnerable Communities](#), *US Council on Environmental Quality*, 7/9/15
2. [Adapting to Climate Change in Coastal Parks: Estimating the Exposure of Park Assets to 1 m of Sea-Level Rise](#), *National Park Service*, 2015
[Press Release: Interior Department Releases Report Detailing \\$40 Billion of National Park Assets at Risk from Sea Level Rise Findings for Assateague Island National Seashore](#)
[\\$135M in Assateague assets at risk from climate change](#), *DelmarvaNow.com*, 7/1/15
[Outer Banks national seashores could lose \\$2 billion to rising seas](#), *Raleigh News & Observer*, 6/24/15
[NPS: sea level rise puts cape at risk](#), *Carteret County News-Times*, 7/4/15
3. [Interior's Northeast Climate Science Center Releases Report to Help State Wildlife Managers in the Northeast and Midwest Alleviate Impacts of Climate Change on Species and Ecosystems](#), *US Dept. of Interior Northeast Climate Center*, 6/29/15
[Integrating Climate Change into the State Wildlife Action Plans](#), *Northeast Climate Center*
[Integrating Climate Change into Northeast and Midwest State Wildlife Action Plans](#), *Northeast Climate Center*, 5/15
4. [Community Resilience Planning Guide](#), *US Dept. of Commerce National Institute of Standards and Technology*

5. [Summer Temperature Trends](#), *Climate Central*, 6/17/15
**Maps illustrate average of just over 0.5°F for eastern Virginia.*
6. [What's the difference between global warming and climate change?](#), *NOAA Climate*, 6/28/15

D. Global Resources/Tools

1. [State of the Climate in 2014](#), *American Meteorological Society*, July 2015
[2014 State of the Climate: Highlights](#), *NOAA Climate*
[Bringing together 400+ experts to give Earth its annual climate checkup](#), *NOAA Climate*, 7/30/15
2. [NASA releases detailed global climate change projections](#), *NASA*, 6/9/15
3. [Climate Time Machine](#), *NASA*
**Interactive animations of how some of Earth's key climate indicators are changing over time.*
4. [Latest Sea Level Measurements](#), *NASA*, 5/15

Adaptation Research Articles & News Items

A. Sea Level Research Articles & News Items

1. [Sea Level Rise Is On the Up and Up](#), *Climate Central*, 5/11/15
2. [Expect more flooding and erosion, study says](#), *Virginian-Pilot*, 5/20/15
3. [Why the Earth's past has scientists so worried about sea level rise](#), *Washington Post*, 7/9/15
4. [Coastal Nations, Megacities Face 20 Feet of Sea Rise](#), *Climate Central*, 7/9/15
5. [Global sea levels have risen six meters or more with just slight global warming](#), *Oregon State Univ.*, 7/9/15
6. [Washington D.C., Sinking Fast, Adding to Threat of Sea-Level Rise](#), *Univ. of Vermont*, 1/14/15
[Past and present sea levels in the Chesapeake Bay Region, USA](#), *Geological Society of America*, 7/28/15
[Pleistocene relative sea levels in the Chesapeake Bay region and their implications for the next century](#), *GSA Today*, August 2015
[Why sea level is rising so fast on Delmarva](#), *WBOC*, 7/29/15
7. [Researchers study the impact of saltwater intrusion on tidal wetlands](#), *Virginia Commonwealth University*, 7/28/15
**Study conducted in New Kent County*

B. Climate Change Research Articles & News Items

Atmospheric Warming and Impacts to Terrestrial and Aerial Ecology

1. [Global Climate on Verge of Multi-Decadal Change](#), *Univ. of Southampton*, 5/27/15
2. [Experts tie hurricane changes to climate change](#), *Tampa Tribune*, 5/25/15
3. [VA seeing more ticks as species from North, South expand their range](#), *Bay Journal*, 6/8/15
4. [Dramatic Ice Sheet Collapse 135 Thousand Years Ago Triggered Strong Global Climate Change](#), *Univ. of Southampton*, 6/8/15
5. [New study links global warming to Hurricane Sandy and other extreme weather events](#), *The Guardian*, 6/15/15
6. [Study Suggests Key Role for Warming in Extreme Weather](#), *Climate Central*, 6/23/15
7. [Analyzing ocean mixing reveals insight on climate](#), *Los Alamos National Laboratory*, 7/30/15
8. [The complicated relationship between agriculture and climate change](#), *Investigate Midwest*, 7/9/15
9. [Buzz the Alarm: Climate Change Puts Squeeze on Bumblebees](#), *Univ. of Vermont*, 7/9/15
10. [Irregular heartbeat of the Sun driven by double dynamo](#), *Royal Astronomical Society*, 7/9/15
11. [Oceans slowed global temperature rise, scientists report](#), *UCLA*, 7/16/15
12. [NASA Finds Oceans Slowed Global Temperature Rise](#), *NASA*, 7/9/15
13. [Fossil fuel emissions will complicate radiocarbon dating, warns scientist](#), *Imperial College of London*, 7/20/15
14. [Mammoths killed by abrupt climate change](#), *Univ. of Adelaide*, 7/24/15
15. [Study Finds Abrupt Climate Change May Have Rocked the Cradle of Civilization](#), *Univ. of Miami*, 7/23/15
16. [Abrupt climate change may have doomed mammoths and other megafauna, scientists report](#), *Washington Post*, 7/23/15
17. [Glaciers melt faster than ever](#), *Univ. of Zurich*, 8/3/15

Ocean/Water Resources and Impacts to Aquatic Ecology

1. [Accelerated warming of the continental shelf off northeast coast](#), *Woods Hole Oceanographic Institute*, 6/11/15
[Scientists detect mysterious warming in US coastal waters](#), *Climate News Network*, 6/28/15
2. [Recycled water, salt-tolerant grass a water-saving pair](#), *American Society of Agronomy*, 6/24/15
3. [Melting Arctic sea ice could be disrupting the oceans' circulation—with major consequences](#), *Washington Post*, 6/29/15
4. [Seafood supply altered by climate change](#), *Univ. of British Columbia*, 6/30/15
5. [Climate change could drain global seafood supplies](#), *CBS News*, 7/2/15
6. [Ocean warming leads to stronger precipitation extremes](#), *Helmholtz Center for Ocean Research*, 7/13/15
7. [Climate Change Is Increasing Stress on Oceans](#), *Climate Central*, 7/14/15
8. [How bass are wiping out vulnerable fish species and what that tells us about climate change](#), *Univ. of Toronto*, 7/14/15
9. [Ocean acidification may cause dramatic changes to phytoplankton](#), *Massachusetts Institute of Technology*, 7/20/15
10. [Decadal acidification in the water masses of the Atlantic Ocean](#), *Rios et al.*

C. Hazard Mitigation & Climate Adaptation Planning & Policy Items

(information on impacts to economies & the built environment)

1. [Sediment tracer study assists nearshore beach replenishment trial](#), *Dredging News Online*, 5/7/15
2. [Saltmarsh mallow could help battle against sea water](#), *American Farm*, 9/30/14
3. [Ratings agency turns attention to Hampton Roads flooding](#), *Daily Press*, 5/15/15
4. [Is renourishing beaches to fight sea level rise just a pipe dream?](#), *Bay Journal*, 6/3/15
5. [U.S. fishing industry should brace for a stiff economic jolt from climate change](#), *Climate Wire*, 6/17/15
6. [A rising tide of concern](#), *Virginia Business*, 6/29/15
7. [What Is Climate Change Doing to Your Health?](#), *US News & World Report*, 7/9/15
8. [\\$38 million Prime Hook Refuge restoration begins](#), *Delaware Online*, 7/13/15
[Prime Hook refuge shows signs of renewal](#), *Cape Gazette*, 8/3/15
9. [\\$50 billion plan to save Louisiana's wetlands](#), *Public Radio International*, 7/19/15
10. [Increasing risk of compound flooding from storm surge and rainfall for major US cities](#), *Nature Climate Change*, 7/27/15

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Appendix E

Southern Accomack County Ground Water Summit

EASTERN SHORE OF VIRGINIA GROUND WATER COMMITTEE
Southern Accomack County Ground Water Summit
October 30, 2014

NAME	AFFILIATION	EMAIL ADDRESS**
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Rich HUBBARD	NORTHAMPTON BOS	
Robert Tittle		robert.a.tittle@nasa.gov
Ray Rosowiczka	CHINCOTHAQUE	therrsoverizon.net
Nancy Kosrubien	"	
Wanda Thornton	Accomack Co	
Grayson Chesser	Accomack Co	
Charles Spangler		pfscts@gmail.com
Janet C. Powell	ESM-CHEM.	
JAY DAVENPORT	ONANCOCK	JAY@SAILDRIVER.COM
SIMMY BUNDICK	QUINBY, VA	Lemack well pump & water jet
Mary SILVERMAN	ONANCOCK VA	alan.silverman@verizon.net
Robert Crockett	Accomack County BOS	
JACK PIERSON	Oxley	VATAACK79@yahoo.com
Matthew Kulack		
Jaydon Rochete	Onancock	hrjr2@verizon.net
Dirk Lynch	MSA PC.	edirklynch@gmail.com
Cole Chanock	Sol. Water District	Cole.Chanock@esswd.org
Bill CREAGER	OUWAY	
Stewart Hall	Accomack County	shall@co.accomack.va.us
Mark Taylor	Accomack County	mtaylor@co.accomack.va.us
Elaine Nes	A-NPDC	
J. Morrison	Accomack Co.	vmorrison@co.accomack.va.us
Dominique Jones	Accomack Co	dmjones@email.wvu.edu

The Eastern Shore of Virginia Ground Water Committee Presents a Free, Public Educational Event Summarizing the Specific Ground Water Conditions for Onancock, Onley, Accomac, Wachapreague, Melfa, Keller, Painter, Belle Haven & surrounding areas:

Southern Accomack County Ground Water Summit



THURSDAY, OCTOBER 30, 2014

6:30 P.M. – 8:00 P.M.

EASTERN SHORE COMMUNITY COLLEGE

WORKFORCE DEVELOPMENT BUILDING, 29300 LANKFORD HWY., MELFA

- *Where is our ground water?* ●● *How much is there?* ●●
- *How is it replenished?* ●● *How safe is my water?* ●●
- *Are there ways I can protect it?* ●● *How old is the water?* ●●
- *Should I be worried about the quality of my water?* ●●
- *What is being done to ensure it is safe?* ●●
- *Will my community have sufficient water to sustain itself?* ●●
- *Is there enough to support growth for generations to come?* ●●

Learn answers to these & many other questions!!!

*Also, look for upcoming Ground Water Summits for other Eastern Shore communities!
Please Contact Curt Smith at 787-2936 or csmith@a-npdc.org for more information.*



PRESS RELEASE

Contact : Curt Smith, A-NPDC
Phone: 787-2936 x 114
Email: csmith@a-npdc.org

“Is there enough water to support our community for generations to come?”

**Public Summit to Address Ground Water Issues and Conditions for
Southern Accomack County Scheduled for October 30**

Ground water is the sole source of drinking water on the Shore and its sustainability and quality are essential for residents and communities.

The October 30 Southern Accomack Ground Water Summit is an educational forum that will seek to answer the question, “Is there enough water to support our community for generations to come?” and explore other topics crucial to understanding groundwater conditions specifically focusing on Onancock, Onley, Accomac, Wachapreague, Melfa, Keller, Painter, Belle Haven, and surrounding areas.

Participants will learn where their water comes from, how and when it got there, what is being done to ensure its quality, and the threats to our future water supply and quality. Other presentations will touch on the area’s geologic evolution, and what is - and is not - known about the resource.

The Eastern Shore of Virginia Ground Water Committee invites the public to this FREE SEMINAR on Thursday, October 30, from 6:30-8:00 p.m. at the Eastern Shore Community College Workforce Development Building at 29300 Lankford Highway in Melfa.

Britt McMillan, Consulting Hydrogeologist to the Eastern Shore Ground Water Committee, and Curt Smith, Director of Planning for the Accomack-Northampton Planning District Commission, will be presenting and responding to questions from the audience.

This event is the third in a series of community-focused ground water summits presented by the Ground Water Committee. The next summit is scheduled for June 2015 and will focus on Accomack County communities from Parksley to Temperanceville. A future summit in October 2015 will focus on Northern Accomack County communities including Chincoteague, Saxis, Wallops, and Greenbackville.

For additional information, please contact Curt Smith at 787-2936.

*Southern Accomack County
Ground Water Summit*

Geologic Evolution of the Southern Delmarva Peninsula

Curt Smith
Director of Planning
Accomack-Northampton Planning District Commission
October 30, 2014

Virginia's Eastern Shore
A-NPDC

Virginia Coastal Zone
MANAGEMENT PROGRAM

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

A-NPDC Overview and Purpose



- Commonwealth created 21 PDCs in 1970 to address regional issues by fostering cooperation amongst localities and cooperation between state & localities
- Accomack-Northampton Planning District:
 - Members: 2 Counties and Town of Chincoteague
 - Also provides services to 18 other incorporated towns
- Affiliate Organizations:
 - A-N Regional Housing Authority → provides privately or authority-owned rental housing
 - ESV Housing Alliance → improving housing for homeowners
 - A-NPDC →
 - Community Development
 - Economic Development
 - Transportation Planning
 - Environmental Planning → Ground Water Committee; Climate Adaptation Working Group

ESVA Ground Water Committee

Current Members

<i>Accomack Co.</i>	<i>Northampton Co.</i>
Jim Belote	Gene Hampton
Grayson Chesser	Peter Henderson
J.W. Jeffries	Granville Hogg
Wanda J. Thornton, Chairman	Richard Hubbard, Vice Chairman

Non-Voting Ex-Officio

Steve Miner
Katie Nunez
Elaine Meil, Secretary

Created as bi-county committee in 1990 to:

- Assist local governments & residents in understanding, protecting, & managing GW resources
 - Household Hazardous Waste Collection (2004-2014)
- Prepare a GW resources protection & management plan (Created 1992, Updated 2013)
 - Water Supply Plans (2011)
- Serve as an educational & informational resource
 - Public Workshops
 - GW Website
 - ESVA GW Award Program
- Initiate special studies concerning the protection & management of the GW resource
 - ESVA GW Model
 - Water Quality Studies – 2001, 2013
- Coordinate & communicate among parties responsible for GW protection, management, & research

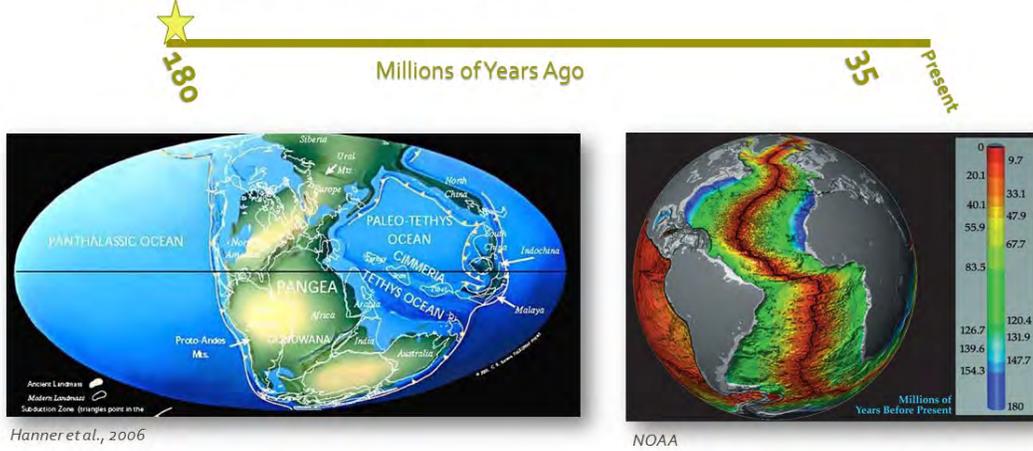
Accomack-Northampton Planning District Commission

Presentation Overview

- Causes of Geologic Change:
 - Uniform and gradual land subsidence and fluctuations in sea level working in tandem with punctuated catastrophic events (meteor impact, storms, etc.)
- Timeline:
 - i. Opening of Atlantic Ocean & Salisbury Embayment – **≈180 Million Years Ago (MYA)**
 - ii. Filling of Salisbury Embayment (Potomac Formation) – **≈180 to 35.5 MYA**
 - iii. Bolide impact & removal of pre-impact sediments – **≈35.5 MYA**
 - iv. Deposition of post-impact sediments – **≈35.5 MYA – Present**
 - v. Reworking of surficial sediments & progradation of peninsula – **≈200,000 YA – Present**
 - vi. Sea level reaches elevation of modern Chesapeake Bay transitioning system from riverine to estuarine - **≈8,000 YA**
 - vii. Sea level continues to rise and inundate the Chesapeake Bay watershed and the Chesapeake Bay begins to take its modern appearance we currently recognize - **≈3,000 YA**

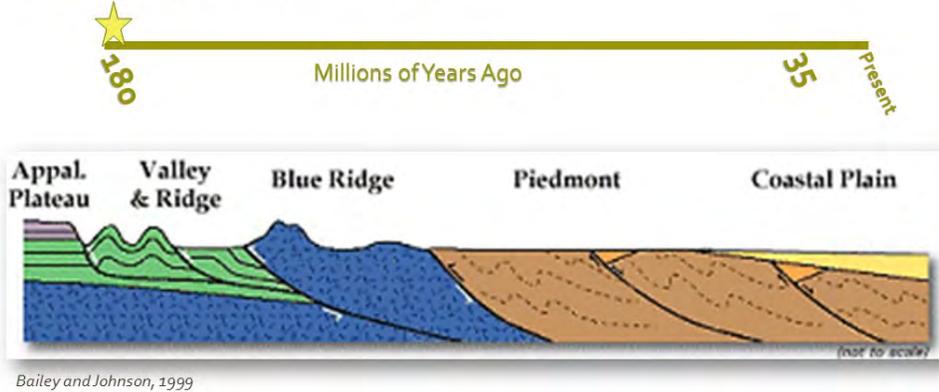
Accomack-Northampton Planning District Commission

Opening of Atlantic Ocean



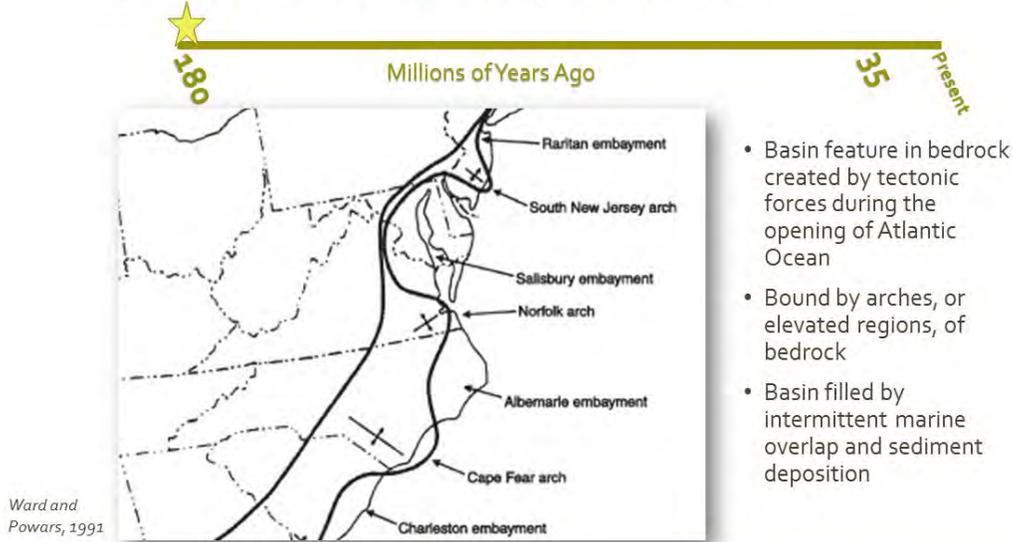
Accomack-Northampton Planning District Commission

Opening of Atlantic Ocean



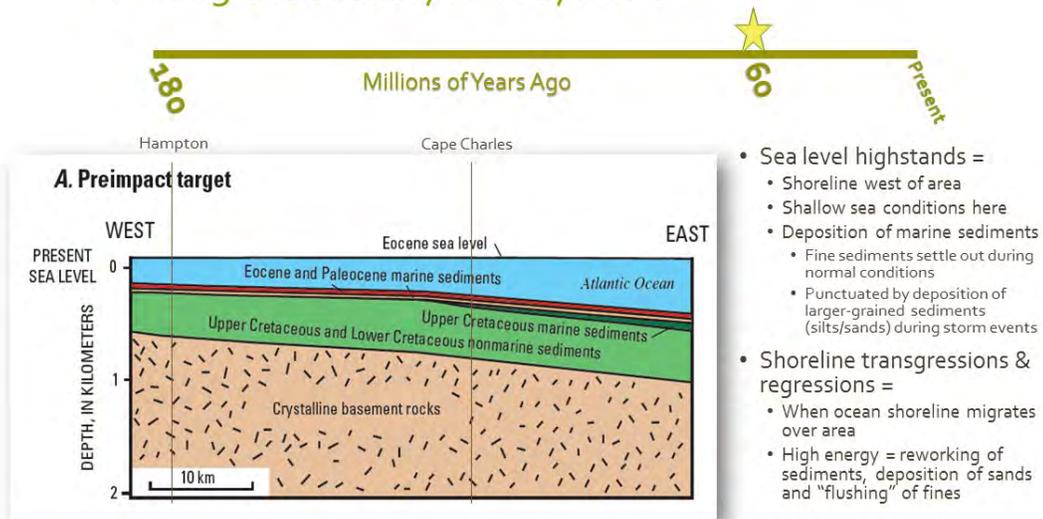
Accomack-Northampton Planning District Commission

Development of Salisbury Embayment



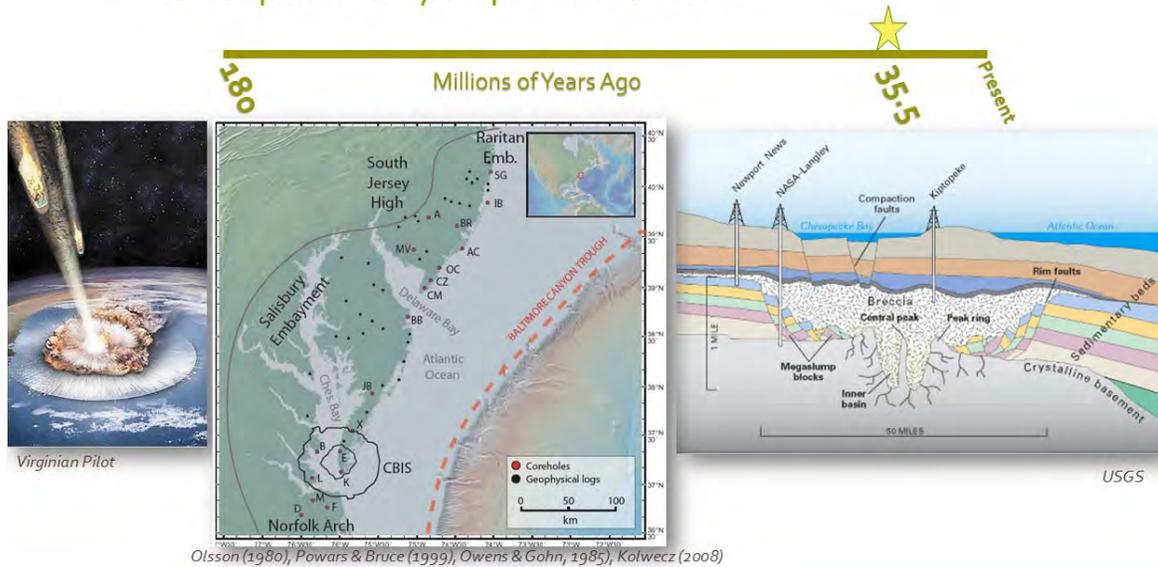
Accomack-Northampton Planning District Commission

In-Filling of Salisbury Embayment



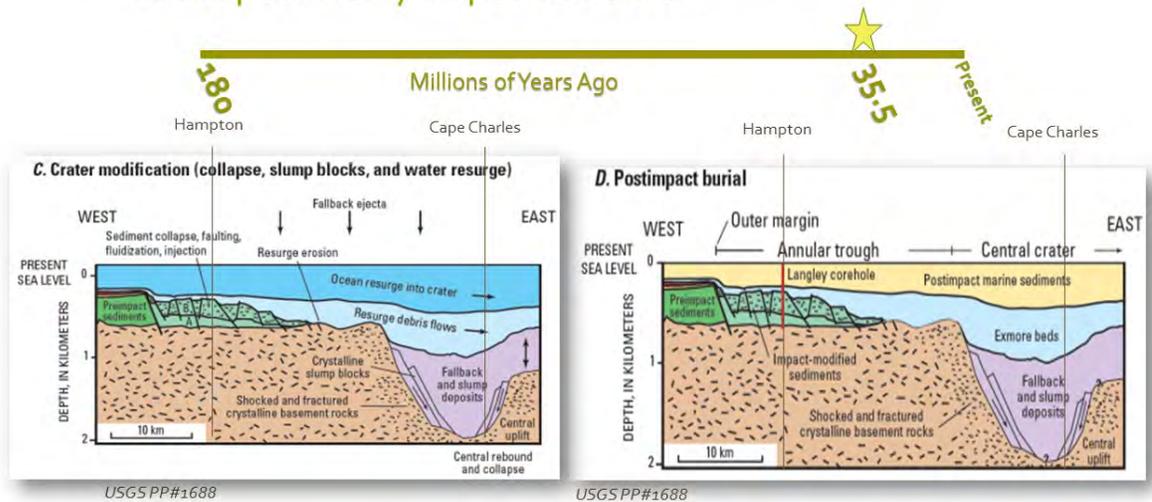
Accomack-Northampton Planning District Commission

Chesapeake Bay Impact Structure

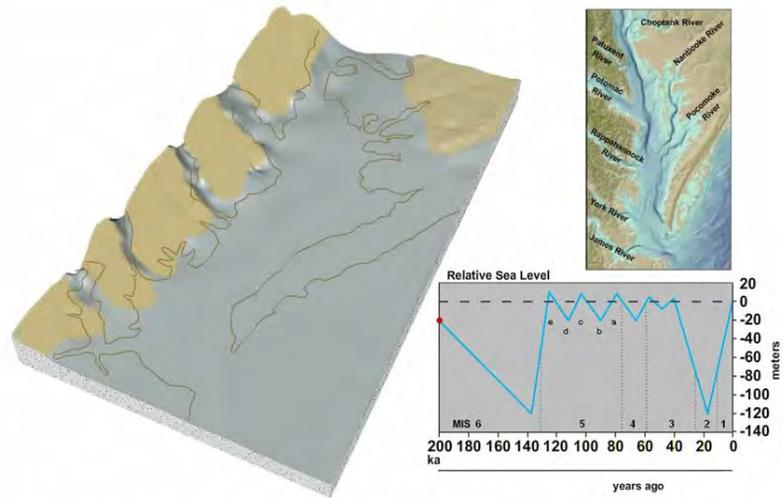


Accomack-Northampton Planning District Commission

Chesapeake Bay Impact Structure



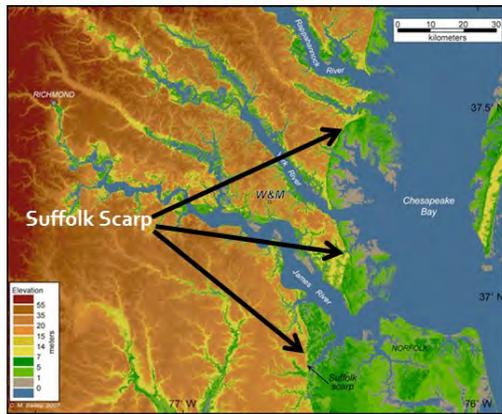
Accomack-Northampton Planning District Commission



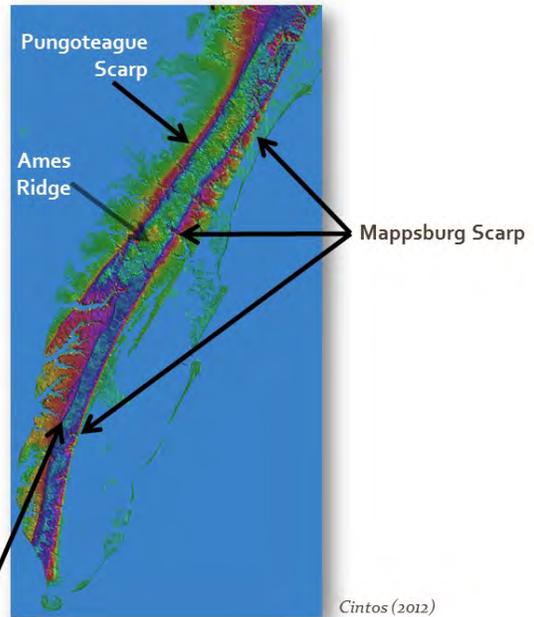
USGS Chesapeake Bay Evolution Animation

Accomack-Northampton Planning District Commission

Surficial Features:
Relict Shorelines



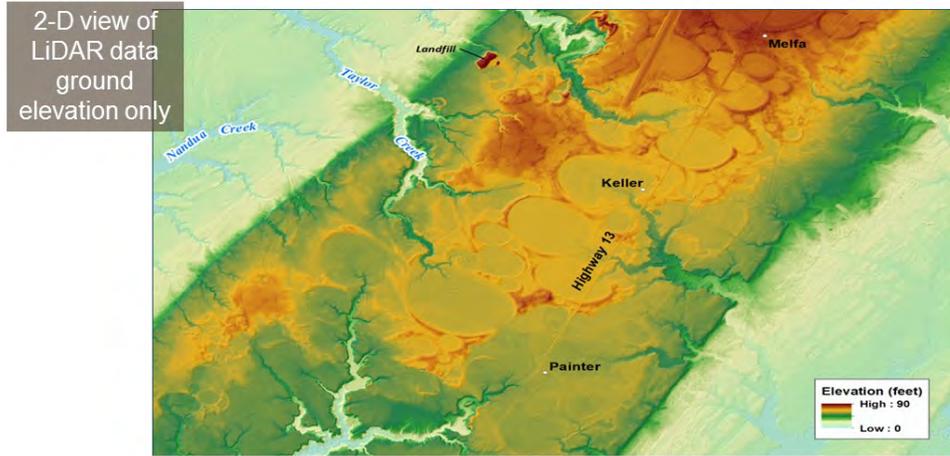
Bailey (2009)



Cintos (2012)

Accomack-Northampton Planning District Commission

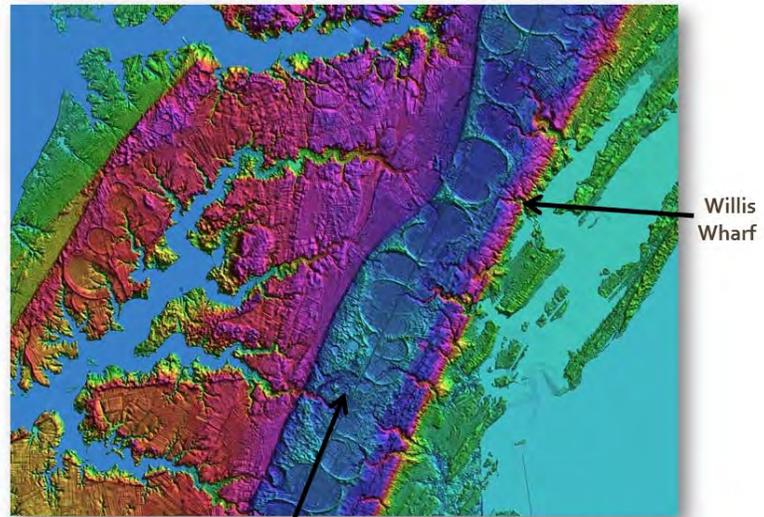
South-Central Accomack County (Melfa, Keller, & Painter)



The Nature Conservancy (2011)

Surficial Features: Carolina Bays

- Over 700 shallow, elliptical depressions
 - Similar orientation (NW-SE)
 - Variable size (1 – 1,000 acres)
 - Some overlapping
 - Coarse-grained rims
 - Fine-grained floors
- Variable ages (100,000- <5,000 years)
- Debated origin
 - Wind & Water
 - Shock wave from bolide explosion

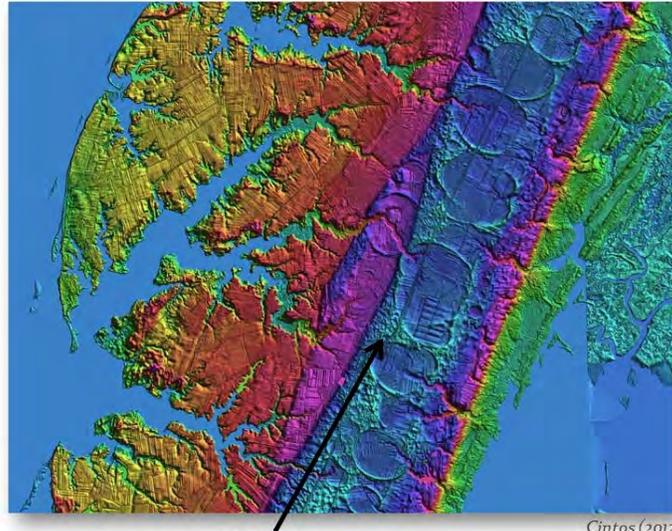


Nassawadox

Cintos (2012)

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Carolina Bays**

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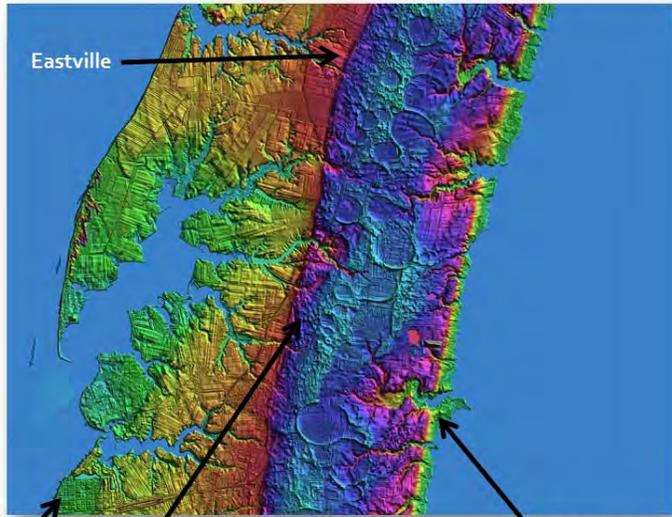


Machipongo

Cintos (2012)

**Surficial Features:
Carolina Bays**

- Over 700 shallow, elliptical depressions
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Cape Charles

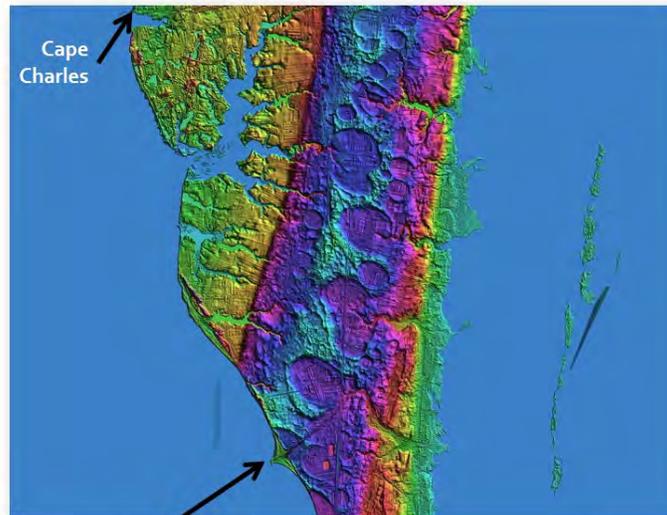
Cheriton

Oyster

Cintos (2012)

Surficial Features: Carolina Bays

- Over 700 shallow, elliptical depressions
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Kiptopeke SP

Cintos (2012)

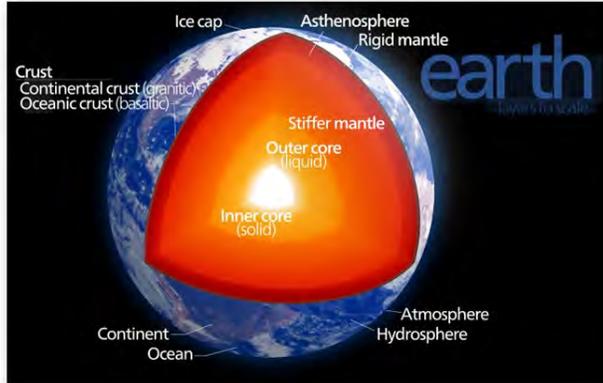
Accomack-Northampton Planning District Commission



Curt Smith
Director of Planning
Accomack-Northampton
Planning District Commission
csmith@a-npdc.org
757-787-2936



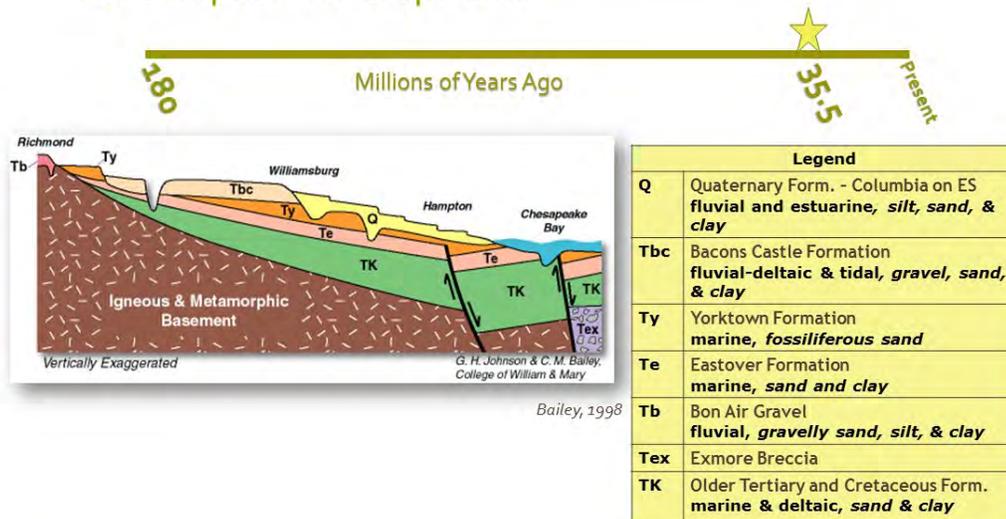
The Earth's Interior



- Universe Age: 13.82 Billion Years
- Earth Age: 4.54 Billion Years
- Depth to Center ≈ 4,030 Miles
 - Crust - <0.01%
 - Oceanic Crust (≈3-6 mi. thick)
 - Continental Crust (≈20-30 mi. thick)
 - Mantle (≈1,800 mi.) - 45%
 - Outer Core (≈1,400 mi.) – 35%
 - Inner Core (≈800 mi.) – 20%

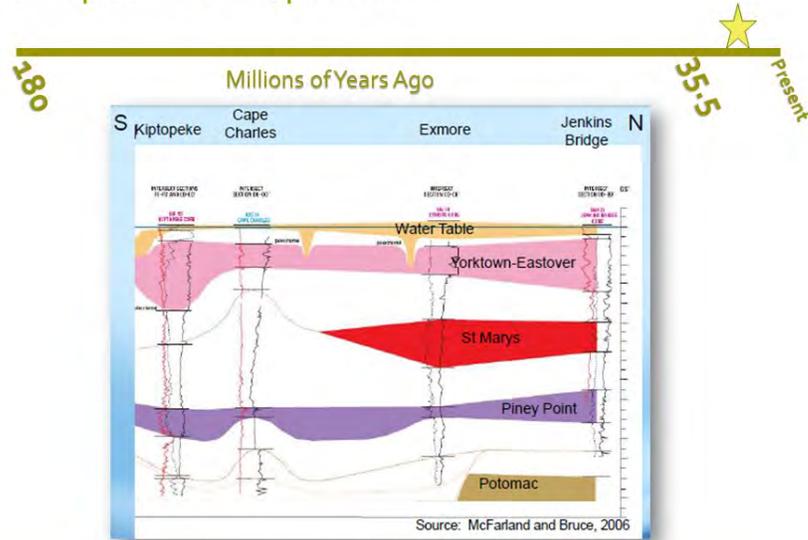
Accomack-Northampton Planning District Commission

Post-Impact Development



Accomack-Northampton Planning District Commission

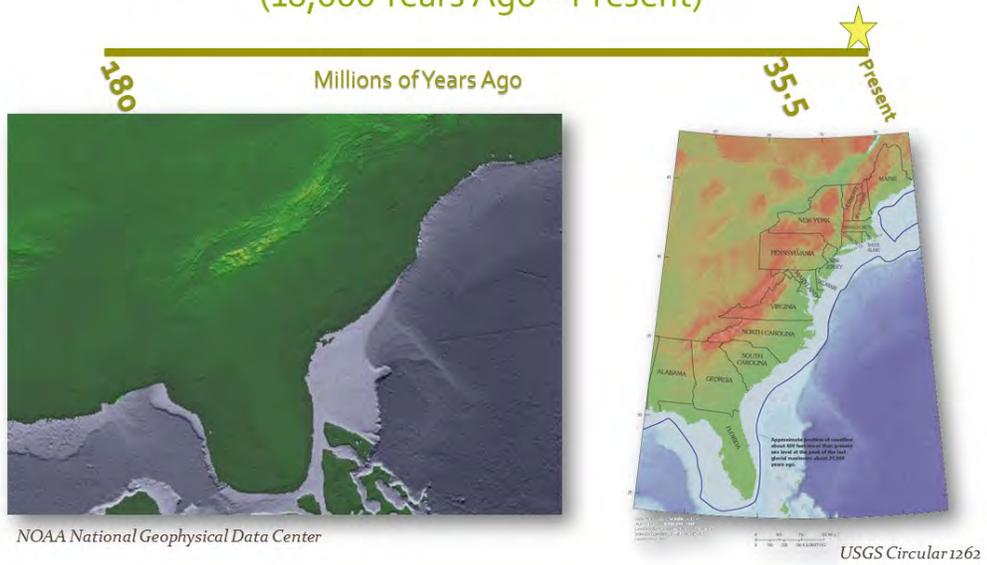
Post-Impact Development



23

Accomack-Northampton Planning District Commission

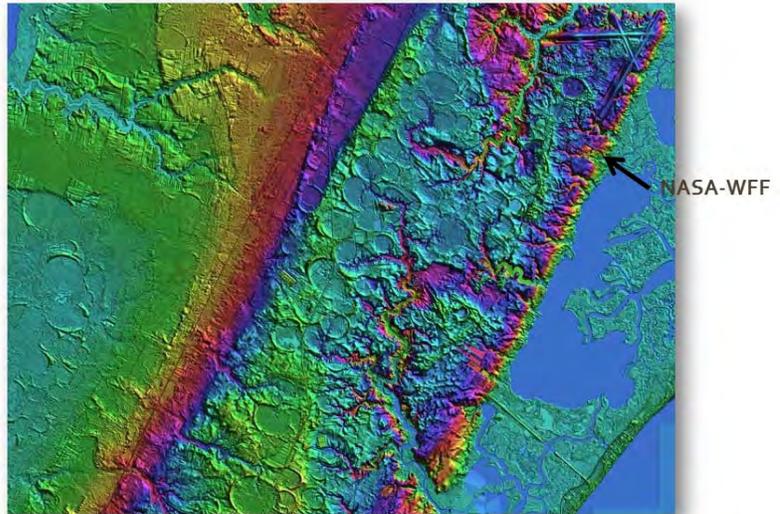
Conditions During and Since Last Glacial Maximum (18,000 Years Ago – Present)



Accomack-Northampton Planning District Commission

**Surficial Features:
Carolina Bays**

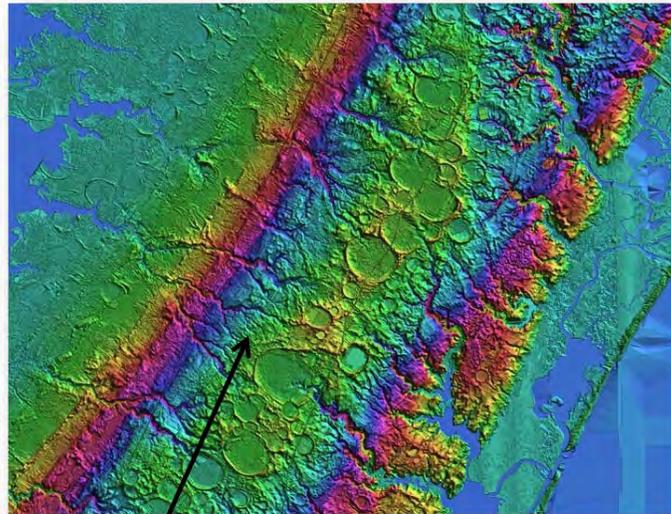
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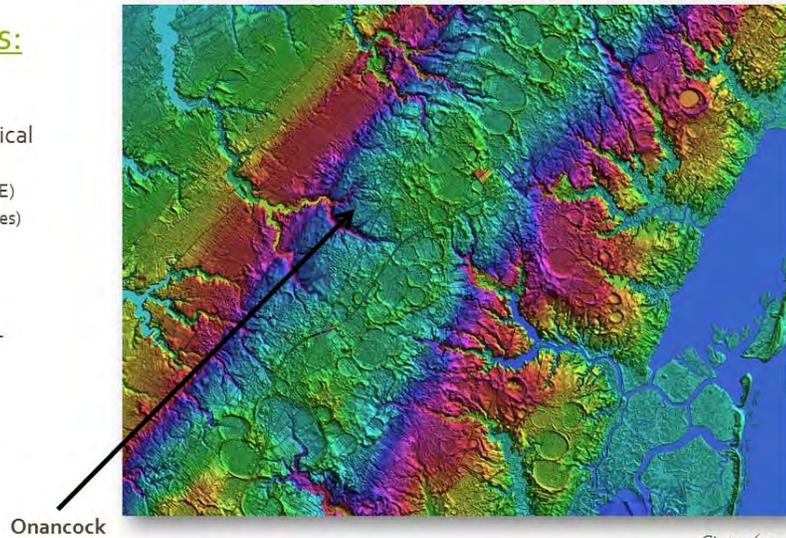


Parksley

Cintos (2012)

Surficial Features: Carolina Bays

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 - Variable size (1 – 1,000 acres)
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Cintos (2012)

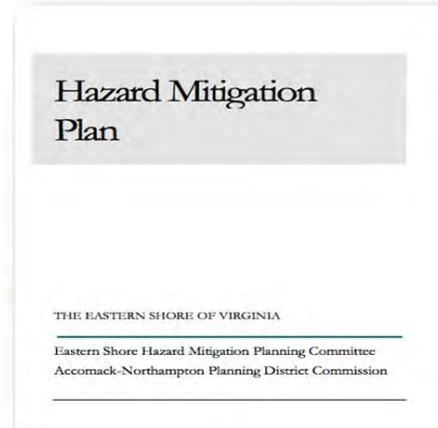
Long –Term Planning for Eastern Shore & Chesapeake Bay

- **Accomack & Northampton Counties**
 - Neither have policies directly addressing sea level rise
 - Both acknowledge sea level rise in Comp Plans
 - Accomack acknowledges modern rates @ 1.5 to 3 times the historic rate
 - Both mitigate flooding damages via:
 - Enforcing flood-resistant construction practices in Flood Hazard Areas
 - Both require homes constructed in Flood Hazard Areas be at least 1 ft above the FEMA Base Flood Elevation
 - Participating in the FEMA Community Rating System program (Accomack does, North. does not)
 - Elevating houses (approx. 100 in past)
 - Implementing Chesapeake Bay Preservation Act on both bayside and seaside
- **State Efforts**
 - **Governor's Commission on Climate Change (2008)** – identified CC impacts and adaptation strategies
 - **VIMS – VA Recurrent Flooding Study (2012)**
 - Identifies issues facing coastal localities, recommends options for adaptation
 - Forecasts 1.0-2.5' of SLR by 2050 and 1.5-7.5' of SLR by 2100
 - **Secure Commonwealth Panel Recurrent Flooding Sub-panel (2013-2014)** – Developing implementation strategies for adaptation
- **ESVA Ground Water Committee - Ground Water Supply Protection and Management Plan Update** → 2013; monitoring regional salt water intrusion into aquifers
- **NASA Wallops Flight Facility – Adaptation Workshop** → Fall 2012; Climate Adaptation Science Initiative; Accomack Co. Joint Land Use Study → 2013
- **USFWS ESVA and Chincoteague National Wildlife Refuges**

Long –Term Planning Continued - ESVA Hazard Mitigation Plan

- A-NPDC, 2 Counties, 13 Towns
- Original 2006, Updated in 2011

1. *Review historical hazards*
2. *Identify and prioritize natural hazards*
 - Highest Priority Hazards: **Coastal Flooding**, High Wind, Stormwater Flooding, Coastal Erosion
3. *Conduct risk & vulnerability assessment for high priority hazards*
 - ESVA Coastal Flooding Risk in 2011 → \$470,000,000 Potential Total Loss (with \$300,000,000 Uninsured) from a 100-Year Flood Event
4. *Define mitigation strategies and develop mitigation projects to mitigate future hazard impacts*

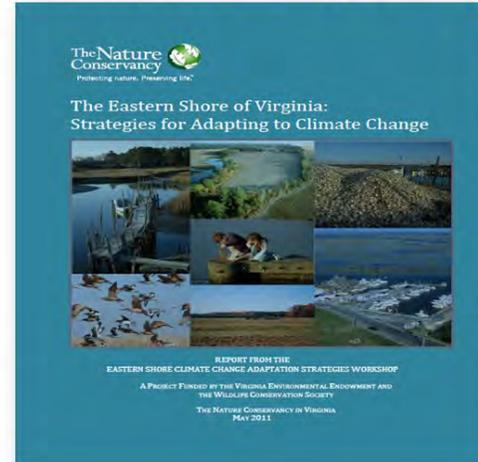


November 6, 2013

Accomack-Northampton Planning District Commission

Long –Term Planning Continued – The Nature Conservancy’s ESVA Climate Adaptation Project

- **ESVA Climate Adaptation Workshop**
 - August 2010
 - Local and regional participants
 - Industries (agriculture, aquaculture, tourism)
 - Local, state, and federal government agencies
 - Local community organizations
 - Identified impacts to natural and built environment
 - Created Climate Adaptation Working Group
- **ESVA Strategies for Adapting to Climate Change**
 - May 2011
- **High resolution elevation data (LiDAR) for Accomack and Northampton Counties**
 - March 2012



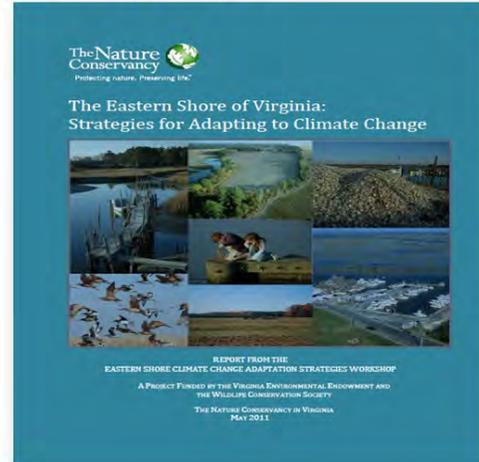
30

July 22, 2012

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Long –Term Planning Continued – *ESVA Strategies for Adapting to Climate Change Report*

- Identifies global climate change impacts on ESVA
 - Sea level
 - Temperature
 - Precipitation
- Develops vision for adaptation on ESVA
- Prioritizes Adaptation Strategies
 1. Local Adaptation Planning – County Comp Plans, Hazard Mitigation Plan
 2. Shoreline Management Plans – with VIMS
 3. Restoration & Protection of Natural Systems
 4. Ground Water Management
 5. Education & Outreach



31

July 22, 2012

Footer text here

Long –Term Planning Continued – ESVA Climate Adaptation Working Group

- Local, State, & Federal Representatives
 - A-NPDC, ESSWCD
 - ESVA Counties & Towns
 - VDEM, VCZMP, VIMS, UVA-LTER, VDCR, VDOT
 - NASA-WFF, USDA-NRCS, USFWS
 - Eastern Shorekeeper, Nature Conservancy, CBES, ES RC&D Council, VESLT, Wetlands Watch
 - & the list is still growing!



- Facilitate implementation of key adaptation strategies by ESVA localities
- Public Education & Outreach
- Forum for comparison & coordination amongst localities & agencies
- Serve as contact point for state and regional studies
- Explore funding options for adaptation

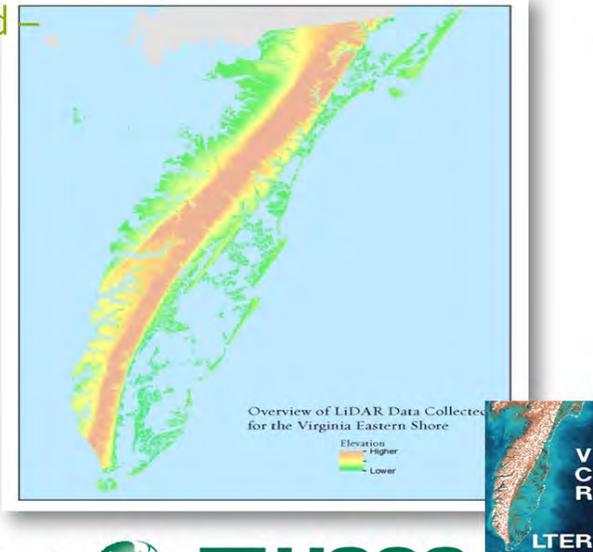
32

July 22, 2012

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Long –Term Planning Continued – LiDAR Elevation Data

- Many Planning Uses:
 - More safely site development out of harm’s way
 - Document shoreline change
 - Hazard mitigation planning
 - Emergency service planning
 - Stormwater management plans
 - FEMA Flood Insurance Rate Maps
 - Document vegetation cover & land-use practices



The Nature Conservancy
Protecting nature. Preserving life.™

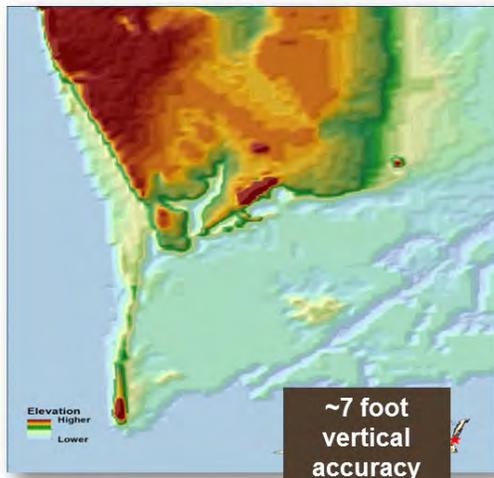
USGS
science for a changing world

UNIVERSITY OF VIRGINIA

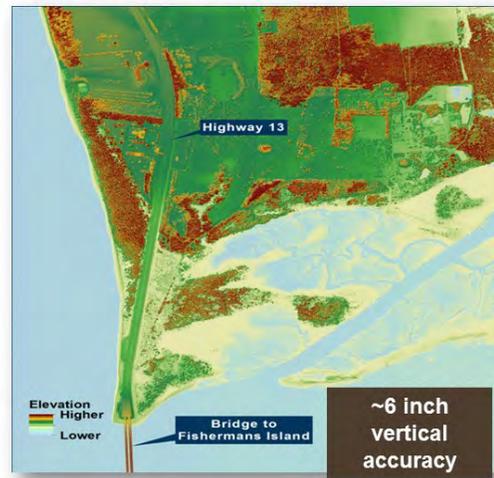
33 July 23, 2012 Footer text here

LiDAR Elevation Data Example: Southern Tip of Shore

Old Elevation Data



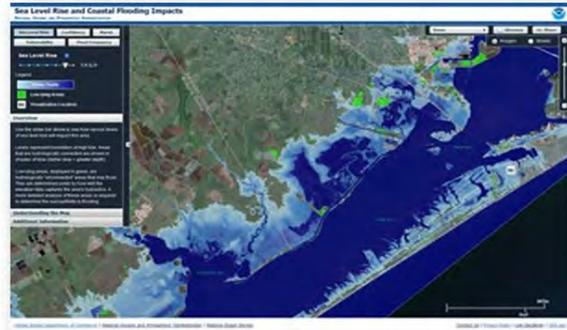
New LiDAR Data



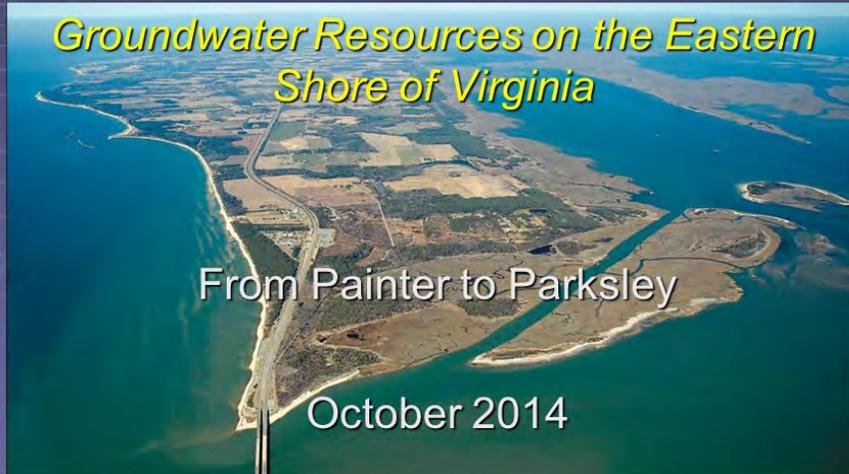
34 July 23, 2012 Footer text here

NOAA Sea Level Rise & Coastal Flooding Impacts Viewer

- NOAA Coastal Services Center Digital Coast
- Maps – Now Available
 - Sea Level Rise Inundation
 - Shallow Flooding Frequency & Duration
 - Socioeconomic Vulnerability
 - Marsh Impacts/Migration
 - Mapping Confidence



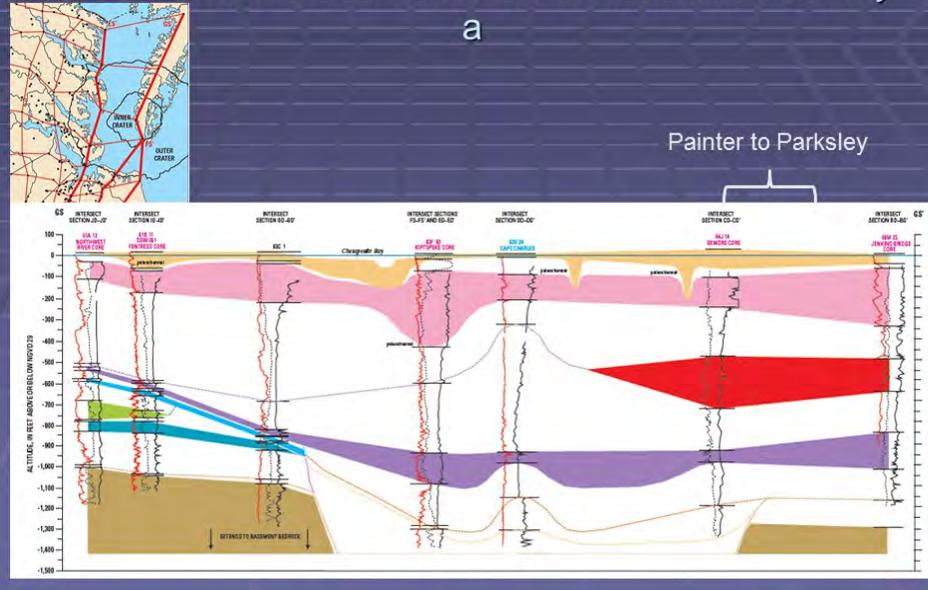
Eastern Shore of Virginia



Painter to Parksley

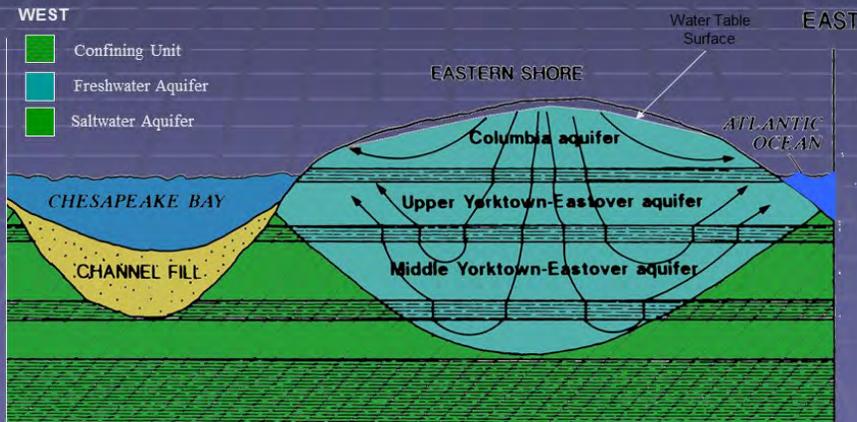


Hydrogeology of the Eastern Shore: Meteorite destroyed most aquifers deeper than Yorktown-Eastover in the Southern Part of Accomack County



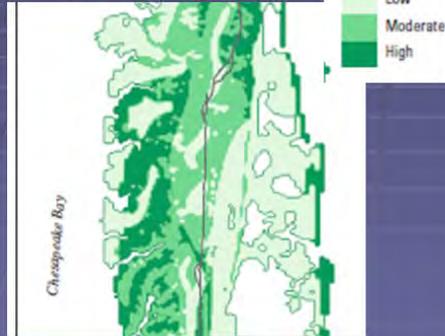
Water Table and Fresh Water Confined Aquifers

Fresh ground water is restricted to depths less than 350 feet

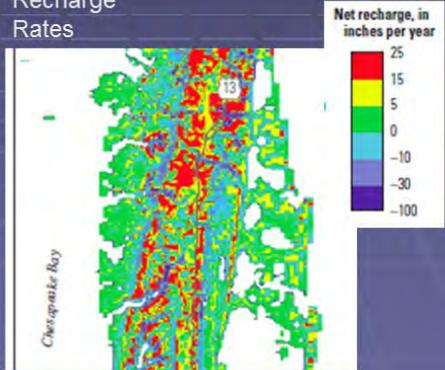


Recharge to the water table is a function of soil type, slope, and location

Potential Recharge areas (based on soil type and slope)

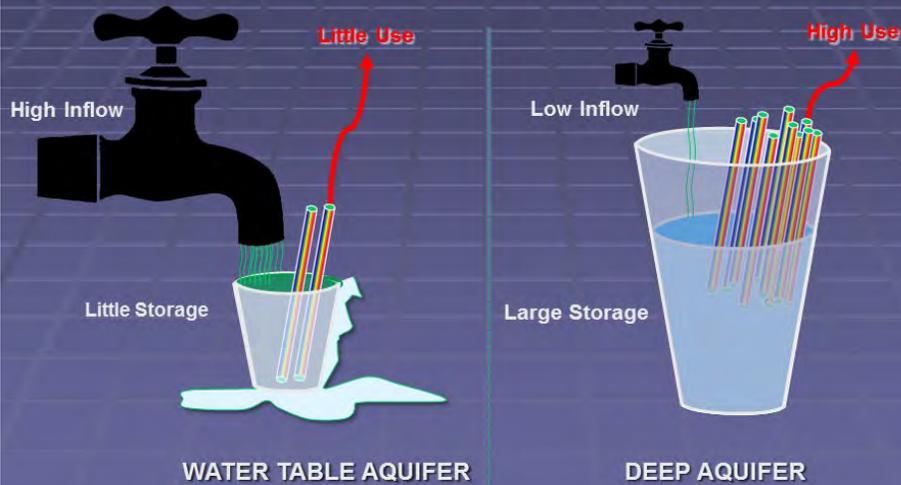


Estimated Recharge Rates



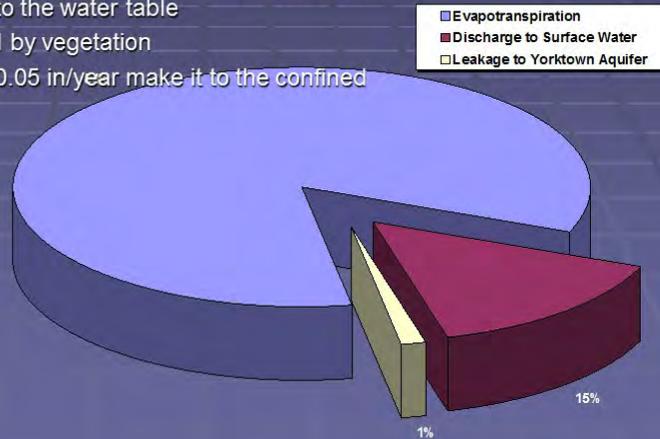
Source: USGS

Water Table / Yorktown Dilemma



Of the water infiltrating to the water table, only a small amount reaches the Yorktown aquifer

- Limited Recharge:
 - Of the 44-inches of annual precipitation only 5 to 6 inches infiltrate to the water table
 - Most is removed by vegetation
 - And only about 0.05 in/year make it to the confined aquifer ($\approx 1\%$)



Irrigation Ponds

- Water table is the most sustainable groundwater resource
- Use of ponds that are excavated below the groundwater table (but not deep enough to reach the Yorktown-East over) are a good source for this water
- Storage in the ponds help offset the lack of storage in the Columbia



Age of the water table is recent – Yorktown-Eastover is ancient



Exmore Paleochannel

- Northern-most of three known paleochannels
- Removed sediments from the original Yorktown Confining Unit
- Deposited other sediments in their place
- Effect on groundwater flow between the Columbia and Yorktown Eastover aquifers is uncertain



Permitted Groundwater Withdrawal Amounts

Annual Permit (MGD)

2013

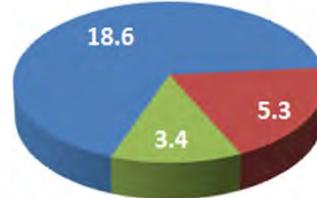


Total = 10.5 MGD

- Agricultural (MGD)
- Industrial/Commercial (MGD)
- Public Water Supply (MGD)

Monthly Maximum Permit (GPD)

2013



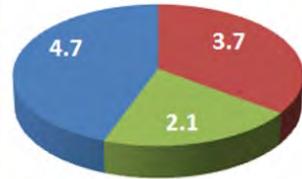
Total = 27.3 MGD

- Agricultural (MGD)
- Industrial/Commercial (MGD)
- Public Water Supply (MGD)

Permitted Groundwater Withdrawal Amounts

Annual Permit (MGD)

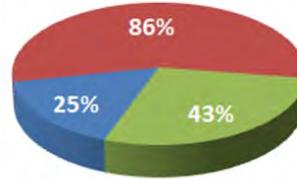
2013



Total = 10.5 MGD

- Agricultural (MGD)
- Industrial/Commercial (MGD)
- Public Water Supply (MGD)

Annual Actual Use -
Percent of Permitted Amount
2013

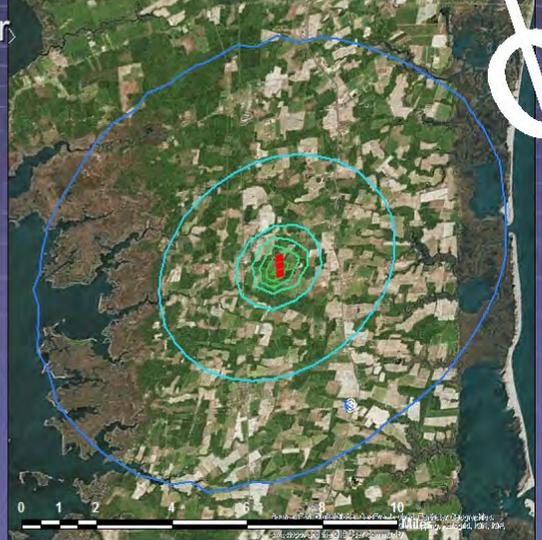


Total = 50%

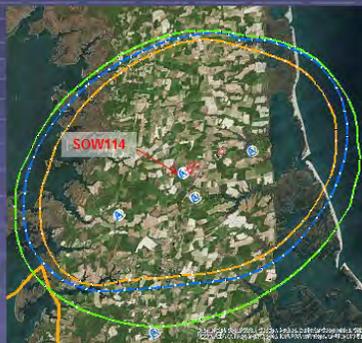
- Agricultural (MGD)
- Industrial/Commercial (MGD)
- Public Water Supply (MGD)

Water Levels and Distance to Pumping

Effect of lowering water levels due to pumping decreases rapidly (logarithmically) with distance from the pumping source.

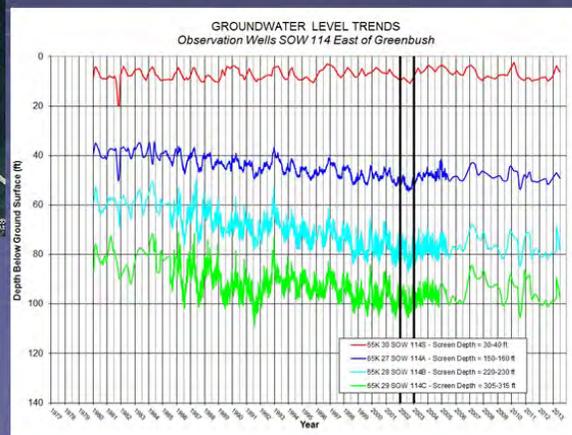


Water Levels Trends



Confining units separating the aquifers greatly reduces effects from pumping.

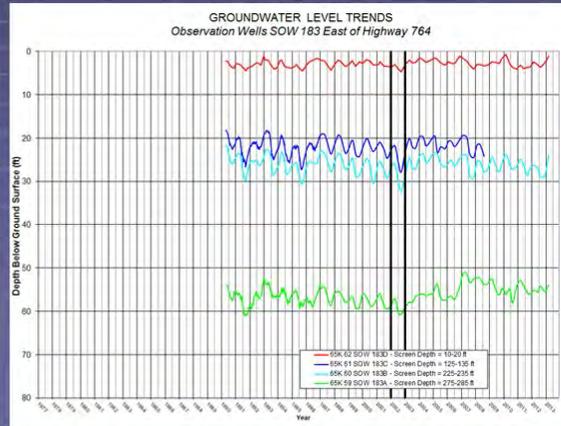
- 1/3 mile from Perdue Well Field



Water Levels Trends



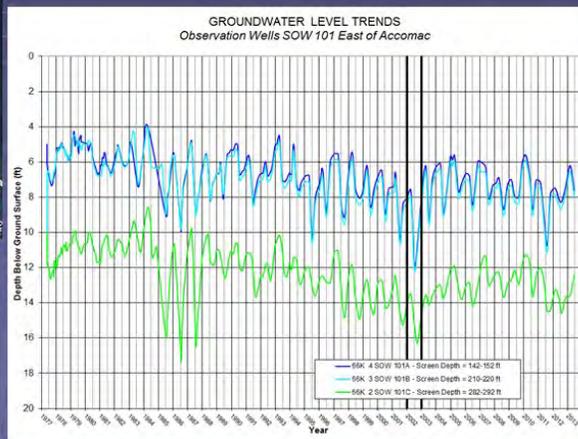
- 1-mile from Perdue Well Field



Water Levels Trends



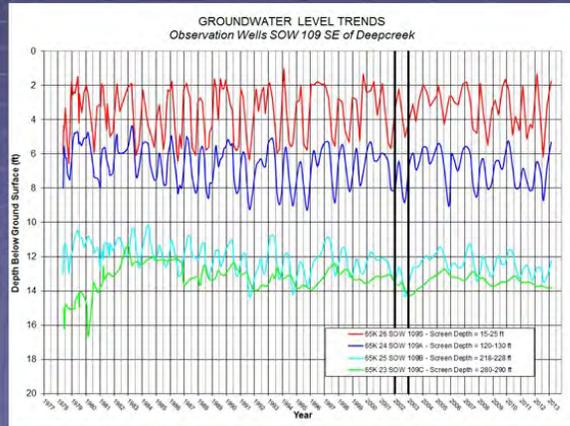
- 2 1/3-mile from Perdue Well Field



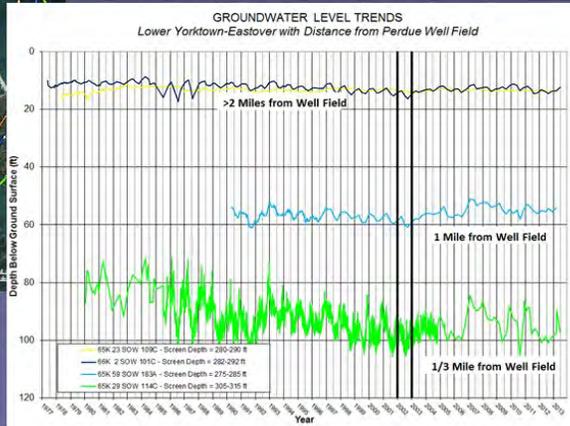
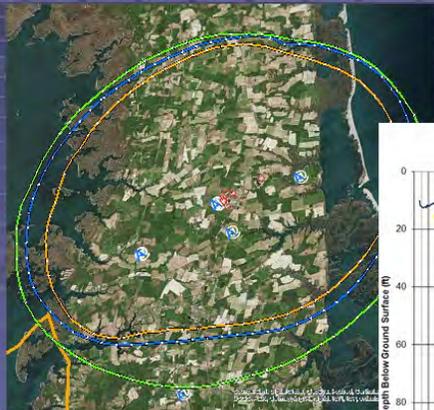
Water Levels Trends



- 3 1/2-miles from Perdue Well Field

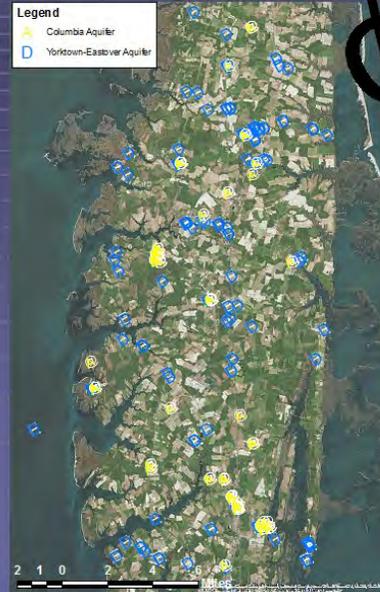


Water Levels Trends

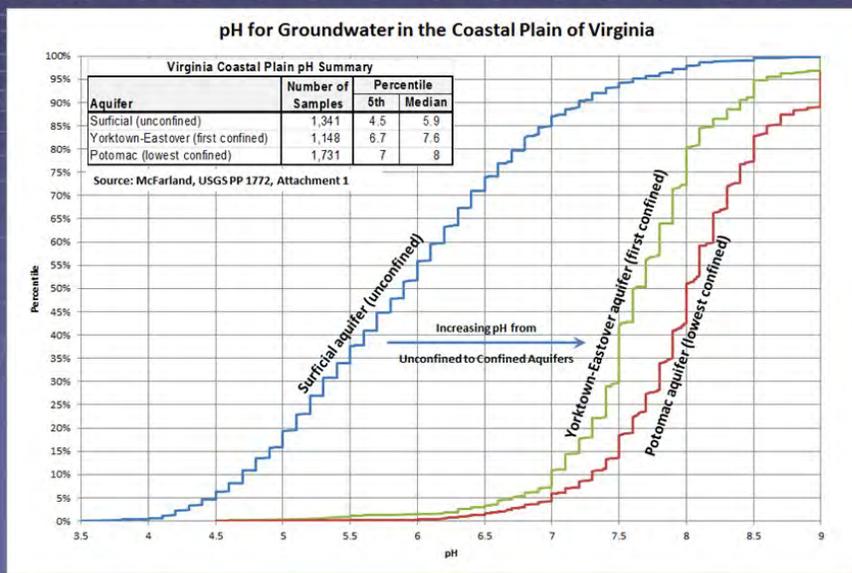


Groundwater Quality

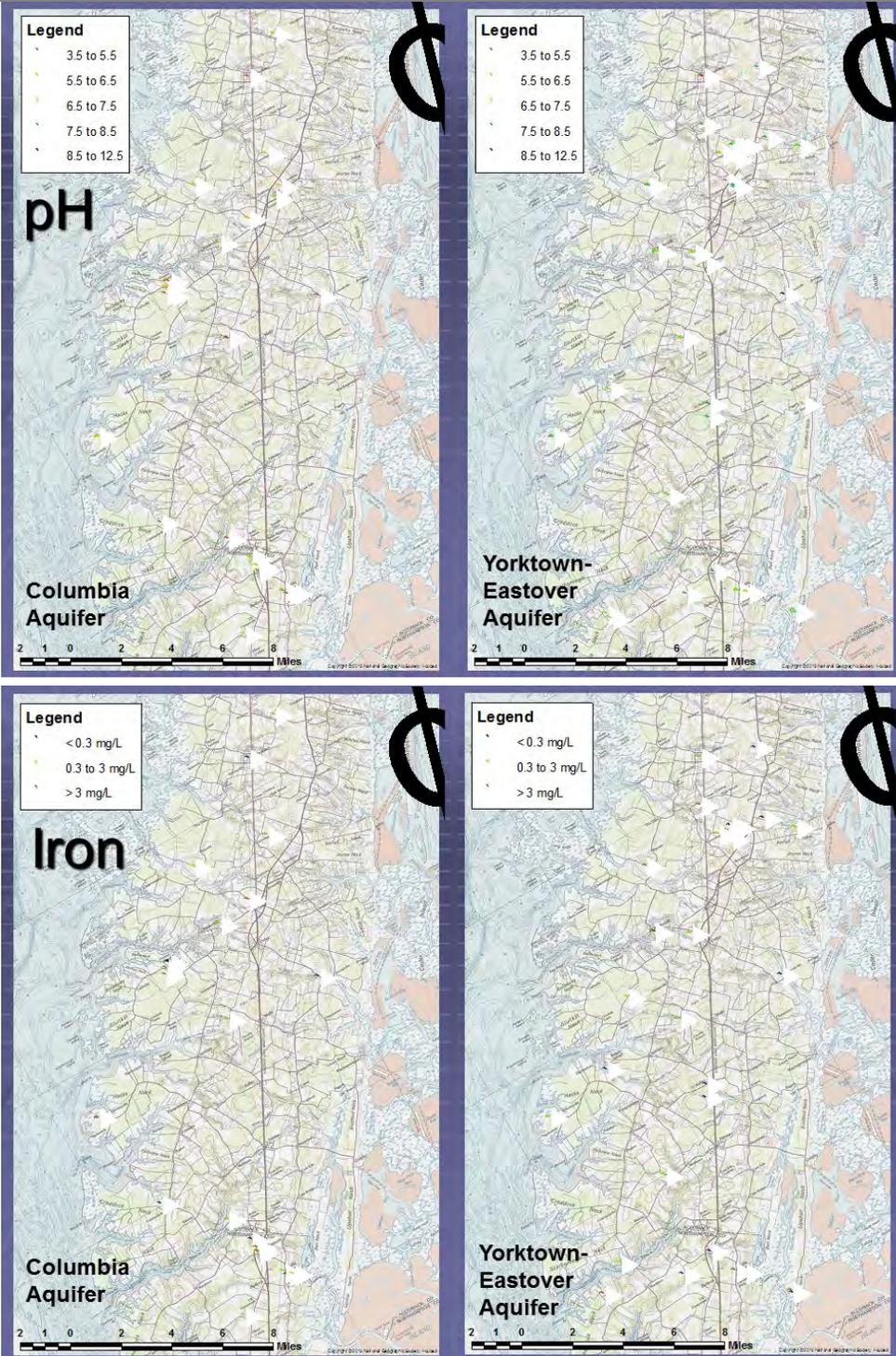
- Multiple sources:
 - USGS – USGS studies and “warehouse” for data
 - DEQ (routine regulatory reporting)
 - Periodic studies: Universities (VPI, RMC, UVA) and ANPDC
 - Health Department



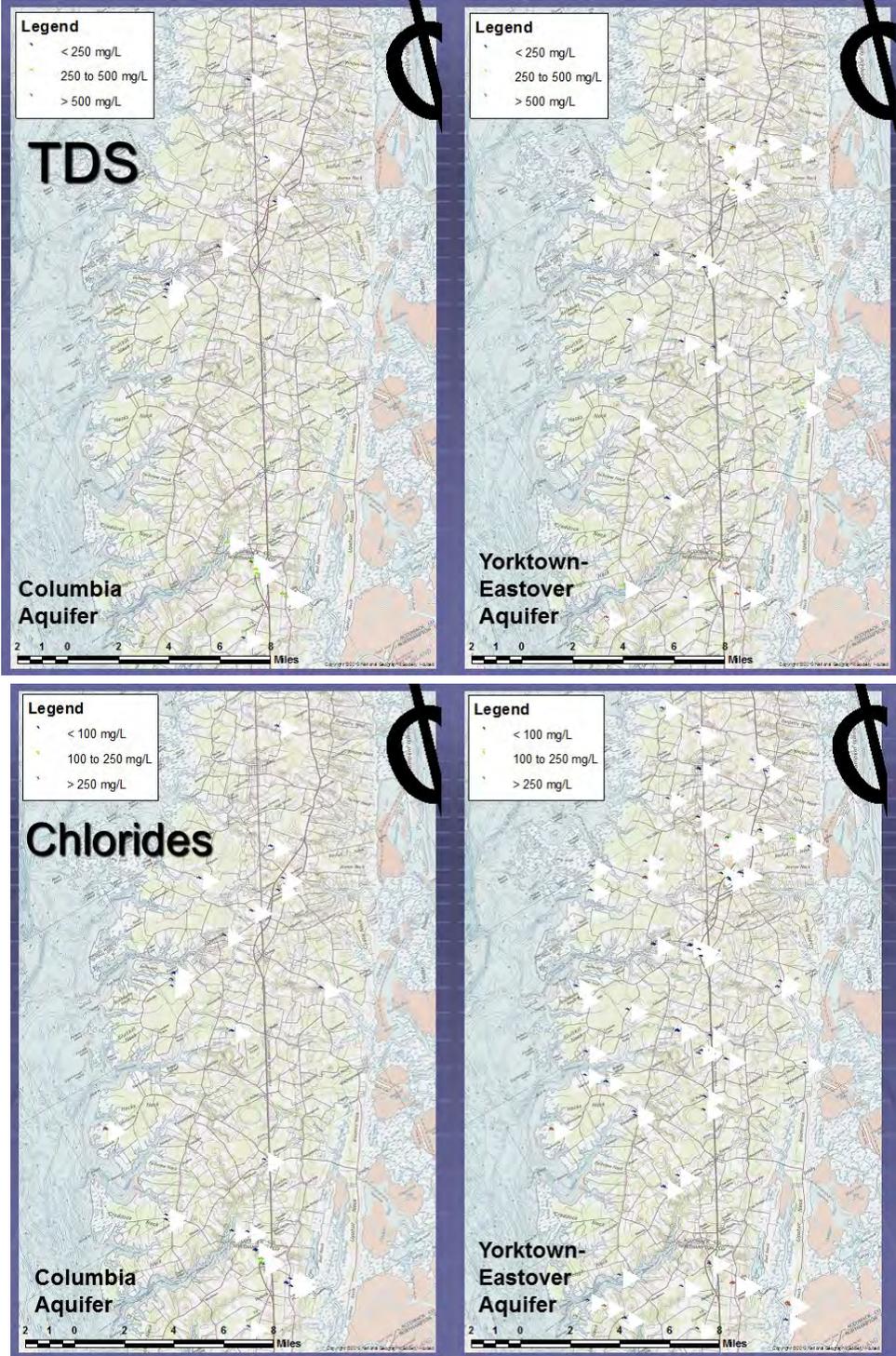
pH of the Surficial (Columbia) aquifer is typically more acidic than deeper aquifers



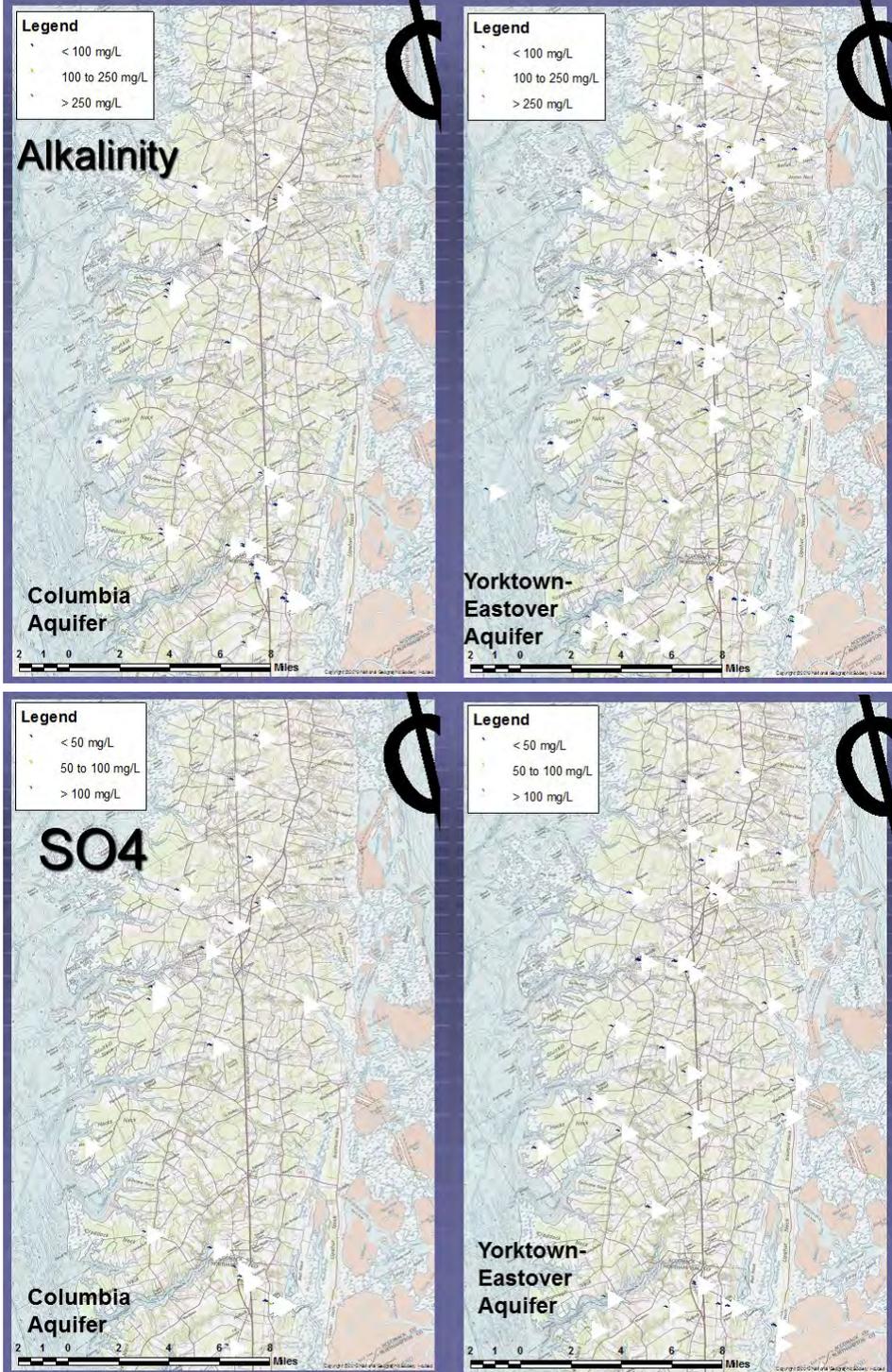
Accomack – Northampton Coastal Resources Technical Assistance Program

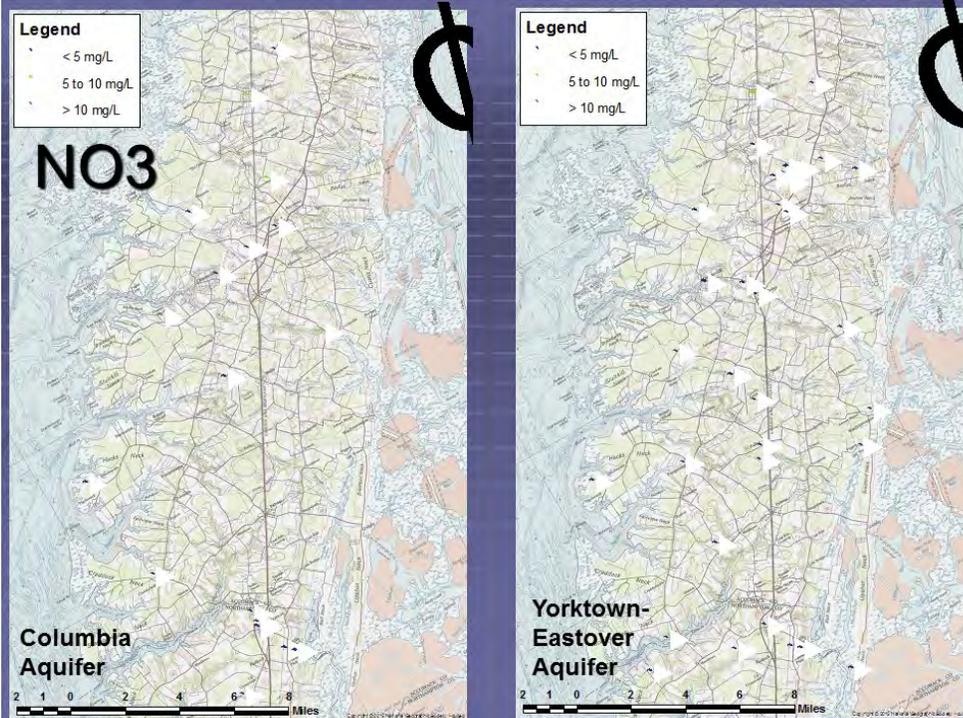


Accomack – Northampton Coastal Resources Technical Assistance Program

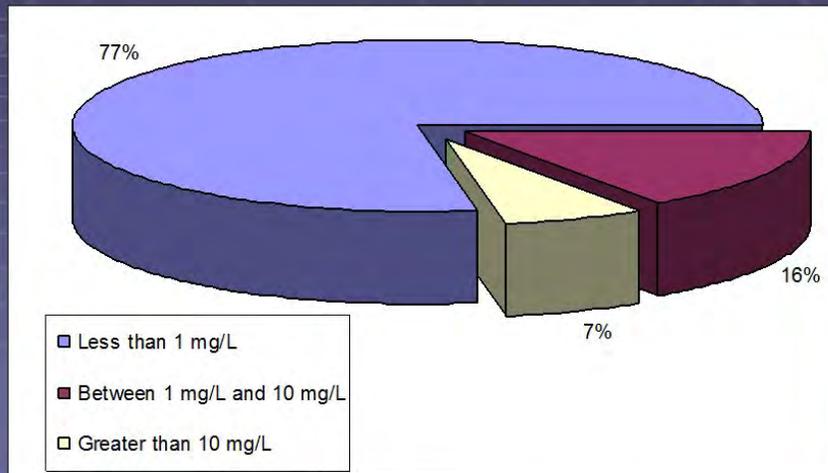


Accomack – Northampton Coastal Resources Technical Assistance Program

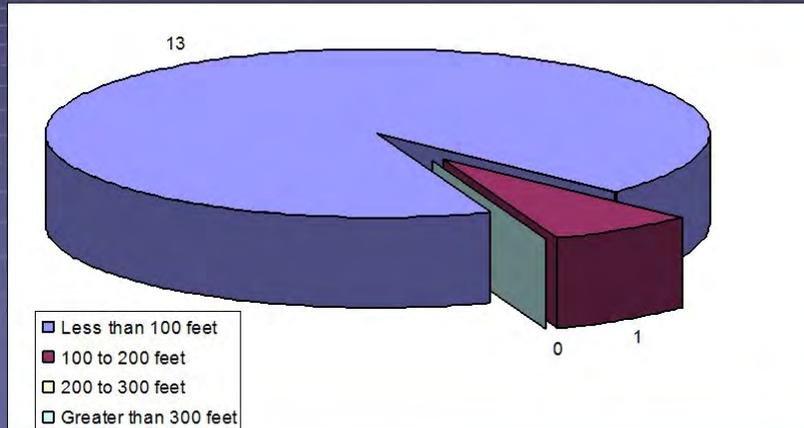




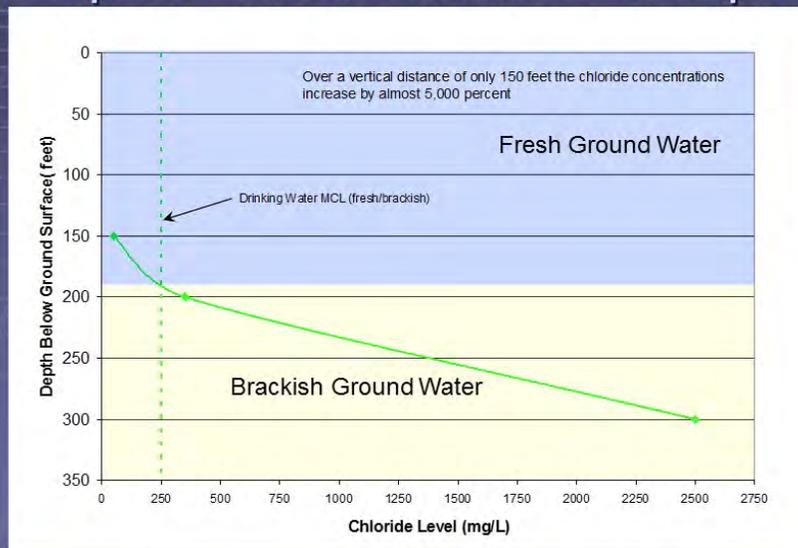
Nitrate From VPI 1993 Study – Percent Exceeding Drinking Water MCL



Nitrate From VPI 1993 Study – Exceeding Drinking Water MCL by Depth

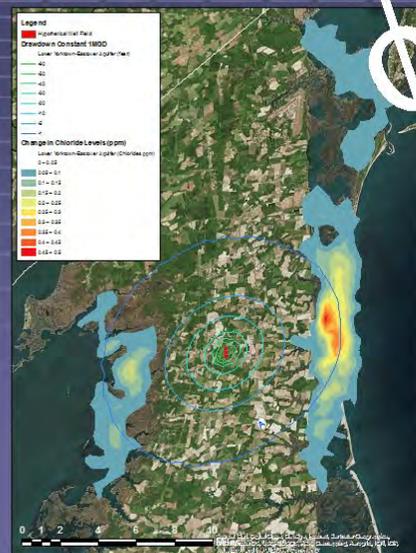


Susceptibility for Saltwater Intrusion: Upshur Neck Seaside Example

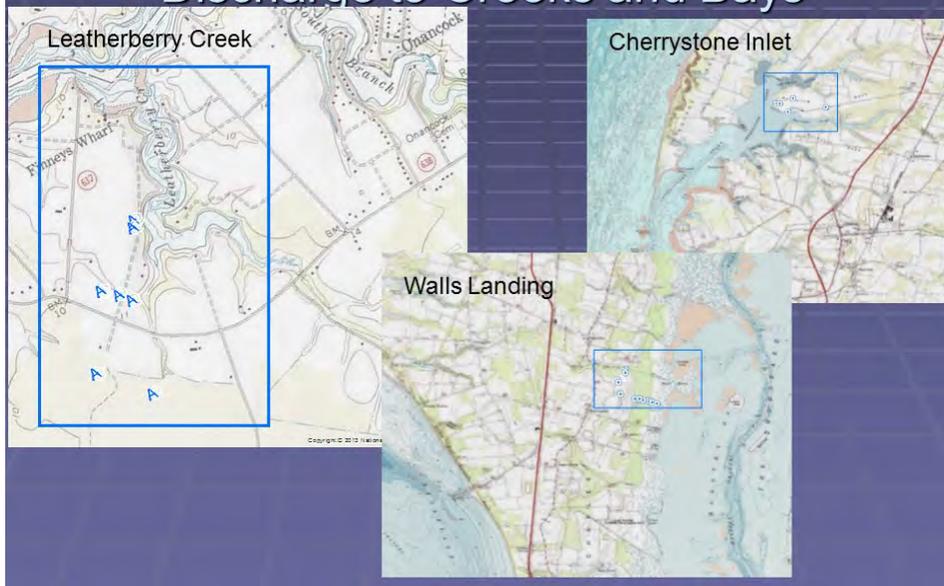


Potential Saltwater Intrusion in Yorktown-Eastover

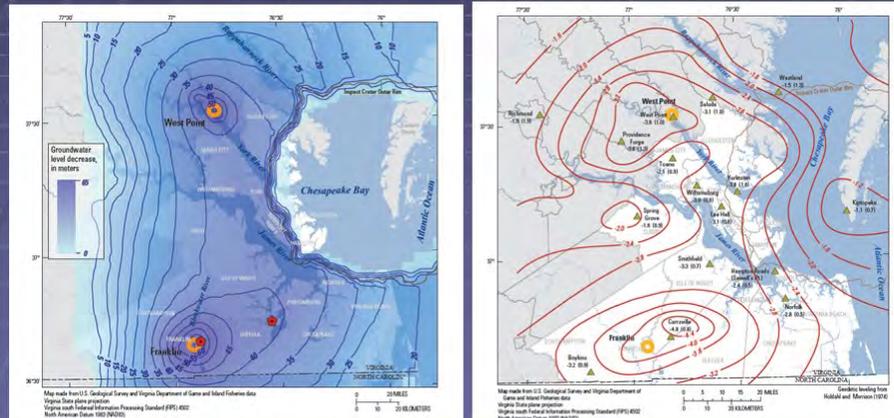
- Near the Spine Recharge Area:
 - Much larger withdrawals are possible without significant saltwater intrusion.
 - Any saltwater intrusion would most likely be restricted to the coast (Bay or Seaside). Area affected can be large.
- Near the Bay or Seaside:
 - Much more susceptible to upconing (upward movement of saltwater).
 - Area affected would be restricted to the point(s) of withdrawal.



Other Studies: Shallow Groundwater Discharge to Creeks and Bays



Other Studies: Relative Sea Level Rise – lower than other areas in Virginia thanks to the meteorite impact



Overall Summary

- Southern end of Accomack County is in the area where available yield from the Yorktown-Eastover increases substantially from south (Northampton County) to north.
- Lowered water levels most likely limit withdrawals along the central spine (near Rt. 13).
- Saltwater intrusion limits withdrawals along the Bay and Seaside

Overall Summary – Groundwater Availability

- Current use is sustainable.
- In excess of 1 MGD of additional groundwater can be sustainably withdrawn from the Yorktown-Eastover if the well field is properly located and developed.
- Columbia (Surficial) aquifer recharges at about 100x faster than Yorktown-Eastover.
- Appropriate storm water management (LIDs) can be used with development to preserve the high recharge to the Columbia.
- Greater than 1 MGD of additional groundwater can be sustainably withdrawn from the Columbia (Surficial) aquifer. Space requirement (low per well yield) is the greatest limiting factor.

Overall Summary – Water Use and Water Levels

- Largest single water user on the Shore (Perdue) is within this area, with an average use of 1.8 MGD.
- Water levels from the Perdue withdrawal have stabilized and current use is sustainable.
- Water levels recover rapidly with distance (and depth) from the source of pumping. Very little influence from Perdue use is observed beyond 2-miles from the well field.

Overall Summary – Water Quality

- Groundwater quality in both Water Table (Columbia / Surficial) and Yorktown-Eastover is good.
- Areas near the Bay and Seaside are susceptible to saltwater intrusion.
- Areas affected by saltwater intrusion can be limited and/or treated through membrane treatment systems.
- Yorktown-Eastover is much more susceptible to saltwater intrusion than the Columbia (water table)
- Risk for saltwater intrusion can be greatly reduced by maximizing use of the Columbia where possible.

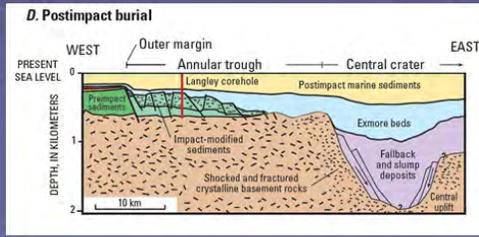
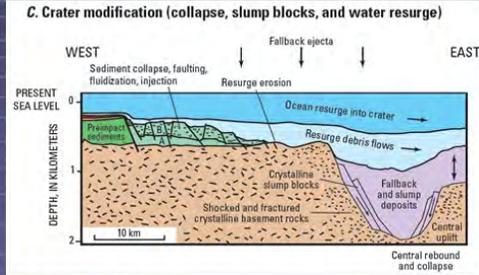
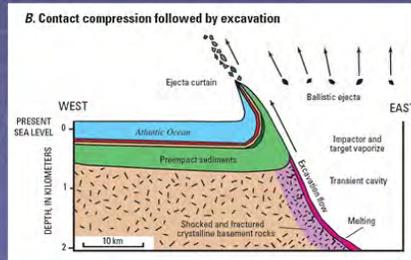
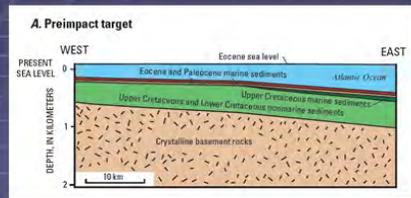
Overall Summary – Water Quality

- High iron is a common problem in both the Columbia and Yorktown-Eastover
- Columbia (Surficial / Water Table)
 - Low pH
 - Generally high nitrates (from land use)
 - Localized high sulfates (likely natural sources)
 - More susceptible to land use contamination
- Yorktown-Eastover
 - High hardness (greater with depth)
 - High dissolved solids and salts (greater with depth and closer to coast)

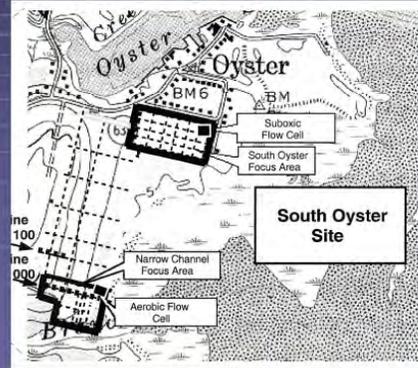
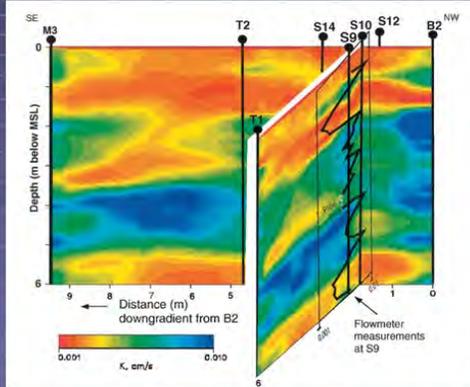
Overall Summary – Future Research

- Influence of the Exmore (and Eastville) paleochannels on flow and recharge between the Columbia and Yorktown-Eastover.
- Saltwater intrusion along the coastal areas. Saltwater intrusion through upconing.
- Influence of land use on groundwater quality.





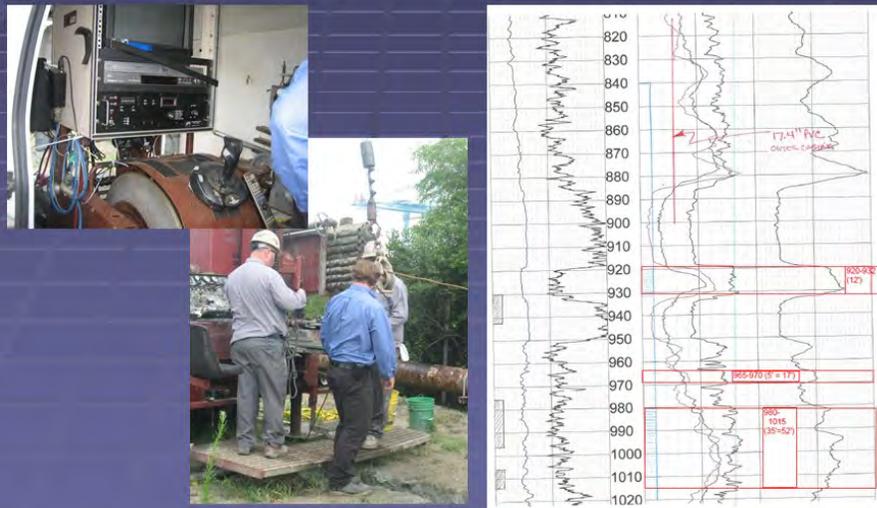
Other Studies: Microbial transport in Groundwater



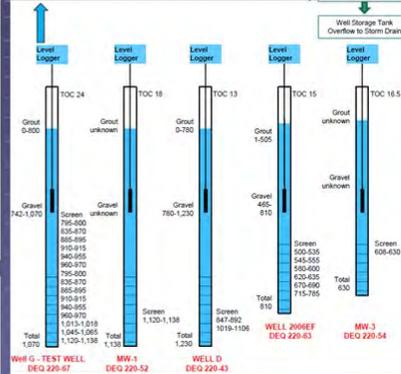
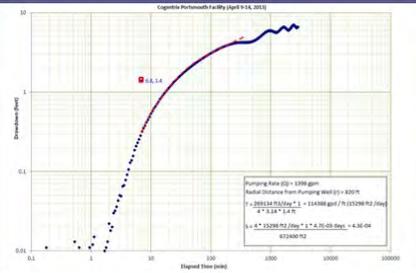
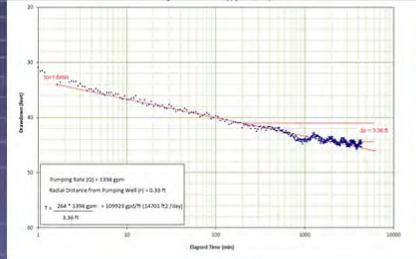
Drill cuttings and cores provide direct samples of aquifer and confining units



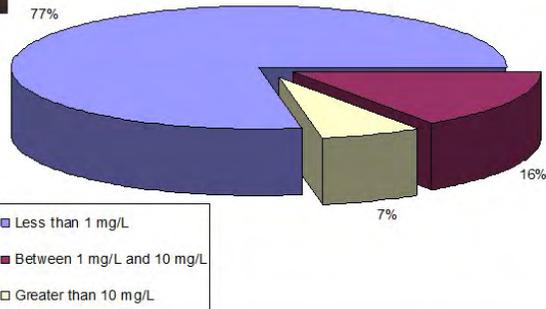
Geophysical techniques can provide accurate depths for aquifers and confining units



Aquifer tests provide the most accurate comparable measure of hydraulic properties

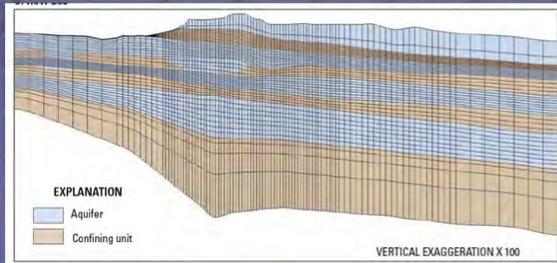


Water samples collected from wells are most commonly used to assess water quality



Groundwater Models – Allow use of empirical data to evaluate behavior of the aquifers

- Richardson “Sharp” model
- Sandford, Pope & Nelms. Eastern Shore Model





Brit McMillan presenting at the Ground Water Summit



Brit McMillan engaging the public on local groundwater issues

Appendix F

Ground Water Presentation at Virginia Master Well Owner Network Workshop



Virginia Cooperative Extension

Virginia Tech • Virginia State University

www.ext.vt.edu

EASTERN SHORE Drinking Water Clinic

Does your water come from a well, spring, or cistern?

Do you want to learn more about the quality of your water and how to care for your water system?

How does it work?

1. At a brief informational meeting, pick up a sample kit and get instructions to collect your household water sample.
2. Collect a sample from your tap at home and complete a short questionnaire.
3. Drop off sample at a local designated place and time.
4. About 4 weeks later, receive your confidential test results, an explanation of what the numbers mean, and information about how to handle any problems that are present.



What does the water test include?

Iron	Manganese	Sulfate	Hardness
Sodium	Copper	Nitrate	Arsenic
Fluoride	pH	Total Dissolved Solids	
Coliform bacteria	<i>E. coli</i> bacteria	Lead	

How much does it cost? Due to a USDA Rural Health and Safety grant we are able to lower the testing costs to \$10.00/sample for the first 150 participants. There will be another 25 sample kits available at \$49.00. This payment covers the cost of one sampling kit. Please pre-register – supplemental funding is limited!

Eastern Shore	Date and Time	Location	Alternative Sample Drop-off Locations
Pick up sample kit and receive directions to collect samples	October 2 nd 5pm – 7pm	Eastern Shore AREC 33446 Research Drive Painter, VA 23421	October 7 th Before 5 pm
Collection Date/Drop off samples	October 7 th 12pm – 8pm	Eastern Shore AREC 33446 Research Drive Painter, VA 23421	Northampton Residents: Nassawadox Health Department
Interpretation meeting	November 13 th 6pm – 8pm	Eastern Shore Community College 29300 Lankford Hwy Melfa, VA	Accomack Residents: Accomack Health Department

Who to Contact to Register or with Questions:

Accomack County Residents: Theresa Long - tmjlong@vt.edu / 757-787-1361 x10

Northampton County Residents: Ursula Deitch - utankard@vt.edu / 757-678-7946 x 11

For more information, visit: www.wellwater.bse.vt.edu. All participant information is kept strictly confidential.

If you are a person with a disability and desire any assistive devices, services or other accommodations to participate in this activity, please contact Ursula at 757-678-7946 during business hours of 9 a.m. and 5 p.m. to discuss accommodations 5 days prior to the event. *TDD number is (800) 828-1120.



Drinking Water Clinic Results Interpretation Meeting

Agenda:

- 6:00 – 6:15pm Registration/pick up results
- 6:15 – 6:45pm Welcome from Erin Ling, Coordinator of the Virginia Household Water Quality Program at Virginia Tech
Program Description and Results Interpretation
- 6:45 -7:15pm Curt Smith, Director of planning at the ANPDC
Regional Hydrogeologic framework
- 7:15-7:30pm Jimmy Bundick, Owner of Bundick Well & Pump, Belle Haven, VA
Remediation techniques
- 7:30-8:00pm Questions answered by Erin Ling, Jimmy Bundick, Curt Smith

Accomack County Planning Commission

Overview of Ground Water on the Eastern Shore

Curt Smith
Director of Planning
Accomack-Northampton Planning District Commission
April 22, 2014

A-NPDC Overview and Purpose



- Commonwealth created 21 PDCs in 1970 to address regional issues by fostering cooperation amongst localities and cooperation between state & localities
- Accomack-Northampton District:
 - Members: 2 Counties and Town of Chincoteague
 - Also provides services to 18 other towns
- Affiliate Organizations:
 - A-N Regional Housing Authority → provides privately or authority-owned rental housing
 - ESV Housing Alliance → improving housing for homeowners
 - A-NPDC →
 - Community Development
 - Economic Development
 - Transportation Planning
 - Environmental Planning → **Ground Water Committee**; Climate Adaptation Working Group

Accomack-Northampton Planning District Commission

Presentation Overview

1. Geologic/Hydrogeologic Framework Evolution
2. Ground Water Conditions
3. Ground Water Use
4. Threats to Ground Water Quality
5. Ground Water Management and Water Supply Planning

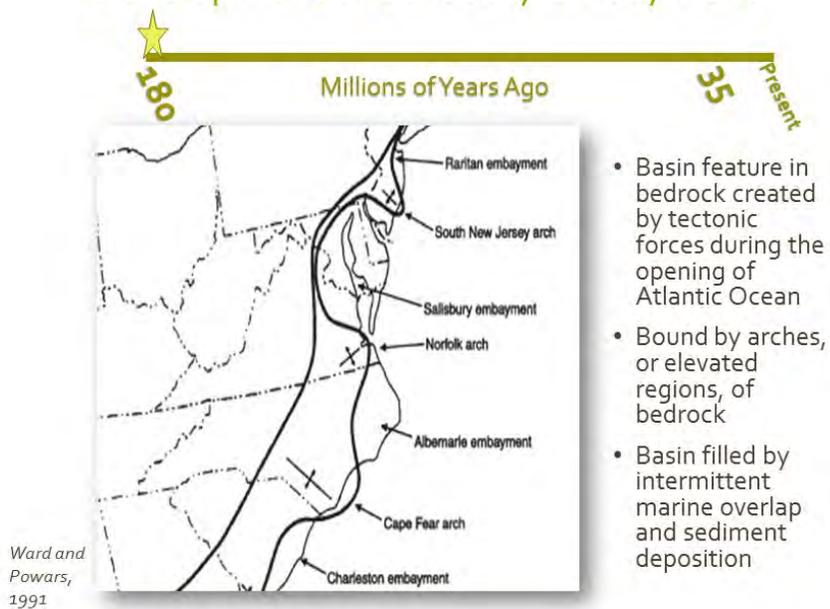
Accomack-Northampton Planning District Commission

Geologic/Hydrogeologic Framework Evolution

- Timeline:
 - i. Opening of Atlantic Ocean & Salisbury Embayment – **≈180 Million Years Ago (MYA)**
 - ii. Filling of Salisbury Embayment (Potomac Formation) – **≈180 to 35.5 MYA**
 - iii. Bolide impact & removal of pre-impact sediments – **≈35.5 MYA**
 - iv. Deposition of post-impact sediments – **≈35.5 MYA – Present**
 - v. Reworking of surficial sediments & progradation of peninsula – **≈200,000 YA – Present**
 - vi. Sea level reaches elevation of modern Chesapeake Bay transitioning system from riverine to estuarine - **≈8,000 YA**
 - vii. Sea level continues to rise and inundate the Chesapeake Bay watershed and the Chesapeake Bay begins to take its modern appearance we currently recognize - **≈3,000 YA**

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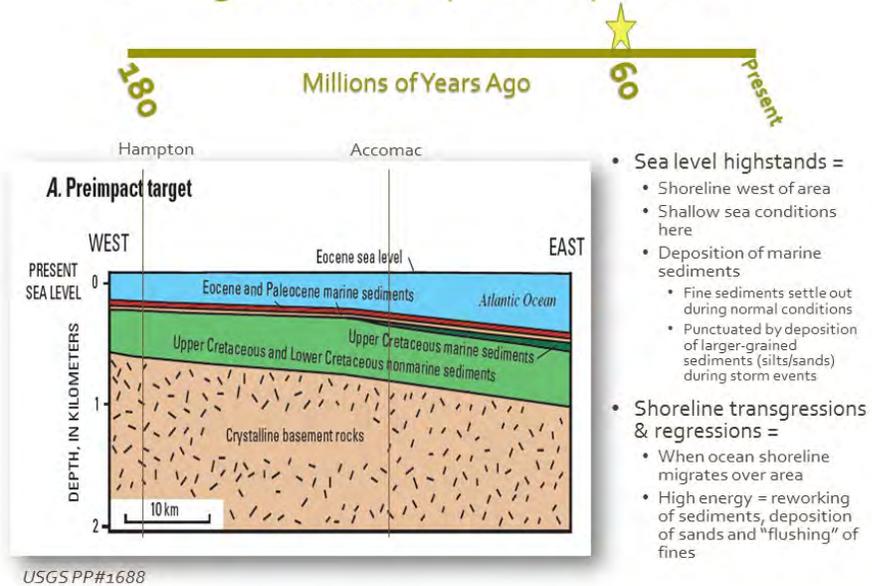
Development of Salisbury Embayment



Opening of Atlantic Ocean

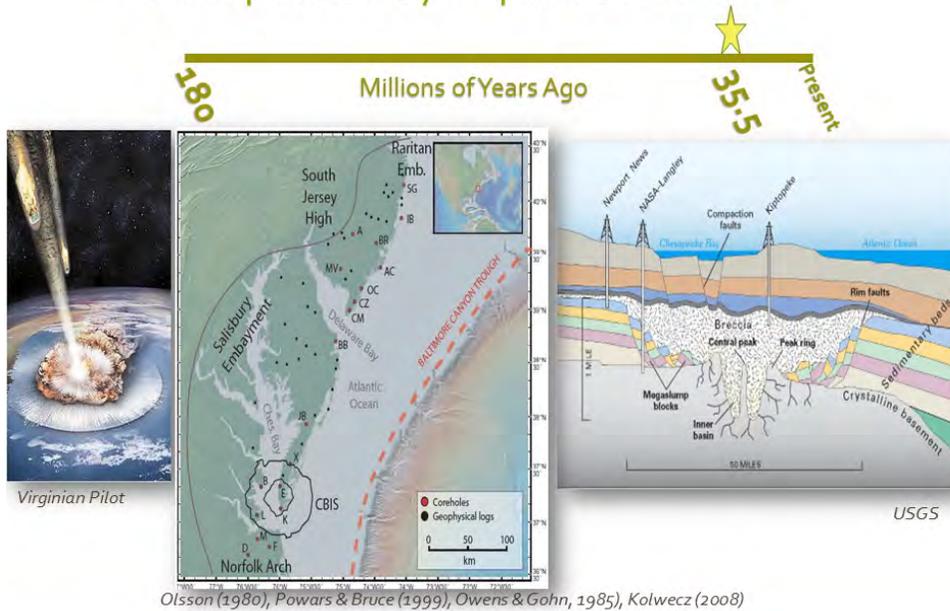


In-Filling of Salisbury Embayment

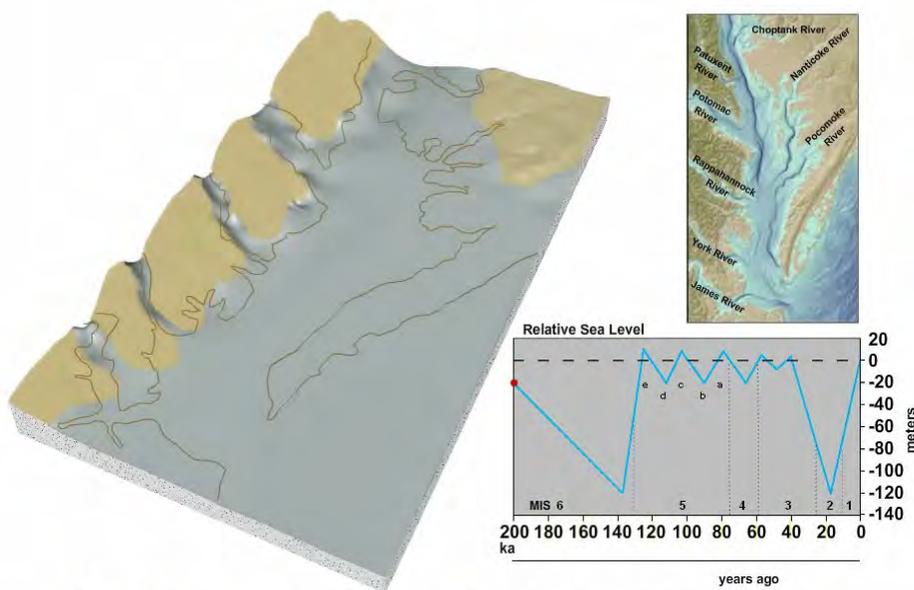


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Chesapeake Bay Impact Structure



Accomack-Northampton Planning District Commission

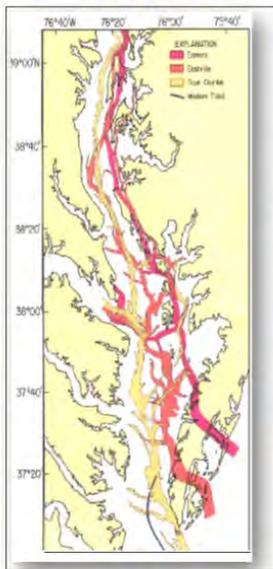


USGS Chesapeake Bay Evolution Animation

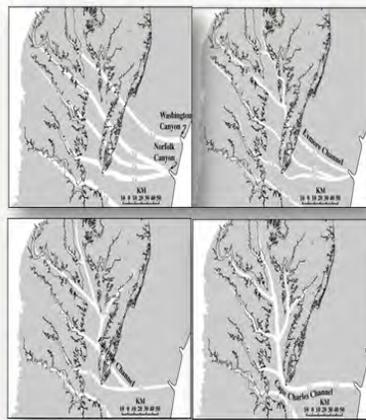
(Bratton et. al, 2009)

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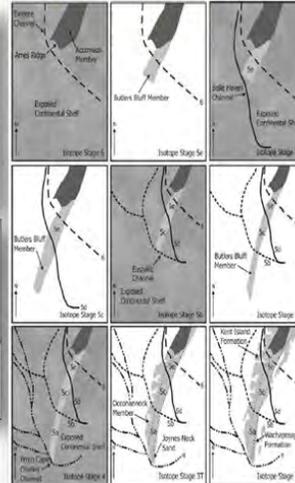
Development of Eastern Shore & Chesapeake Bay



Colman et al
(1990)



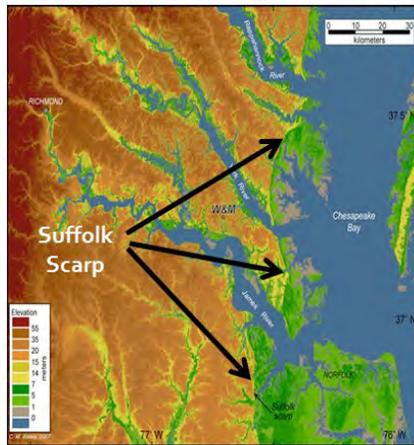
Hobbs (2004)



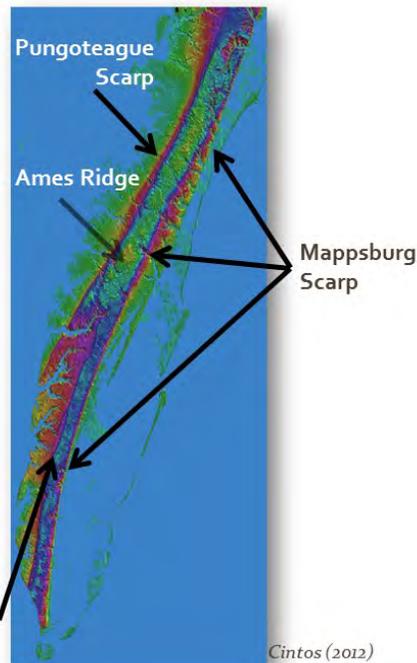
Scott (2006)

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**Surficial Features:
Relict Shorelines**



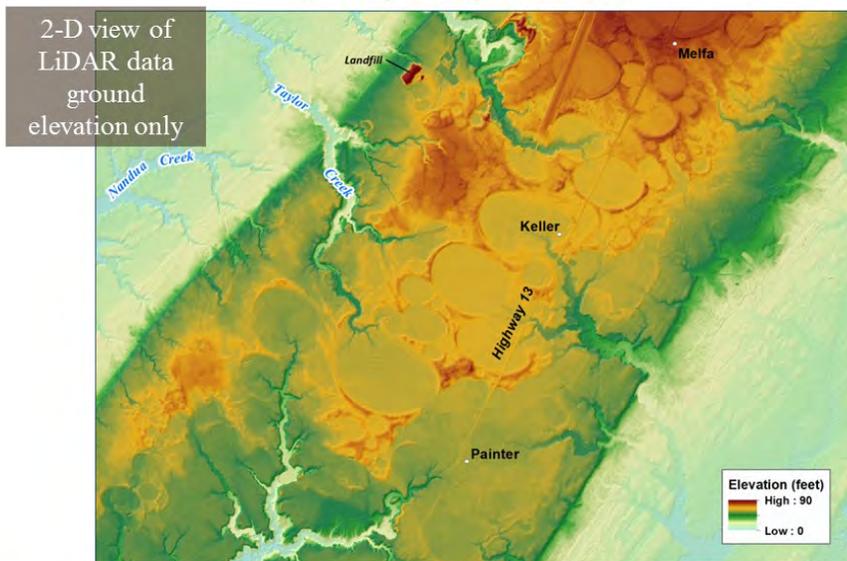
Bailey (2009)



Cintos (2012)

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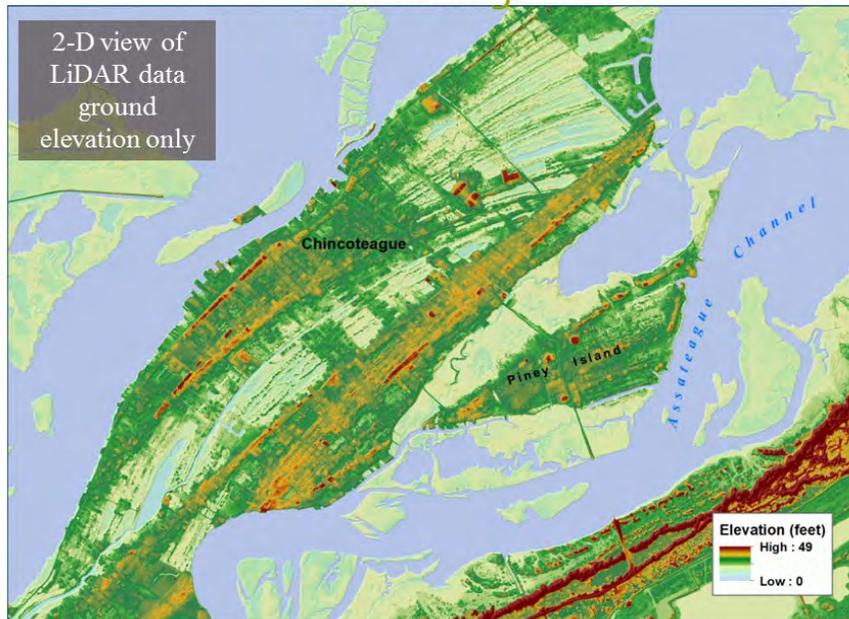
**South-Central Accomack County
(Melfa, Keller, & Painter)**



The Nature Conservancy (2011)

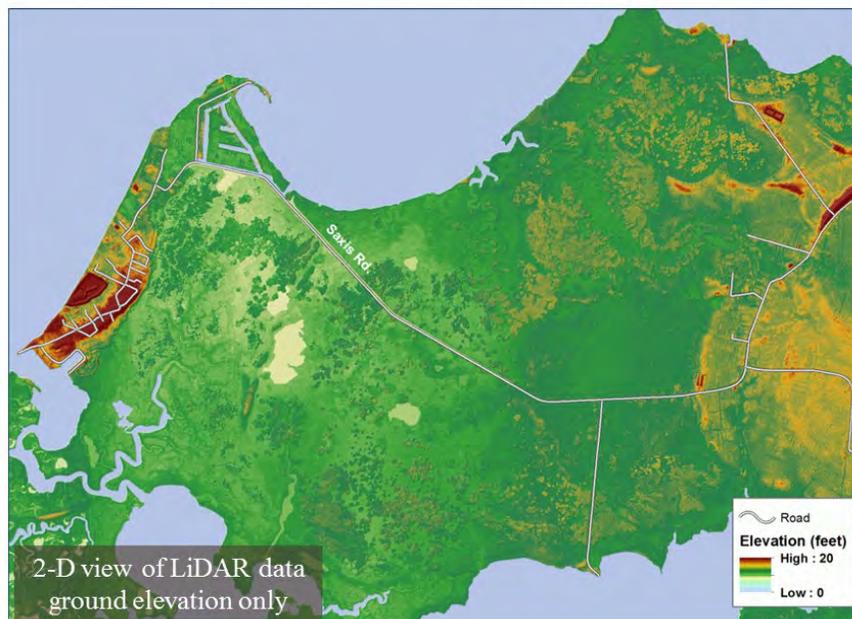
Accomack-Northampton Planning District Commission

Chincoteague



Accomack-Northampton Planning District Commission

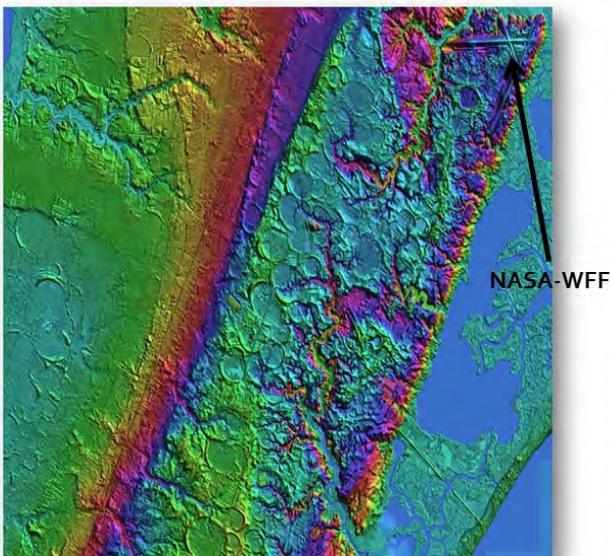
Saxis/Sanford



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Surficial Features: Carolina Bays

- Over 700 shallow, elliptical depressions
 - Similar orientation (NW-SE)
 - Variable size (1 – 1,000 acres)
 - Some overlapping
 - Coarse-grained rims
 - Fine-grained floors
- Variable ages (100,000-<5,000 years)
- Debated origin
 - Wind & Water
 - Shock wave from bolide explosion

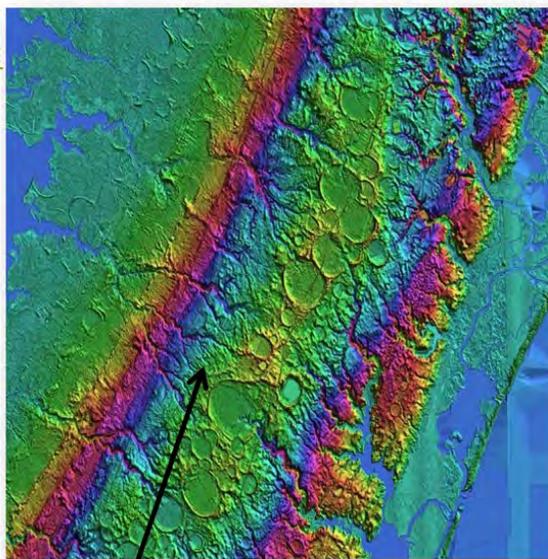


Cintos (2012)

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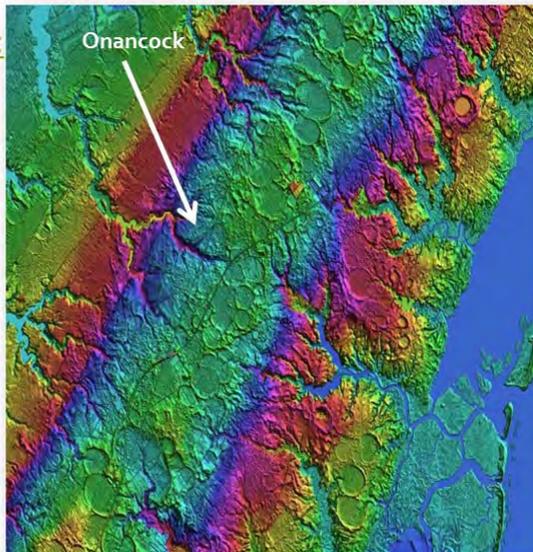
Parksley

Cintos (2012)

November 6, 2013 Accomack-Northampton Planning District Commission

Surficial Features: Carolina Bays

- Over 700 shallow, elliptical depressions
 - Similar orientation (NW-SE)
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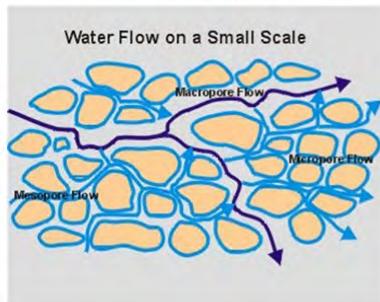


Cintos (2012)

Ground Water Conditions on the Eastern Shore

Ground Water is not like an underground river!

- Groundwater flows through porous soils and sediment that includes gravels, sands, silts, and clay.



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Soil/Sediment type determines if it can be used as a source of water

An Aquifer is a Source for Groundwater and is:

Any coarse grained material (sand, gravel) that can supply sufficient water for a beneficial use

A Confining Unit Impedes Movement of Groundwater and is:

Any fine grained material (silt, clay) that can significantly restrict vertical movement of groundwater such that the resulting groundwater is under pressure.

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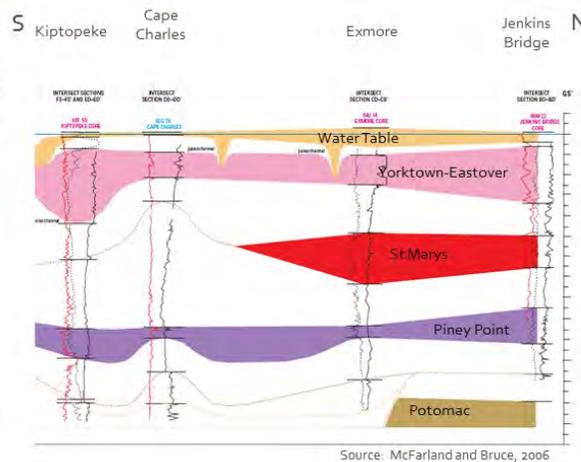
Aquifers are defined by where they appear relative to a confining layer

- Water Table
 - Water is not “under pressure”
 - Well yield is lower than comparable confined aquifers
 - Replenished (recharged) directly by precipitation
 - More vulnerable to contamination from surface activities
- Confined aquifer
 - Water is under pressure, confined by an overlying layer(s) of silt and clay
 - Replenished from vertical flow through the confining unit (recharge is much lower than a water table aquifer)
 - More vulnerable to saltwater intrusion

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All Groundwater Aquifers on the Eastern Shore

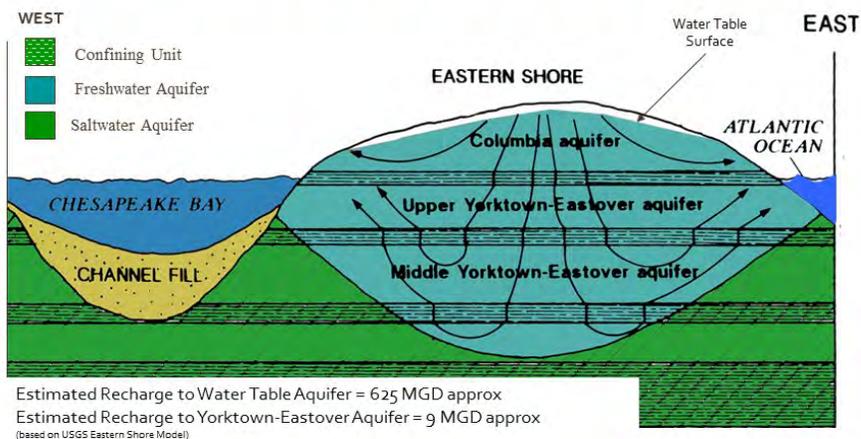
- Fresh Groundwater is restricted to the Columbia (Water Table) aquifer and significant portions of the Yorktown-Eastover aquifer
- Brackish groundwater is found in portions of the Yorktown-Eastover, all of the St. Marys Aquifer, Piney Point, and Potomac aquifers
- The Columbia, Yorktown-Eastover, and Piney Point aquifers are found throughout the Eastern Shore
- St. Marys and Potomac Aquifers are absent in the southern portion of the Shore



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Water Table and Fresh Water Confined Aquifers on the Eastern Shore

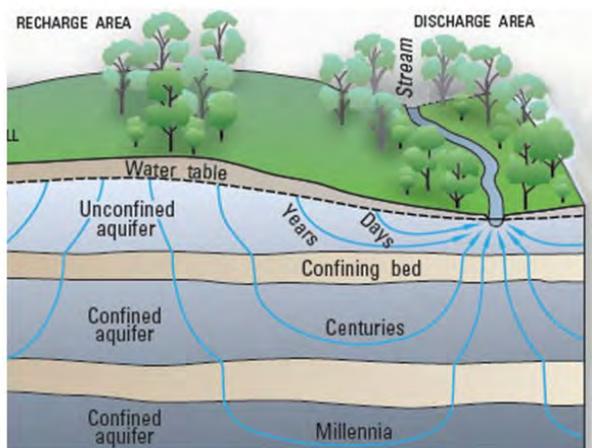
Fresh ground water is restricted to depths less than 350 feet



Accomack-Northampton Planning District Commission

Movement through the Groundwater System

- Horizontal flow typically toward a surface water body. Gradient is often low and the actual flow rate is low
- Vertical flow typically downward and very low



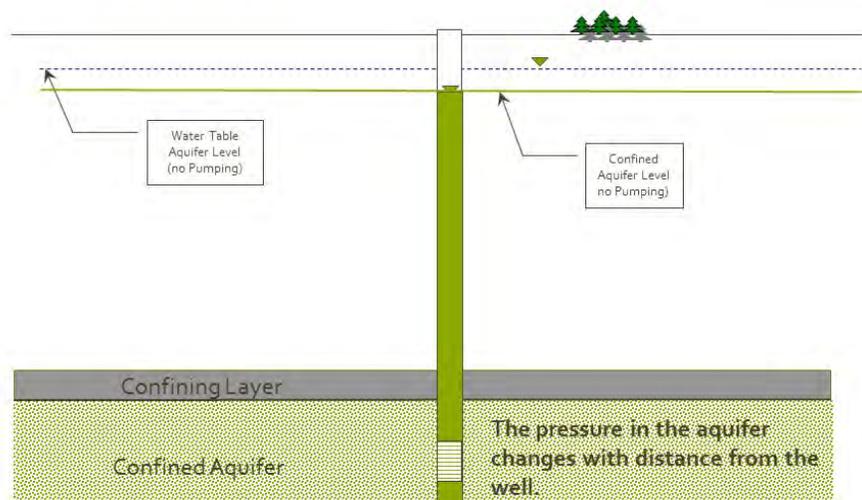
Accomack-Northampton Planning District Commission

Hydraulic Gradient Under Confined Pumping Conditions

- Horizontal flow may be re-oriented toward well. Gradient (flow rate) is often significantly increased
- Vertical flow remains downward but rate often significantly increased

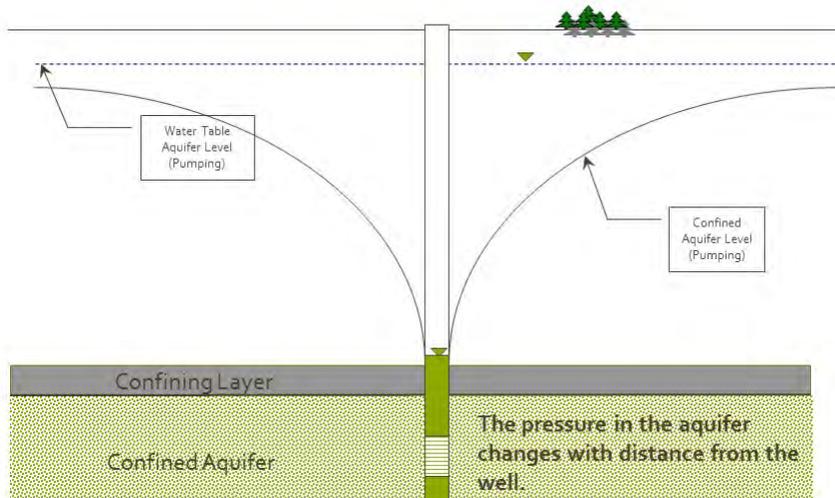
Accomack-Northampton Planning District Commission

Groundwater Levels under no Pumping



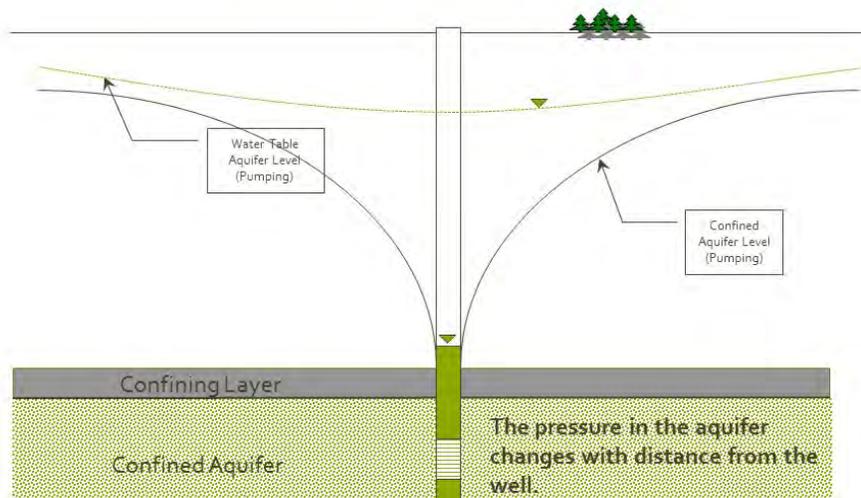
Accomack-Northampton Planning District Commission

Pumping from a confined aquifer with little leakage through the confining layer

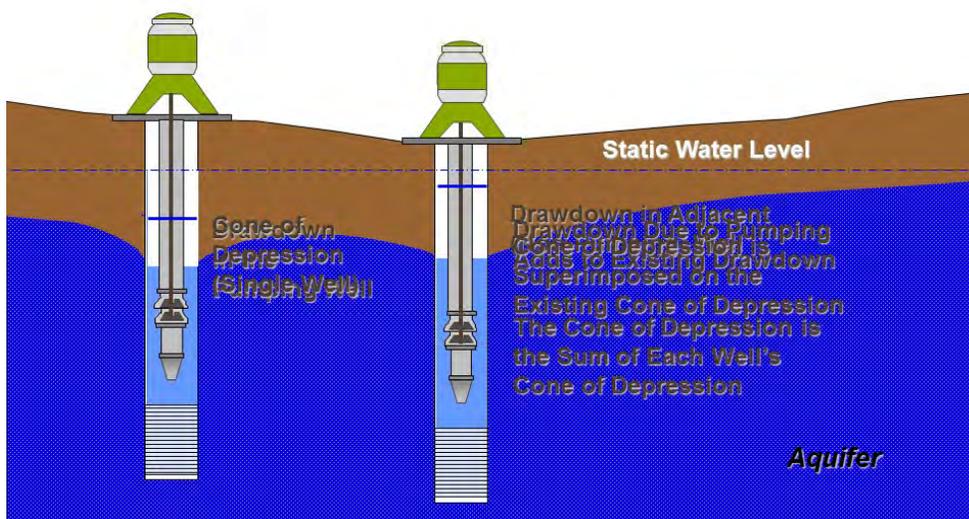


Accomack-Northampton Planning District Commission

Pumping from a confined aquifer with significant leakage through the confining layer

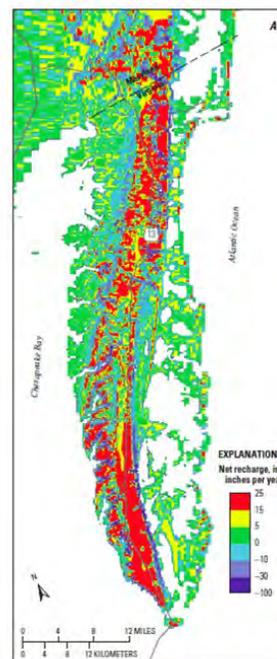
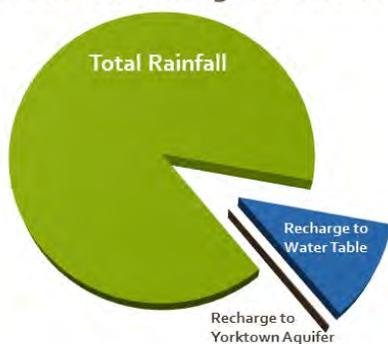


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How Much Water Recharges the Aquifers?

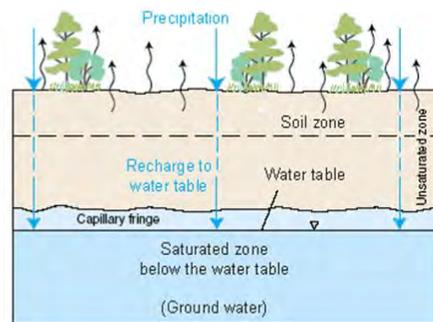
- All fresh water comes from precipitation falling directly on the Shore
- About 88% of the precipitation never infiltrates to the groundwater



Accomack-Northampton Planning District Commission

How Much Water Recharges the Aquifers?

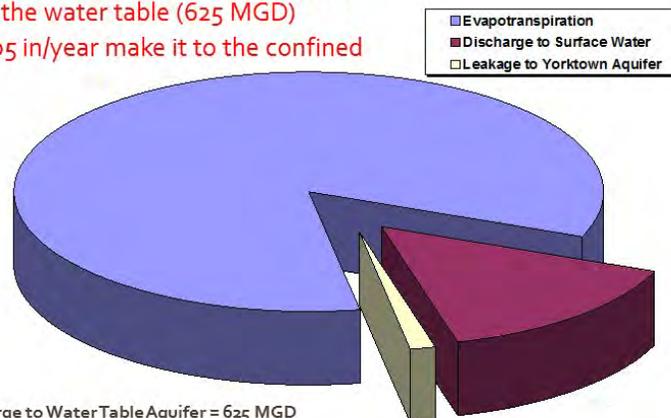
- Most of the rainfall never infiltrates to the groundwater and is lost through:
 - Evaporation
 - Interception (on plants and trees)
 - Direct runoff
 - Evapotranspiration



Accomack-Northampton Planning District Commission

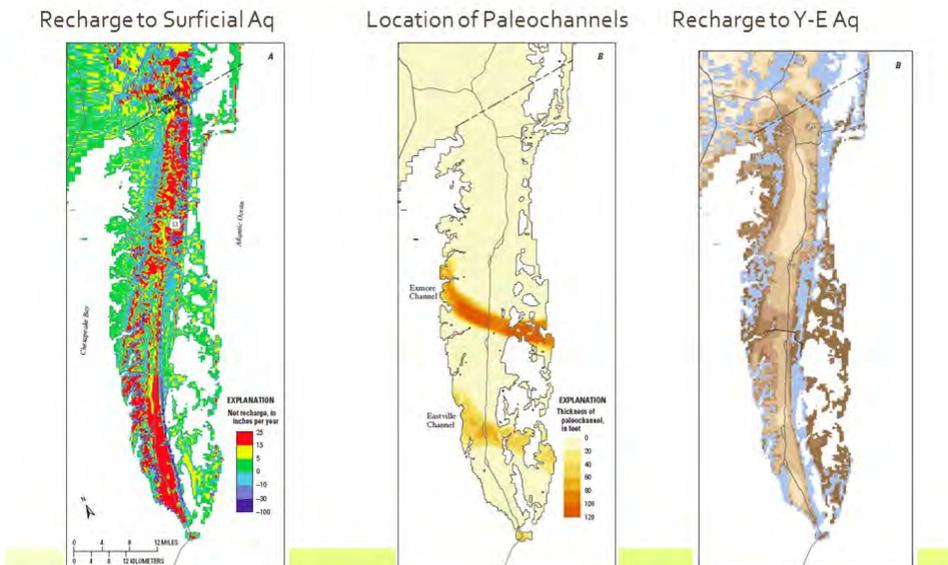
Of the water infiltrating to the water table, only a small amount reaches the Yorktown aquifer

- **Limited Recharge:**
 - Of the 44-inches of annual precipitation only 5 to 6 inches infiltrate to the water table (625 MGD)
 - And only about 0.05 in/year make it to the confined aquifer (9 MGD)



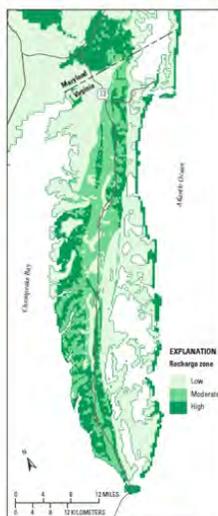
Accomack-Northampton Planning District Commission

Recharge amounts vary across the Shore

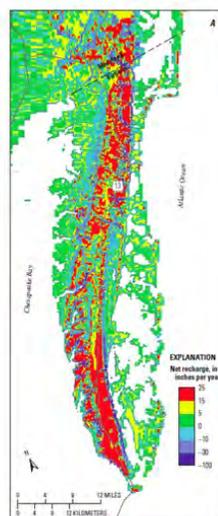


Recharge to the water table is a function of soil type, slope, and location

Potential Recharge areas (based on soil type and slope)



Estimated Recharge Rates



Source: USGS

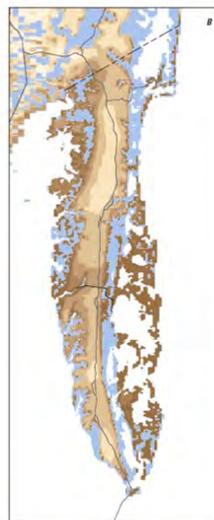
Source: USGS

Recharge to the Yorktown depends more on where pumping from the aquifer is occurring

Estimated in
1900
(pre-pumping)



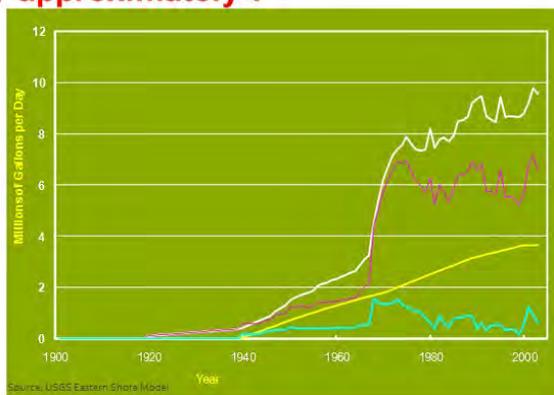
Estimated in
2003
(Effects of
pumping)



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Recharge rate to the Yorktown has increased over time due to pumping

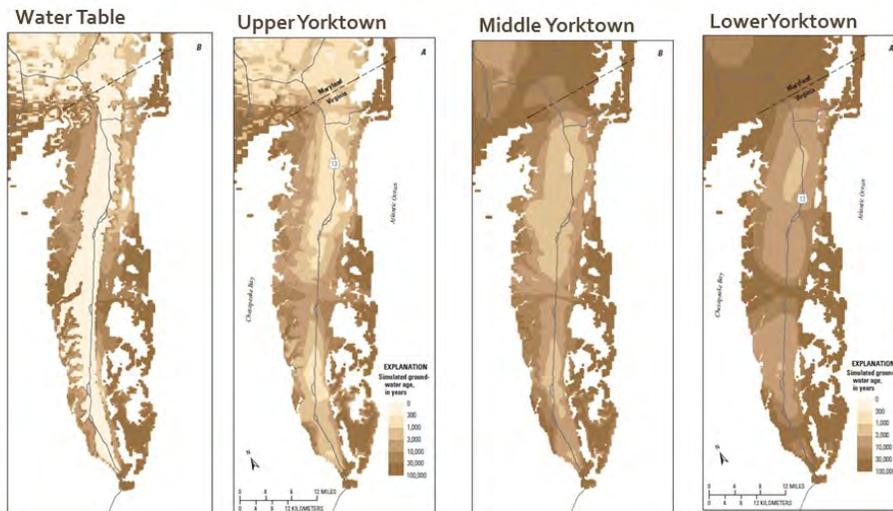
- **Current Yorktown-Eastover Aquifer use exceeds recharge by approximately 1 MGD**
- **Recharge will increase as use increases – but will NOT keep pace with pumping**



Source: USGS Eastern Shore Model

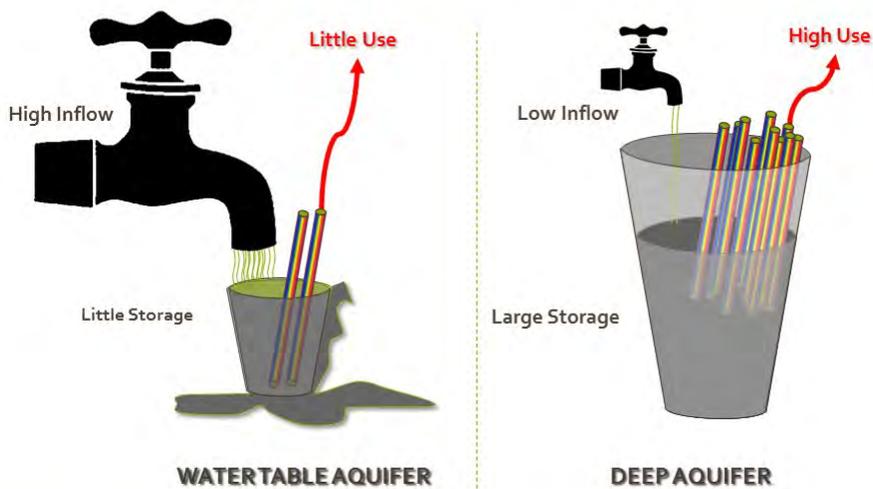
Accomack-Northampton Planning District Commission

Estimated Water Ages Reflect Recharge Rates



Accomack-Northampton Planning District Commission

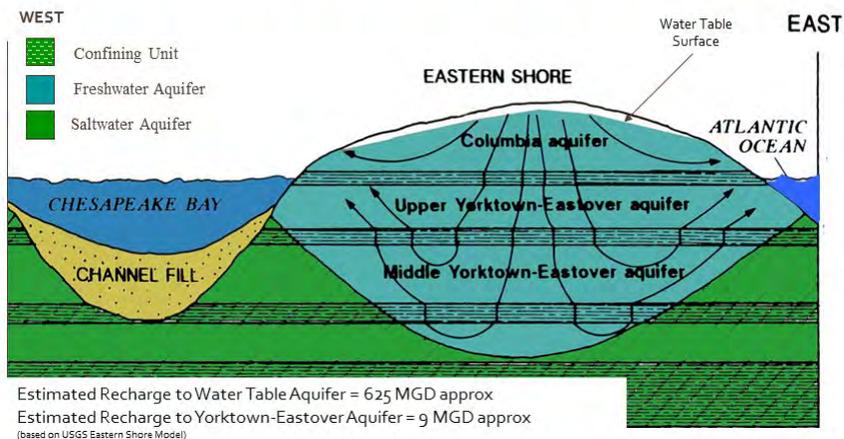
Water Table / Yorktown Dilemma



Accomack-Northampton Planning District Commission

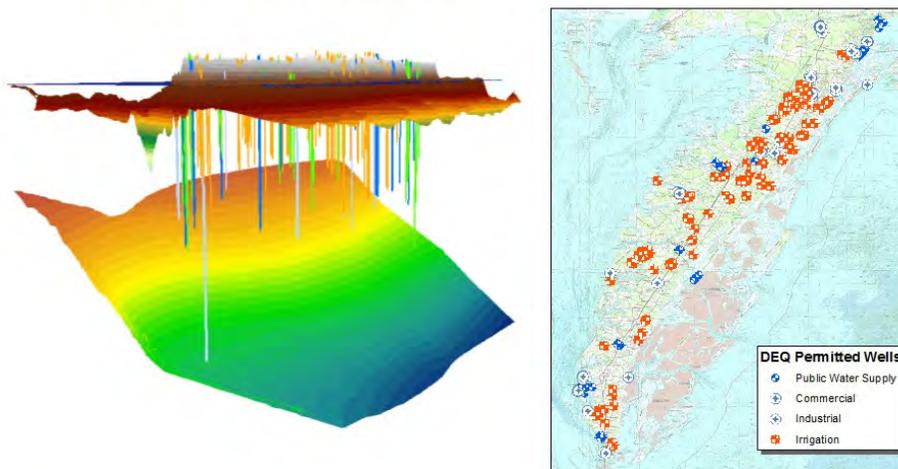
Ultimately the Balance of Recharge to Use Dictates Stability of the Fresh Water Lens

Fresh ground water is restricted to depths less than 350 feet



Accomack-Northampton Planning District Commission

Groundwater Use on the Eastern Shore



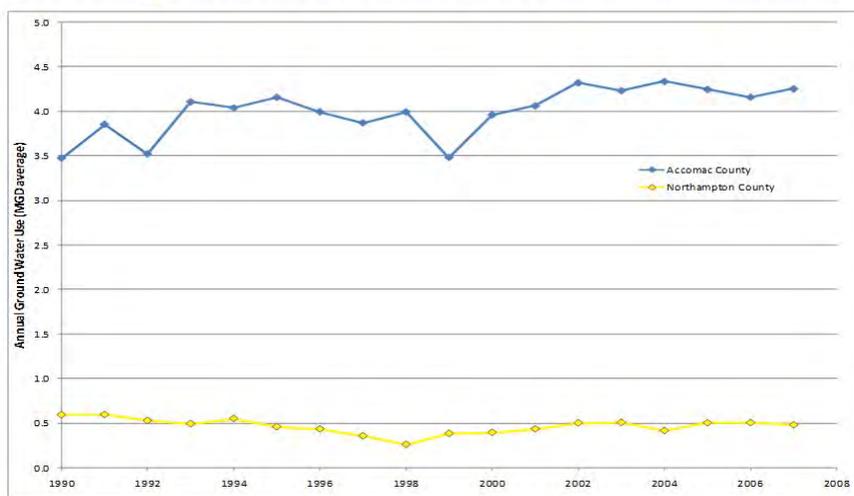
Accomack-Northampton Planning District Commission

Ground Water Use and Ground Water Level Measurements

- Ground Water Use for permitted wells (wells pumping greater than 300,000 gallons-per-month) are submitted to VDEQ
- Ground Water Levels are routinely measured in Observation Wells by the USGS

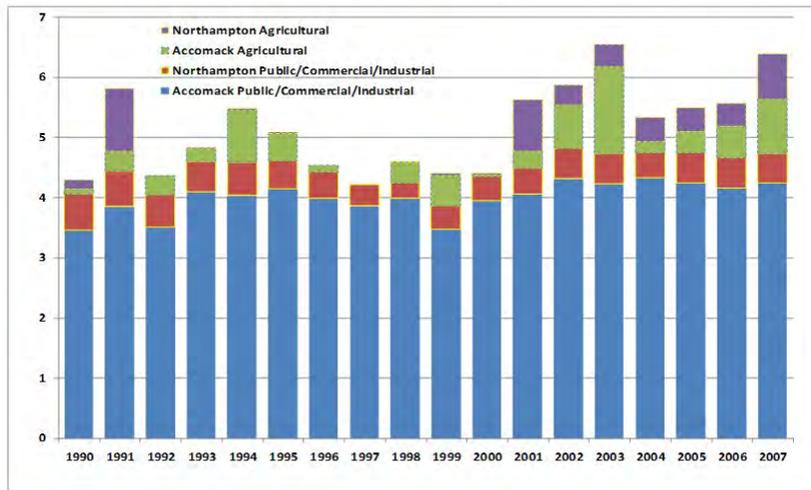
Accomack-Northampton Planning District Commission

Non-Agricultural Ground Water Use Trends



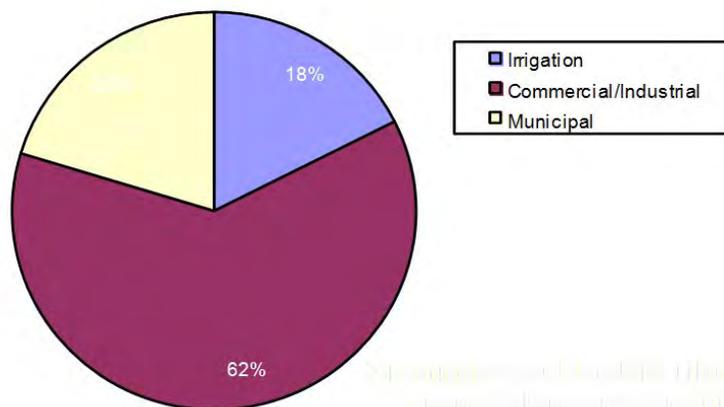
Accomack-Northampton Planning District Commission

All Permitted Ground Water Use



Accomack-Northampton Planning District Commission

Types of Groundwater Use



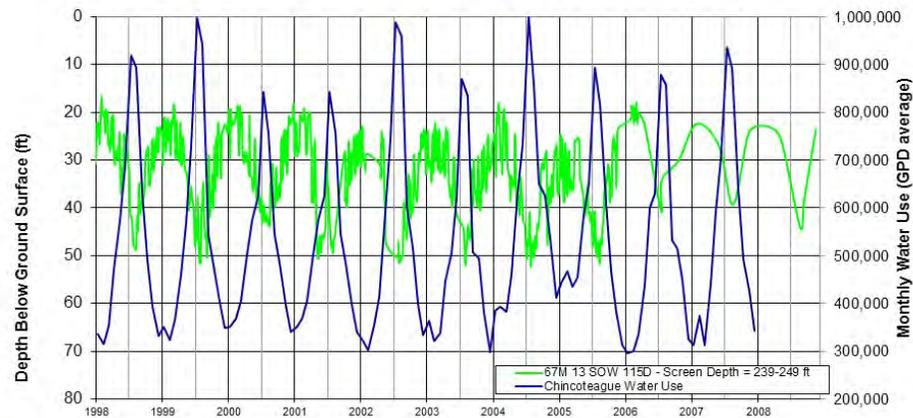
Accomack-Northampton Planning District Commission

Why Measure Ground Water Levels?

- Ground water use:
 - Lowers ground water levels, reducing available water to other ground water users
 - Reduces the size of the freshwater lens
- Impact of ground water use can be evaluated:
 - Indirectly using models
 - Measured directly from pumping wells and observation wells

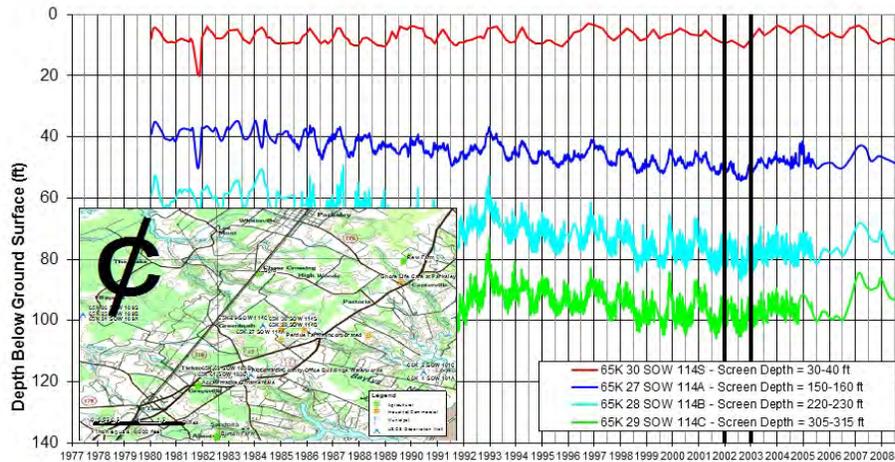
Accomack-Northampton Planning District Commission

Water Level Change and Monthly Use



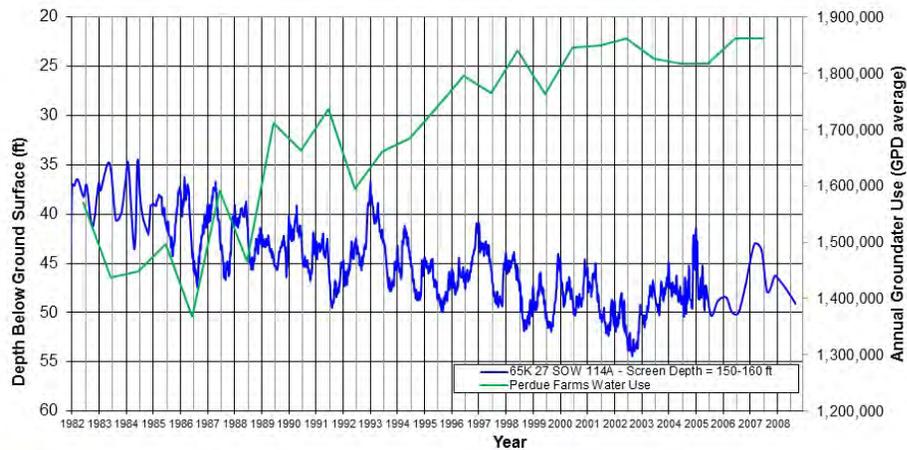
Accomack-Northampton Planning District Commission

Ground Water Levels Near Perdue Farms



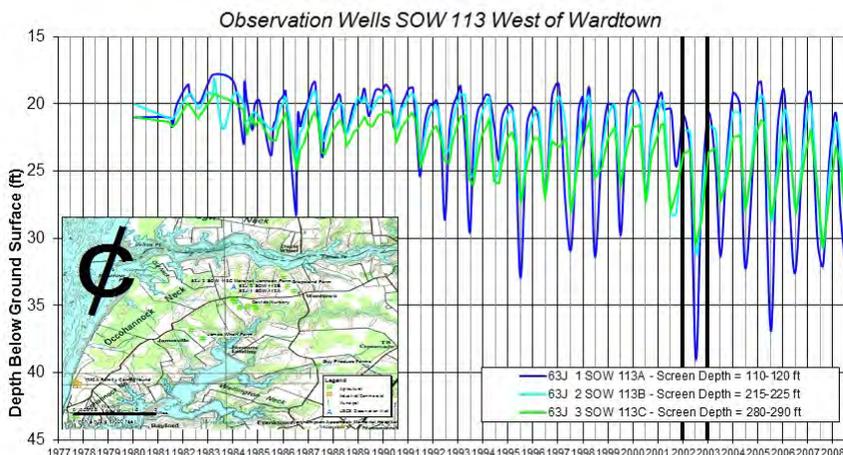
Accomack-Northampton Planning District Commission

Water Level Change and Annual Use Near Perdue Farms

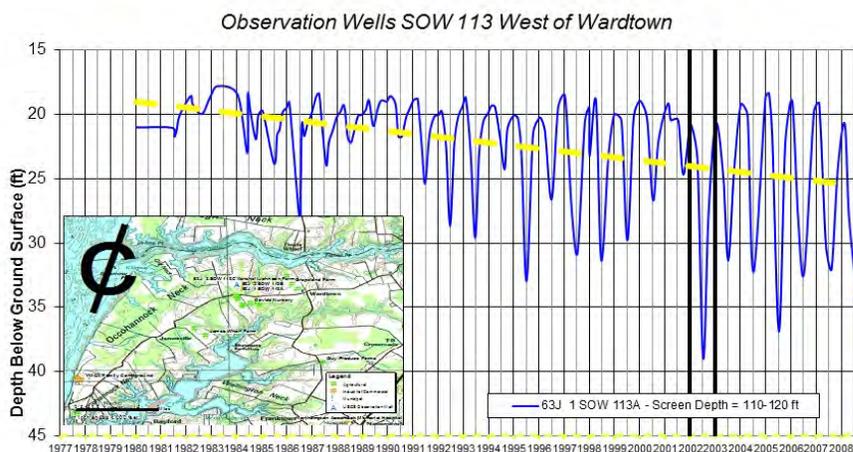


Accomack-Northampton Planning District Commission

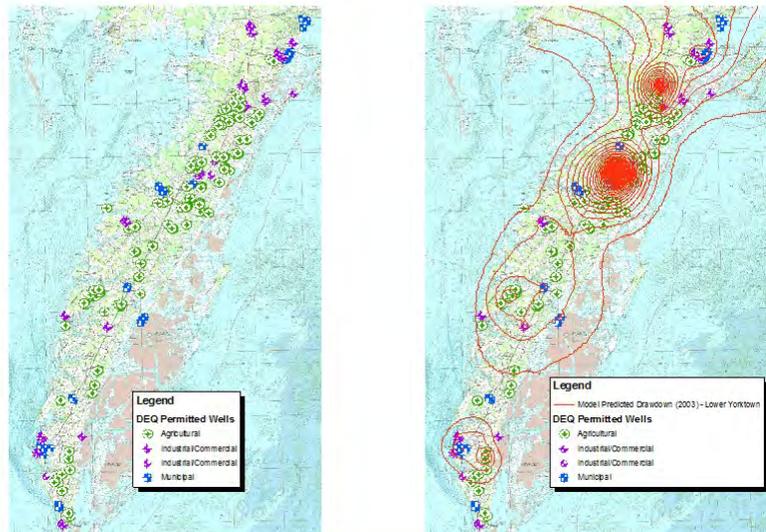
Effect of Irrigation Use



Long Term Decline from Irrigation Use



Amount of water level decline in the Lower Yorktown Aquifer



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Threats to Ground Water Quality & Quantity on the Eastern Shore

- Water Table Aq.
 - Quality → Surface Activities
 - Quantity → Drought
- Confined Aq.
 - Quality → Over-pumping
 - Quantity → Over-pumping

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Potential Threats To Water Table Water Quality

Sources:

- Agriculture / Livestock
 - Nutrients (Fertilizers)
 - Pesticides / Herbicides
 - On-site waste disposal

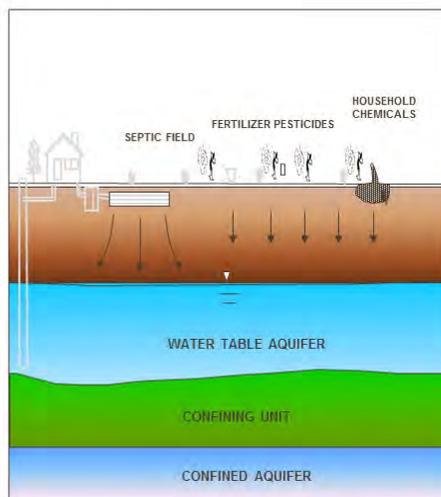
Waste Units

- *Septic Systems / Drain Fields*
- Public Sewers
- Underground Storage Tanks (USTs)

Residential

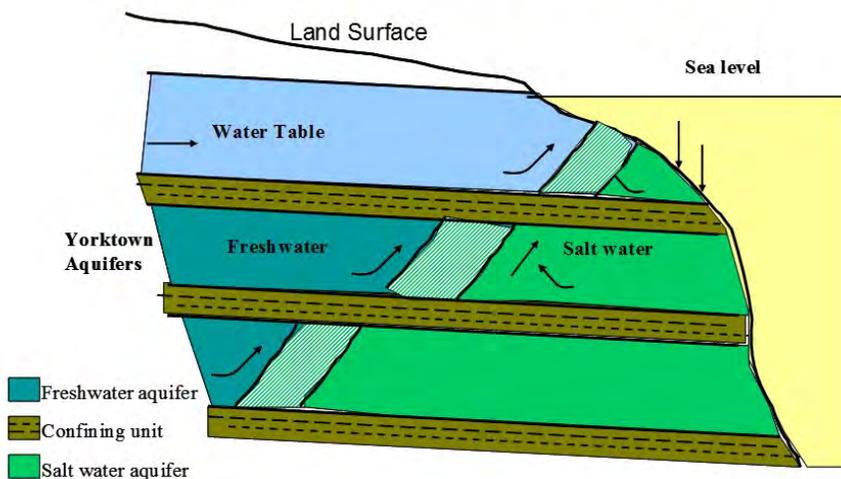
- *Nutrients / Pesticides - Herbicides*
- *Petroleum and solvents*

Function of amount (loading) and area of application



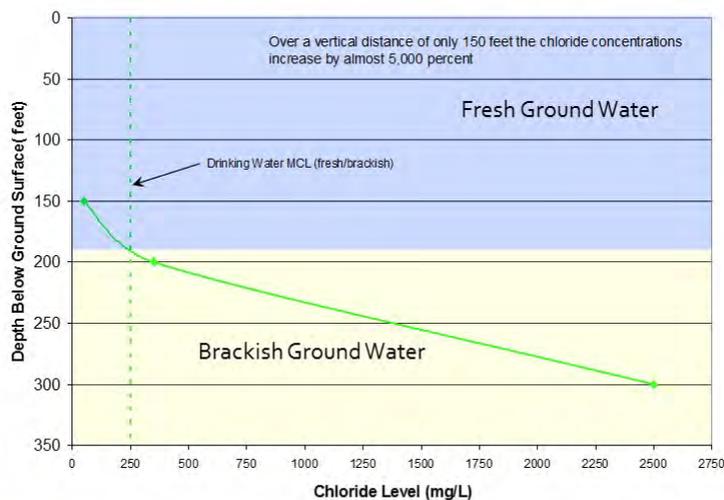
Accomack-Northampton Planning District Commission

Potential Threats to Yorktown- Eastover Aquifer Water Quality



Accomack-Northampton Planning District Commission

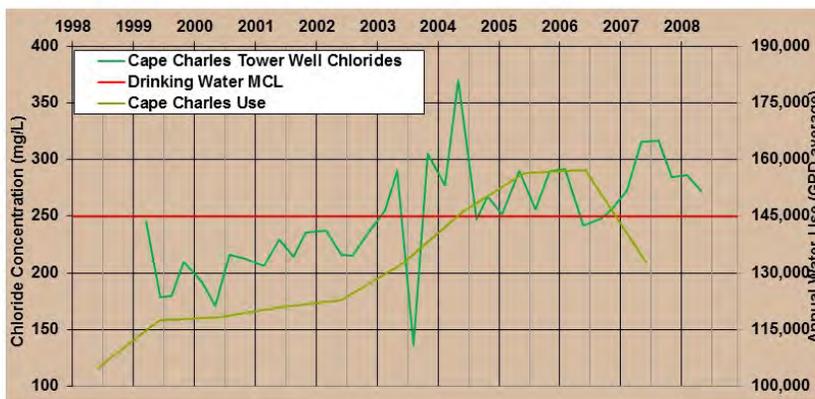
Chloride Increase With Depth Upshur Neck Seaside Example



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Why the Eastern Shore of Virginia?

Most likely cause for a loss of fresh ground water is salt water intrusion due to over pumping



Accomack-Northampton Planning District Commission

Ground Water Management and Water Supply Planning

- ESVA Ground Water Committee
- ESVA Ground Water Resource Protection and Preservation Plan
- Water Supply Plans – Accomack & Northampton Cos.

Accomack-Northampton Planning District Commission

ESVA Ground Water Committee

- Formed in 1990 by Accomack & Northampton to study and plan for ground water protection and management
- 11-member Committee meets monthly
 - 2 County Administrators, 4 County Supervisors, 4 County-appointed members, A-NPDC Executive Director
- Coordinated by A-NPDC with funding from Counties & VA Coastal Zone Management Program
- Contracts consulting hydrogeologist to advise Committee
- Activities:
 - Develop protection and management plans
 - Ground Water Research: USGS, VA Tech, Randolph-Macon
 - Public Workshops & Educational Materials
 - Review/comment on state withdrawal permit applications and federal environmental assessments
 - Coordinate with state/federal governments on ground water-related regulations
 - ESVA Ground Water Model
 - ESVA Ground Water Award Program
 - Household Hazardous Waste Collection

Accomack-Northampton Planning District Commission

ESVA Ground Water Resource Protection and Preservation Plan

- Originally adopted in 1992 and Updated in 2013
- Purpose:
 - Ensure that adequate and safe drinking water is available to all citizens of the commonwealth
 - Encourage, promote, and protect all other beneficial uses
 - Encourage, promote, and develop incentives for alternative water sources, included but not limited to desalinization
- Components of Plan
 - Water Resources: Current understanding of water resources. Will periodically update as new research is available.
 - Land and Water Resource Use: Water use will be updated annually.
 - Resource Vulnerability:
 - Saltwater Intrusion: Water quality trends updated annually. Modeling and other research updated periodically.
 - Water Level Declines: Updated annually.
 - Land Use Activities: Updated periodically based on research.
 - Sustainability Plan

Accomack-Northampton Planning District Commission

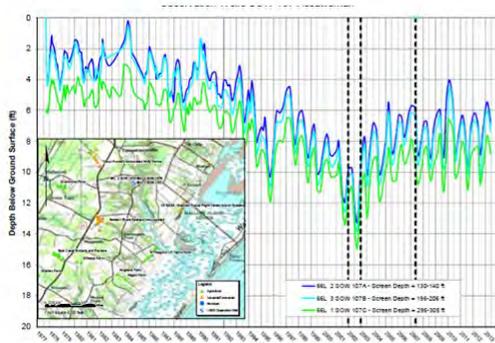
Component Summary

- Institutional Controls: Federal / State / Local
- Research:
 - Hydraulic Characteristics: Paleochannels; Confining Units; Deeper Aquifers
 - Water Quality: Freshwater/Saltwater Transition; Agricultural Nutrients; On-Site Systems; Emerging Contaminants
 - Climate Change
- Monitoring: Water Use; Groundwater Levels; Water Quality
- Alternate Source Development: Columbia (Water Table); Membrane Treatment; Reuse; ARS
- Conservation and Reduction

Accomack-Northampton Planning District Commission

Highlights

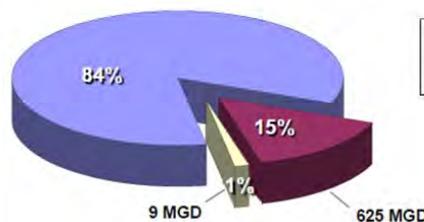
- Relevant components of the 1992 plan have been retained.
- Sections of the plan will be updated, some as frequently as annually to maintain current. Plan and various components such as monitoring data and research publications will be linked on the internet to improve accessibility.



Accomack-Northampton Planning District Commission

Highlights

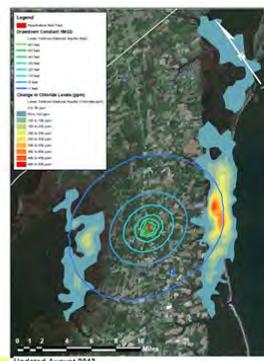
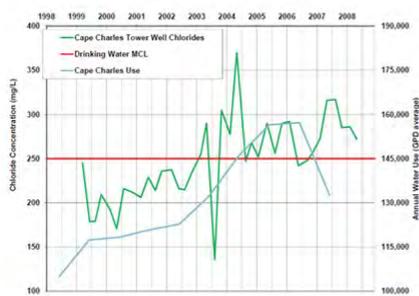
- Better understanding of the groundwater resource: Columbia aquifer is replenished at much higher rates than the Yorktown-Eastover. With lower withdrawals, the Columbia is an underused resource.



Accomack-Northampton Planning District Commission

Highlights

- Better understating of the vulnerability: Improved models for the Shore provide greater insight on flow dynamics. Yorktown-Eastover more vulnerable near the Bayside and Seaside, less vulnerable near the spine than previously thought.

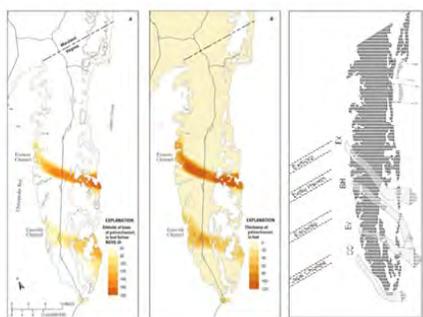


Accomack-Northampton Planning District Commission

Updated August 2013

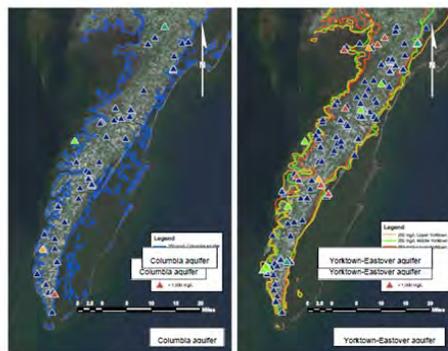
Highlights

- Research needs are more focused and will be periodically revised.



Source: Sanford, et al. 2009

Source: Hobbs, et al. 2008



Accomack-Northampton Planning District Commission

Accomack County Water Supply Plan

- Regulations: 9 VAC 25-780
 - Adopted in 2011
 - Required to be reviewed every 5 years and rewritten every 10 years
- Purpose:
 - Ensure that adequate and safe drinking water is available to all citizens of the commonwealth
 - Encourage, promote, and protect all other beneficial uses
 - Encourage, promote, and develop incentives for alternative water sources, included but not limited to desalinization
- Components of Plan
 - Existing Water Sources (*Description of water systems*)
 - Existing Water Use (*Description of current and historical use*)
 - Existing Water Resource Conditions (*Groundwater Resource, Natural Resources*)
 - Projected Water Demand (*Future water use*)
 - Water Demand Management (*Water Conservation and Management*)
 - Drought Response and Contingency Plan
 - Statement of Need and Alternatives (*Use / Resource Constraints; alternate sources / technologies*)

Accomack-Northampton Planning District Commission

Thank You!



Curt Smith
 Director of Planning
 Accomack-Northampton
 Planning District Commission
csmith@a-npdc.org
 757-787-2936



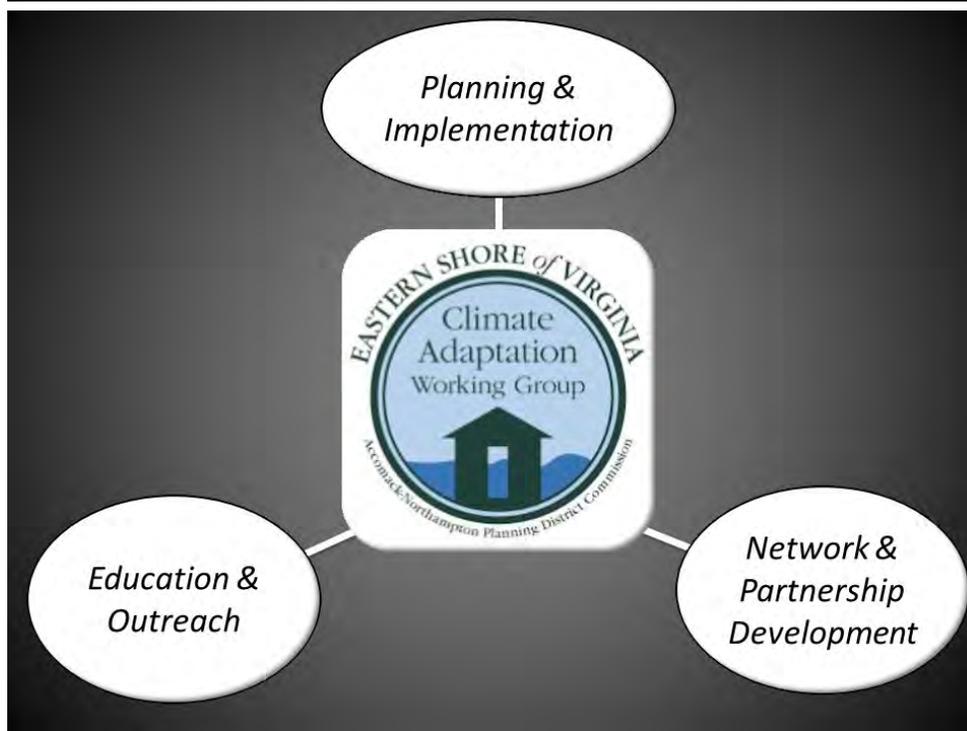
Appendix G

Coastal Resilience Presentation at Adaptive Planning for Flooding and Coastal Change in Virginia Conference

Adaptive Planning on Virginia's Eastern Shore



Curt Smith, Director of Planning
Accomack-Northampton Planning District Commission
December 12, 2014



CAWG Networking & Coordination

- *Established in 2011*
- *Meets quarterly*



*Over 30
Participating
Agencies:*

<u>Local Gov.</u>	<u>Reg. Agencies</u>	<u>State Gov./Academia</u>	<u>Federal Gov</u>	<u>Non-Gov. Org.</u>
Accomack Co.	A-NPDC	VCZMP	NASA-WFF	Nature Conservancy
Northampton Co.	ESSWCD	VDEM	USDA-NRCS	Citizens for a Better ES
Cape Charles	ESHD	VDOT	USFWS	Eastern Shorekeeper
Chincoteague		VDCR	NOAA	ES RC&D
Exmore		VMRC, VDH		VES Land Trust
Onancock		VDGIF, VDOF		Wetlands Watch
Saxis, Tangier		VIMS, ODU		Chinco. Bay Field Station
Wachapreague		UVA-LTER		Ches. Bay Found.

CAWG Education & Outreach: Public Workshops

*Coastal Flooding Workshop
June 2012*

*>200 residents in attendance for
first public event addressing sea
level rise*



Other Workshops:

- 2012 NASA-WFF Adaptation Workshop
- 2013 Coastal Insurance Workshop
- 2013 NOAA Sea Level Rise Viewer Workshop

CAWG Education & Outreach:

Quarterly Newsletter

Includes:

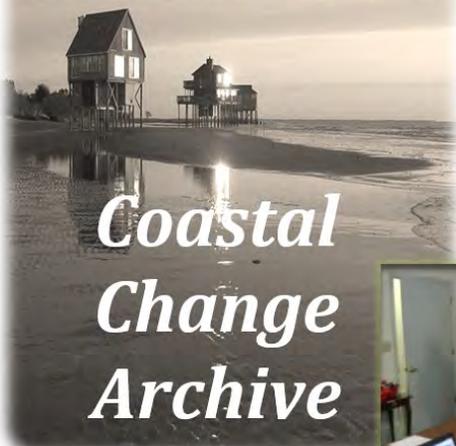
- Adaptation Planning Resources/Tools
- Research & Policy Articles
- News Coverage & Current Events

Related to:

- Sea Level Rise & Recurrent Flooding
- Climate Change
 - Atmospheric Warming and Resulting Impacts
 - Changes to Water Resources & Resulting Impacts
- Hazard Mitigation & Climate Adaptation

ESVA Coastal Change Archive

Eastern Shore of Virginia



Coastal
Change
Archive

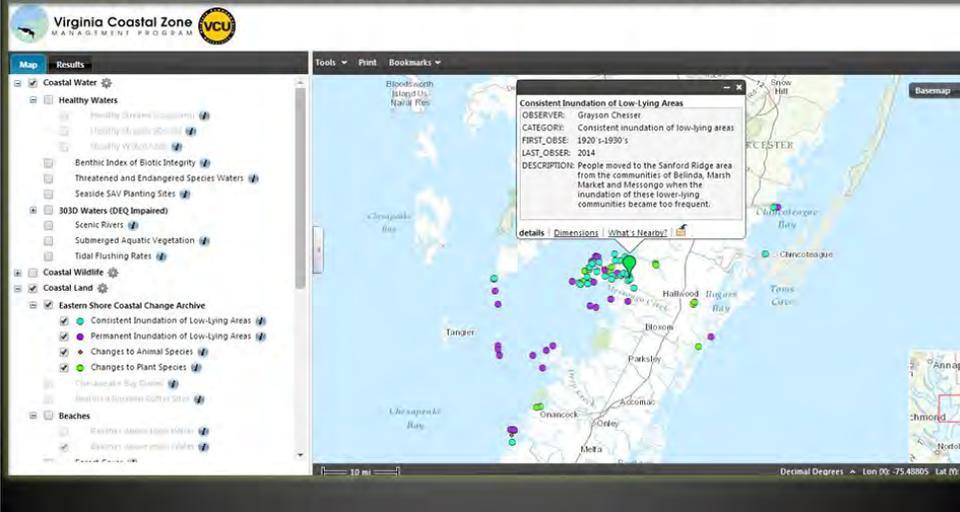
Compilation of local accounts of observations made regarding changes to the natural environment related to sea level rise and climate change



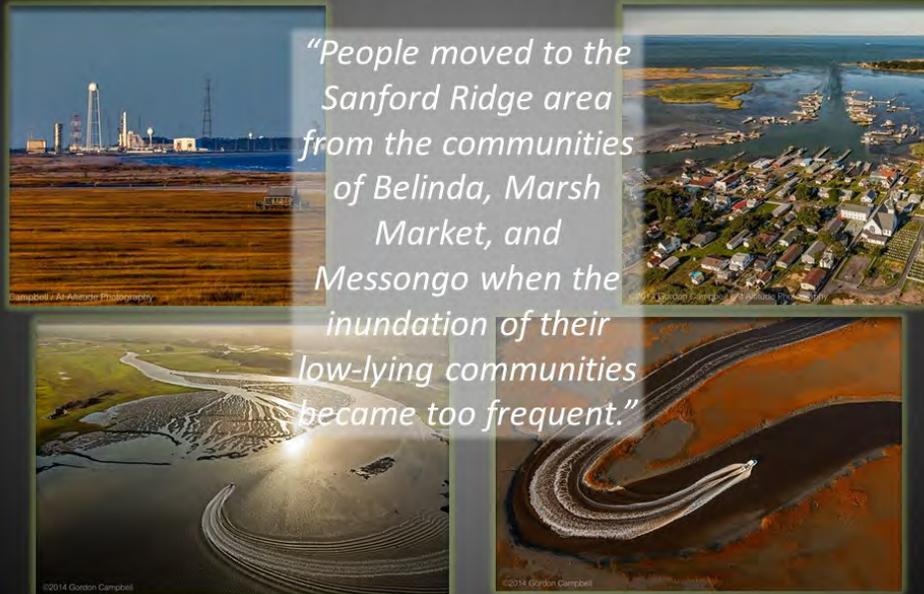
ESVA Coastal Change Archive

Categories of Stories Included in Archive:

- Consistent inundation of low-lying areas
- Changes to animal species
- Permanent inundation of low-lying areas
- Changes to plant species



ESVA Coastal Change Archive



CAWG Adaptation Planning & Implementation:

Hazard Mitigation Plan

THE EASTERN SHORE OF VIRGINIA

Eastern Shore Hazard Mitigation Planning Committee
Accomack-Northampton Planning District Commission



The Eastern Shore of Virginia: Strategies for Adapting to Climate Change



REPORT FROM THE
EASTERN SHORE CLIMATE CHANGE ADAPTATION STRATEGIES WORKSHOP
A PROJECT FUNDED BY THE VIRGINIA ENVIRONMENTAL ENDOWMENT AND
THE WILDLIFE CONSERVATION SOCIETY

THE NATURE CONSERVANCY IN VIRGINIA
MAY 2011

CAWG Adaptation Planning & Implementation:

Hazard Mitigation Plan

THE EASTERN SHORE OF VIRGINIA

Eastern Shore Hazard Mitigation Planning Committee
Accomack-Northampton Planning District Commission

2006-2011

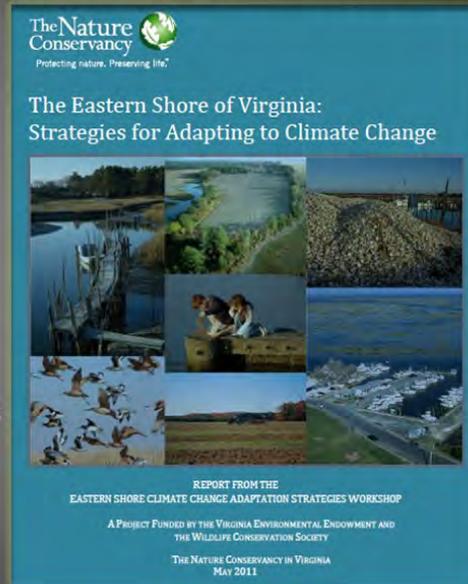
Previously developed mitigation strategies based solely off historic information.

2016

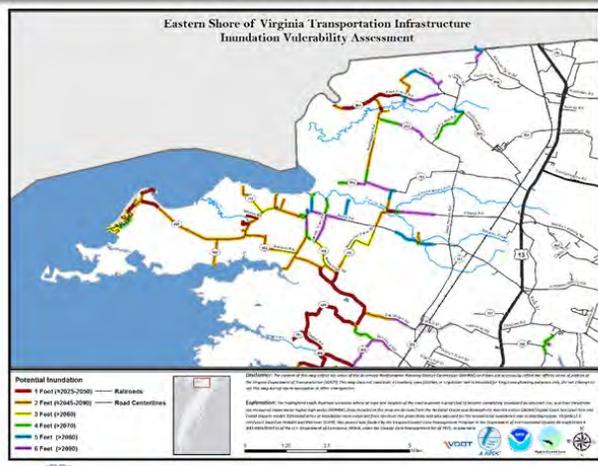
Currently being rewritten to develop mitigation strategies based off both historic and projected conditions.

CAWG Adaptation Planning & Implementation:

- Identifies global climate change impacts on ESVA
 - Sea level
 - Temperature
 - Precipitation
 - Storms
 - CO2 Levels
- Develops vision for adaptation on ESVA
- Prioritizes Adaptation Strategies
- Guiding document for CAWG from 2011-2014



Transportation Infrastructure Inundation Vulnerability Assessment (TIIVA)

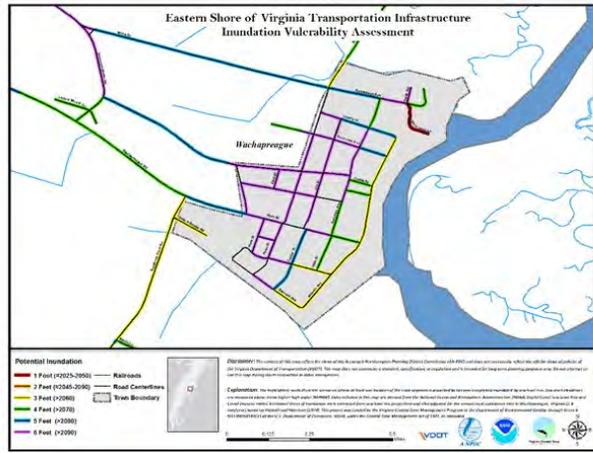


TIIVA: Regional assessment to determine which roads are most vulnerable to permanent inundation from sea level rise

- In partnership with VDOT
- For long-range planning purposes
- Incorporates most recent VIMS SLR projections
- Considers how communities could have access limited or become disconnected with inundation of connector routes
- Final report: January 2015



Transportation Infrastructure Inundation Vulnerability Assessment (TIIVA)



TIIVA: Regional assessment to determine which roads are most vulnerable to permanent inundation from sea level rise

- In partnership with VDOT
- For long-range planning purposes
- Incorporates most recent VIMS SLR projections
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- Final report: January 2015



2014-2016 NFWF Hurricane Sandy Coastal Resiliency Project: Coastal Resilience on Virginia's Eastern Shore

- Nature Conservancy – Project Lead
- Collaborative Region-wide Stakeholder Process
 - November 2014 Kickoff Workshop with 75 Community Leaders
- Coastal Resilience Decision Support Tool
 - Management options under SLR, storm surge, marsh migration scenarios
 - Management options under barrier island-inlet modeling system scenarios
- Oyster Reef Demo Projects and Wave Attenuation Model



Other Local Adaptation Activities

- **ESVA Ground Water Committee**
 - *Ground Water Supply Protection and Management Plan (2013)*
 - Monitoring regional salt water intrusion into aquifers
- **Conservation Planning**
 - Seaside Special Area Management Plan
 - Southern Tip Partnership
- **Working Waterfronts**
 - Definition and inventory (2012)
 - Marina Needs Assessment (2012)



- **UVA-LTER**
 - NSF-funded project on Seaside Virginia Coast Reserve
 - Studying and modeling wetland vulnerability and coastal resilience on Seaside



Curt Smith
Accomack-Northampton Planning District Commission
757-787-2936
csmith@a-npdc.org



Appendix H

Northern Eastern Shore Community Rating System Workshop

Contact Connie Morrison 757-787-2936, ext. 127

FOR IMMEDIATE RELEASE



Workshop Teaches Communities to Lower Flood Risk

Wetlands Watch to bring flood expertise to Eastern Shore

ACCOMACK— Flooding is one of the greatest threats to the personal and financial safety of Eastern Shore residents, according to a local group appointed to make a plan to address flooding, high winds, erosion and other hazards.

“We can’t do anything to stop hurricanes and other storms that bring flooding and high winds, but we can get smarter about the harm they bring, including floods and flood zones, and how to protect ourselves,” said Jim Eichelberger, Mayor of Parksley and Chairman of the local-government-appointed Eastern Shore Hazard Mitigation Steering Committee. The committee was established to re-write the plan that evaluates and prioritizes actions to protect life and property before disaster strikes.

Accomack-Northampton Planning District Commission is organizing the work under a grant from the Federal Emergency Management Agency and the Virginia Department of Emergency Management. The commission and two agencies, along with the National Oceanic and Atmospheric Administration, the Virginia Coastal Zone Management Program, and the non-profit Wetlands Watch are co-sponsoring two Feb. 11 workshops for Accomack and Northampton individuals and communities that want to learn more about flooding, flood zones, and floodplain management actions communities can take to potentially lower flood insurance rates.

Shannon Hulst Jarbeau, Certified Floodplain Manager and Assistant Director of Wetlands Watch in Norfolk, Virginia, and Mary-Carson Stiff, JD, also a Certified Floodplain Manager and

Assistant Director of Wetlands Watch, are recognized regional experts in the Community Rating System, and will lead both sessions. They will teach participants how communities can work together to lower flood insurance rates, over time, between 5 percent and 45 percent through the Community Rating System, a voluntary program that offers flood insurance discounts in exchange for advanced floodplain management actions at the local level.

Communities opting into the program increase public flood awareness, enhance public safety, reduce damage to private property and public infrastructure, avoid economic disruption and losses, reduce human suffering, and protect the environment. As communities incrementally implement more rigorous program levels, they qualify for greater flood insurance discounts from the National Flood Insurance Program.

“The Community Rating System is an excellent way to encourage localities to improve their resiliency to flooding, protect open space and wetlands, and adapt to sea level rise, while also earning a discount on flood insurance rates and helping their constituents cope with increasing costs,” says Jarbeau. “These are all positive outcomes that we hope to help localities achieve.”

Jarbeau and Stiff will explain the initial steps communities need to take to qualify for the program, and how to earn credits for further reductions, particularly for actions they are likely already taking.

Session one will be held at VIMS in Wachapreague, 40 Atlantic Ave, on Feb. 11 from 1:30-3:30 p.m. The second session is also Feb. 11, from 6:30-8:30 p.m., at the Northampton County Administration Board Room, Second Floor, 16404 Courthouse Road, Eastville. The same information will be presented at both sessions.

For more information about the workshop or the hazard mitigation plan, please contact Connie Morrison, Accomack-Northampton Planning District Commission, 787-2936, or cmorrison@anpdc.org.

COMMUNITY RATING SYSTEM WORKSHOP		SIGN-IN SHEET	
Location:	Wachapreague	Meeting Date:	February 11, 2015

Name	County/Town	E-Mail
✓ John C Pavlik	Town of ONLEY	(Clerk/Treasurer)
✓ Ed Pissel	Town of NASSAWOX	edgibb@verizon.net
✓ Bill Neville	Town of Chimney	waxville@chimneygoe-va.gov
✓ Kym Kuda	Somerset County	kkuda@somersetmd.us
✓ Gary Pusey	Somerset Co. (Md)	gpusey@somersetmd.us
✓ Charles Kline	VA DCR	
✓ Tom Brockmanbrugh	Accomack Co	Tbrockmanbrugh@accomackva.gov
✓ Aileen Joekel	Town of Wachapreague	ajoen@baybeyond.net
✓ Peter Smith	Northampton County	psmith@psththe.co.northampton.va.us
✓ Shelia Corbin	Accomack County	shelia.corbin@rivhs.com
✓ Jim Eichelberger	Town of Parkley	eichelberger@Parkley.org

COMMUNITY RATING SYSTEM



FEBRUARY 11, 2015

PRESENTERS

- SHANNON HULST JARBEAU, CERTIFIED FLOODPLAIN MANAGER AND ASSISTANT DIRECTOR OF WETLANDS WATCH
- MARY-CARSON STIFF, JD, CERTIFIED FLOODPLAIN MANAGER AND ASSISTANT DIRECTOR OF WETLANDS WATCH

RESOURCES

- CRSRESOURCES.ORG CRS MANUAL, TRAINING, AND OTHER RESOURCES
- FLOODSMART.GOV - OFFICIAL SITE OF THE NATIONAL FLOOD INSURANCE PROGRAM
- THE NATURE CONSERVANCY IS BUILDING A ROBUST ON-LINE COASTAL RESILIENCE DECISION SUPPORT TOOL.
 - IT WILL PROVIDE LOCAL INFORMATION NEEDED TO HELP MAKE DECISIONS ABOUT WHICH CRS ELEMENTS AND ACTIVITIES TO SELECT.
 - THE VIRGINIA SECTION IS EXPECTED TO BE READY IN 2016.
 - TO SEE HOW IT FUNCTIONS IN OTHER AREAS OF THE COUNTRY, GO TO COASTALRESILIENCE.ORG

HAZARD MITIGATION PLAN UPDATE

- MEETS MONTHLY, FIRST WEDNESDAY, 10 A.M - NOON AT EASTERN SHORE COMMUNITY COLLEGE
- PUBLIC IS WELCOME TO ATTEND
- TO GET ON MAILING LIST FOR MATERIALS, SEE CONNIE MORRISON AFTER THIS MEETING

COMMUNITY RATING SYSTEM



FEMA



Special thanks to VIMS and Northampton County for providing meeting space and to Shannon Hulst Jarbeau and Mary-Carson Stiff of Wetlands Watch for being our presenters

THANK YOU FOR ATTENDING!

February 11, 2015

THE COMMUNITY RATING SYSTEM AND HAZARD MITIGATION PLANNING



Shannon Hulst Jarbeau and Mary-Carson Stiff

Accomack-Northampton Planning District Commission
Regional Hazard Mitigation Plan Update



THE COMMUNITY RATING SYSTEM (CRS)

- Voluntary NFIP program offers discounts on flood insurance to reward good floodplain management within a community
- Various activities to improve floodplain management/earn credit
- Administered by “community” = government division with land use authority (locality)



GOALS OF THE CRS

- Reduce flood damage to insurable property
- Strengthen and support the insurance aspects of the NFIP
- Encourage a comprehensive approach to floodplain management



CRS RATING TABLE

Class	Points	Premium Reduction
1	4500+	45%
2	4000-4499	40%
3	3500-3999	35%
4	3000-3499	30%
5	2500-2999	25%
6	2000-2499	20%
7	1500-1999	15%
8	1000-1499	10%
9	500-999	5%
10	0-499	0%



CRS CREDITS INTO \$\$\$\$ SAVED: FLORIDA STUDY

- Every time a CRS rating increases by one class, reducing premiums by 5% → the average amount of flood damage in that locality decreases by \$303K
- Actions required to earn one class increase protect a locality against ≈2 inches of rain



Brody, et. al, *The Rising Cost of Floods*, Journal of the American Planning Association (2007).



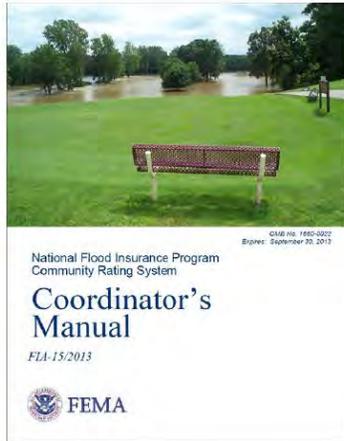
MINIMUM REQUIREMENTS FOR CRS PARTICIPATION



- 500 credit points
- Join & participate in NFIP for 1 year
- Full compliance with minimum NFIP regs
- Maintain elevation certificates (new construction)
- Meet repetitive loss criteria: info gathering, outreach, mitigation plan, mapping (part of hazmit plan)
- Flood insurance for locality-owned property in SFHA
- Show LiMWA line on new FIRMs



CRS COORDINATOR'S MANUAL



- Guide to basic structure, applying, participating, earning credit
- Updated May 2013, Effective until 2016
- 600+ pages
- **Website:** crsresources.org



INSURANCE SERVICES OFFICE (ISO)

- Operates the CRS on behalf of FEMA
- 16 community specialists
 - Grant majority of Credit
 - Conduct community visits
 - Each specialist has about 100 communities
 - New Virginia Specialist: Christina Groves
- 5 program coordinators
- Several consultants
- Specialists, Program Coordinators, consultants, and FEMA work together



CRS ACTIVITY EXAMPLES

- **Public Information**
 - Outreach, hazard disclosure
- **Mapping and Regulations**
 - Open space preservation, stormwater management regulations, GIS
- **Flood Damage Reduction**
 - Acquisition/relocation, mitigation, floodplain management planning
- **Warning and Response**
 - Flood emergency management, dams, levees



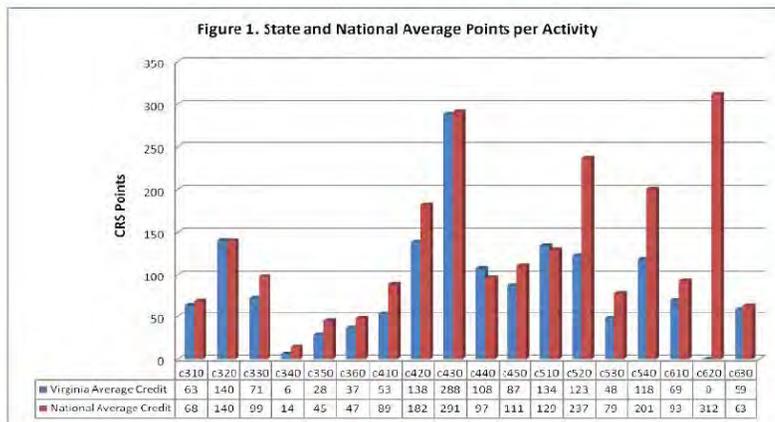
CRS ACTIVITY EXAMPLES

- Preserving open land in the floodplain
- Having/enforcing statewide building codes
- Adding freeboard provision to ordinance
- Low density zoning
- Letters to property owners in floodprone areas
- Retrofitting floodprone buildings
- Removing floodprone buildings from floodplain
- Having/enforcing stormwater management regulations
- Maintaining drainage systems



VIRGINIA AND THE CRS

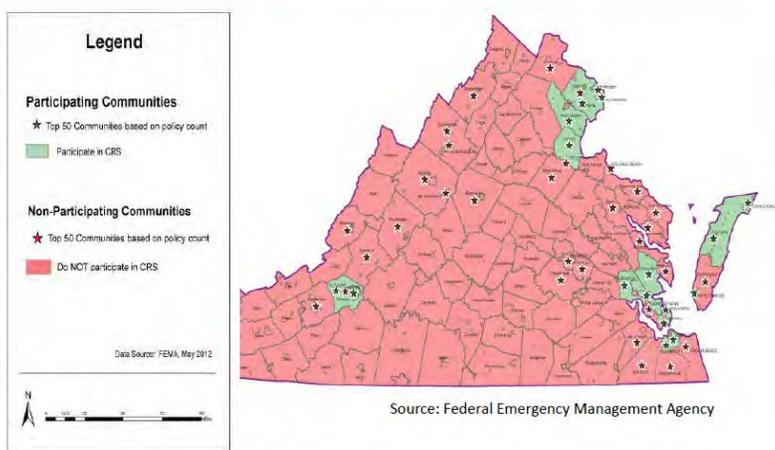
Figure 1. State and National Average Points per Activity



Source: http://crsresources.org/files/200/state-profiles/va-state_profile.pdf



VIRGINIA AND THE CRS



POLICIES IN FORCE	PREMIUM	CRS SAVINGS
55,076	\$38,259,246	\$2,844,066



VIRGINIA AND THE CRS

- 23 participating VA communities
 - Accomack, Cape Charles, Chincoteague, Wachapreague
- New applicant: City of Richmond
- Class 5: City of Alexandria
- In 2013, 55,000 policyholders in VA saved \$3 million in premium costs
- Uniform Minimum Credit (min. 131)



VA EASTERN SHORE: SPECIAL FLOOD HAZARD AREAS



Source: <http://www.arcgis.com/home/webmap/viewer.html?webmap=e9aa2179f31b4b9cbe5c7f8b1b91cea3>



VIRGINIA NFIP POLICIES → CRS SAVINGS

Community	NFIP Policies	NFIP Premium	CRS Discount
Accomack County	2,789	\$2,346,251	\$240,330
Alexandria	1,661	\$1,091,965	\$127,227
Arlington County	967	\$326,397	\$11,515
Bridgewater	60	\$66,403	\$6,559
Cape Charles	337	\$374,411	\$17,891
Chincoteague	954	\$980,532	\$104,810
Fairfax County	7,137	\$3,119,327	\$245,432
Falls Church	183	\$173,325	\$21,384
Gloucester County	1,715	\$1,334,946	\$193,381
Hampton	11,615	\$8,687,319	\$794,364
James City County	1,005	\$589,044	\$59,612
Norfolk	12,284	\$8,717,367	\$366,153
Poquoson	3,283	\$2,907,897	\$140,880
Portsmouth	3,865	\$2,565,079	\$102,526
Prince William County	1,539	\$768,454	\$35,764
Roanoke County	442	\$403,074	\$35,421
Roanoke	651	\$935,295	\$144,379
Stafford County	771	\$411,283	\$21,441
Vienna	125	\$77,918	\$4,418
Wachapreague	109	\$107,257	\$5,329
York County	3,584	\$2,275,702	\$165,251
CRS Localities	55,076	\$38,259,246	\$2,844,066
Non-CRS Localities	59,171	\$37,458,889	\$0
All Localities	114,247	\$75,718,135	\$2,844,066

Source: Federal
Emergency Management
Agency



ACCOMACK

CRS What-If

Community: ACCOMACK COUNTY * State: VIRGINIA
 County: ACCOMACK COUNTY CID: 510001

Current CRS Class = 8 (Printable Version)

	TOTAL	SFHA *	X-STD/AR/A99 **	PRP ***
PIF	2,597	2,407	19	171
PREMIUM	\$2,461,549	\$2,363,900	\$26,048	\$71,601
AVERAGE PREMIUM	\$943	\$962	\$1,371	\$419
CRS Class				
09	Per Policy \$51	\$56	\$72	\$0
	Per Community \$132,699	\$131,328	\$1,371	\$0
08	Per Policy \$102	\$109	\$72	\$0
	Per Community \$264,025	\$262,654	\$1,371	\$0
07	Per Policy \$152	\$164	\$72	\$0
	Per Community \$366,354	\$363,963	\$1,371	\$0
06	Per Policy \$203	\$218	\$144	\$0
	Per Community \$528,050	\$525,308	\$2,742	\$0
05	Per Policy \$254	\$273	\$144	\$0
	Per Community \$659,379	\$656,637	\$2,742	\$0
04	Per Policy \$304	\$327	\$144	\$0
	Per Community \$750,705	\$747,963	\$2,742	\$0
03	Per Policy \$355	\$382	\$144	\$0
	Per Community \$922,033	\$919,291	\$2,742	\$0
02	Per Policy \$406	\$436	\$144	\$0
	Per Community \$1,053,359	\$1,050,617	\$2,742	\$0
01	Per Policy \$456	\$491	\$144	\$0
	Per Community \$1,184,687	\$1,181,945	\$2,742	\$0

* SFHA (Zones A, AE, A1-A30, V, V1-V30, AO, and AH): Discount varies depending on class.
 ** SFHA (Zones A99, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, and AR/AO): 10% discount for Classes 1-6; 5% discount for Classes 7-9.
 *** Preferred Risk Policies are not eligible for CRS Premium Discounts.



CAPE CHARLES

CRS What-If

Assessment: CRS Code: ZIP/PO: Acre/Foot: Comments: Values: Units:

Community: CAPE CHARLES, TOWN OF State: VIRGINIA
County: NORTHAMPTON COU. CID: 510106

Current CRS Class = 8 → [Printable Version]

	TOTAL	SFHA *	X-STD/AR/A99 **	PRP ***
PIF	324	259	6	59
PREMIUM	\$425,371	\$391,277	\$5,920	\$28,174
AVERAGE PREMIUM	\$1,313	\$1,511	\$987	\$479
CRS Class				
09	Per Policy \$65	\$80	\$52	\$0
	Per Community \$20,505	\$20,594	\$312	\$0
08	Per Policy \$128	\$159	\$52	\$0
	Per Community \$41,499	\$41,187	\$312	\$0
07	Per Policy \$182	\$239	\$52	\$0
	Per Community \$62,052	\$61,781	\$312	\$0
06	Per Policy \$256	\$318	\$104	\$0
	Per Community \$82,997	\$82,374	\$623	\$0
05	Per Policy \$320	\$398	\$104	\$0
	Per Community \$103,551	\$102,968	\$623	\$0
04	Per Policy \$385	\$477	\$104	\$0
	Per Community \$124,184	\$123,561	\$623	\$0
03	Per Policy \$447	\$557	\$104	\$0
	Per Community \$144,778	\$144,104	\$623	\$0
02	Per Policy \$510	\$636	\$104	\$0
	Per Community \$165,371	\$164,748	\$623	\$0
01	Per Policy \$574	\$716	\$104	\$0
	Per Community \$185,965	\$185,341	\$623	\$0



* SFHA (Zones A, AE, A1-A30, V, V1-V30, AO, and AH): Discount varies depending on class.
 ** SFHA (Zones A99, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, and AR/AO): 10% discount for Classes 1-6; 5% discount for Classes 7-9.
 *** Preferred Risk Policies are not eligible for CRS Premium Discounts.



CHINCOTEAGUE

CRS What-If

Assessment: CRS Code: ZIP/PO: Acre/Foot: Comments: Values: Units:

Community: CHINCOTEAGUE, TOWN OF State: VIRGINIA
County: ACCOMACK COUNTY CID: 510002

Current CRS Class = 8 → [Printable Version]

	TOTAL	SFHA *	X-STD/AR/A99 **	PRP ***
PIF	1,034	1,034	0	0
PREMIUM	\$1,218,655	\$1,218,855	\$0	\$0
AVERAGE PREMIUM	\$1,179	\$1,179	\$0	\$0
CRS Class				
09	Per Policy \$65	\$65	\$0	\$0
	Per Community \$67,703	\$67,703	\$0	\$0
08	Per Policy \$131	\$131	\$0	\$0
	Per Community \$135,406	\$135,406	\$0	\$0
07	Per Policy \$196	\$196	\$0	\$0
	Per Community \$203,109	\$203,109	\$0	\$0
06	Per Policy \$262	\$262	\$0	\$0
	Per Community \$270,812	\$270,812	\$0	\$0
05	Per Policy \$327	\$327	\$0	\$0
	Per Community \$338,514	\$338,514	\$0	\$0
04	Per Policy \$393	\$393	\$0	\$0
	Per Community \$406,217	\$406,217	\$0	\$0
03	Per Policy \$458	\$458	\$0	\$0
	Per Community \$473,920	\$473,920	\$0	\$0
02	Per Policy \$524	\$524	\$0	\$0
	Per Community \$541,623	\$541,623	\$0	\$0
01	Per Policy \$589	\$589	\$0	\$0
	Per Community \$609,326	\$609,326	\$0	\$0



* SFHA (Zones A, AE, A1-A30, V, V1-V30, AO, and AH): Discount varies depending on class.
 ** SFHA (Zones A99, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, and AR/AO): 10% discount for Classes 1-6; 5% discount for Classes 7-9.
 *** Preferred Risk Policies are not eligible for CRS Premium Discounts.



NORTHAMPTON

CRS What-If

Application: CRS Class: ZIP: Active Policy: Comments: What: ID:

Community: NORTHAMPTON COUNTY * State: VIRGINIA
 County: NORTHAMPTON COU... CID: 510105

Current CRS Class = 10 [Printable Version]

	TOTAL	SFHA *	X-STD/AR/A99 **	PRP ***
PIF	422	285	16	121
PREMIUM	\$363,538	\$290,014	\$21,714	\$51,810
AVERAGE PREMIUM	\$861	\$1,016	\$1,357	\$428
CRS Class				
09 Per Policy	\$37	\$51	\$68	\$0
Per Community	\$15,587	\$14,501	\$1,086	\$0
08 Per Policy	\$71	\$102	\$68	\$0
Per Community	\$30,087	\$29,001	\$1,086	\$0
07 Per Policy	\$106	\$153	\$68	\$0
Per Community	\$44,588	\$43,502	\$1,086	\$0
06 Per Policy	\$143	\$204	\$136	\$0
Per Community	\$60,174	\$58,003	\$2,171	\$0
05 Per Policy	\$177	\$254	\$136	\$0
Per Community	\$74,675	\$72,603	\$2,171	\$0
04 Per Policy	\$211	\$305	\$136	\$0
Per Community	\$80,175	\$87,004	\$2,171	\$0
03 Per Policy	\$246	\$356	\$136	\$0
Per Community	\$103,676	\$101,505	\$2,171	\$0
02 Per Policy	\$280	\$407	\$136	\$0
Per Community	\$118,177	\$116,005	\$2,171	\$0
01 Per Policy	\$314	\$468	\$136	\$0
Per Community	\$132,677	\$130,506	\$2,171	\$0

* SFHA (Zones A, AE, A1-A30, V, V1-V30, AO, and AH). Discount varies depending on class.
 ** SFHA (Zones A99, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, and AR/AO): 10% discount for Classes 1-6; 5% discount for Classes 7-9.
 *** Preferred Risk Policies are not eligible for CRS Premium Discounts.



ONANCOCK

CRS What-If

Application: CRS Class: ZIP: Active Policy: Comments: What: ID:

Community: ONANCOCK, TOWN OF State: VIRGINIA
 County: ACCOMACK COUNTY CID: 510258

Current CRS Class = 10 [Printable Version]

	TOTAL	SFHA *	X-STD/AR/A99 **	PRP ***
PIF	23	3	0	20
PREMIUM	\$13,979	\$5,609	\$0	\$8,170
AVERAGE PREMIUM	\$608	\$1,936	\$0	\$408
CRS Class				
09 Per Policy	\$13	\$97	\$0	\$0
Per Community	\$280	\$290	\$0	\$0
08 Per Policy	\$25	\$194	\$0	\$0
Per Community	\$581	\$581	\$0	\$0
07 Per Policy	\$38	\$290	\$0	\$0
Per Community	\$871	\$871	\$0	\$0
06 Per Policy	\$51	\$387	\$0	\$0
Per Community	\$1,162	\$1,162	\$0	\$0
05 Per Policy	\$63	\$484	\$0	\$0
Per Community	\$1,452	\$1,452	\$0	\$0
04 Per Policy	\$76	\$581	\$0	\$0
Per Community	\$1,743	\$1,743	\$0	\$0
03 Per Policy	\$88	\$678	\$0	\$0
Per Community	\$2,033	\$2,033	\$0	\$0
02 Per Policy	\$101	\$775	\$0	\$0
Per Community	\$2,324	\$2,324	\$0	\$0
01 Per Policy	\$114	\$871	\$0	\$0
Per Community	\$2,614	\$2,614	\$0	\$0

* SFHA (Zones A, AE, A1-A30, V, V1-V30, AO, and AH). Discount varies depending on class.
 ** SFHA (Zones A99, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, and AR/AO): 10% discount for Classes 1-6; 5% discount for Classes 7-9.
 *** Preferred Risk Policies are not eligible for CRS Premium Discounts.



Accomack – Northampton Coastal Resources Technical Assistance Program

SAXIS

CRS What-If

Application: CRIS Class: ZIP Code: Activity Period: Coverage: Comments: What? CRIS

Community: SAXIS, TOWN OF State: VIRGINIA
County: ACCOMACK COUNTY CID: 510003

Current CRS Class = 10 [Printable Version]

	TOTAL	SFHA *	X-STD/AR/A99 **	PRP ***
PIF	50	46	1	3
PREMIUM	\$42,668	\$39,332	\$2,229	\$1,006
AVERAGE PREMIUM	\$651	\$655	\$2,229	\$335
CRS Class				
09 Per Policy	\$42	\$43	\$111	\$0
09 Per Community	\$2,078	\$1,367	\$111	\$0
08 Per Policy	\$81	\$86	\$111	\$0
08 Per Community	\$4,045	\$3,933	\$111	\$0
07 Per Policy	\$120	\$128	\$111	\$0
07 Per Community	\$6,011	\$5,900	\$111	\$0
06 Per Policy	\$162	\$171	\$223	\$0
06 Per Community	\$8,089	\$7,966	\$223	\$0
05 Per Policy	\$201	\$214	\$223	\$0
05 Per Community	\$10,056	\$9,833	\$223	\$0
04 Per Policy	\$240	\$257	\$223	\$0
04 Per Community	\$12,022	\$11,900	\$223	\$0
03 Per Policy	\$280	\$299	\$223	\$0
03 Per Community	\$13,989	\$13,766	\$223	\$0
02 Per Policy	\$319	\$342	\$223	\$0
02 Per Community	\$15,956	\$15,733	\$223	\$0
01 Per Policy	\$358	\$385	\$223	\$0
01 Per Community	\$17,922	\$17,699	\$223	\$0

- * SFHA (Zones A, AE, A1-A30, V, V1-V30, AO, and AH): Discount varies depending on class.
- ** SFHA (Zones A99, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, and AR/AC): 10% discount for Classes 1-6; 5% discount for Classes 7-9.
- *** Preferred Risk Policies are not eligible for CRS Premium Discounts.



TANGIER

CRS What-If

Application: CRIS Class: ZIP Code: Activity Period: Coverage: Comments: What? CRIS

Community: TANGIER, TOWN OF State: VIRGINIA
County: ACCOMACK COUNTY CID: 510004

Current CRS Class = 10 [Printable Version]

	TOTAL	SFHA *	X-STD/AR/A99 **	PRP ***
PIF	81	69	11	1
PREMIUM	\$57,996	\$47,859	\$9,791	\$346
AVERAGE PREMIUM	\$716	\$694	\$890	\$346
CRS Class				
09 Per Policy	\$36	\$35	\$45	\$0
09 Per Community	\$2,883	\$2,893	\$490	\$0
08 Per Policy	\$69	\$69	\$45	\$0
08 Per Community	\$5,275	\$4,796	\$490	\$0
07 Per Policy	\$96	\$104	\$45	\$0
07 Per Community	\$7,688	\$7,179	\$490	\$0
06 Per Policy	\$130	\$139	\$89	\$0
06 Per Community	\$10,551	\$9,572	\$979	\$0
05 Per Policy	\$160	\$173	\$89	\$0
05 Per Community	\$12,944	\$11,965	\$979	\$0
04 Per Policy	\$189	\$208	\$89	\$0
04 Per Community	\$15,337	\$14,358	\$979	\$0
03 Per Policy	\$219	\$243	\$89	\$0
03 Per Community	\$17,730	\$16,751	\$979	\$0
02 Per Policy	\$248	\$277	\$89	\$0
02 Per Community	\$20,123	\$19,144	\$979	\$0
01 Per Policy	\$278	\$312	\$89	\$0
01 Per Community	\$22,516	\$21,537	\$979	\$0

- * SFHA (Zones A, AE, A1-A30, V, V1-V30, AO, and AH): Discount varies depending on class.
- ** SFHA (Zones A99, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, and AR/AC): 10% discount for Classes 1-6; 5% discount for Classes 7-9.
- *** Preferred Risk Policies are not eligible for CRS Premium Discounts.



WACHAPREAGUE

CRS What-If

Application: _____ CRS Code: _____ ZIP Code: _____ Active Date: _____ Coverage: _____ Comments: _____ User: _____ CIA: _____

Community: WACHAPREAGUE, TOWN OF State: VIRGINIA
 County: ACCOMACK COUNTY CID: 510005

[Printable Version]

		TOTAL	SFHA *	X-STD/AR/A99 **	PRP ***
PIF		107	101	1	5
PREMIUM		\$126,692	\$123,510	\$1,066	\$2,116
AVERAGE PREMIUM		\$1,184	\$1,223	\$1,066	\$423
CRS Class					
09	Per Policy	\$61	\$64	\$56	\$0
	Per Community	\$6,557	\$6,501	\$56	\$0
08	Per Policy	\$122	\$129	\$56	\$0
	Per Community	\$13,057	\$13,001	\$56	\$0
07	Per Policy	\$183	\$183	\$56	\$0
	Per Community	\$19,558	\$19,502	\$56	\$0
06	Per Policy	\$244	\$257	\$112	\$0
	Per Community	\$26,114	\$26,002	\$112	\$0
05	Per Policy	\$305	\$322	\$112	\$0
	Per Community	\$32,615	\$32,503	\$112	\$0
04	Per Policy	\$366	\$366	\$112	\$0
	Per Community	\$39,115	\$39,003	\$112	\$0
03	Per Policy	\$426	\$451	\$112	\$0
	Per Community	\$45,616	\$45,504	\$112	\$0
02	Per Policy	\$487	\$515	\$112	\$0
	Per Community	\$52,116	\$52,004	\$112	\$0
01	Per Policy	\$548	\$579	\$112	\$0
	Per Community	\$58,617	\$58,505	\$112	\$0

* SFHA (Zones A, AE, A1-A30, V, V1-V30, AO, and AH): Discount varies depending on class.
 ** SFHA (Zones A99, AR, AR/A, AR/AE, AR/A1-A30, AR/AH, and AR/AO): 10% discount for Classes 1-6; 5% discount for Classes 7-9.
 *** Preferred Risk Policies are not eligible for CRS Premium Discounts.



CRS RESOURCES

- [Web training: crsresources.org](http://crsresources.org)
 - (webinars, online materials, helpful resources, etc.)
- [In-person training at FEMA's Emergency Management Institute](#)
- Learn from others: Coastal Virginia CRS Working Group
 - Contact shannon.hulst@wetlandswatch.org for more
- Self-guided ([Manual](#) review)
- FEMA Region III CRS Coordinator: Mari Radford, mari.radford@fema.dhs.gov
- Virginia's ISO Specialist: Christina Groves, christina.groves@verisk.com



CO-BENEFITS REPORT



CO-BENEFITS REPORT

- Opportunity to use incentives of CRS to drive sea level rise adaptation
- Public wants better CRS rating in response to rising flood insurance rates
- Lots of co-benefits: e.g. open space protection can be used for
 - Stormwater management
 - Green infrastructure
 - Meeting TMDL goals
 - Reducing flood risk
 - Public access
 - Recreational value, etc.



CO-BENEFITS REPORT

- Reviews common activities and programs local governments likely enforce/implement
- Reviews CRS credit opportunities for each activity, basic CRS requirements, co-benefits
- NOT intended to replace *CRS Coordinator's Manual* – to be used in tandem
- Some reviewed activities do not earn much (or any) credit, but we thought they would be of interest (e.g. CBPAs, Dunes and Beaches Act)



TOPICS COVERED

- Land Use Planning
- Locality Geographic Information Systems
- Floodplain Protection Programs
- Stormwater Management
- Community Engagement
- Building Codes and Structural Mitigation
- Emergency Management



TOPIC EXAMPLES

- Comprehensive Plans
- Chesapeake Bay Preservation Areas
- Common GIS Data Layers
- Land Preservation Tax Credits
- Wetland Protection/Mitigation Banks
- Beaches, Dunes, and Erosion
- High Water Mark Initiatives
- Individual Building Mitigation
- Natural Stormwater Solutions
- Hazard Mitigation Plans

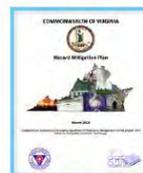


HAZARD MITIGATION PLANNING



BASIC CRS CREDIT FOR HAZARD MITIGATION PLANS

- Activity 510a, Floodplain Management Planning (FMP), *CRS Manual* p. 510-4
- Up to 382 points
- 10 steps laid out in *CRS Manual*
- Public involvement strongly encouraged & eligible for 120 points
- Plan must be adopted by locality governing body
- Plans must be evaluated annually; evaluation form must be submitted with annual CRS recertification
- Background information and recommendations must be updated every 5 years by October 1



CRS FLOODPLAIN MANAGEMENT PLANNING STEPS

1. Organize to prepare the plan (create a committee)
- ★ 2. Involve the public (part of step 1 or separate)
3. Coordinate (existing plans, other agencies)
4. Assess the hazard (specific and detailed discussion of local flood hazard, including repetitive loss areas and general mapping)
5. Assess the problem (what is at risk, including repetitive loss areas)

At least one rep from each locality must attend ALL meetings



CRS FLOODPLAIN MANAGEMENT PLANNING STEPS

6. Set goals (address all flood-related hazards)
7. Review possible activities (review wide range of activities; include discussion)
8. Draft an action plan (select appropriate activities)
9. Adopt the plan (all locality governing bodies)
10. Implement, evaluate, and revise ★



DMA REQUIREMENTS VS. CRS REQUIREMENTS

CRS Floodplain Management Plan Requirements	Federal Multi-Hazard Mitigation Requirements	Federal Multi-Hazard Mitigation References	Maximum CRS Points
Step 1. Organize	Task 1: Determine the Planning Area and Resources & Task 2: built the Planning Team	44 C.F.R. §201.6(c)(1)	15
Step 2. Involve the Public	Task 3: Create an Outreach Strategy	44 C.F.R. §201.6(b)(1)	120
Step 3. Coordinate	Task 4: Review Community Capabilities	44 C.F.R. §201.6(b)(2) & (3)	35
Step 4. Assess the Hazard	Task 5: Conduct a Risk Assessment	44 C.F.R. §201.6(c)(2)(i), (ii) & (iii)	35
Step 5. Assess the Problem			52
Step 6. Set Goals	Task 6: Develop a Mitigation Strategy	44 C.F.R. §201.6(c)(3)(i), (ii), & (iii)	2
Step 7. Review Possible Activities			35
Step 8. Draft an Action Plan			60
Step 9. Adopt the Plan	Task 8: Review and Adopt the Plan	44 C.F.R. §201.6(c)(5)	2
Step 10. Implement, Evaluate, Revise	Task 7: Keep the Plan Current & Task 9: Create a Safe and Resilient Community	44 C.F.R. §201.6(c)(4)	26
TOTAL			382



HAZARD MITIGATION TIPS & RECOMMENDATIONS

- Follow *CRS Manual* to ensure all criteria are met
- **Do not skip steps** in *CRS Manual*
 - Skip one step: locality only gets 50 points, maximum
 - Skip two steps: locality gets **no credit**
 - Steps 3 and 5 often skipped
- Documentation/discussion of **all steps except steps 3 and 9** must be in plan document (3 and 9 may be in separate memo)
- At least one representative from each locality must be at **EVERY** meeting (no credit otherwise)
- Use plan to encourage additional credit-earning activities such as higher standards (Section 430) & prioritizing floodplains for open space preservation (Section 420)



REPETITIVE LOSS DEFINITION

Repetitive Loss Properties:

Properties with 2+ claims of more than \$1,000 paid by the NFIP within any 10-year period since 1978

Example: Property with two claims during the periods 1978–1987 and 1979–1988
(*CRS Manual* p. 500-3)



Source: www.nasa.gov



Source: www.vims.edu



REPETITIVE LOSS CATEGORIES

- Accomack: Category C
- Cape Charles: Category A
- Chincoteague: Category B
- Northampton: Category B (almost C)
- Onancock: Category A
- Saxis: Category A
- Tangier: Category C
- Wachapreague: Category B
- Not listed: Check with DCR



Source: <http://www.erh.noaa.gov>



REPETITIVE LOSS REQUIREMENTS

- **Category A** (No repetitive loss properties)
 - Submit information as needed to update RL list
- **Category B** (1 – 9 repetitive loss properties)
 - Prepare map of RL areas
 - Review and describe RL problem
 - Create list of addresses of all properties with insurable buildings in RL areas
 - Undertake annual outreach project to that area
- **Category C** (10+ repetitive loss properties)
 - All of the above
 - Prepare plan or repetitive loss area analysis



REPETITIVE LOSS ANALYSIS: REQUIRED FOR CAT. C

- Activity 510b, Repetitive Loss Area Analysis (RLAA), *CRS Manual* p. 510-29
- Up to 140 points
- Can be part of hazard mitigation plan
- Repetitive flood area must be mapped
- 5 steps laid out in the *CRS Manual* must be followed
- Analysis must be adopted by the locality and made available to the media
- Plans must be evaluated annually; evaluation form must be submitted with annual CRS recertification
- Analysis must be updated before each cycle verification visit

PRIVACY
PROTECTION IS
CRITICAL!



REPETITIVE LOSS AREA ANALYSIS STEPS

1. Advise Area property owners of analysis
2. Contact agencies with studies on causes or impacts of recurrent flooding
3. Collect data on each Area buildings
4. Review possible mitigation options
5. Document findings (separate analyses for each Area)



PROGRAM FOR PUBLIC INFORMATION: COMPOSITION

- **General**
 - At least 5 people
 - At least 1 locality floodplain management rep
 - At least 1 locality public information office rep (if applicable)
 - At least half of members from outside local government
 - Bonus points for insurance and bank reps
- **Multi-jurisdictional**
 - At least 2 reps from each locality
 - At least half of reps from outside of local government
 - At least half of reps must attend all meetings (digital meetings are acceptable)



PPI STEPS

1. Establish PPI committee
2. Assess locality's public information needs
3. Formulate messages
4. Identify outreach projects to convey chosen messages
5. Examine other public information initiatives
6. Prepare PPI document
7. Implement, monitor, evaluate program



PPI TIPS & RECOMMENDATIONS

- When forming a hazard mitigation planning committee, follow the criteria for PPI composition to use for both purposes
- Be sure to include existing outreach activities
- Depending on the topics covered by a PPI, credit can also be earned for information provided to the public relating to the following activities:
 - Activity 340 (Hazard Disclosure)
 - Activity 350 (Flood Protection Information)
 - Activity 360 (Flood Protection Assistance)
 - Activity 420 (Open Space Preservation)
 - Activity 540 (Drainage System Maintenance)



QUESTIONS?



Shannon Hulst Jarbeau, CFM
Shannon.hulst@wetlandswatch.org

Mary-Carson Stiff, JD, CFM
mc.stiff@wetlandswatch.org



Appendix I
Northern Eastern Shore Community Rating System
Workshop

Appendix K

Ground Water Presentation at the Eastern Shore Master Gardener's Training

Accomack - Northampton Coastal Resources Technical Assistance Program

2015 MG Trainee Class

Sign in sheet

3-25-15

DATE

	PRINT NAME	SIGN NAME
1	Jennifer Alley	Jennifer Alley
2	DENNIS RENO	Dennis Reno
3	JIM WEBER	Jim Weber
4	PHIL GOETKIN	Phil Goetkin
5	DIANE D'AMICO	Diane D'Amico
6	Paul Tiffany	Paul Tiffany
7	Kurt Melton	Kurt Melton
8	SUSANNE GRIZZARD	Susanne Grizzard
9	Mary Klein	Mary Klein
10	Carol Selby	Carol Selby
11	Goldie Delcambre	Goldie Delcambre
12	John White	John White
13	Doris Gebel	Doris Gebel
14	Paul Gebel	Paul Gebel
15	Roland Ratcliffe	Roland Ratcliffe
16	Kim Fehrer	Kim Fehrer
17	Mary Nina M. Trower	Mary Nina M. Trower
18	LISA Benton Madeline Donnell	Lisa Benton Madeline Donnell



Eastern Shore Master Gardeners

Overview of Ground Water on the Eastern Shore

Curt Smith
Director of Planning
Accomack-Northampton Planning District Commission
March 25, 2015



A-NPDC Overview and Purpose



- Commonwealth created 21 PDCs in 1970 to address regional issues by fostering cooperation amongst localities and cooperation between state & localities
- Accomack-Northampton District:
 - Members: 2 Counties and Town of Chincoteague
 - Also provides services to 18 other towns
- Affiliate Organizations:
 - A-N Regional Housing Authority → provides privately or authority-owned rental housing
 - ESV Housing Alliance → improving housing for homeowners
 - A-NPDC →
 - Community Development
 - Economic Development
 - Transportation Planning
 - Environmental Planning → **Ground Water Committee**; Climate Adaptation Working Group

Presentation Overview

1. Geologic/Hydrogeologic Framework Evolution
2. Ground Water Conditions
3. Ground Water Use
4. Threats to Ground Water Quality
5. Ground Water Management and Water Supply Planning

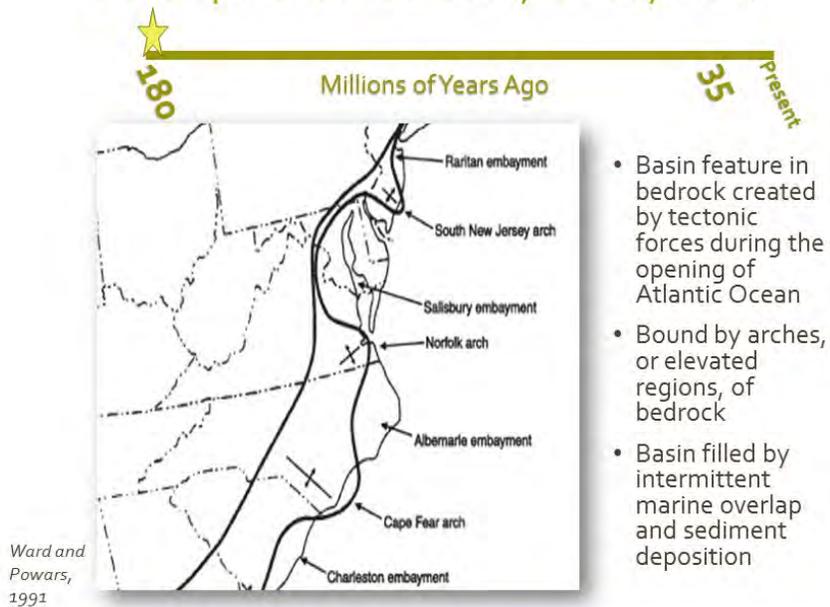
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Geologic/Hydrogeologic Framework Evolution

- Timeline:
 - i. Opening of Atlantic Ocean & Salisbury Embayment – **≈180 Million Years Ago (MYA)**
 - ii. Filling of Salisbury Embayment (Potomac Formation) – **≈180 to 35.5 MYA**
 - iii. Bolide impact & removal of pre-impact sediments – **≈35.5 MYA**
 - iv. Deposition of post-impact sediments – **≈35.5 MYA – Present**
 - v. Reworking of surficial sediments & progradation of peninsula – **≈200,000 YA – Present**
 - vi. Sea level reaches elevation of modern Chesapeake Bay transitioning system from riverine to estuarine - **≈8,000 YA**
 - vii. Sea level continues to rise and inundate the Chesapeake Bay watershed and the Chesapeake Bay begins to take its modern appearance we currently recognize - **≈3,000 YA**

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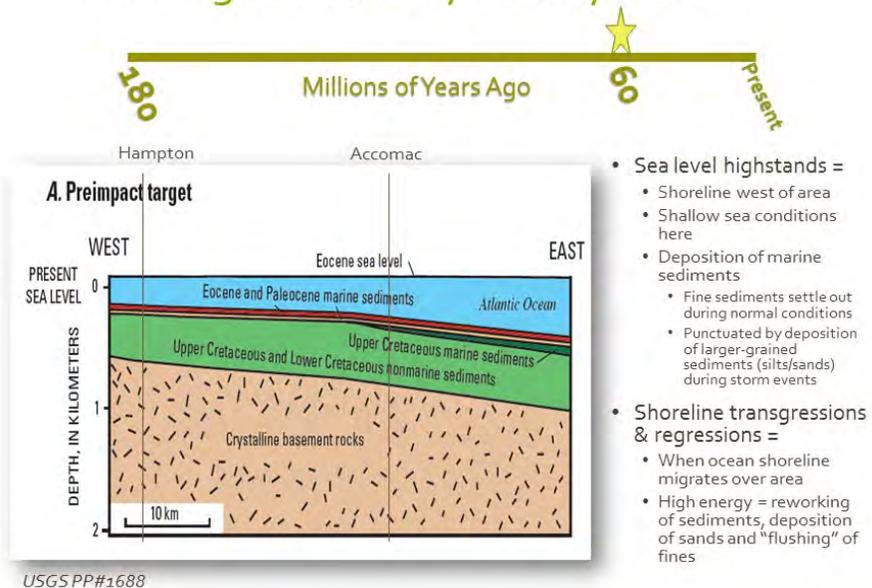
Development of Salisbury Embayment



Opening of Atlantic Ocean

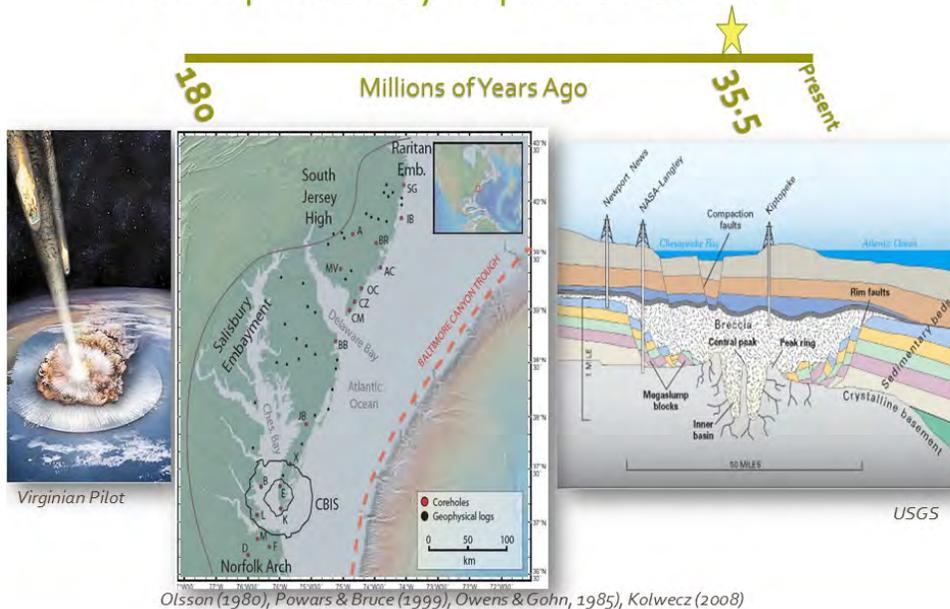


In-Filling of Salisbury Embayment

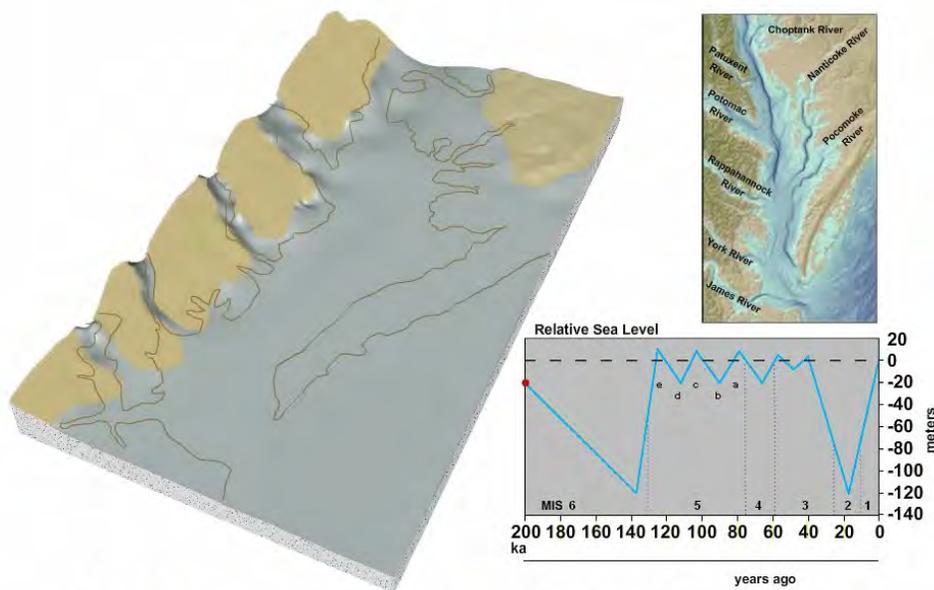


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Chesapeake Bay Impact Structure



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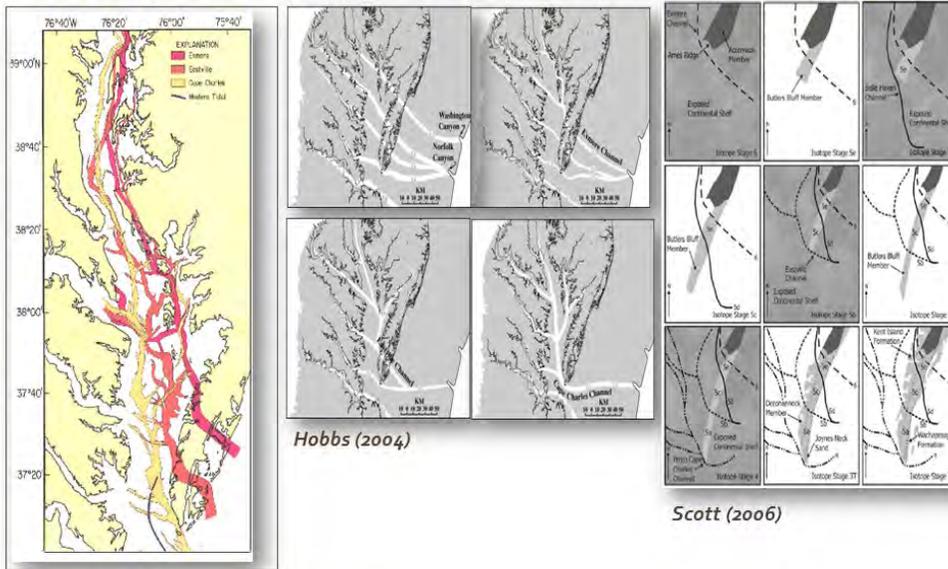


USGS Chesapeake Bay Evolution Animation

(Bratton et. al, 2009)

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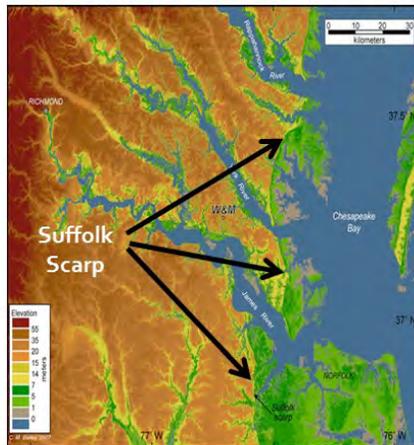
Development of Eastern Shore & Chesapeake Bay



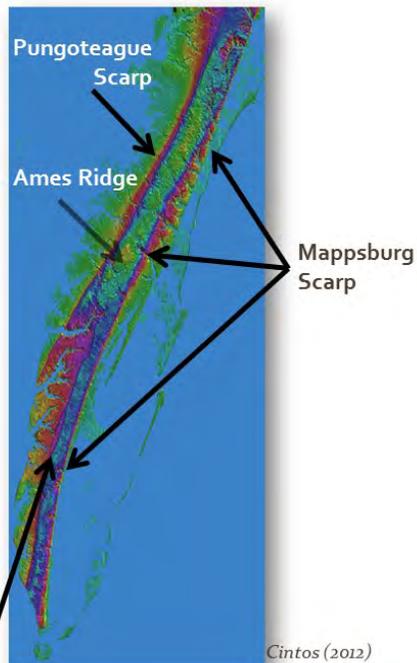
Colman et al
(1990)

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Surficial Features: Relict Shorelines



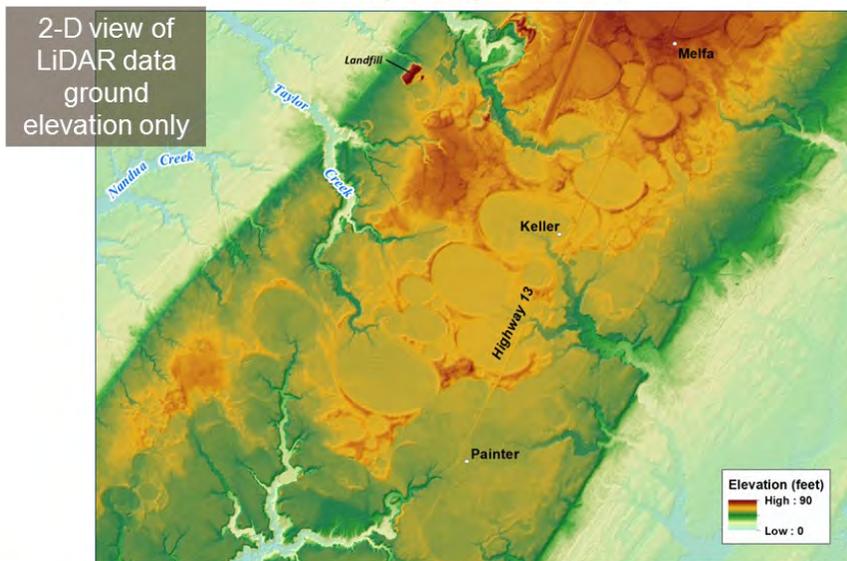
Bailey (2009)



Cintos (2012)

Accomack-Northampton Planning District Commission

South-Central Accomack County (Melfa, Keller, & Painter)



The Nature Conservancy (2011)

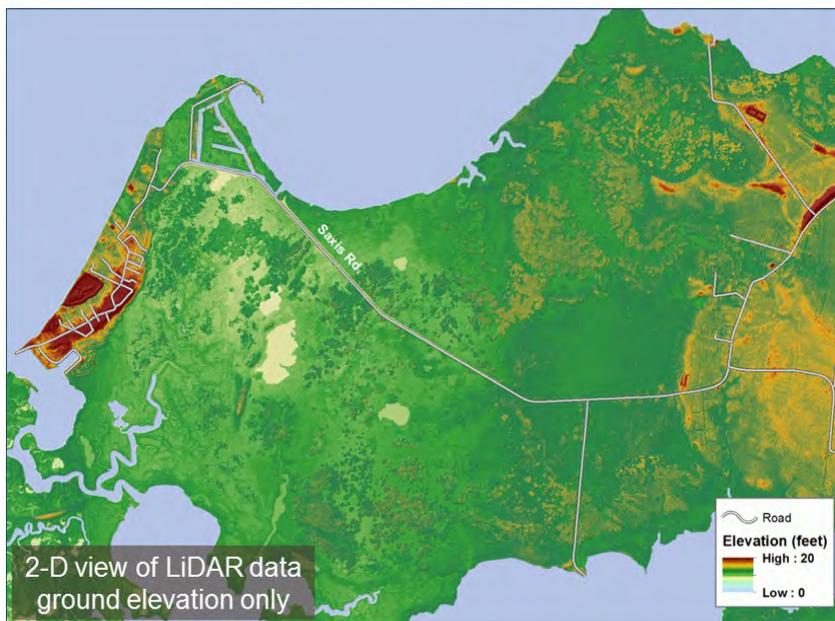
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Chincoteague



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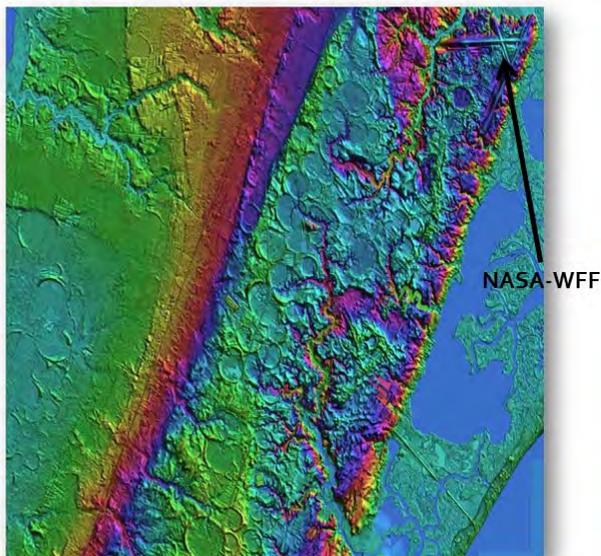
Saxis/Sanford



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Surficial Features: Carolina Bays

- Over 700 shallow, elliptical depressions
 - Similar orientation (NW-SE)
 - Variable size (1 – 1,000 acres)
 - Some overlapping
 - Coarse-grained rims
 - Fine-grained floors
- Variable ages (100,000-<5,000 years)
- Debated origin
 - Wind & Water
 - Shock wave from bolide explosion

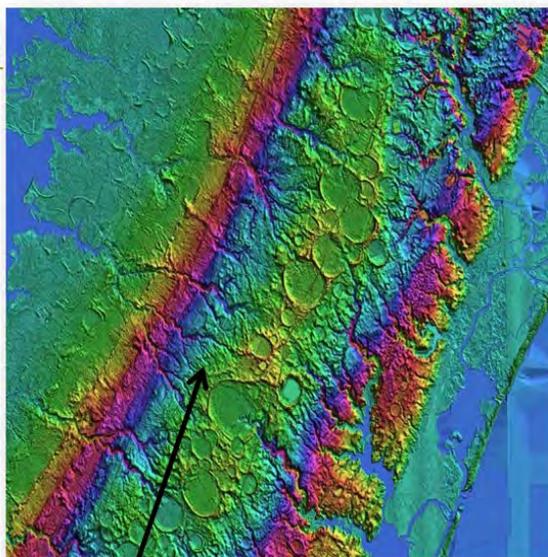


Cintos (2012)

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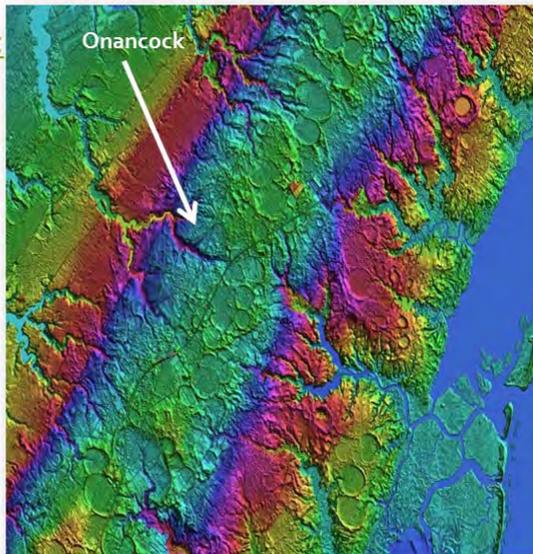


Parksley

Cintos (2012)

Surficial Features: Carolina Bays

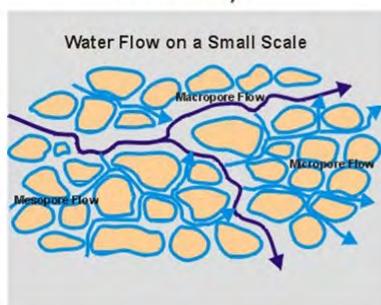
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- Debated origin
 - Wind & Water
 - Shock wave from bolide explosion



Cintos (2012)

Ground Water is not like an underground river!

- Groundwater flows through porous soils and sediment that includes gravels, sands, silts, and clay.



Soil/Sediment type determines if it can be used as a source of water

An Aquifer is a Source for Groundwater and is:

Any coarse grained material (sand, gravel) that can supply sufficient water for a beneficial use

A Confining Unit Impedes Movement of Groundwater and is:

Any fine grained material (silt, clay) that can significantly restrict vertical movement of groundwater such that the resulting groundwater is under pressure.

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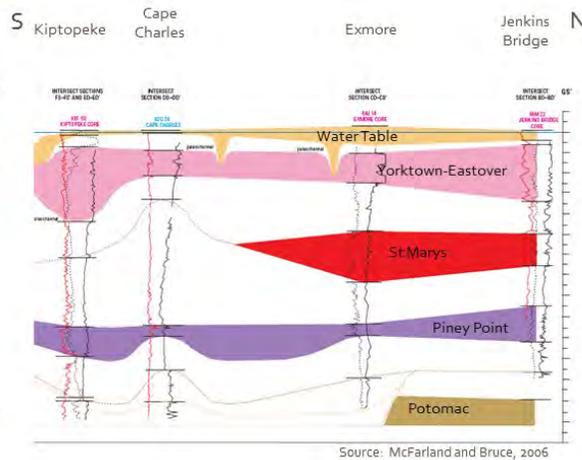
Aquifers are defined by where they appear relative to a confining layer

- Water Table
 - Water is not “under pressure”
 - Well yield is lower than comparable confined aquifers
 - Replenished (recharged) directly by precipitation
 - More vulnerable to contamination from surface activities
- Confined aquifer
 - Water is under pressure, confined by an overlying layer(s) of silt and clay
 - Replenished from vertical flow through the confining unit (recharge is much lower than a water table aquifer)
 - More vulnerable to saltwater intrusion

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All Groundwater Aquifers on the Eastern Shore

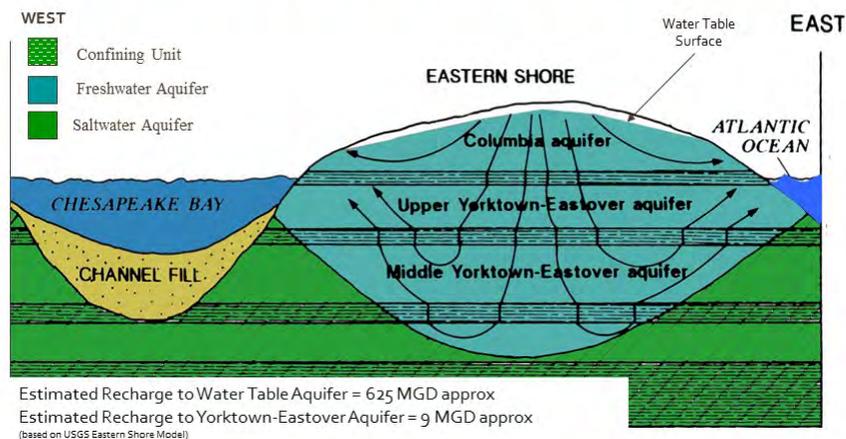
- Fresh Groundwater is restricted to the Columbia (Water Table) aquifer and significant portions of the Yorktown-Eastover aquifer
- Brackish groundwater is found in portions of the Yorktown-Eastover, all of the St. Marys Aquifer, Piney Point, and Potomac aquifers
- The Columbia, Yorktown-Eastover, and Piney Point aquifers are found throughout the Eastern Shore
- St. Marys and Potomac Aquifers are absent in the southern portion of the Shore



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Water Table and Fresh Water Confined Aquifers on the Eastern Shore

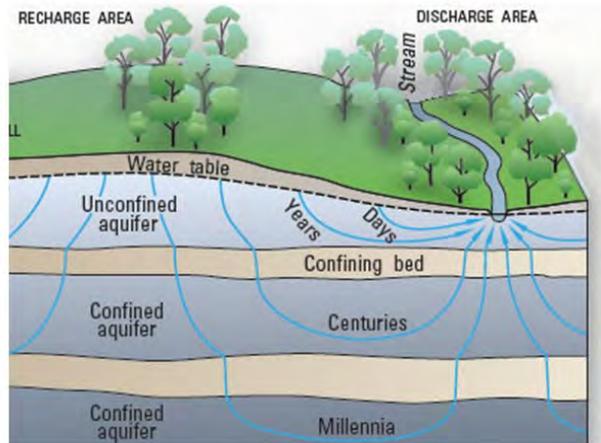
Fresh ground water is restricted to depths less than 350 feet



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Movement through the Groundwater System

- Horizontal flow typically toward a surface water body. Gradient is often low and the actual flow rate is low
- Vertical flow typically downward and very low



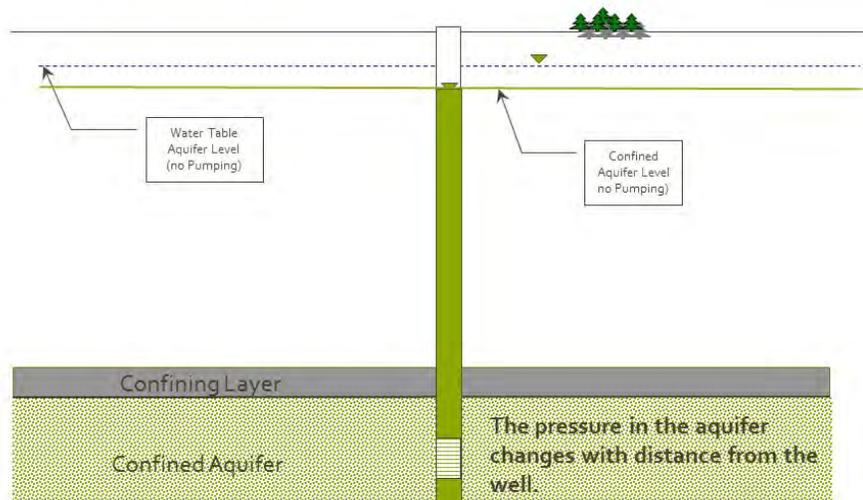
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Hydraulic Gradient Under Confined Pumping Conditions

- Horizontal flow may be re-oriented toward well. Gradient (flow rate) is often significantly increased
- Vertical flow remains downward but rate often significantly increased

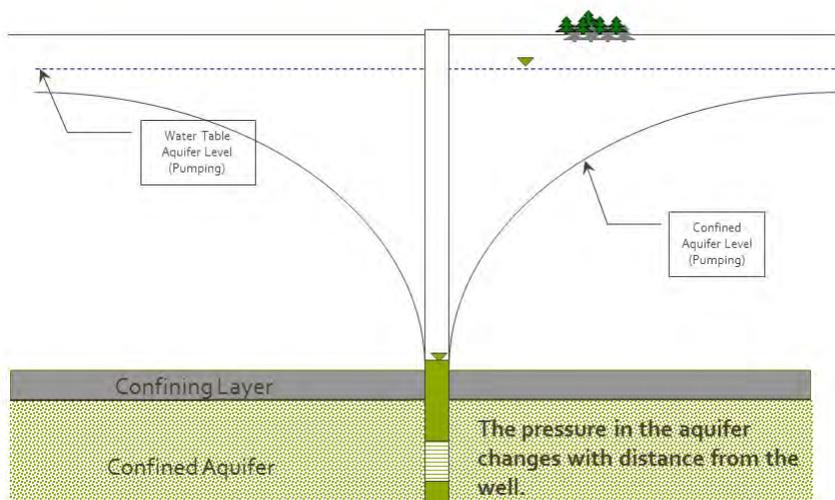
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Groundwater Levels under no Pumping



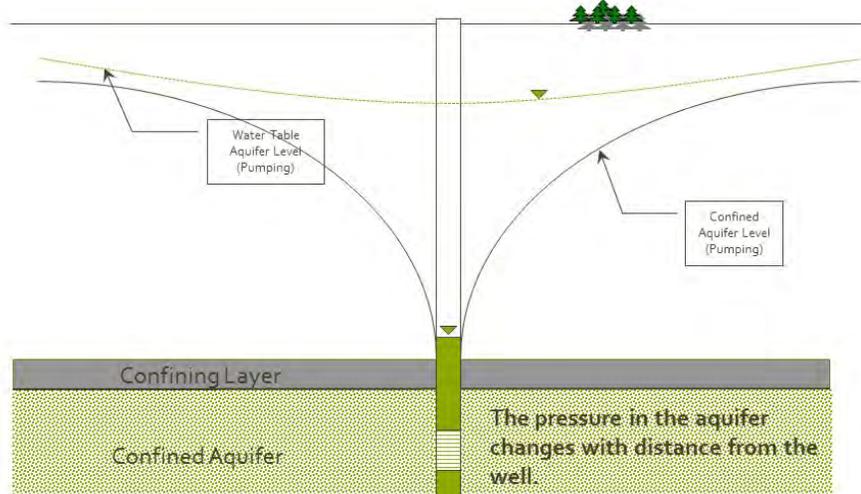
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Pumping from a confined aquifer with little leakage through the confining layer

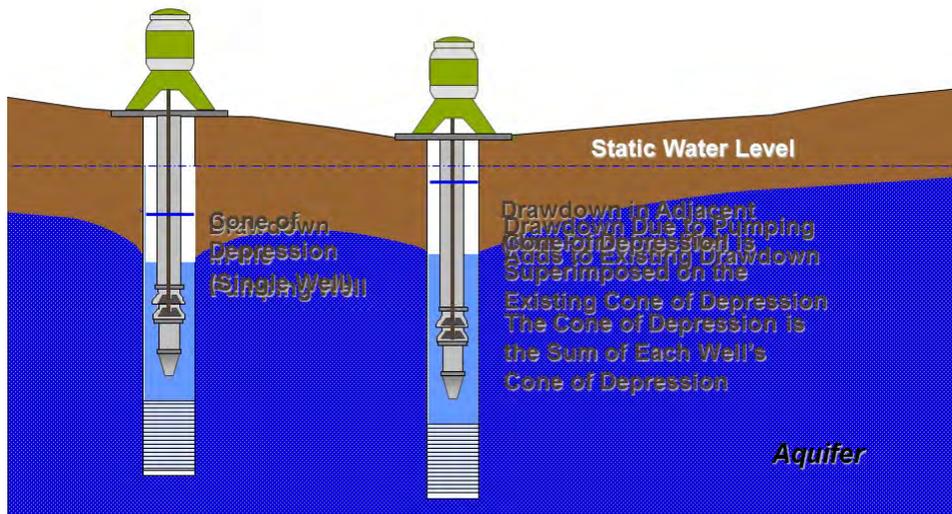


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Pumping from a confined aquifer with significant leakage through the confining layer

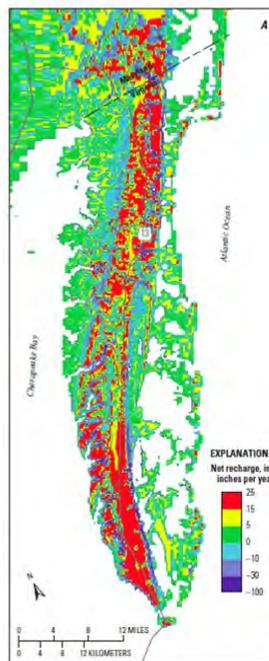
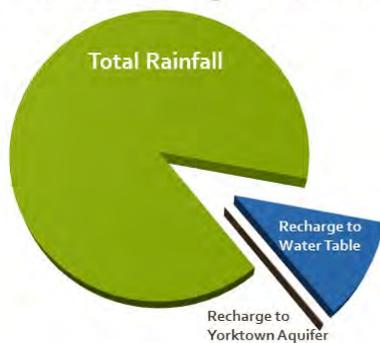


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How Much Water Recharges the Aquifers?

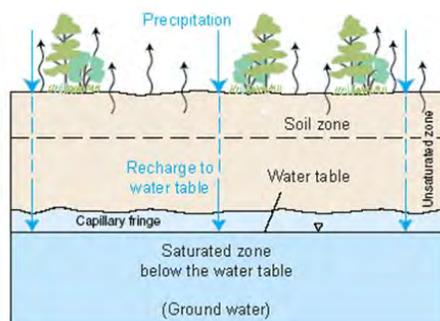
- All fresh water comes from precipitation falling directly on the Shore
- About 88% of the precipitation never infiltrates to the groundwater



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How Much Water Recharges the Aquifers?

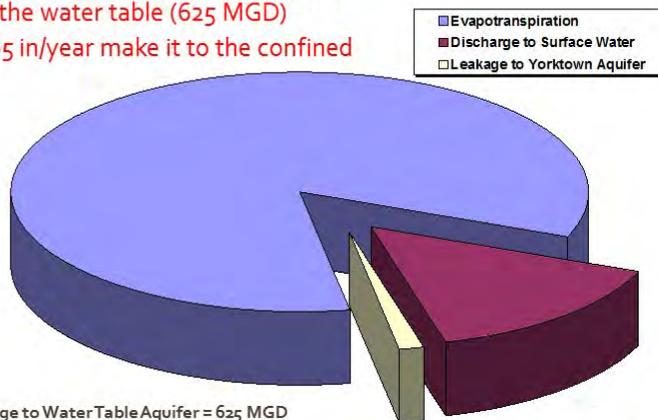
- Most of the rainfall never infiltrates to the groundwater and is lost through:
 - Evaporation
 - Interception (on plants and trees)
 - Direct runoff
 - Evapotranspiration



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Of the water infiltrating to the water table, only a small amount reaches the Yorktown aquifer

- Limited Recharge:
 - Of the 44-inches of annual precipitation only 5 to 6 inches infiltrate to the water table (625 MGD)
 - And only about 0.05 in/year make it to the confined aquifer (9 MGD)

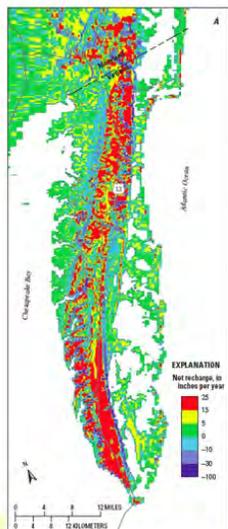


Total Estimated Recharge to Water Table Aquifer = 625 MGD

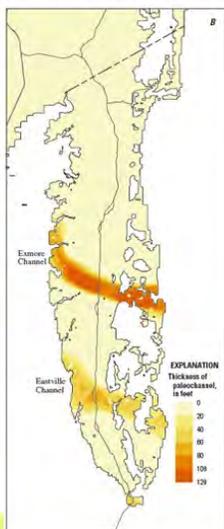
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Recharge amounts vary across the Shore

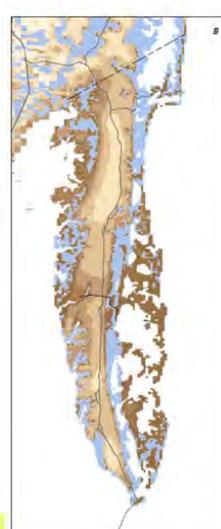
Recharge to Surficial Aq



Location of Paleochannels



Recharge to Y-E Aq

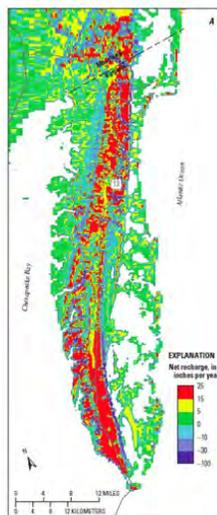


Recharge to the water table is a function of soil type, slope, and location

Potential Recharge areas (based on soil type and slope)



Estimated Recharge Rates



Source: USGS

Source: USGS

Accomack-Northampton Planning District Commission

Recharge to the Yorktown depends more on where pumping from the aquifer is occurring

Estimated in 1900 (pre-pumping)



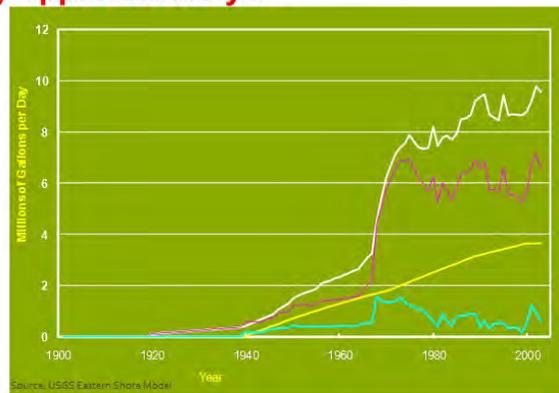
Estimated in 2003 (Effects of pumping)



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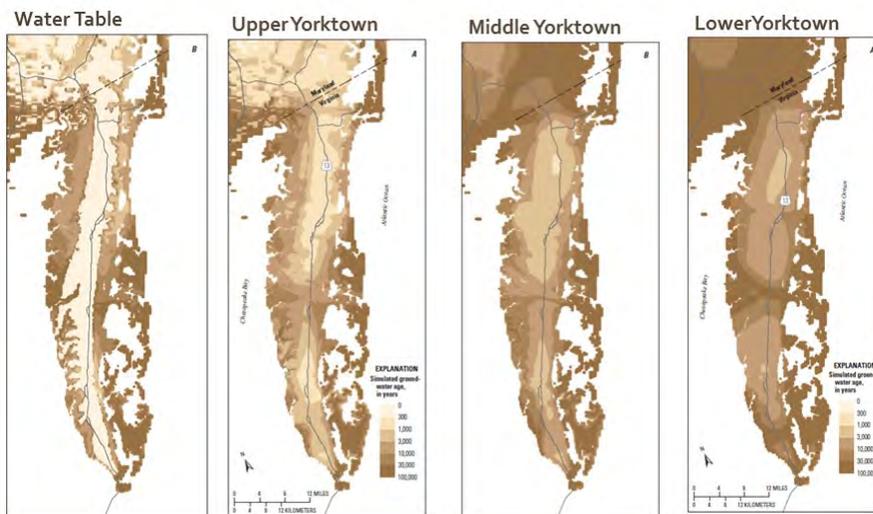
Recharge rate to the Yorktown has increased over time due to pumping

- **Current Yorktown-Eastover Aquifer use exceeds recharge by approximately 1 MGD**
- **Recharge will increase as use increases – but will NOT keep pace with pumping**



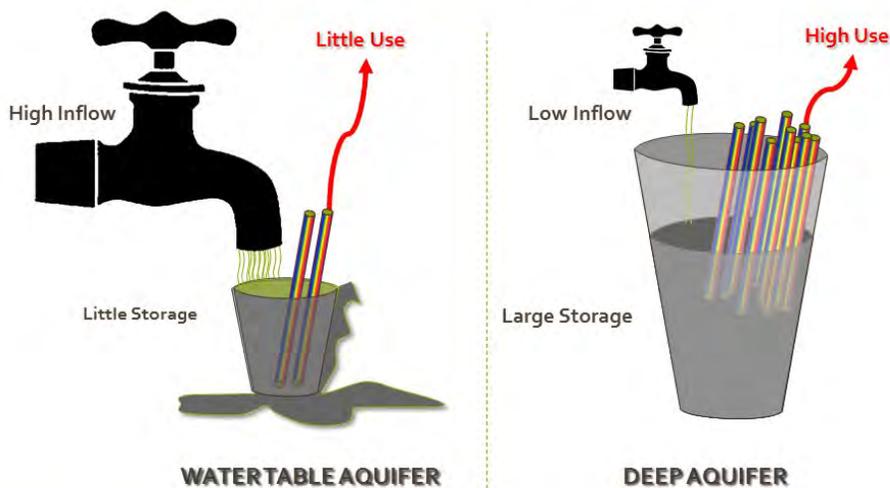
Accomack-Northampton Planning District Commission

Estimated Water Ages Reflect Recharge Rates



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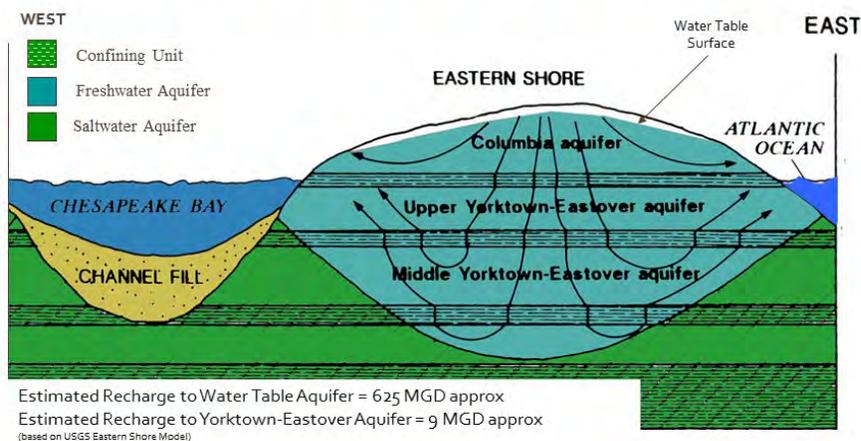
Water Table / Yorktown Dilemma



Accomack-Northampton Planning District Commission

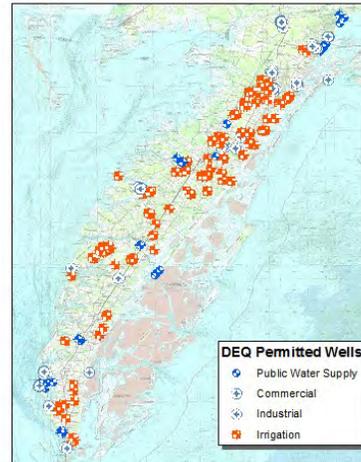
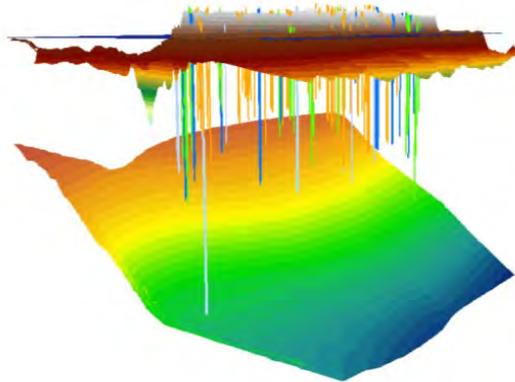
Ultimately the Balance of Recharge to Use Dictates Stability of the Fresh Water Lens

Fresh ground water is restricted to depths less than 350 feet



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Groundwater Use on the Eastern Shore



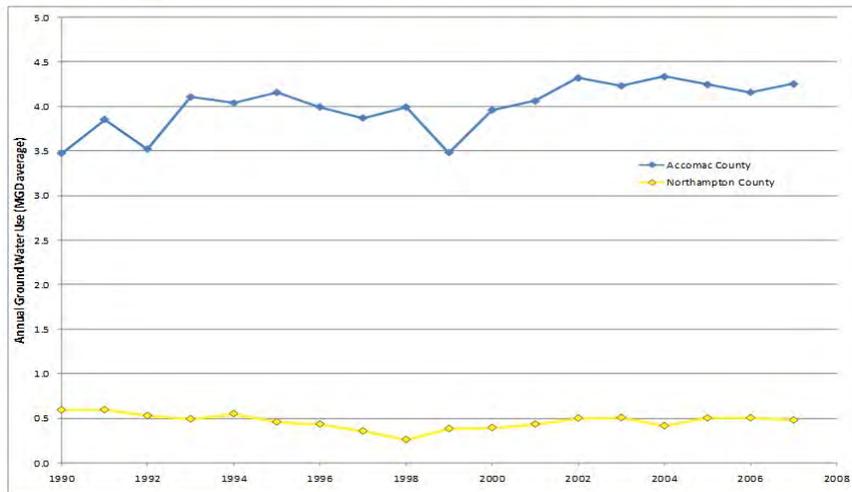
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Ground Water Use and Ground Water Level Measurements

- Ground Water Use for permitted wells (wells pumping greater than 300,000 gallons-per-month) are submitted to VDEQ
- Ground Water Levels are routinely measured in Observation Wells by the USGS

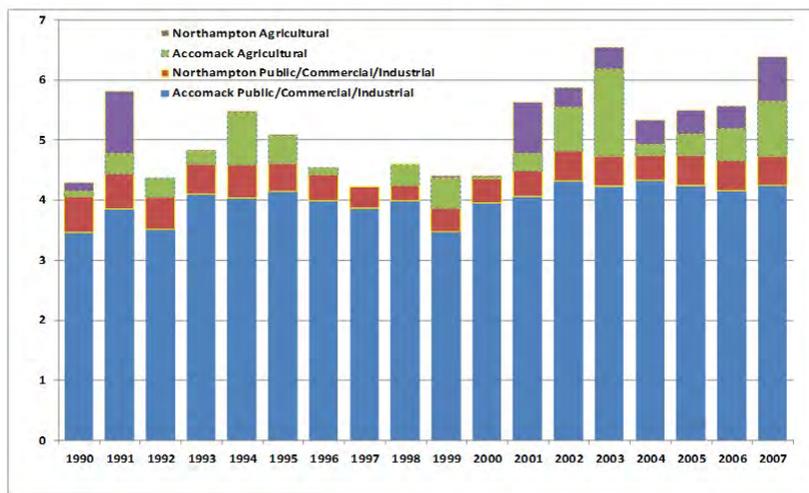
Accomack-Northampton Planning District Commission

Non-Agricultural Ground Water Use Trends



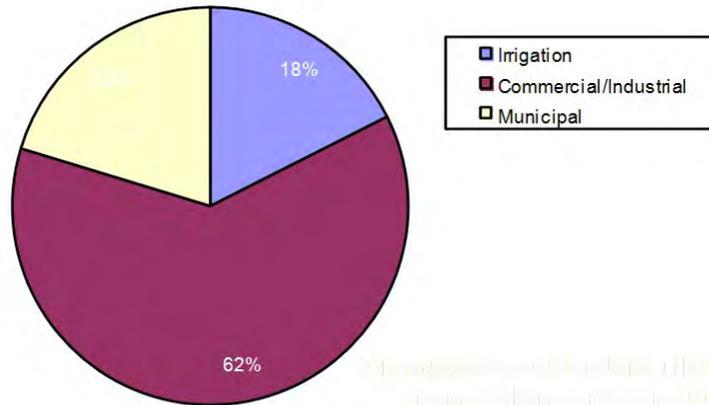
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All Permitted Ground Water Use



Accomack-Northampton Planning District Commission

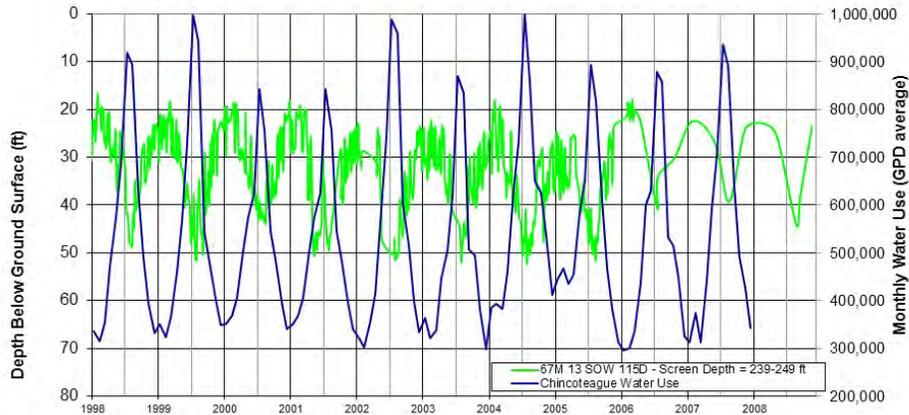
Types of Groundwater Use



Why Measure Ground Water Levels?

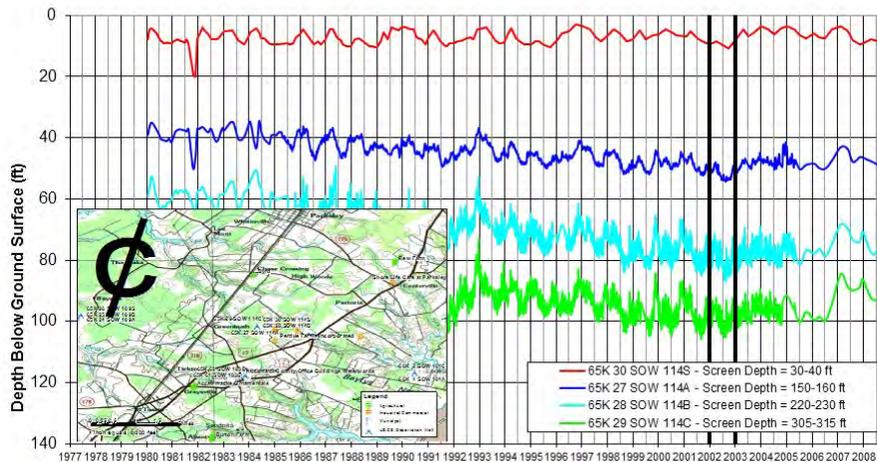
- Ground water use:
 - Lowers ground water levels, reducing available water to other ground water users
 - Reduces the size of the freshwater lens
- Impact of ground water use can be evaluated:
 - Indirectly using models
 - Measured directly from pumping wells and observation wells

Water Level Change and Monthly Use



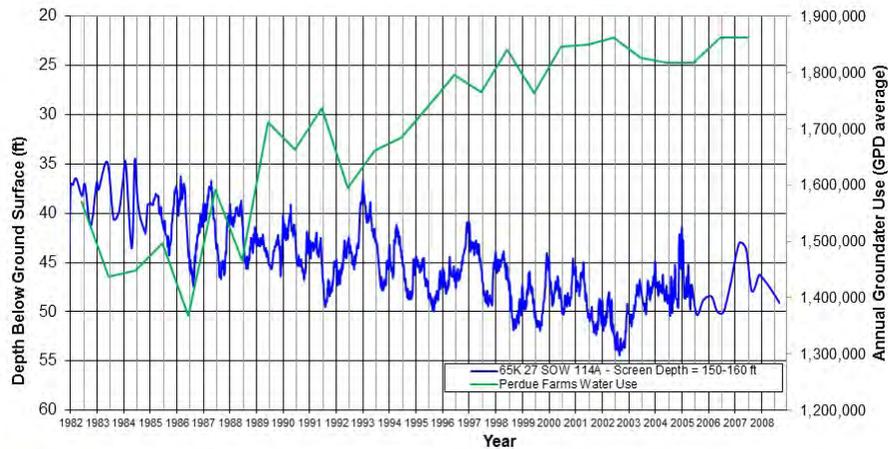
Accomack-Northampton Planning District Commission

Ground Water Levels Near Perdue Farms



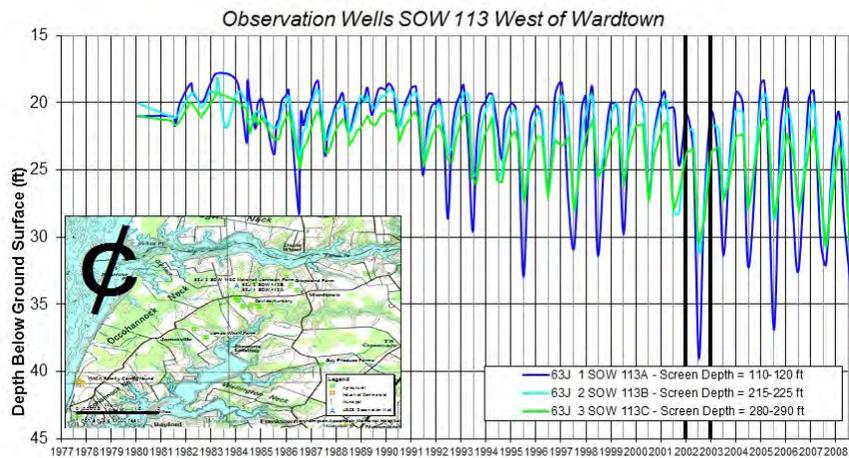
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Water Level Change and Annual Use Near Perdue Farms

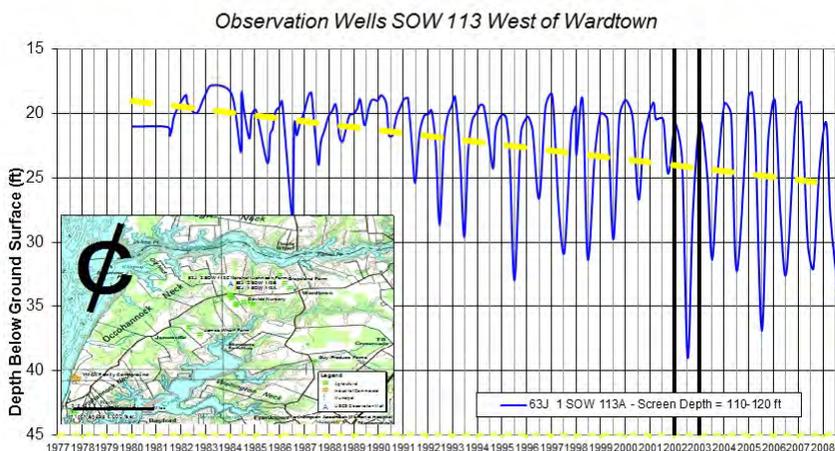


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Effect of Irrigation Use

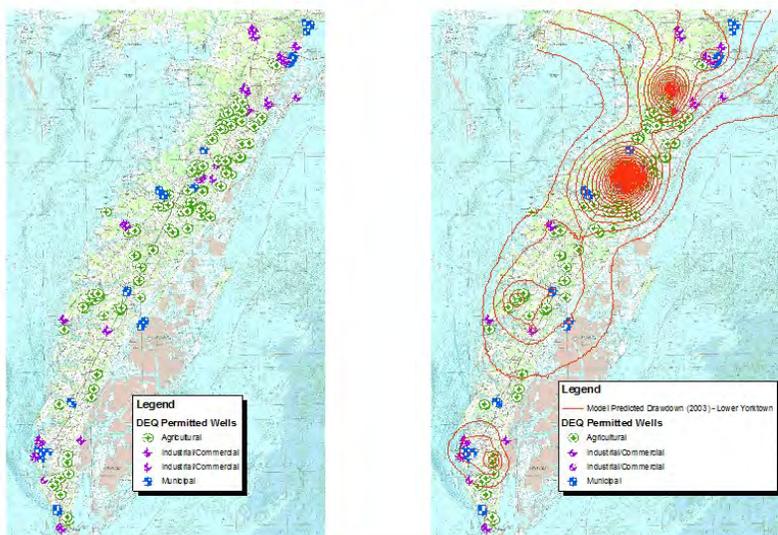


Long Term Decline from Irrigation Use



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Amount of water level decline in the Lower Yorktown Aquifer



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Threats to Ground Water Quality & Quantity on the Eastern Shore

- Water Table Aq.
 - Quality → Surface Activities
 - Quantity → Drought
- Confined Aq.
 - Quality → Over-pumping
 - Quantity → Over-pumping

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Potential Threats To Water Table Water Quality

Sources:

Agriculture / Livestock

- Nutrients (Fertilizers)
- Pesticides / Herbicides
- On-site waste disposal

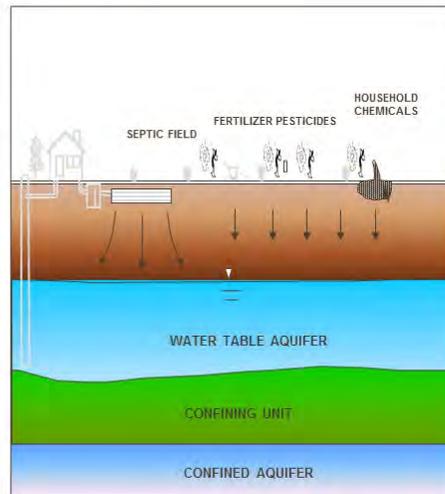
Waste Units

- *Septic Systems / Drain Fields*
- Public Sewers
- Underground Storage Tanks (USTs)

Residential

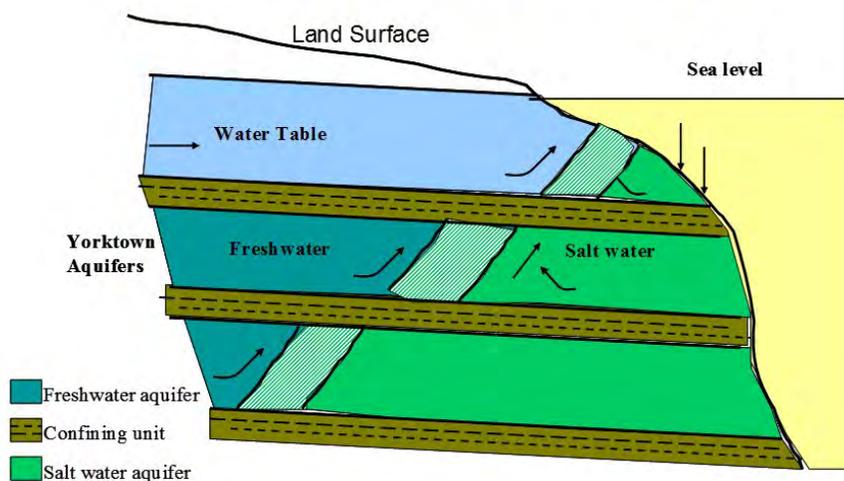
- *Nutrients / Pesticides - Herbicides*
- *Petroleum and solvents*

Function of amount (loading) and area of application



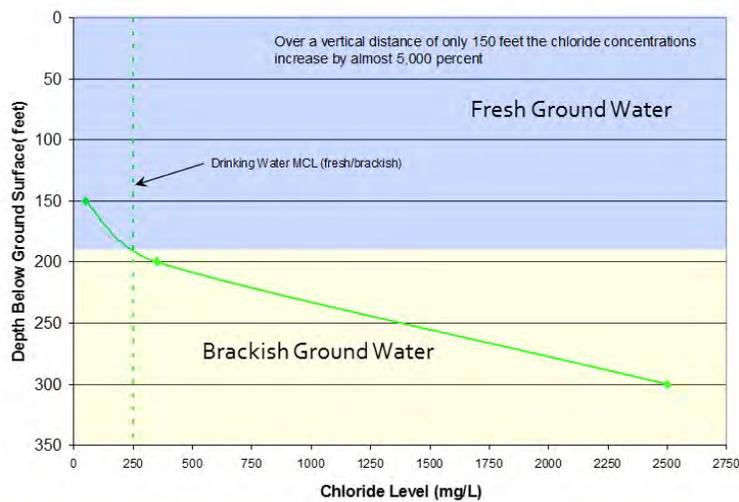
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Potential Threats to Yorktown-Eastover Aquifer Water Quality



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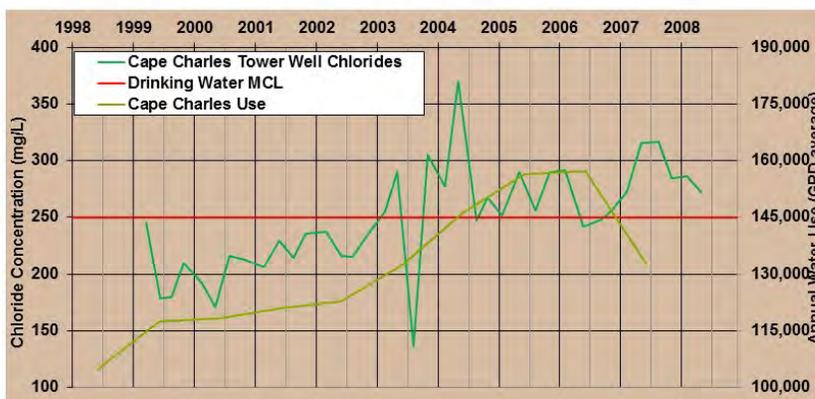
Chloride Increase With Depth Upshur Neck Seaside Example



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Why the Eastern Shore of Virginia?

Most likely cause for a loss of fresh ground water is salt water intrusion due to over pumping



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Ground Water Management and Water Supply Planning

- ESVA Ground Water Committee
- ESVA Ground Water Resource Protection and Preservation Plan
- Water Supply Plans – Accomack & Northampton Cos.

Accomack-Northampton Planning District Commission

ESVA Ground Water Committee

- Formed in 1990 by Accomack & Northampton to study and plan for ground water protection and management
- 11-member Committee meets monthly
 - 2 County Administrators, 4 County Supervisors, 4 County-appointed members, A-NPDC Executive Director
- Coordinated by A-NPDC with funding from Counties & VA Coastal Zone Management Program
- Contracts consulting hydrogeologist to advise Committee
- Activities:
 - Develop protection and management plans
 - Ground Water Research: USGS, VA Tech, Randolph-Macon
 - Public Workshops & Educational Materials
 - Review/comment on state withdrawal permit applications and federal environmental assessments
 - Coordinate with state/federal governments on ground water-related regulations
 - ESVA Ground Water Model
 - ESVA Ground Water Award Program
 - Household Hazardous Waste Collection

Accomack-Northampton Planning District Commission

ESVA Ground Water Resource Protection and Preservation Plan

- Originally adopted in 1992 and Updated in 2013
- Purpose:
 - Ensure that adequate and safe drinking water is available to all citizens of the commonwealth
 - Encourage, promote, and protect all other beneficial uses
 - Encourage, promote, and develop incentives for alternative water sources, included but not limited to desalinization
- Components of Plan
 - Water Resources: Current understanding of water resources. Will periodically update as new research is available.
 - Land and Water Resource Use: Water use will be updated annually.
 - Resource Vulnerability:
 - Saltwater Intrusion: Water quality trends updated annually. Modeling and other research updated periodically.
 - Water Level Declines: Updated annually.
 - Land Use Activities: Updated periodically based on research.
 - Sustainability Plan

Accomack-Northampton Planning District Commission

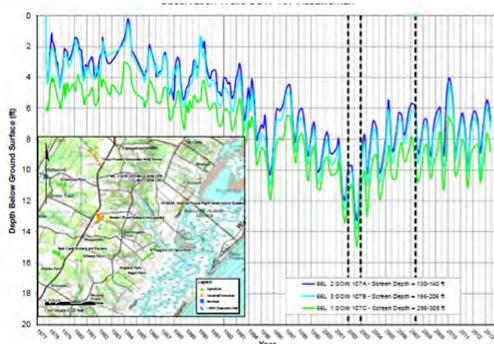
Component Summary

- Institutional Controls: Federal / State / Local
- Research:
 - Hydraulic Characteristics: Paleochannels; Confining Units; Deeper Aquifers
 - Water Quality: Freshwater/Saltwater Transition; Agricultural Nutrients; On-Site Systems; Emerging Contaminants
 - Climate Change
- Monitoring: Water Use; Groundwater Levels; Water Quality
- Alternate Source Development: Columbia (Water Table); Membrane Treatment; Reuse; ARS
- Conservation and Reduction

Accomack-Northampton Planning District Commission

Highlights

- Relevant components of the 1992 plan have been retained.
- Sections of the plan will be updated, some as frequently as annually to maintain current. Plan and various components such as monitoring data and research publications will be linked on the internet to improve accessibility.



Accomack-Northampton Planning District Commission

Highlights

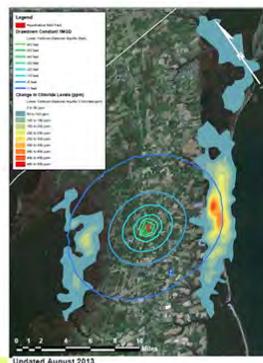
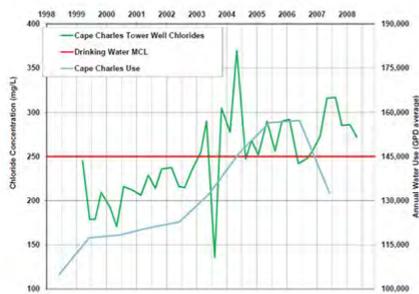
- Better understanding of the groundwater resource: Columbia aquifer is replenished at much higher rates than the Yorktown-Eastover. With lower withdrawals, the Columbia is an underused resource.



Accomack-Northampton Planning District Commission

Highlights

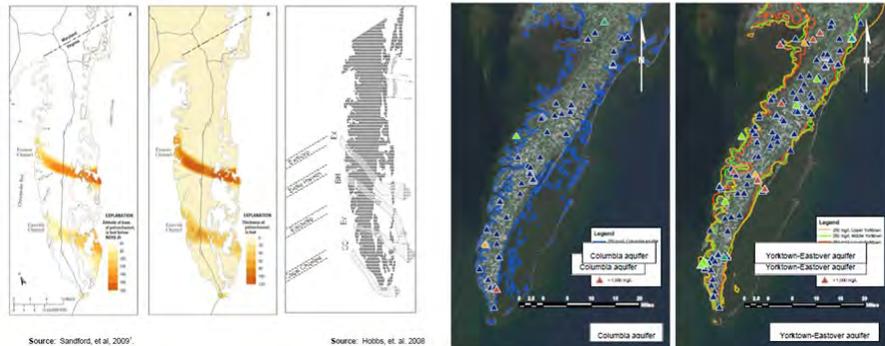
- Better understating of the vulnerability: Improved models for the Shore provide greater insight on flow dynamics. Yorktown-Eastover more vulnerable near the Bayside and Seaside, less vulnerable near the spine than previously thought.



Accomack-Northampton Planning District Commission

Highlights

- Research needs are more focused and will be periodically revised.



Accomack-Northampton Planning District Commission

Accomack County Water Supply Plan

- Regulations: 9 VAC 25-780
 - Adopted in 2011
 - Required to be reviewed every 5 years and rewritten every 10 years
- Purpose:
 - Ensure that adequate and safe drinking water is available to all citizens of the commonwealth
 - Encourage, promote, and protect all other beneficial uses
 - Encourage, promote, and develop incentives for alternative water sources, included but not limited to desalination
- Components of Plan
 - Existing Water Sources (*Description of water systems*)
 - Existing Water Use (*Description of current and historical use*)
 - Existing Water Resource Conditions (*Groundwater Resource, Natural Resources*)
 - Projected Water Demand (*Future water use*)
 - Water Demand Management (*Water Conservation and Management*)
 - Drought Response and Contingency Plan
 - Statement of Need and Alternatives (*Use / Resource Constraints; alternate sources / technologies*)

Accomack-Northampton Planning District Commission

Thank
You!

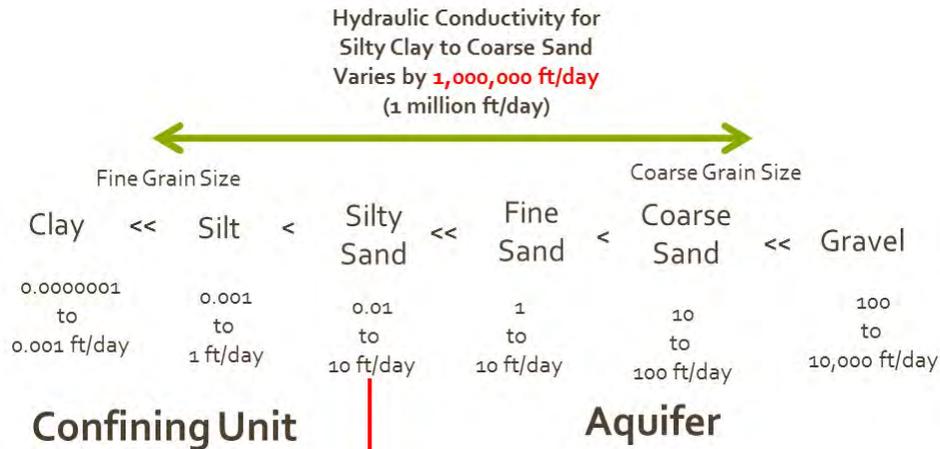


Curt Smith
 Director of Planning
 Accomack-Northampton
 Planning District Commission
csmith@a-npdc.org
 757-787-2936

Long –Term Planning for Eastern Shore & Chesapeake Bay

- **Accomack & Northampton Counties**
 - Neither have policies directly addressing sea level rise
 - Both acknowledge sea level rise in Comp Plans
 - Accomack acknowledges modern rates @ 1.5 to 3 times the historic rate
 - Both mitigate flooding damages via:
 - Enforcing flood-resistant construction practices in Flood Hazard Areas
 - Both require homes constructed in Flood Hazard Areas be at least 1 ft above the FEMA Base Flood Elevation
 - Participating in the FEMA Community Rating System program (Accomack does, North. does not)
 - Elevating houses (approx. 100 in past)
 - Implementing Chesapeake Bay Preservation Act on both bayside and seaside
- **State Efforts**
 - **Governor's Commission on Climate Change (2008)** – identified CC impacts and adaptation strategies
 - **VIMS – VA Recurrent Flooding Study (2012)**
 - Identifies issues facing coastal localities, recommends options for adaptation
 - Forecasts 1.0-2.5' of SLR by 2050 and 1.5-7.5' of SLR by 2100
 - **Secure Commonwealth Panel Recurrent Flooding Sub-panel (2013-2014)** – Developing implementation strategies for adaptation
- **ESVA Ground Water Committee** - *Ground Water Supply Protection and Management Plan Update* → 2013; monitoring regional salt water intrusion into aquifers
- **NASA Wallops Flight Facility** – Adaptation Workshop → Fall 2012; Climate Adaptation Science Initiative; Accomack Co. Joint Land Use Study → 2013
- **USFWS ESVA and Chincoteague National Wildlife Refuges**

The Factor Most Important in Controlling Rate of Groundwater Flow is Hydraulic Conductivity



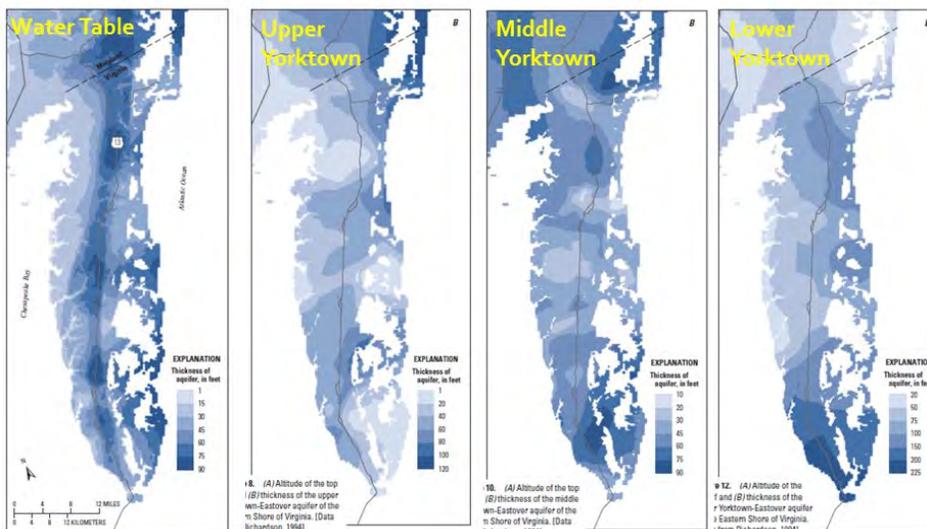
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The Second Most Important Factor is Aquifer Thickness

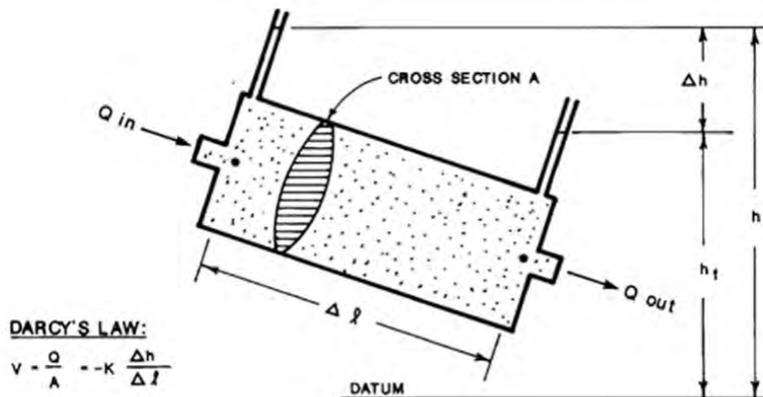
- The amount of water that can flow through and aquifer increases linearly with increase in thickness (doubling the thickness doubles the potential flow)
- Hydraulic conductivity times the aquifer thickness is called *Transmissivity*, and is the primary term describing groundwater flow

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The Water Table aquifer is thin compared to the Yorktown aquifer



Transmissivity determines how fast groundwater CAN flow but a gradient is needed to make it flow.



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Appendix K

Presentation at Virginia Municipal League Meeting: Sea Level Rise on the Eastern Shore

Preparing for Sea-Level Rise on the Eastern Shore






Curt Smith, Director of Planning
Accomack-Northampton Planning District Commission
April 30, 2015


ESVA Hazard Mitigation Plan

 Hazard Mitigation Plan

Original 2006, Updated in 2011,
2016 rewrite underway

1. *Review historical hazards*
(**2016 HMP to consider both historical and projected hazards)
2. *Identify and prioritize natural hazards*
Highest Priority Hazards: Coastal Flooding, High Wind, Stormwater Flooding, Coastal Erosion
3. *Conduct risk & vulnerability assessment for high priority hazards*
ESVA Coastal Flooding Risk in 2011 → \$470,000,000 Potential Total Loss (with \$300,000,000 Uninsured) from a 100-Year Flood Event
4. *Define mitigation strategies and develop mitigation projects to mitigate future hazard impacts*

THE GOVERNMENT OF VIRGINIA
 COMMONWEALTH OF VIRGINIA
 EASTERN SHORE MITIGATION PLANNING COMMISSION
 ACCOMACK-NORTHAMPTON PLANNING DISTRICT COMMISSION



ESVA Climate Adaptation Working Group (CAWG)



- **Local, State, & Federal Representatives**
 - A-NPDC, ESSWCD
 - ESVA Counties & Towns
 - VDEM, VCZMP, VIMS, UVA-LTER, VDCR, VDOT
 - NASA-WFF, USDA-NRCS, USFWS
 - Eastern Shorekeeper, Nature Conservancy, CBES, ES RC&D Council, VESLT, Wetlands Watch
 - & the list is still growing!



- Facilitate implementation of key adaptation strategies by ESVA localities
- Public Education & Outreach
- Forum for coordination amongst localities & agencies
- Serve as point of contact for state and regional activities
- Explore funding options for adaptation



ESVA Strategies for Adapting to Climate Change Report



- **Identifies global climate change impacts on ESVA**
 - Sea level
 - Storms
 - Temperature
 - CO2 Levels
 - Precipitation
- **Develops vision for adaptation on ESVA**
- **Prioritizes Adaptation Strategies**
 1. Local Adaptation Planning – County Comp Plans, Hazard Mitigation Plan
 2. Shoreline Management Plans – with VIMS
 3. Restoration & Protection of Natural Systems
 4. Ground Water Management
 5. Education & Outreach





CAWG Public and Stakeholder Outreach Activities





Workshops

- 2012 Coastal Flooding Workshop
 - First public survey of local attitudes/opinions related to SLR and adaptation
- 2012 NASA-WFF Adaptation Workshop
- 2013 Coastal Insurance Workshop
- 2013 NOAA Sea Level Rise Viewer Workshop
- 2014 Enhancing Coastal Resilience Community Leader Workshop



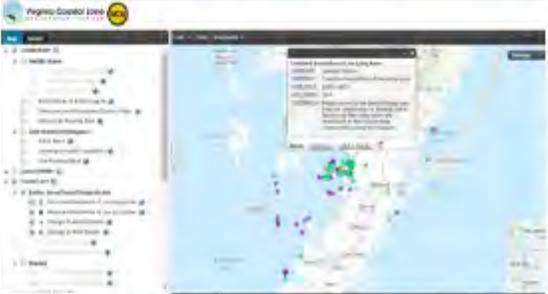
CAWG Public and Stakeholder Outreach Activities



Coastal Change Archive

Compilation of local accounts of observations made regarding changes to the natural environment related to sea level rise and climate change

- Consistent inundation of low-lying areas
- Permanent inundation of low-lying areas
- Changes to animal species
- Changes to plant species





Virginia Coastal Resources



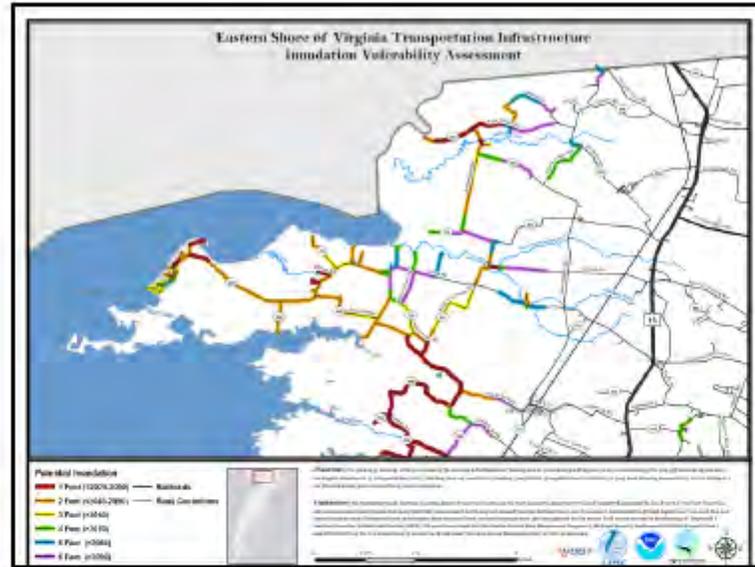
Transportation Infrastructure Inundation Vulnerability Assessment (TIIVA)

Regional assessment to determine which roads are most vulnerable to inundation from sea-level rise

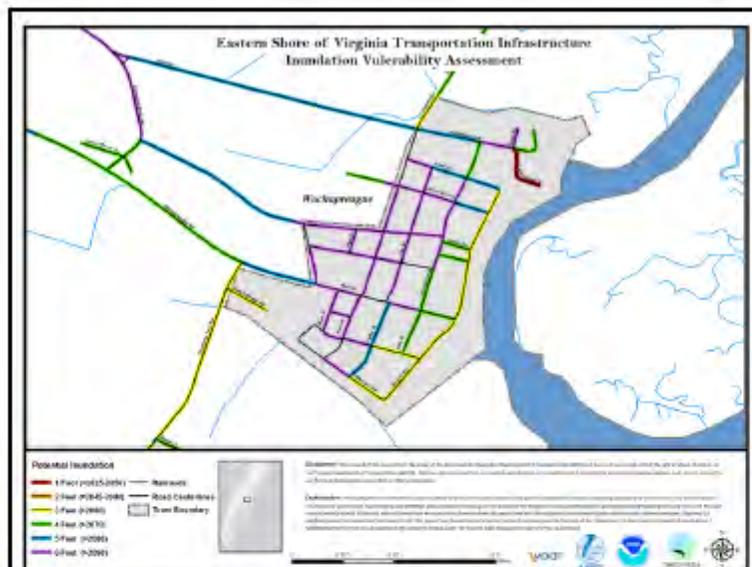
- In partnership with VDOT
- For long-range planning purposes
- Incorporates most recent VIMS SLR projections
- Considers how communities could have access limited or become disconnected with inundation of connector routes
- First region-wide study of its type in state
- Final report: May 2015

The slide features several logos: the Virginia Coastal Zone logo in the top left, the Virginia Coastal Zone logo with 'A-NPDC' in the top right, the NOAA logo in the bottom left, and the VDOT logo in the bottom center. It also includes three maps: a regional map of Virginia, a detailed map of the coastal zone, and a map showing road networks and inundation risk.

Regional Maps



Town Maps



Sea Level Scenarios Above Current MHHW													
Jurisdiction	Total Miles of Roads	1 foot (=2025-2040)		2 feet (=2040-2070)		3 feet (=2055-2100)		4 feet (>2065)		5 feet (>2075)		6 feet (>2085)	
		Total Miles Inundated	% of Total in Jurisdiction	Total Miles Inundated	% of Total in Jurisdiction	Total Miles Inundated	% of Total in Jurisdiction	Total Miles Inundated	% of Total in Jurisdiction	Total Miles Inundated	% of Total in Jurisdiction	Total Miles Inundated	% of Total in Jurisdiction
Eastern Shore of Virginia	1516	33	2.2%	131	8.6%	209	13.8%	270	17.8%	319	21.0%	371	24.5%
Accomack County	1014	31	3.1%	115	11.3%	183	18.0%	236	23.3%	275	27.1%	316	31.2%
Town of Belle Haven	7	0	0.0%	0	0.0%	0	0.0%	0.11	1.6%	0.11	1.6%	0.32	4.6%
Town of Chicoteague	60	4	6.7%	38	63.3%	56	93.3%	60	100.0%	60	100.0%	60	100.0%
Town of Onancock	13	0	0.0%	0.43	3.3%	0.79	6.1%	1	7.7%	1	7.7%	1	7.7%
Town of Saxis	4	0.25	6.3%	1	25.0%	2	50.0%	4	100.0%	4	100.0%	4	100.0%
Town of Tangier	4	4	100.0%	4	100.0%	4	100.0%	4	100.0%	4	100.0%	4	100.0%
Town of Wachapreague	5	0.12	2.4%	0.12	2.4%	0.88	17.6%	2	40.0%	2	40.0%	5	100.0%
Northampton County	502	2	0.4%	16	3.2%	26	5.2%	34	6.8%	44	8.8%	55	11.0%
Town of Cape Charles	28	0	0.0%	0	0.0%	0	0.0%	0.2	0.7%	6	21.4%	8	28.6%

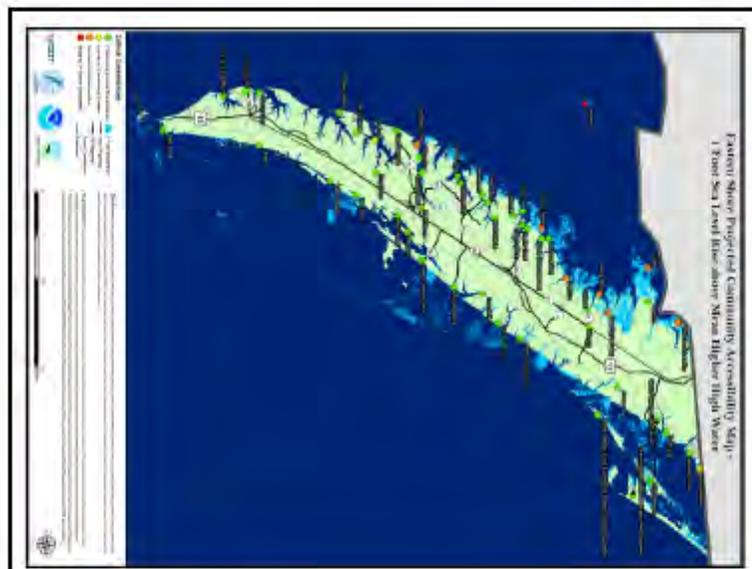
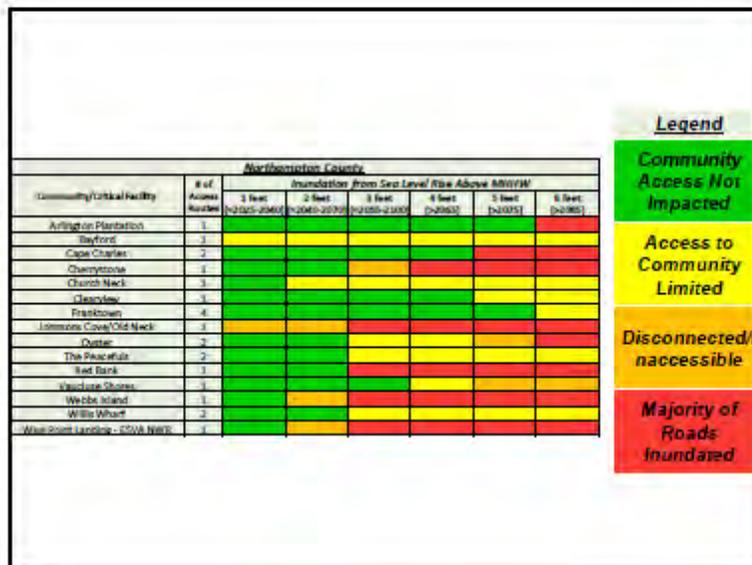
Community Accessibility Maps

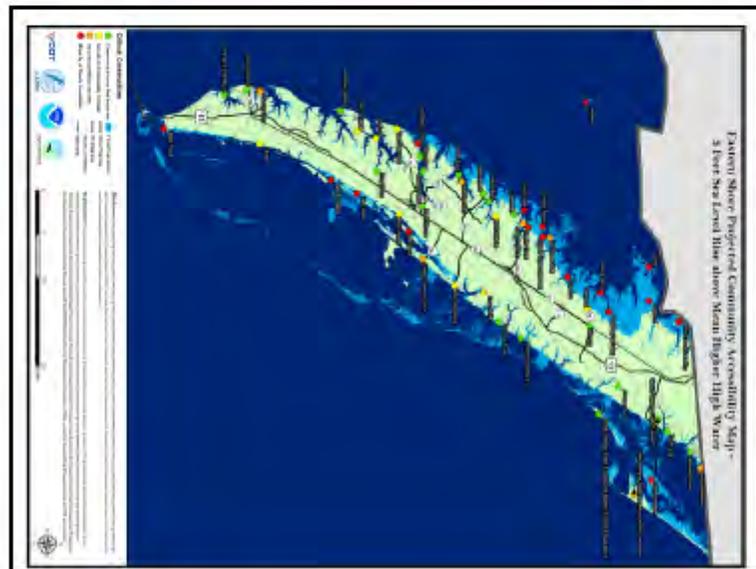
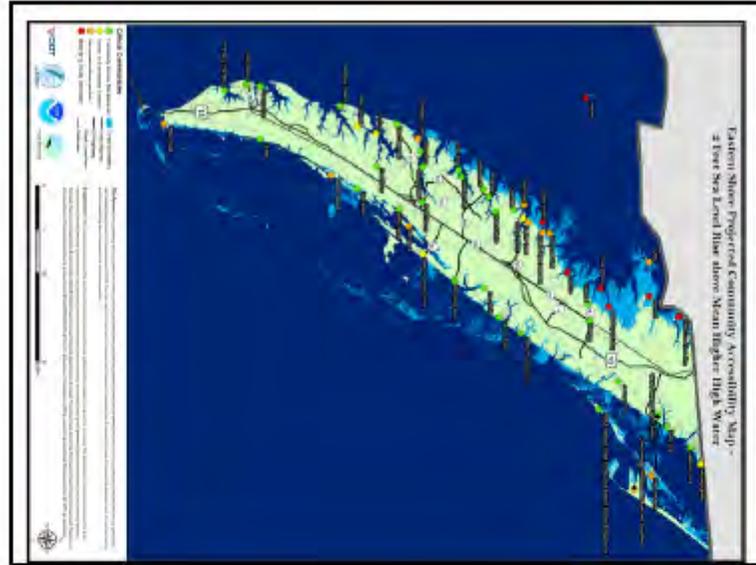
Accomack County							
Community/Critical Facility	# of Access Routes	Inundation From Sea Level Rise Above MHW					
		1 foot (>2015-2030)	2 feet (>2015-2030)	3 feet (>2030-2050)	4 feet (>2050)	5 feet (>2075)	6 feet (>2095)
Abbeville	1	Green	Green	Green	Green	Green	Green
Adams Neck	1	Green	Green	Green	Green	Green	Green
Apple Hill (Kays Neck)	1	Green	Green	Green	Green	Green	Green
Belle Haven	1	Green	Green	Green	Green	Green	Green
Bechtold	1	Green	Green	Green	Green	Green	Green
Brown	1	Green	Green	Green	Green	Green	Green
Captains Cove	1	Green	Green	Green	Green	Green	Green
Castle	1	Green	Green	Green	Green	Green	Green
Castle View	1	Green	Green	Green	Green	Green	Green
Chincoteague	1	Green	Green	Green	Green	Green	Green
Chincoteague Pier - Middle Section	1	Green	Green	Green	Green	Green	Green
Coopers Beach	1	Green	Green	Green	Green	Green	Green
East Point	1	Green	Green	Green	Green	Green	Green
East Wharf	1	Green	Green	Green	Green	Green	Green
Deep Creek	1	Green	Green	Green	Green	Green	Green
Grading Landing	1	Green	Green	Green	Green	Green	Green
Greenbank	1	Green	Green	Green	Green	Green	Green
Hamlet	1	Green	Green	Green	Green	Green	Green
Hallsville	1	Green	Green	Green	Green	Green	Green
Hickwood	1	Green	Green	Green	Green	Green	Green
Hickwood	1	Green	Green	Green	Green	Green	Green
Hickling	1	Green	Green	Green	Green	Green	Green
Henry's Point	1	Green	Green	Green	Green	Green	Green
Highville	1	Green	Green	Green	Green	Green	Green
Mount Nebo	1	Green	Green	Green	Green	Green	Green
Mount Nebo	1	Green	Green	Green	Green	Green	Green
Mount Nebo	1	Green	Green	Green	Green	Green	Green
NAA Wildlife Light Facility - Main Area	1	Green	Green	Green	Green	Green	Green
NAA Wildlife Light Facility - Mid-Atlantic Regional Headquarters	1	Green	Green	Green	Green	Green	Green
North Chincoteague	1	Green	Green	Green	Green	Green	Green
Port of East Chincoteague	1	Green	Green	Green	Green	Green	Green
Public Cove	1	Green	Green	Green	Green	Green	Green
Radford	1	Green	Green	Green	Green	Green	Green
Shore	1	Green	Green	Green	Green	Green	Green
Schooner Bay	1	Green	Green	Green	Green	Green	Green
Tanger	1	Green	Green	Green	Green	Green	Green
Tranthead	1	Green	Green	Green	Green	Green	Green
Walden Harbor Neck	1	Green	Green	Green	Green	Green	Green
Walden Neck	1	Green	Green	Green	Green	Green	Green

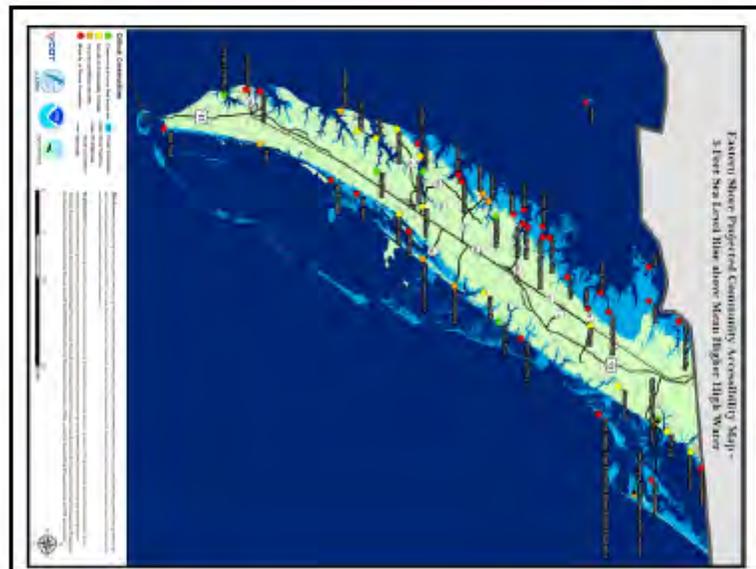
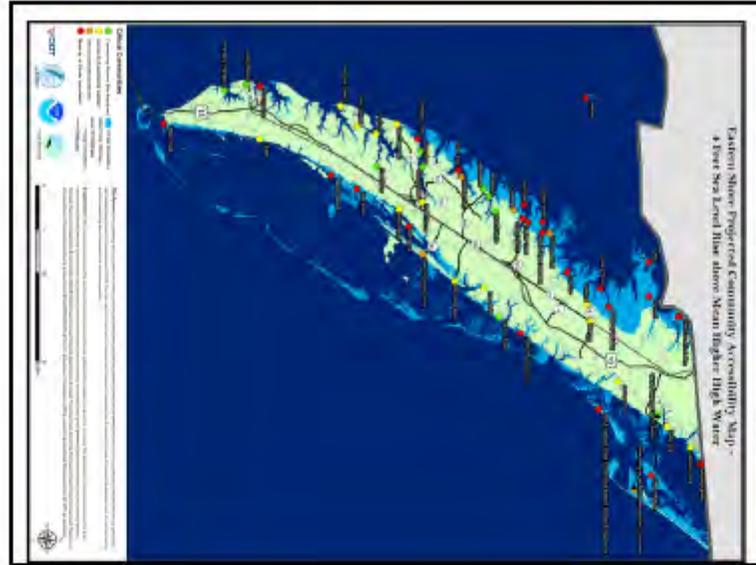
Legend

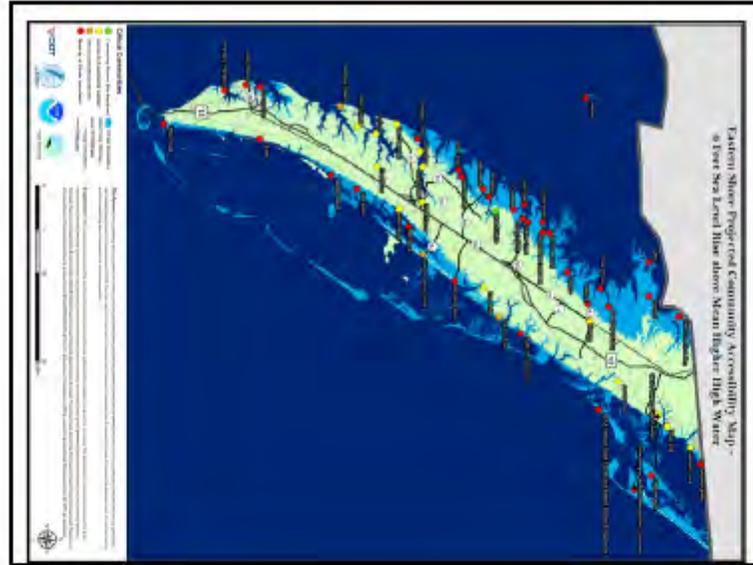
- Community Access Not Impacted
- Access to Community Limited
- Disconnected/Inaccessible
- Majority of Roads Inundated

5/1/2015









Thank you!




A-NPDC

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757-787-2936

Appendix L

Household Hazardous Waste

2015 ESVA Household Hazardous Waste Collection

THE ONLY LOCAL OPTION FOR ACCOMACK & NORTHAMPTON COUNTY RESIDENTS TO PROPERLY DISPOSE OF THEIR HOUSEHOLD HAZARDOUS WASTE

WHY PARTICIPATE? - Household products containing toxic chemicals like pesticides, solvents, cleaning products, & weed killers can be a threat to people and the environment if improperly discarded. Never throw these materials into the trash as the toxic chemicals may harm sanitation workers, or result in fires in collection vehicles. It is also not safe to pour them into a sink, ditch, or storm drain as they can end up in the environment polluting the air, water, or soil.

SATURDAY, MAY 2

AT 3 LOCATIONS!!!

1) IN NORTHERN ACCOMACK:
CHINCOTEAGUE CONVENIENCE CENTER
5073 DEEP HOLE ROAD, CHINCOTEAGUE

2) IN CENTRAL ACCOMACK:
TASLEY CONVENIENCE CENTER
24574 COASTAL BOULEVARD, TASLEY

3) IN NORTHAMPTON:
BIRDSNEST CONVENIENCE CENTER
9005 BIRDSNEST DRIVE, BIRDSNEST

COLLECTIONS BEGIN AT 10:00 AM & CLOSE PROMPTLY AT 2:00 PM & WILL TAKE PLACE RAIN OR SHINE

◇◇◇ **ACCOMACK & NORTHAMPTON RESIDENTS ONLY** ◇◇◇

*****PARTICIPATE AT ANY OF THE 3 SITES*****

UP TO 50 POUNDS FOR FREE!!!

ADDITIONAL WASTE WILL COST \$1.00/LB

DISPOSAL OF THE FIRST 50 POUNDS FOR FREE WILL BE AVAILABLE ONLY AS FUNDS ALLOW.

First come, first served...Arrive early to ensure your spot!!!

What to Bring

- ✓ Garden chemicals
- ✓ Poisons
- ✓ Repellants
- ✓ Degreasers
- ✓ Fuel: gas, kerosene
- ✓ Fungicides
- ✓ Wood preservatives
- ✓ Other hazardous waste
- ✓ Wood stain
- ✓ Paint thinner
- ✓ Paint remover
- ✓ Driveway sealers
- ✓ Epoxy
- ✓ Rodent poison
- ✓ Asbestos

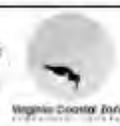
Hazardous items will have cautionary words on the label. For example: Danger, Warning, or Caution. Other words or phrases that can signal hazardous products include: poisonous, hazardous, combustible, flammable, corrosive, volatile, caustic, irritant, explosive, toxic, use with adequate ventilation, or avoid inhaling.

If no words indicate it is a hazardous product, it likely isn't. Dispose of it in your regular trash!

Do Not Bring

- x PAINT WILL NOT BE ACCEPTED (LATEX OR OIL-BASED)!!! **Paint can be discarded by removing lid to allow to air dry or mix with absorbent (e.g. kitty litter, wood chips) until no longer a liquid & discarded in plastic bag**
- x Commercial waste
- x Industrial waste
- x Car batteries
- x Tires
- x Motor oil
- x Ammunition
- x Flares
- x Explosives
- x Empty containers of any kind
- x Radioactive waste
- x Medicines
- x PCBs
- x Smoke detectors
- x Freon
- x Propane tanks
- x Medical waste
- x Biological waste

For additional information, please contact the Accomack-Northampton Planning District Commission at 787-2936 or www.a-npdc.org



This community service event is sponsored by the ESVA Ground Water Committee. It is made possible by funding from Accomack & Northampton Counties, A-NPDC, VA Coastal Zone Management Program, & NOAA & volunteer work from Waste Watchers of the Eastern Shore. This event is not open to business, industry, or institutions.

Contact Curt Smith 757-787-2936, ext. 114

FOR IMMEDIATE RELEASE



11th Annual Household Hazardous Waste Collection

Groundwater Committee Offers Three Convenient Locations on the Eastern Shore

ACCOMACK— Hazardous wastes tend to accumulate around everyone’s home over time creating unnecessary health and safety risks at home. They need to be disposed of safely, responsibly.

“The Eastern Shore’s landfills were not engineered to handle these materials. If these hazardous wastes are not disposed of properly, first, it’s illegal, and second, it threatens the health of Eastern Shore residents and the fragile environment that Eastern Shore residents rely on for their livelihood,” said Rick Hubbard, Ground Water Committee Vice Chairman and Northampton County Supervisor. “Every ounce of hazardous waste collected ensures that waste does not pollute our water resources on the Eastern Shore and endanger our water quality, our jobs, and our citizens’ health.”

The Eastern Shore of Virginia Ground Water Committee is pleased to announce the 11th Annual Household Hazardous Waste Collection will be held Saturday, May 2 from 10:00 AM – 2:00 PM, *rain or shine*. This annual spring collection event – the best and only local option for proper household hazardous waste disposal on the Eastern Shore – is available to residents of Accomack and Northampton, and this year, is offered concurrently at County Convenience Centers in Chincoteague and Tasley in Accomack, and Birdsnest in Northampton.

Residents can bring and dispose of up to 50 pounds of hazardous waste for free, as long as

County Supervisor.

ACCEPTED household wastes include: garden chemicals, poisons, repellants, degreasers, fuels (including gasoline and kerosene), fungicides, wood preservatives, wood stain, paint thinner and remover, driveway sealers, epoxy, rodent poison, and asbestos.

Items NOT ACCEPTED include: commercial and industrial wastes, car batteries, tires, motor oil, ammunition, flares, explosives, medical and biological wastes, radioactive waste, medicines, PCBs, smoke detectors, Freon or propane tanks, and empty containers of any kind.

Paint is also not accepted. “To responsibly dispose of oil and latex paint, remove the container lid to allow the paint to dry, or mix the paint with an absorbent such as kitty litter or wood chips. Once the paint solidifies, place the paint container in a plastic bag and dispose with the regular trash,” advises Stewart Hall, Accomack County Public Works Director.

This event is an annual public service made available through funding provided by Accomack and Northampton Counties, Accomack-Northampton Planning District Commission, Virginia Coastal Zone Management Program, and NOAA and through volunteer assistance provided by Waste Watchers of Virginia’s Eastern Shore. The event will occur on a Saturday during the same time each year and residents are advised to accumulate and store wastes in a safe, secure location in preparation for the annual collection. For questions or more information, please contact Curtis Smith, Accomack-Northampton Planning District Commission, 787-2936, extension 114 or csmith@a-npdc.org.



A-NPDC staff and workers at the Household Hazardous Waste Collection



Containers for the hazardous waste



One of the sites for the household hazardous waste collection



Workers disposing of the hazardous waste



Household Hazardous Waste Collection



Connie Morrison (A-NPDC) keeping accurate logs of collected materials

Appendix M

Central Accomack County Ground Water Summit

PRESS RELEASE

Contact : Curt Smith, A-NPDC
Phone: 787-2936 x 114
Email: csmith@a-npdc.org

**Public Summit to Address Ground Water Issues and Conditions for
Central Accomack County Scheduled for June 16**

Is there enough water to support our community for generations to come?

Ground water is the sole source of drinking water on the Shore and its sustainability and quality are essential for residents and communities.

The June 16 Central Accomack Ground Water Summit is an educational forum that will seek to answer the question, “Is there enough water to support our community for generations to come?” and explore other topics crucial to understanding groundwater conditions specifically focusing on Accomack, Parksley, Bloxom, Hallwood, and surrounding areas.

Participants will learn where their water comes from, how and when it got there, what is being done to ensure its quality, and the threats to our future water supply and quality. Other presentations will touch on the area’s geologic evolution, and what is - and is not - known about the resource.

The Eastern Shore of Virginia Ground Water Committee invites the public to this FREE SEMINAR on Tuesday, June 16, from 6:30-8:00 p.m. at the Metompkin Elementary School at 24501 Parksley Road in Parksley.

Britt McMillan, Consulting Hydrogeologist to the Eastern Shore Ground Water Committee, and Curt Smith, Director of Planning for the Accomack-Northampton Planning District Commission, will be presenting and responding to questions from the audience. There will be ample opportunity for participation from local government officials and the public.

This event is the fourth in a series of community-focused ground water summits presented by the Ground Water Committee. The next and final summit is scheduled for October 2015 and will focus on northern Accomack County communities from Hallwood to New Church including Chincoteague, Saxis, Wallops, and Greenbackville.

For additional information, please contact Curt Smith at 787-2936.

The Eastern Shore of Virginia Ground Water Committee Presents a Free, Public Educational Event Summarizing the Specific Ground Water Conditions for Accomack, Parksley, Bloxom, Hallwood & surrounding areas:

Central Accomack County Ground Water Summit



TUESDAY, JUNE 16, 2015

6:30 P.M. – 8:00 P.M.

METOMPKIN ELEMENTARY SCHOOL

24501 PARKSLEY RD., PARKSLEY

- *Where is our ground water?* ●● *How much is there?* ●●
- *How is it replenished?* ●● *How safe is my water?* ●●
- *Are there ways I can protect it?* ●● *How old is the water?* ●●
- *Should I be worried about the quality of my water?* ●●
- *What is being done to ensure it is safe?* ●●
- *Will my community have sufficient water to sustain itself?* ●●
- *Is there enough to support growth for generations to come?* ●●

Learn answers to these & many other questions!!!

*Also, look for upcoming Ground Water Summits for other Eastern Shore communities!
Please Contact Curt Smith at 787-2936 or csmith@a-npdc.org for more information.*





*Central Accomack County
Ground Water Summit*

Geologic Evolution of the Southern Delmarva Peninsula

Curt Smith
Director of Planning
Accomack-Northampton Planning District Commission
June 16, 2015



A-NPDC Overview and Purpose



- Commonwealth created 21 PDCs in 1970 to address regional issues by fostering cooperation amongst localities and cooperation between state & localities
- Accomack-Northampton Planning District:
 - Members: 2 Counties and Town of Chincoteague
 - Also provides services to 18 other incorporated towns
- Affiliate Organizations:
 - A-N Regional Housing Authority → provides privately or authority-owned rental housing
 - ESV Housing Alliance → improving housing for homeowners
 - A-NPDC →
 - Community Development
 - Economic Development
 - Transportation Planning
 - Environmental Planning → Ground Water Committee; Climate Adaptation Working Group

ESVA Ground Water Committee

Current Members

Accomack Co.	Northampton Co.
Jim Belote	Gene Hampton
Grayson Chesser	Peter Henderson
J.W. Jeffries	Granville Hogg
Wanda J. Thornton, Chairman	Richard Hubbard, Vice Chairman
Non-Voting Ex-Officio	
Steve Miner	
Katie Nunez	
Elaine Meil, Secretary	

Created as bi-county committee in 1990 to:

- Assist local governments & residents in understanding, protecting, & managing GW resources
 - Household Hazardous Waste Collection (2004-2014)
- Prepare a GW resources protection & management plan (Created 1992, Updated 2013)
 - Water Supply Plans (2011)
- Serve as an educational & informational resource
 - Public Workshops
 - GW Website
 - ESVA GW Award Program
- Initiate special studies concerning the protection & management of the GW resource
 - ESVA GW Model
 - Water Quality Studies – 2001, 2013
- Coordinate & communicate among parties responsible for GW protection, management, & research

Accomack-Northampton Planning District Commission

Presentation Overview

- Causes of Geologic Change:
 - Uniform and gradual land subsidence and fluctuations in sea level working in tandem with punctuated catastrophic events (meteor impact, storms, etc.)
- Timeline:
 - i. Opening of Atlantic Ocean & Salisbury Embayment – **≈180 Million Years Ago (MYA)**
 - ii. Filling of Salisbury Embayment (Potomac Formation) – **≈180 to 35.5 MYA**
 - iii. Bolide impact & removal of pre-impact sediments – **≈35.5 MYA**
 - iv. Deposition of post-impact sediments – **≈35.5 MYA – Present**
 - v. Reworking of surficial sediments & progradation of peninsula – **≈200,000 YA – Present**
 - vi. Sea level reaches elevation of modern Chesapeake Bay transitioning system from riverine to estuarine - **≈8,000 YA**
 - vii. Sea level continues to rise and inundate the Chesapeake Bay watershed and the Chesapeake Bay begins to take its modern appearance we currently recognize - **≈3,000 YA**

Accomack-Northampton Planning District Commission

Opening of Atlantic Ocean



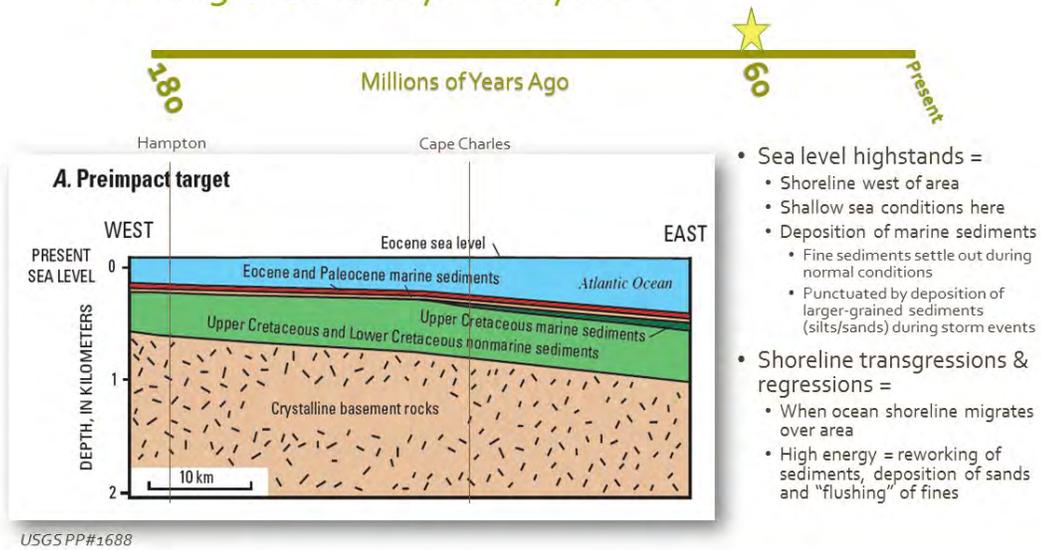
Accomack-Northampton Planning District Commission

Development of Salisbury Embayment



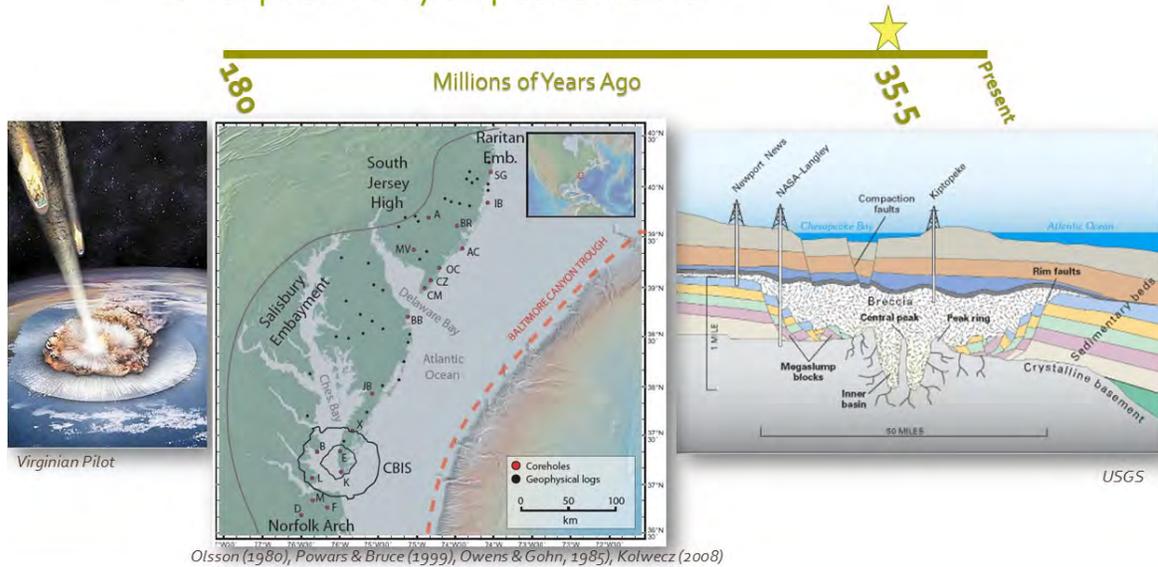
Accomack-Northampton Planning District Commission

In-Filling of Salisbury Embayment



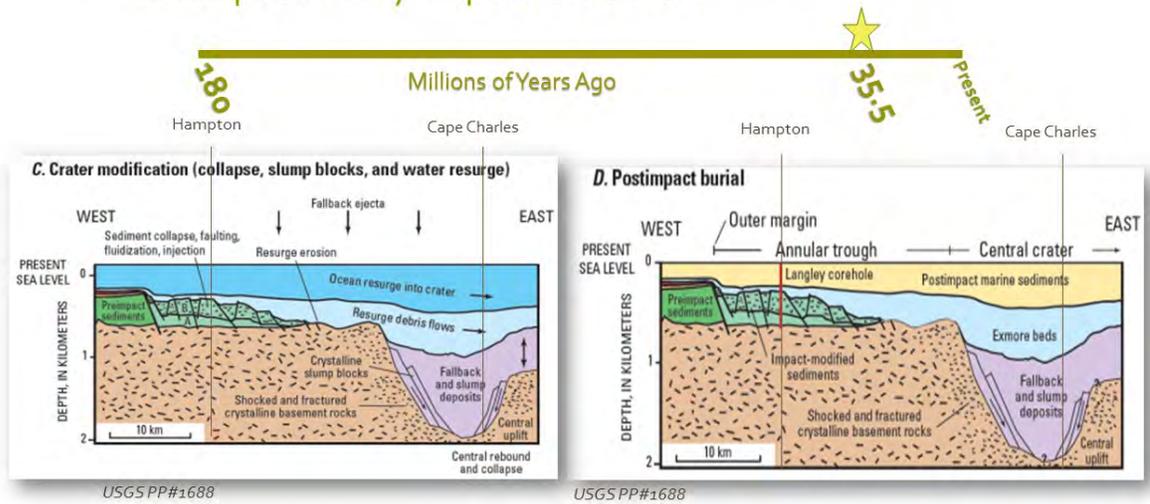
Accomack-Norhampton Planning District Commission

Chesapeake Bay Impact Structure



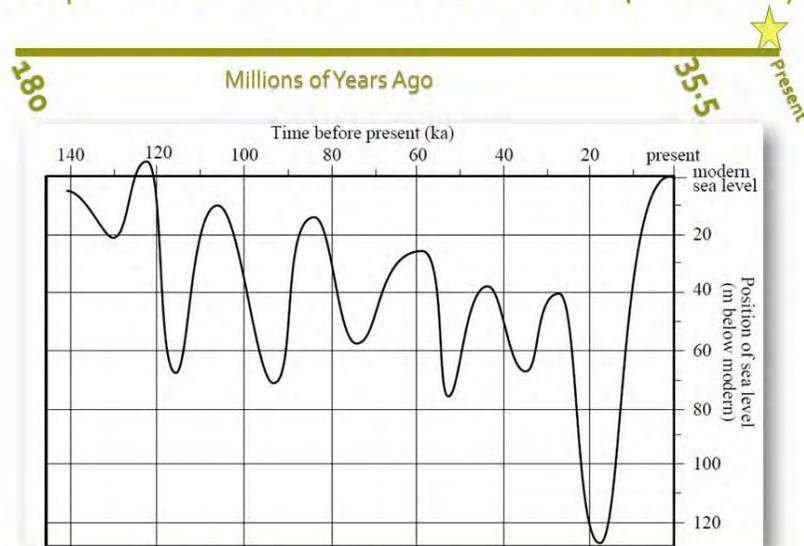
Accomack-Norhampton Planning District Commission

Chesapeake Bay Impact Structure

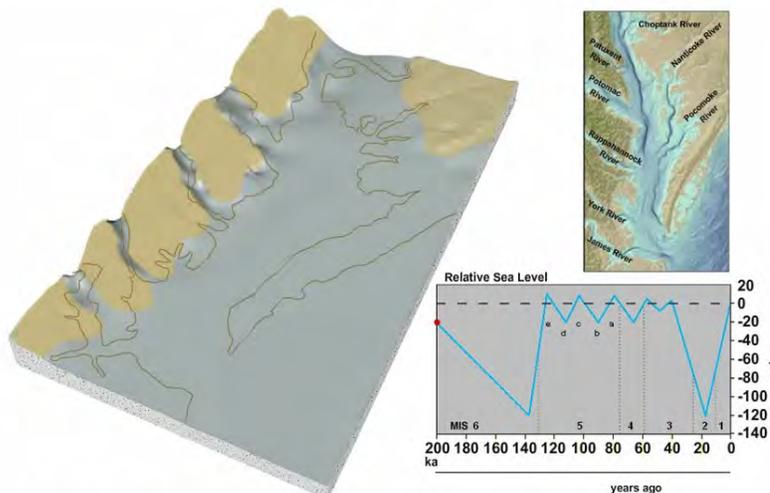


Accomack-Northampton Planning District Commission

Development of Eastern Shore & Chesapeake Bay



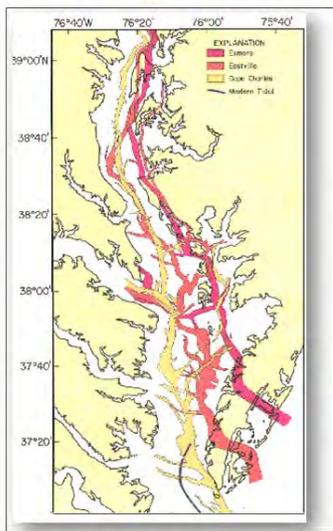
Accomack-Northampton Planning District Commission



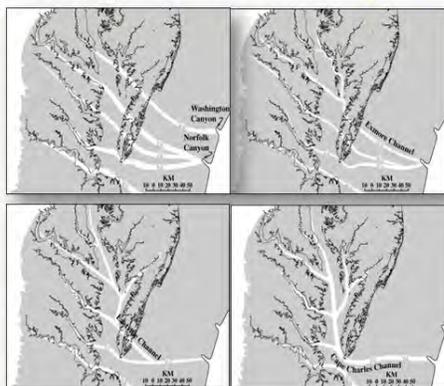
USGS Chesapeake Bay Evolution Animation

Accomack-Northampton Planning District Commission

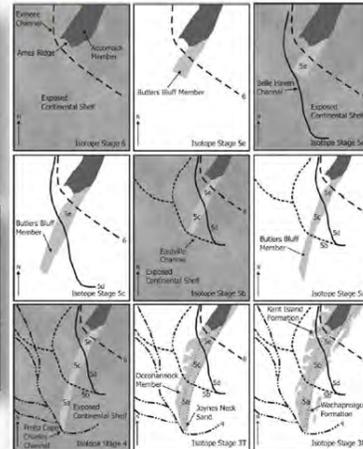
Development of Eastern Shore & Chesapeake Bay



Colman et al (1990)



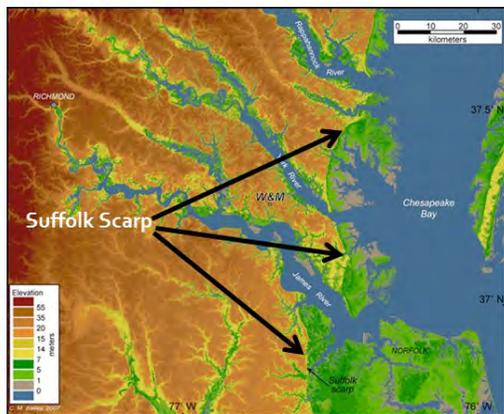
Hobbs (2004)



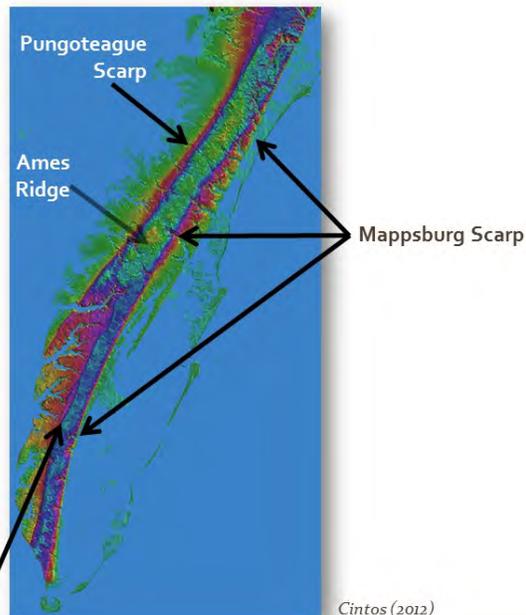
Scott (2006)

Accomack-Northampton Planning District Commission

Surficial Features:
Relict Shorelines



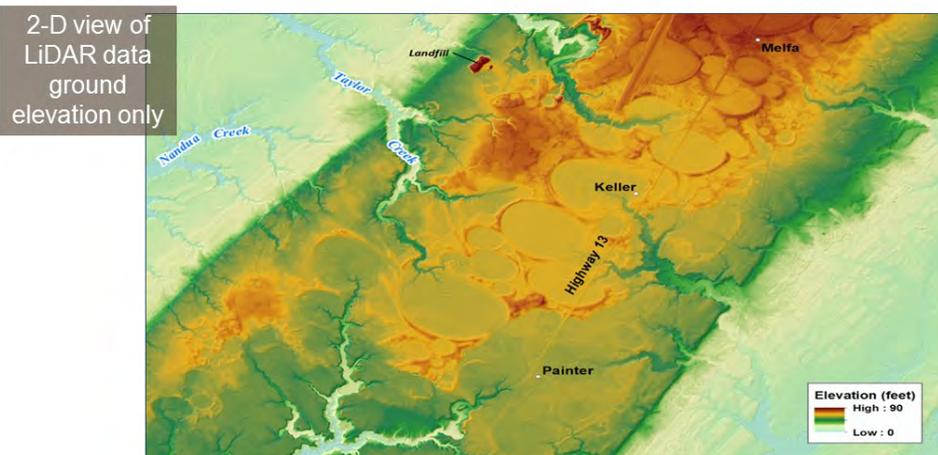
Bailey (2009)



Cintos (2012)

Accomack-Northampton Planning District Commission

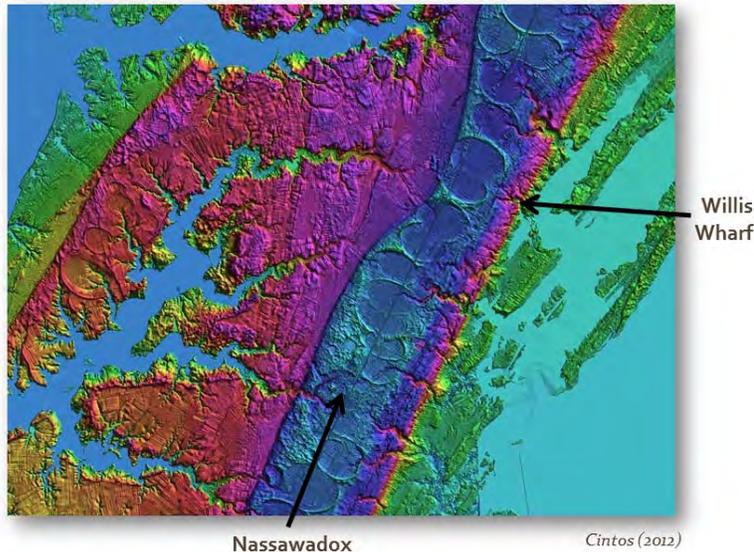
South-Central Accomack County
(Melfa, Keller, & Painter)



The Nature Conservancy (2011)

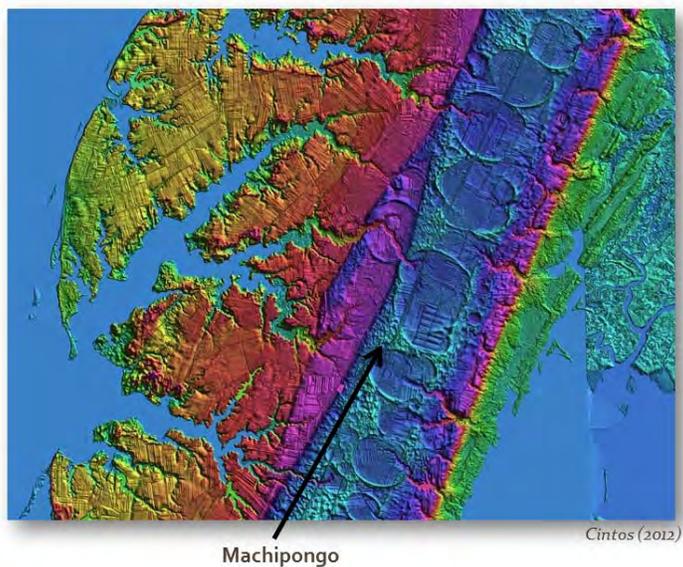
Surficial Features: Carolina Bays

- Over 700 shallow, elliptical depressions
 - Similar orientation (NW-SE)
 - Variable size (1 – 1,000 acres)
 - Some overlapping
 - Coarse-grained rims
 - Fine-grained floors
- Variable ages (100,000- <5,000 years)
- Debated origin
 - Wind & Water
 - Shock wave from bolide explosion



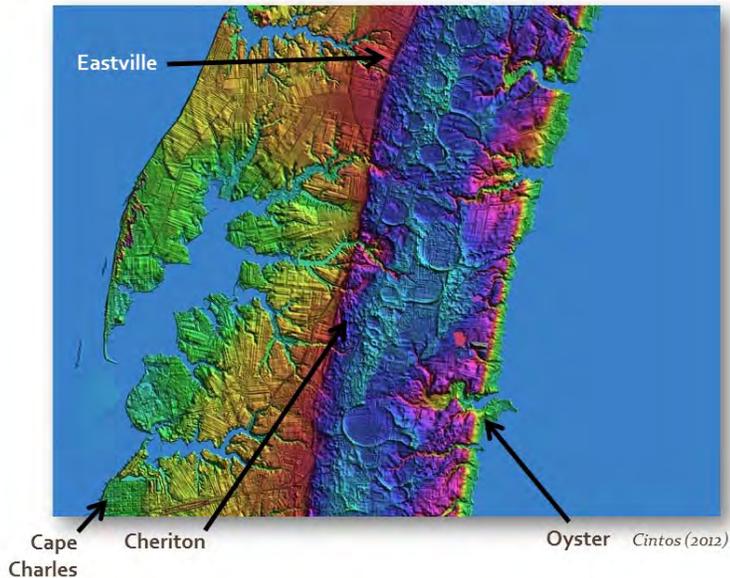
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Surficial Features: Carolina Bays

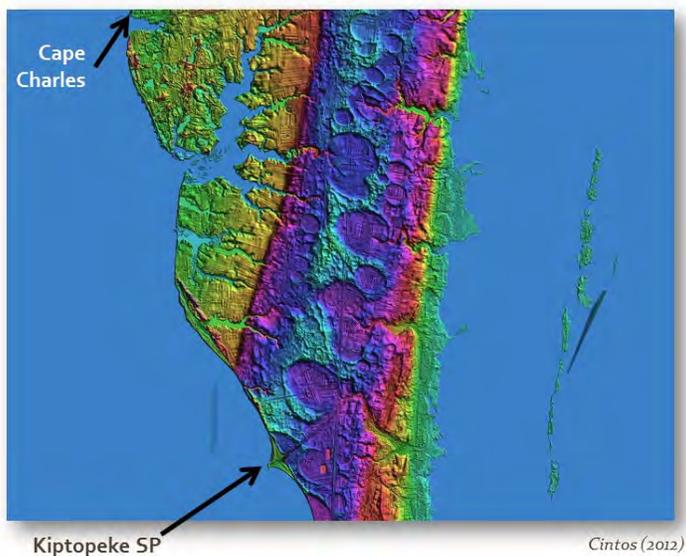
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Accomack-Northampton Planning District Commission

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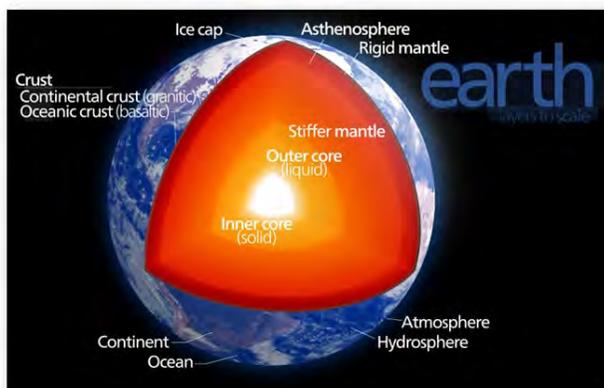
Accomack-Northampton Planning District Commission



Curt Smith
Director of Planning
Accomack-Northampton
Planning District Commission
csmith@a-npdc.org
757-787-2936

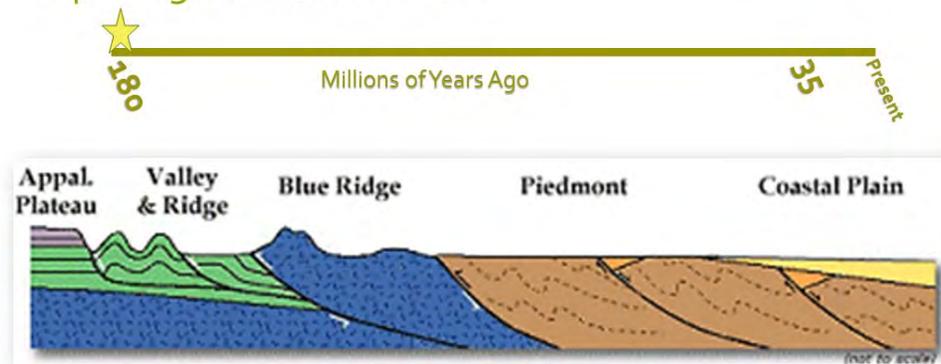


The Earth's Interior



- Universe Age: 13.82 Billion Years
- Earth Age: 4.54 Billion Years
- Depth to Center ≈ 4,030 Miles
- Crust - <0.01%
 - Oceanic Crust (≈3-6 mi. thick)
 - Continental Crust (≈20-30 mi. thick)
- Mantle (≈1,800 mi.) - 45%
- Outer Core (≈1,400 mi.) – 35%
- Inner Core (≈800 mi.) – 20%

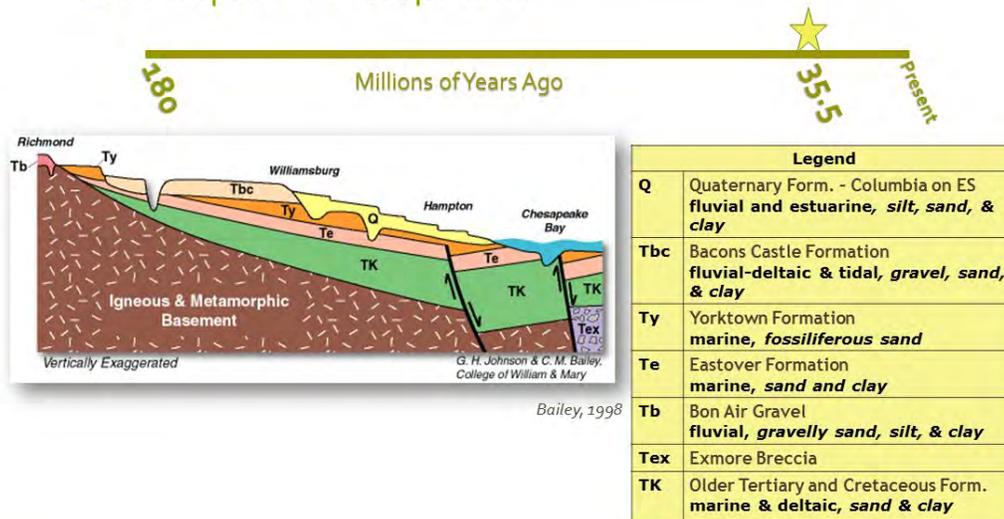
Opening of Atlantic Ocean



Bailey and Johnson, 1999

Accomack-Northampton Planning District Commission

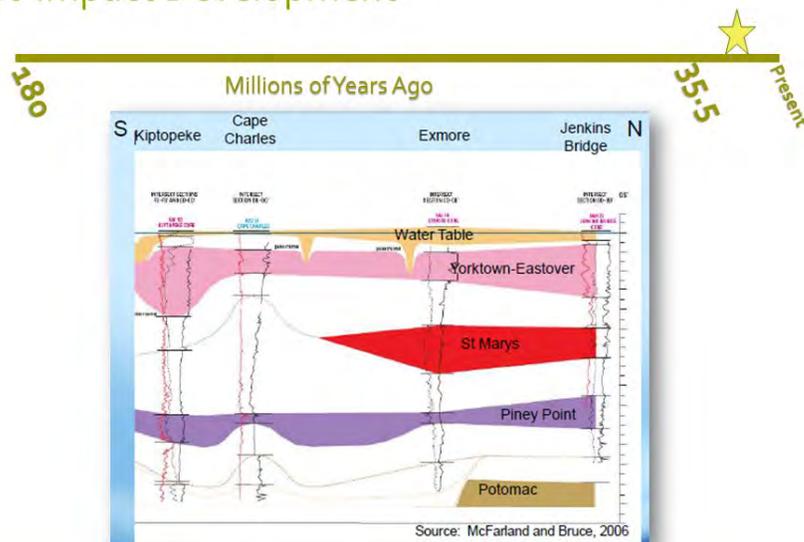
Post-Impact Development



Bailey, 1998

Accomack-Northampton Planning District Commission

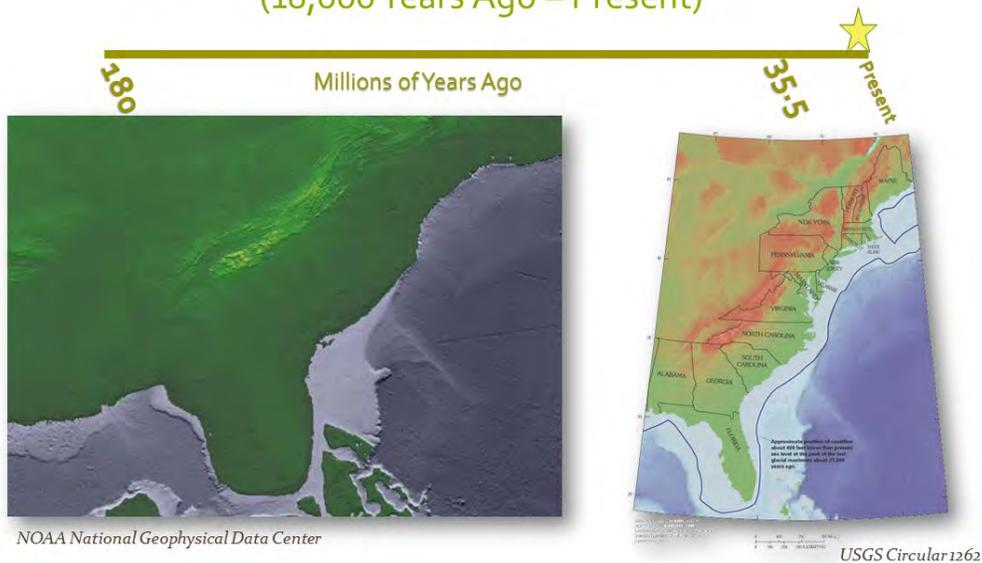
Post-Impact Development



23

Accomack-Northampton Planning District Commission

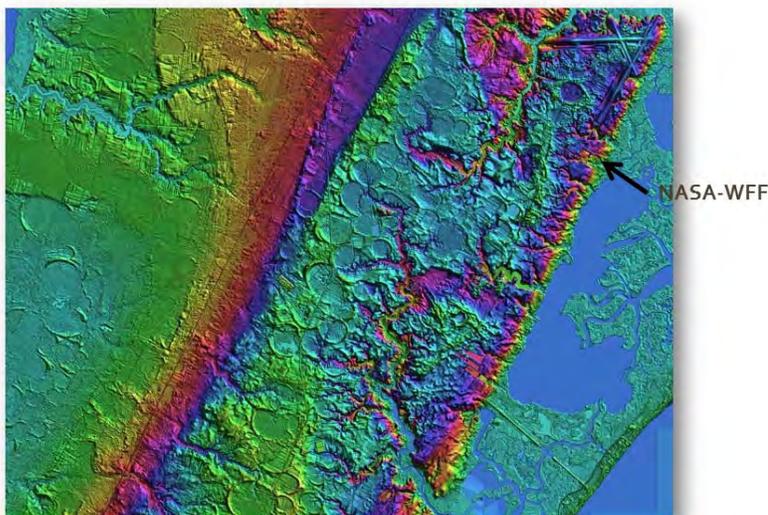
Conditions During and Since Last Glacial Maximum (18,000 Years Ago – Present)



Accomack-Northampton Planning District Commission

Surficial Features: Carolina Bays

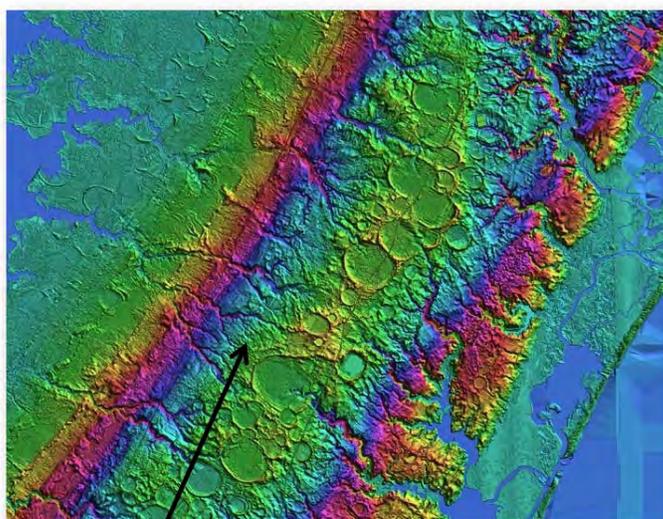
- Over 700 shallow, elliptical depressions
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Cintos (2012)

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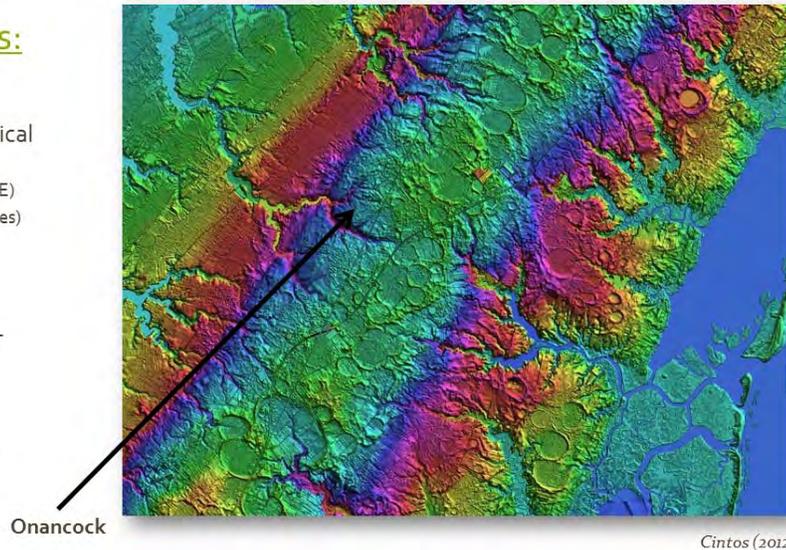


Parksley

Cintos (2012)

Surficial Features: Carolina Bays

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Cintos (2012)

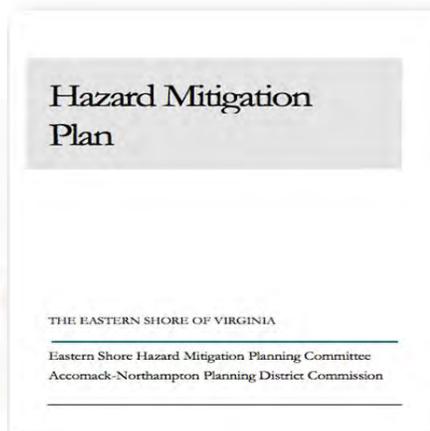
Long –Term Planning for Eastern Shore & Chesapeake Bay

- **Accomack & Northampton Counties**
 - Neither have policies directly addressing sea level rise
 - Both acknowledge sea level rise in Comp Plans
 - Accomack acknowledges modern rates @ 1.5 to 3 times the historic rate
 - Both mitigate flooding damages via:
 - Enforcing flood-resistant construction practices in Flood Hazard Areas
 - Both require homes constructed in Flood Hazard Areas be at least 1 ft above the FEMA Base Flood Elevation
 - Participating in the FEMA Community Rating System program (Accomack does, North. does not)
 - Elevating houses (approx. 100 in past)
 - Implementing Chesapeake Bay Preservation Act on both bayside and seaside
- **State Efforts**
 - **Governor's Commission on Climate Change (2008)** – identified CC impacts and adaptation strategies
 - **VIMS – VA Recurrent Flooding Study (2012)**
 - Identifies issues facing coastal localities, recommends options for adaptation
 - Forecasts 1.0-2.5' of SLR by 2050 and 1.5-7.5' of SLR by 2100
 - **Secure Commonwealth Panel Recurrent Flooding Sub-panel (2013-2014)** – Developing implementation strategies for adaptation
- **ESVA Ground Water Committee - Ground Water Supply Protection and Management Plan Update** → 2013; monitoring regional salt water intrusion into aquifers
- **NASA Wallops Flight Facility** – Adaptation Workshop → Fall 2012; Climate Adaptation Science Initiative; Accomack Co. Joint Land Use Study → 2013
- **USFWS ESVA and Chincoteague National Wildlife Refuges**

Long –Term Planning Continued - ESVA Hazard Mitigation Plan

- A-NPDC, 2 Counties, 13 Towns
- Original 2006, Updated in 2011

1. *Review historical hazards*
2. *Identify and prioritize natural hazards*
 - Highest Priority Hazards: **Coastal Flooding**, High Wind, Stormwater Flooding, Coastal Erosion
3. *Conduct risk & vulnerability assessment for high priority hazards*
 - ESVA Coastal Flooding Risk in 2011 → \$470,000,000 Potential Total Loss (with \$300,000,000 Uninsured) from a 100-Year Flood Event
4. *Define mitigation strategies and develop mitigation projects to mitigate future hazard impacts*

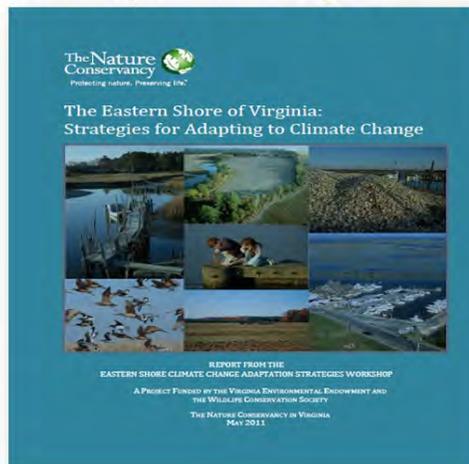


November 6, 2013

Accomack-Northampton Planning District Commission

Long –Term Planning Continued – The Nature Conservancy’s ESVA Climate Adaptation Project

- **ESVA Climate Adaptation Workshop**
 - August 2010
 - Local and regional participants
 - Industries (agriculture, aquaculture, tourism)
 - Local, state, and federal government agencies
 - Local community organizations
 - Identified impacts to natural and built environment
 - Created Climate Adaptation Working Group
- **ESVA Strategies for Adapting to Climate Change**
 - May 2011
- **High resolution elevation data (LiDAR) for Accomack and Northampton Counties**
 - March 2012



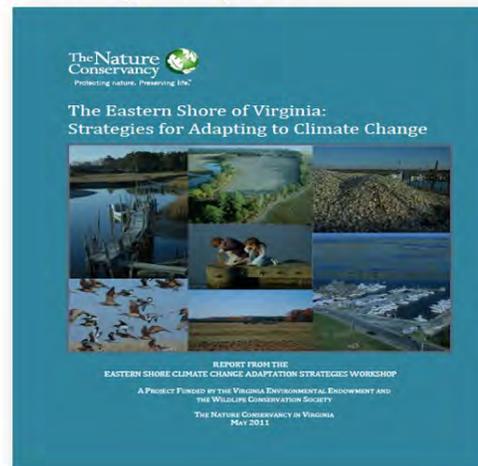
30

July 23, 2012

Footer text here

Long –Term Planning Continued – ESVA Strategies for Adapting to Climate Change Report

- Identifies global climate change impacts on ESVA
 - Sea level
 - Temperature
 - Precipitation
- Develops vision for adaptation on ESVA
- Prioritizes Adaptation Strategies
 1. Local Adaptation Planning – County Comp Plans, Hazard Mitigation Plan
 2. Shoreline Management Plans – with VIMS
 3. Restoration & Protection of Natural Systems
 4. Ground Water Management
 5. Education & Outreach



31 July 22, 2012 Footer text here

Long –Term Planning Continued – ESVA Climate Adaptation Working Group

- Local, State, & Federal Representatives
 - A-NPDC, ESSWCD
 - ESVA Counties & Towns
 - VDEM, VCZMP, VIMS, UVA-LTER, VDCR, VDOT
 - NASA-WFF, USDA-NRCS, USFWS
 - Eastern Shorekeeper, Nature Conservancy, CBES, ES RC&D Council, VESLT, Wetlands Watch
 - & the list is still growing!

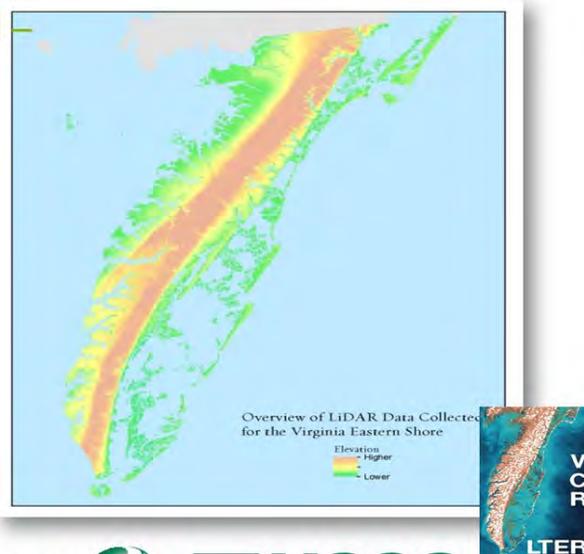


- Facilitate implementation of key adaptation strategies by ESVA localities
- Public Education & Outreach
- Forum for comparison & coordination amongst localities & agencies
- Serve as contact point for state and regional studies
- Explore funding options for adaptation

32 July 22, 2012 Footer text here

Long –Term Planning Continued LiDAR Elevation Data

- Many Planning Uses:
 - More safely site development out of harm’s way
 - Document shoreline change
 - Hazard mitigation planning
 - Emergency service planning
 - Stormwater management plans
 - FEMA Flood Insurance Rate Maps
 - Document vegetation cover & land-use practices



The Nature Conservancy
Protecting nature. Preserving life.™

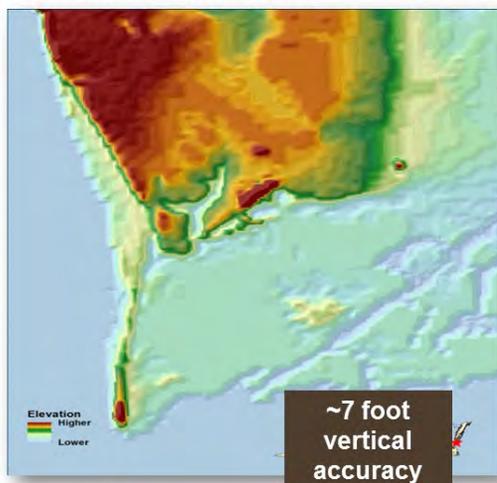
USGS
science for a changing world

UNIVERSITY OF VIRGINIA

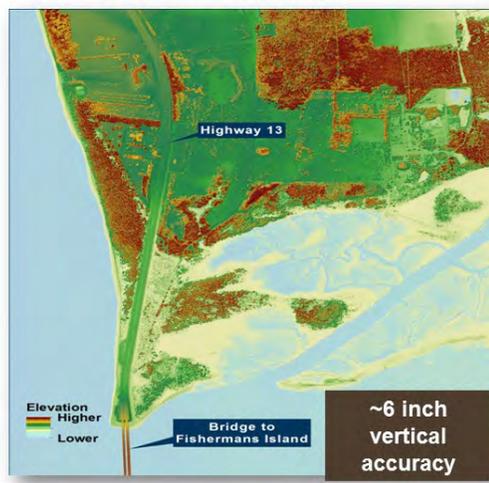
33 July 22, 2012 Footer text here

LiDAR Elevation Data Example: Southern Tip of Shore

Old Elevation Data



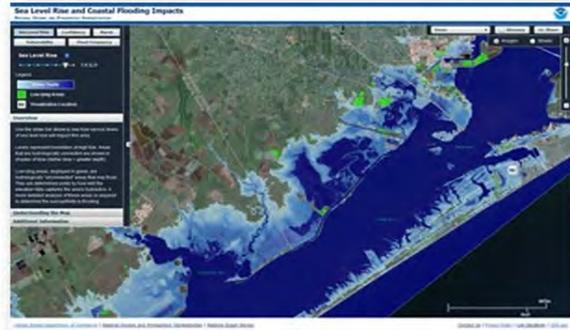
New LiDAR Data



34 July 22, 2012 Footer text here

NOAA Sea Level Rise & Coastal Flooding Impacts Viewer

- NOAA Coastal Services Center Digital Coast
- Maps – Now Available
 - Sea Level Rise Inundation
 - Shallow Flooding Frequency & Duration
 - Socioeconomic Vulnerability
 - Marsh Impacts/Migration
 - Mapping Confidence



Accomack – Northampton Coastal Resources Technical Assistance Program



Britt McMillan speaking to local residents at the Ground Water Summit



Britt McMillan engaging local residents on ground water issues

Appendix N

Local Watershed TMDL Working Group Meeting for
Nassawadox, Little Mosquito, and Assawoman Creeks

Kick-off Work Group Meeting
Nassawadox Creek Bacteria TMDL
and
Little Mosquito Creek & Assawoman Creek Dissolved Oxygen TMDL
June 23, 2015
10:00-12:00

Agenda

1. Welcome and Introductions
2. Presentation on TMDL development and watershed details
3. Discuss pollutant source assessment
4. Next steps / Timeline

Contact:

Jennifer Howell

VADEQ-TRO

5636 Southern Blvd, Virginia Beach VA 23462

Email: jennifer.howell@deq.virginia.gov

Phone: (757) 967-8952

Nassawadox and Tributaries Bacteria TMDL
Little Mosquito Creek and Assawoman Creek DO TMDL
Work Group Meeting
June 23, 2015

Name	Affiliation	Email or Address (preferred contact info)
Cot Smith	A-NPDC	CSM: H@c-wydc.org
Phil Hickman	Dublin Farms	dublinfarms@yahoo.com
Brian Sturgis	NPS	brian_sturgis@nps.gov
Brie Prosser	Northampton County Citizen Group	BProsser@aol.com
Ken Duff	citizen	envnoduf@aol.com
Rick Hester	Northampton H&S	RHURHAB@aol.com
Ben Willis	A-NPDC	bwillis@email.wm.edu
Mac Sisson	VIMS	sisson@vims.edu
Anne Schell	DES	Anne.Schell@del.egov.com

Nassawadox and Tributaries Bacteria TMDL
Little Mosquito Creek and Assawoman Creek DO TMDL
Work Group Meeting
June 23, 2015

Name	Affiliation	Email or Address (preferred contact info)
JIAN SHEN	VIMS	shen@vims.edu
Ricardo Snyder	VIMS - EST WATER RESOURCES	rsnyder@vims.edu
Stewart Hall	Accomack Co. DPW	shall@co.accomack.va.us
Dr. Sandra Waldstrie	Northampton Resident	drdawn5@gmail.com
Jon Richardson	Eastern Shore Health Dist	jon.richardson@esh.virginia.gov
Jennifer Hales	Wastebuilders	jmhales@verizon.net
Scott & Victoria Belfitt	ASSA WOMAN RADIUM	scbelfitt@verizon.net vrbelfitt@verizon.net
Rob Gleason	Oyster growers Sea-Response, LLC	brogleson@searesponse.com
Cole Chumock	ESSUED / ASSOCIATION Creek residents	cole.chumock@essued.org

Nassawadox and Tributaries Bacteria TMDL
Little Mosquito Creek and Assawoman Creek DO TMDL
Work Group Meeting
June 23, 2015

Name	Affiliation	Email or Address (preferred contact info)
Rick Morrison	Accomack Co.	RMORRISON@CO.ACCEMACK.VA.US
John Morrison	USDA	KORTEL@NORTHAMPTON.VA.US
David Linn	NASA WFF	david.linn@nasa.gov
Jane Conson-Lessler	NRCS- USDA	jane.lassler@va.usda.gov
Bob Meyers	Nass. Co. Ga.	meyersbr@verizon.net
Linda Goldstone	Nass. Creek	linda@goldstone.net

Appendix O

Presentation to Onancock Rotary Club: Sea Level Rise on the Eastern Shore

Preparing for Sea-Level Rise on the Eastern Shore



Curt Smith, Director of Planning
Accomack-Northampton Planning District Commission
July 21, 2015

A-NPDC Overview and Purpose



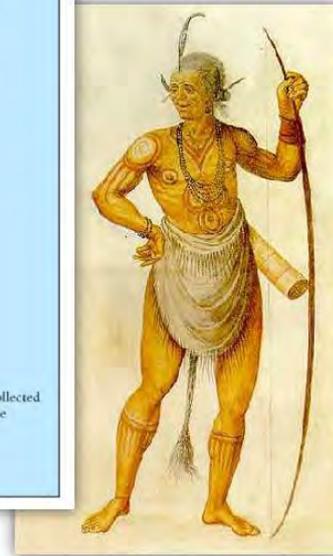
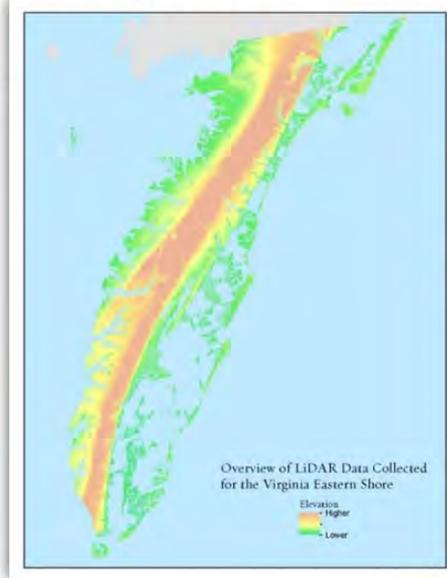
- Commonwealth created 21 PDCs in 1970 to address regional issues by fostering cooperation amongst localities and cooperation between state & localities
- Accomack-Northampton District:
 - Members: 2 Counties and Town of Chincoteague
 - Also provides services to 19 other towns
- Affiliate Organizations:
 - A-N Regional Housing Authority → provides privately or authority-owned rental housing
 - ESV Housing Alliance → improving housing for homeowners
 - A-NPDC →
 - Community Development
 - Economic Development
 - Transportation Planning
 - Environmental Planning → Ground Water Committee; Climate Adaptation Working Group



Local Adaptation History



- Native inhabitants of Eastern Shore appeared to have considered flooding and elevation very effectively when selecting locations for communities.
- Some of these locations are at or near current towns/villages
 - Onancock
 - Eastville
 - Pungoteague



Local Adaptation History



- Eastern Shore regional population peaked approximately 100 years ago
- During 1900s, population remained relatively stable, but development increased in flood-prone areas beginning approximately 50 years ago and continuing to the present
- 100 years ago, residents were self-sufficient with regards to mitigation and adaptation
- In recent decades, residents in flood-prone areas have become increasingly dependent on local, state, and federal governments for assistance with mitigation and adaptation





Local Adaptation Activities



2 Counties and 19 Incorporated Towns

- Neither have specific policies directly addressing sea level rise
- Counties both acknowledge sea level rise in Comp Plans
 - Accomack acknowledges modern rates @ 1.5 to 3 times the historic rate
- Localities mitigate flooding damages by:
 - Enforcing flood-resistant construction practices in Flood Hazard Areas
 - Participating in the National Flood Insurance Program and FEMA Community Rating System program (Accomack, Chincoteague, Cape Charles, and Wachapreague only)
 - Elevating houses (≈100 in region)
 - Implementing Chesapeake Bay Preservation Act on both bayside and seaside



ESVA Hazard Mitigation Plan



Hazard Mitigation Plan

Original 2006, Updated in 2011, 2016 rewrite underway

1. Review historical hazards (***)2016 HMP to consider both historical and projected hazards)
2. Identify and prioritize natural hazards
Highest Priority Hazards: Coastal Flooding, High Wind, Stormwater Flooding, Coastal Erosion
3. Conduct risk & vulnerability assessment for high priority hazards
ESVA Coastal Flooding Risk in 2011 → \$470,000,000 Potential Total Loss (with \$300,000,000 Uninsured) from a 100-Year Flood Event
4. Define mitigation strategies and develop mitigation projects to mitigate future hazard impacts

THE EASTERN SHORE OF VIRGINIA
Eastern Shore Hazard Mitigation Planning Committee
Accomack-Northampton Planning District Commission



ESVA Climate Adaptation Working Group (CAWG)



- Local, State, & Federal Representatives
 - A-NPDC, ESSWCD
 - ESVA Counties & Towns
 - VDEM, VCZMP, VIMS, UVA-LTER, VDCR, VDOT
 - NASA-WFF, USDA-NRCS, USFWS
 - Eastern Shorekeeper, Nature Conservancy, CBES, ES RC&D Council, VESLT, Wetlands Watch
 - & the list is still growing!



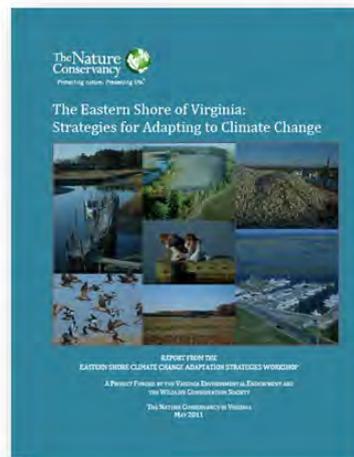
- Facilitate implementation of key adaptation strategies by ESVA localities
- Public Education & Outreach
- Forum for coordination amongst localities & agencies
- Serve as point of contact for state and regional activities
- Explore funding options for adaptation



ESVA Strategies for Adapting to Climate Change Report



- Identifies global climate change impacts on ESVA
 - Sea level
 - Temperature
 - Precipitation
 - Storms
 - CO2 Levels
- Develops vision for adaptation on ESVA
- Prioritizes Adaptation Strategies
 1. Local Adaptation Planning – County Comp Plans, Hazard Mitigation Plan
 2. Shoreline Management Plans – with VIMS
 3. Restoration & Protection of Natural Systems
 4. Ground Water Management
 5. Education & Outreach





CAWG Public and Stakeholder Outreach Activities



Workshops



- 2012 Coastal Flooding Workshop
 - *First public survey of local attitudes/opinions related to SLR and adaptation*
- 2012 NASA-WFF Adaptation Workshop
- 2013 Coastal Insurance Workshop
- 2013 NOAA Sea Level Rise Viewer Workshop
- 2014 Enhancing Coastal Resilience Community Leader Workshop



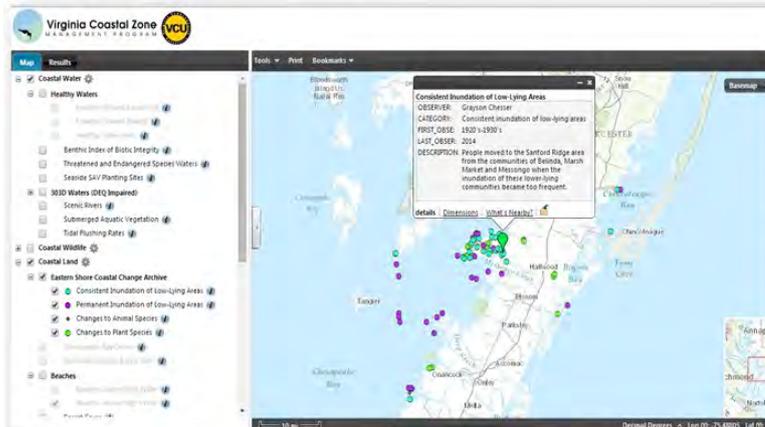
CAWG Public and Stakeholder Outreach Activities



Coastal Change Archive

Compilation of local accounts of observations made regarding changes to the natural environment related to sea level rise and climate change

- *Consistent inundation of low-lying areas*
- *Permanent inundation of low-lying areas*
- *Changes to animal species*
- *Changes to plant species*





Transportation Infrastructure Inundation Vulnerability Assessment (TIIVA)



Regional assessment to determine which roads are most vulnerable to inundation from sea-level rise

- In partnership with VDOT
- For long-range planning purposes
- Incorporates most recent VIMS SLR projections
- Considers how communities could have access limited or become disconnected with inundation of connector routes
- First region-wide study of its type in state
- Final report: May 2015

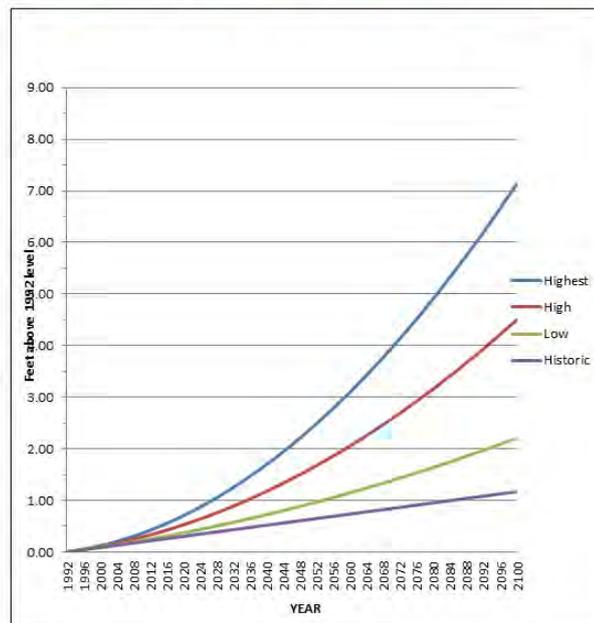


When is this projected to occur?

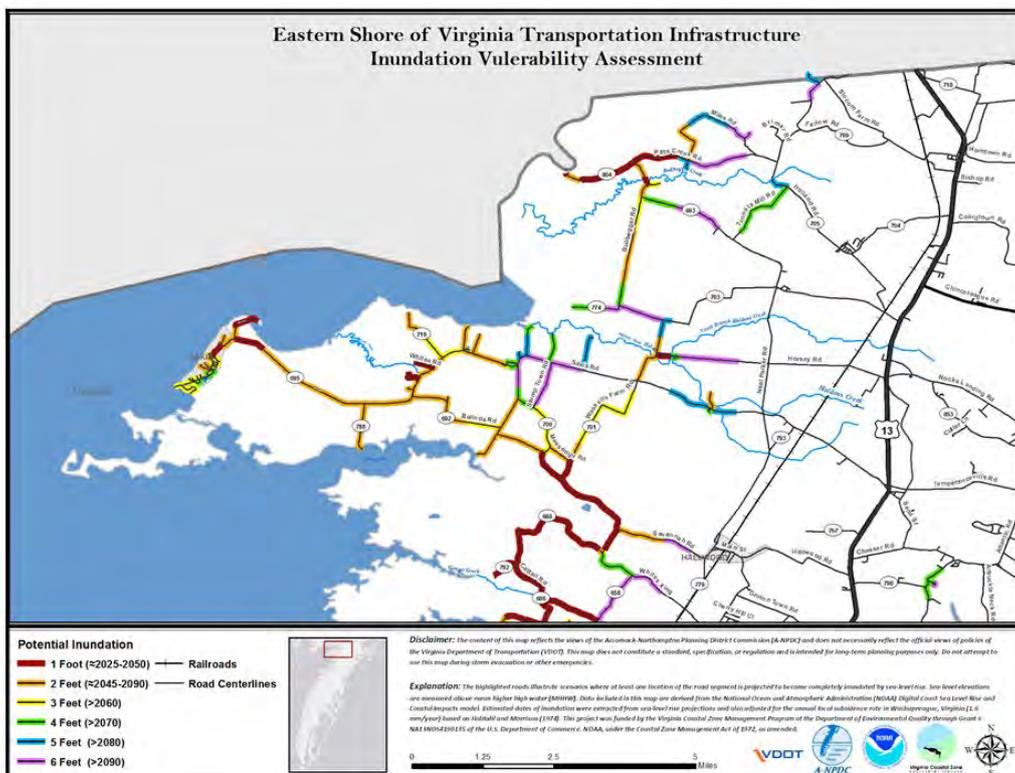


VA Sea-level Projections:

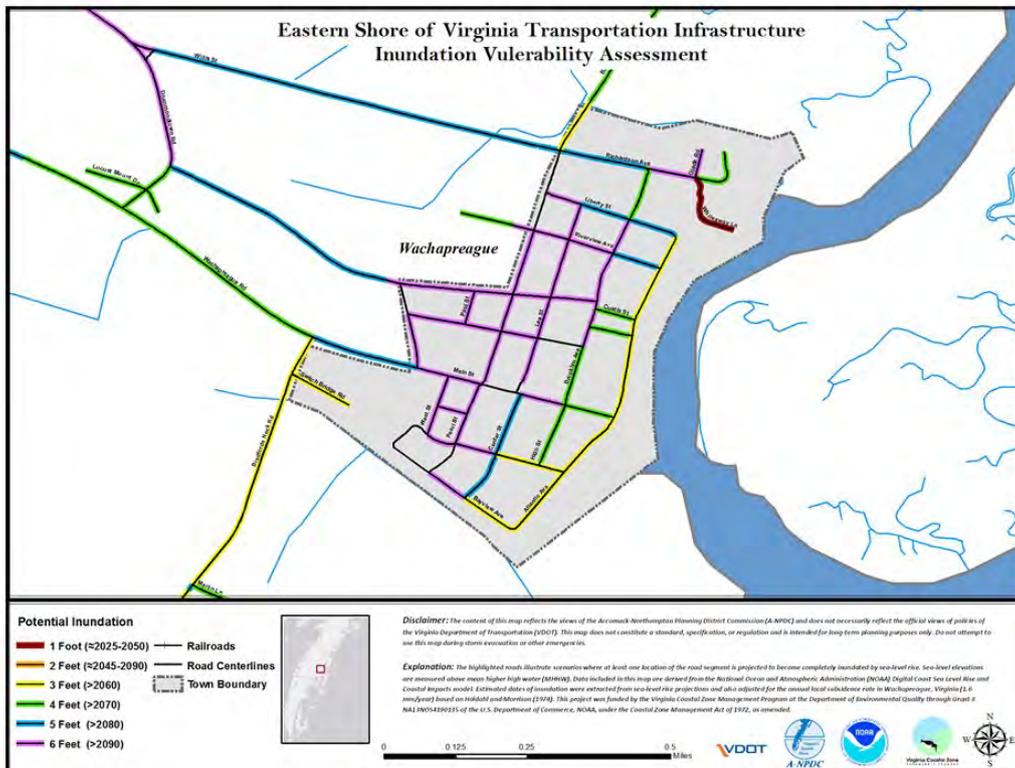
- Includes measurements from 1992-2009 and projections to 2100
- Based on 2014 National Climate Assessment curves
- Adjusted for the annual local subsidence rate in Wachapreague (1.6 mm/yr) based on Holdahl & Morrison 1974 study
- VIMS recommends using high curve



Regional Maps



Town Maps



Sea Level Scenarios Above Current MHHW

Jurisdiction	Total Miles of Roads	1 foot (≈2025-2050)		2 feet (≈2045-2090)		3 feet (>2060)		4 feet (>2070)		5 feet (>2080)		6 feet (>2090)	
		Total Miles Inundated	% of Total in Jurisdiction	Total Miles Inundated	% of Total in Jurisdiction	Total Miles Inundated	% of Total in Jurisdiction	Total Miles Inundated	% of Total in Jurisdiction	Total Miles Inundated	% of Total in Jurisdiction	Total Miles Inundated	% of Total in Jurisdiction
Eastern Shore of Virginia	1516	33	2.2%	131	8.6%	209	13.8%	270	17.8%	319	21.0%	371	24.5%
Accomack County	1014	31	3.1%	115	11.3%	183	18.0%	236	23.3%	275	27.1%	316	31.2%
Town of Belle Haven	7	0	0.0%	0	0.0%	0	0.0%	0.11	1.6%	0.11	1.6%	0.32	4.6%
Town of Chincoteague	60	4	6.7%	38	63.3%	56	93.3%	60	100.0%	60	100.0%	60	100.0%
Town of Onancock	13	0	0.0%	0.43	3.3%	0.79	6.1%	1	7.7%	1	7.7%	1	7.7%
Town of Saxis	4	0.25	6.3%	1	25.0%	2	50.0%	4	100.0%	4	100.0%	4	100.0%
Town of Tangier	4	4	100.0%	4	100.0%	4	100.0%	4	100.0%	4	100.0%	4	100.0%
Town of Wachapreague	5	0.12	2.4%	0.12	2.4%	0.88	17.6%	2	40.0%	2	40.0%	5	100.0%
Northampton County	502	2	0.4%	16	3.2%	26	5.2%	34	6.8%	44	8.8%	55	11.0%
Town of Cape Charles	28	0	0.0%	0	0.0%	0	0.0%	0.2	0.7%	6	21.4%	8	28.6%

Community Accessibility Maps

Accomack County							
Community/Critical Facility	# of Access Routes	Inundation from Sea Level Rise Above MHHW					
		1 feet (~2025-2050)	2 feet (~2045-2090)	3 feet (>2060)	4 feet (>2070)	5 feet (>2080)	6 feet (>2090)
Assawoman	3						
Baileys Neck	1						
Battle Point/Baylys Neck	1						
Belle Haven	4						
Bell Neck	1						
Bloxom	4						
Captains Cove	3						
Cashville	2						
Cedar View	1						
Chincoteague	1						
Chincoteague Nat. Wildlife Refuge	1						
Crystal Beach	1						
East Point	1						
Davis Wharf	1						
Deep Creek	1						
Gladding Landing	1						
Greenbackville	2						
Guard Shore	1						
Guilford	3						
Hacksneck	1						
Harborton	1						
Hopkins	1						
Henry's Point	1						
Locustville	2						
Mount Nebo	3						
Nandua Bay	1						
NASA Wallops Flight Facility - Main Base	2						
NASA Wallops Flight Facility - Mid-Atlantic Regional Spaceport	1						
North Chesconessex	1						
Pitts Creek Landing	1						
Poplar Cove	1						
Sanford	2						
Saxis	1						
Schooner Bay	1						
Tangier	0						
Trails End	1						
Quinby/Upshurs Neck	3						
Wachapreague	4						

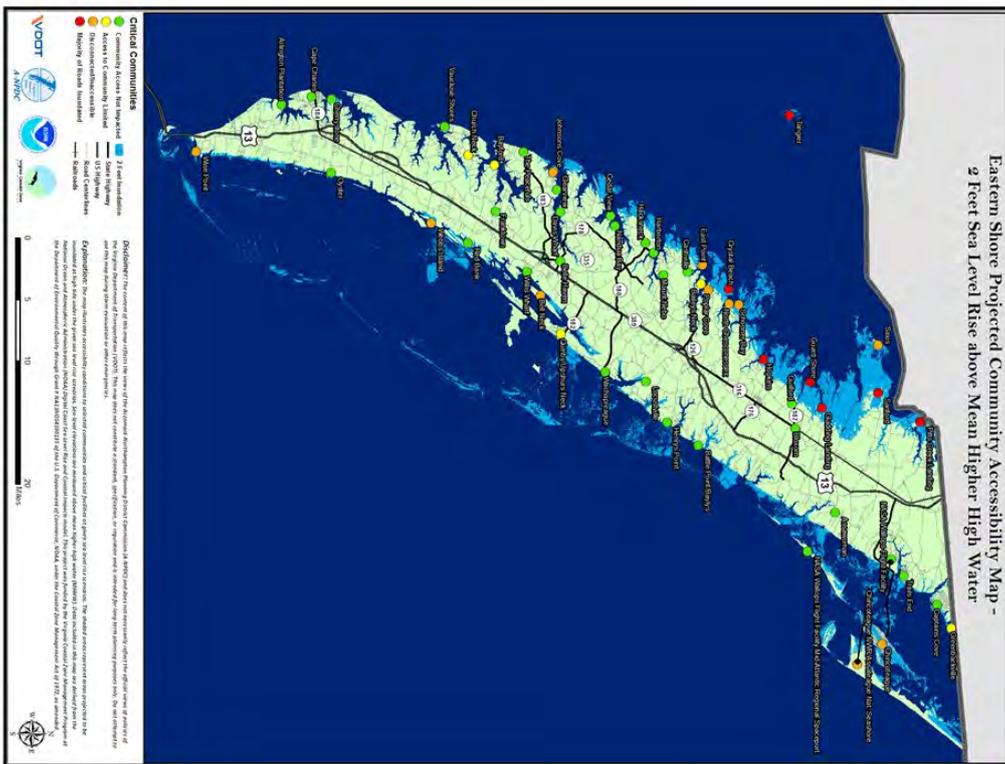
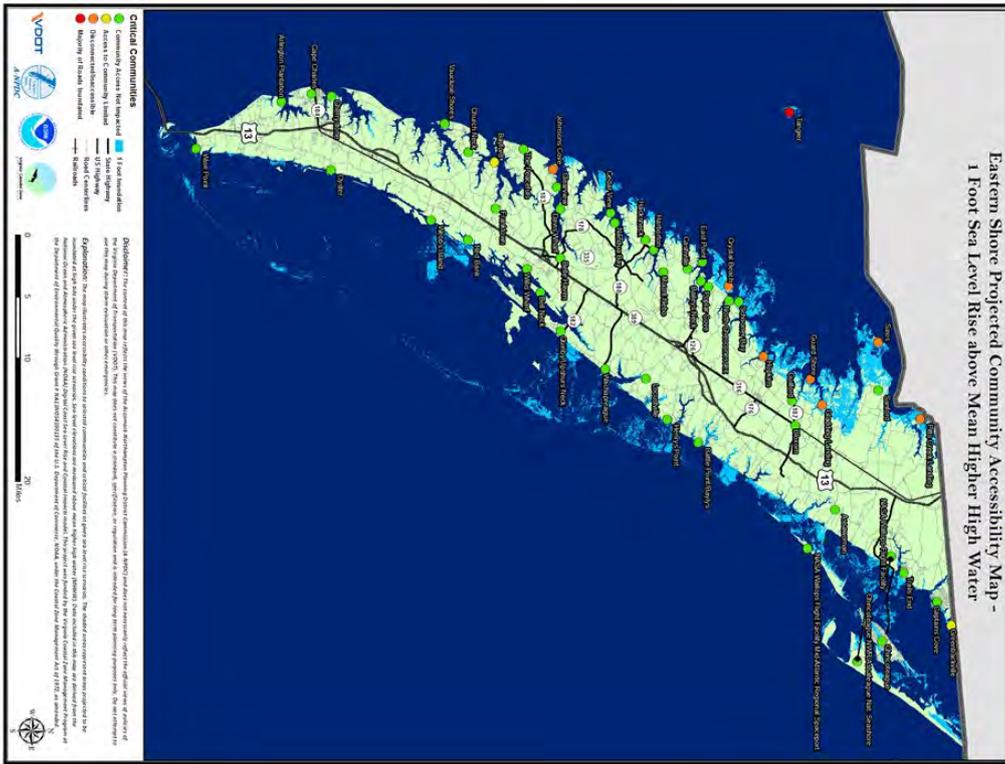
Legend

- Community Access Not Impacted
- Access to Community Limited
- Disconnected/Inaccessible
- Majority of Roads Inundated

Northampton County							
Community/Critical Facility	# of Access Routes	Inundation from Sea Level Rise Above MHHW					
		1 feet (~2025-2040)	2 feet (~2040-2070)	3 feet (~2055-2100)	4 feet (>2065)	5 feet (>2075)	6 feet (>2085)
Arlington Plantation	1						
Bayford	1						
Cape Charles	2						
Cherrystone	1						
Church Neck	1						
Clearview	1						
Franktown	4						
Johnsons Cove/Old Neck	1						
Oyster	2						
The Peacefuls	2						
Red Bank	1						
Vaucluse Shores	1						
Webbs Island	1						
Willis Wharf	2						
Wise Point Landing - ESVA NWR	1						

Legend

- Community Access Not Impacted
- Access to Community Limited
- Disconnected/Inaccessible
- Majority of Roads Inundated



Thank you!



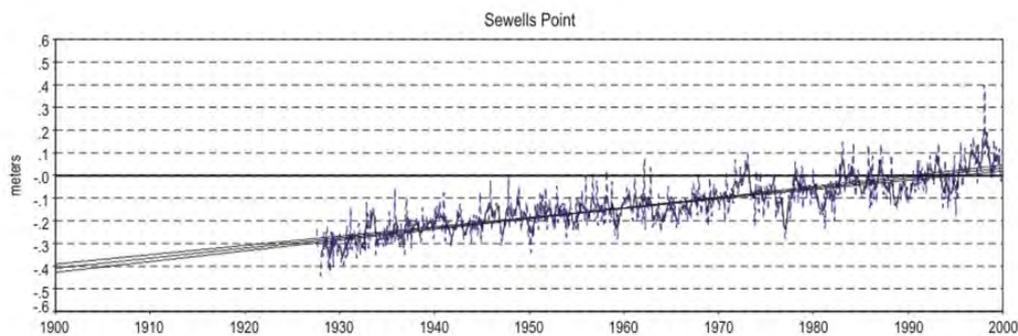
Curt Smith

csmith@a-npdc.org

www.a-npdc.org

757-787-2936

Sea Level Rise on the Shore



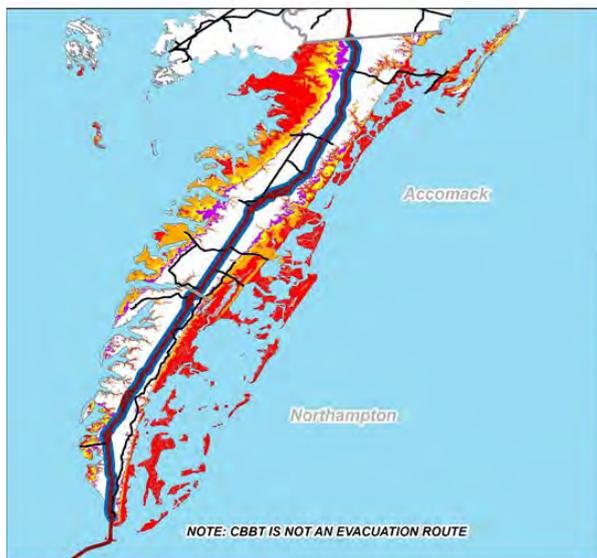
The mean relative sea level trend is 4.42 millimeters/year
(1.45 feet/century)

Flooding Vulnerability on the Shore

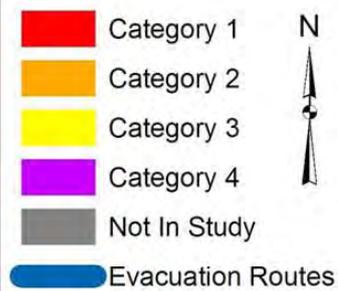


Thieler and Hammar-Klose, 1999

Flooding Vulnerability on the Shore



With 3' SLR, today's category 2 (6-8 ft surge zone) becomes inundated by a category 1 storm.

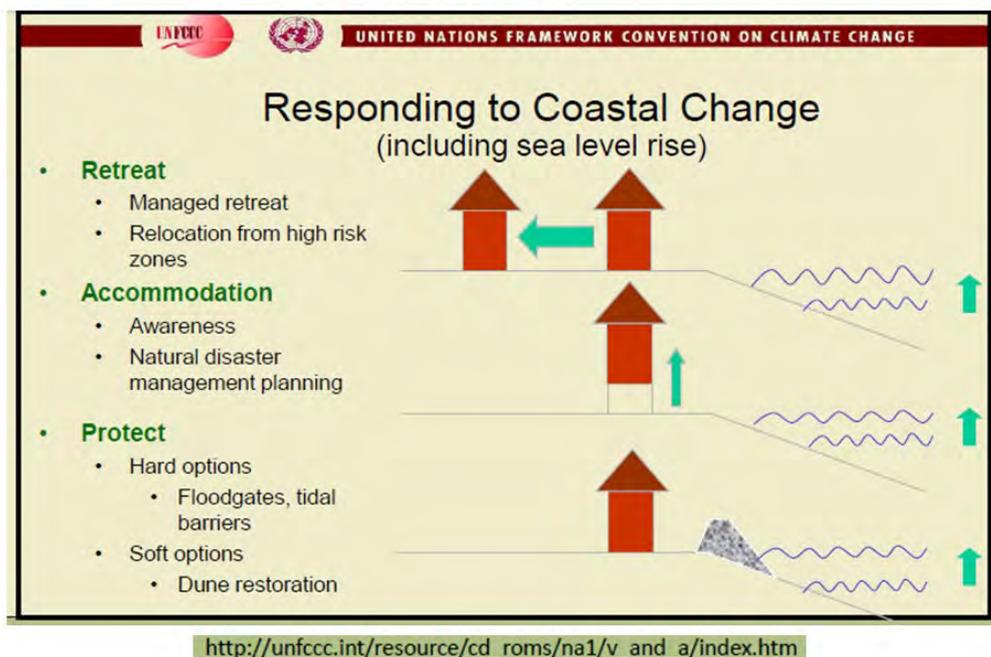


Flooding Vulnerability on the Shore

What's At Risk on the Shore???

- Natural Environment:
 - Ground Water Supply
 - Inundation of Wetlands
 - VA stands to lose between 50-80% of its tidal wetlands with 2' of sea level rise over 100 years (Wetlands Watch, 2007)
 - Loss of critical habitat
- Built Environment:
 - Buildings, utilities, roads
 - Threatens to impact local agriculture, aquaculture, & tourism economies
 - Incorporated Towns: Cape Charles, Wachapreague, Chincoteague, Saxis, Tangier, Onancock
 - NASA Wallops Flight Facility
 - Chincoteague & ESVA NWR

What Do We Do?





Overview and Background



A-NPDC



- State and Federal Governments play a major role in facilitating adaptation planning; however, most adaptation will be implemented at the *local* level.
 - Land-use decisions
 - Public investments
 - Transportation decisions
 - Community development decisions
 - Emergency management
- Virginia: Dillon Rule complicates authority for several issues related to flooding/sea level rise
- Federally-mandated local actions for various programs:
 - FEMA NFIP and Hazard Mitigation
 - USDOT state and regional long-range transportation planning
 - Fed Highway Admin: cost-sharing incentives for SLR/flooding
 - US Dept. of Commerce CEDS
 - USACE SLR standards
 - CZMA: SLR as element of concern



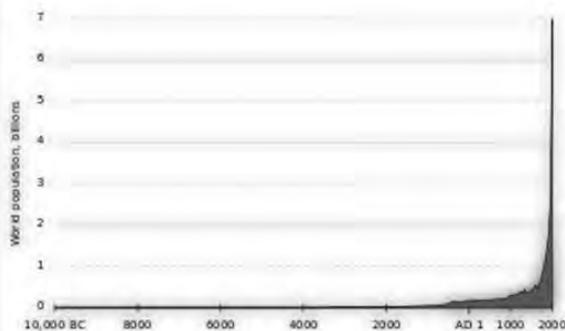
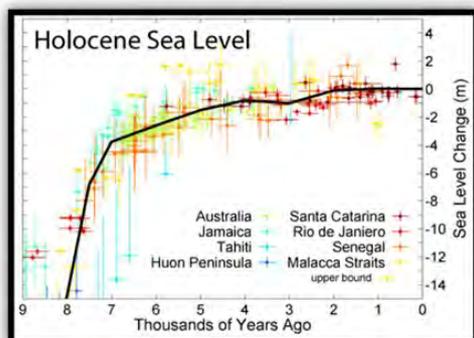
Local Adaptation History



A-NPDC

Worldwide population boomed and communities established permanent residences near the coast during abnormal period of relatively stable global sea level (~<1 ft. – 3 ft./ century)

Problem: Rates of sea level rise are projected to increase back to “normal” levels experienced over past 15,000 year, (24 ft. – 6 ft./century)

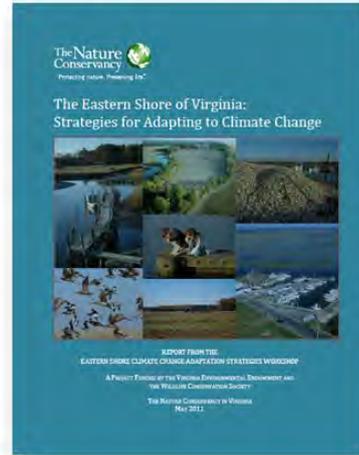




The Nature Conservancy's ESVA Climate Adaptation Project – “The Early Years”



- **ESVA Climate Adaptation Workshop**
 - August 2010
 - Local and regional participants
 - *Industries (agriculture, aquaculture, tourism)*
 - *Local, state, and federal government agencies*
 - *Local community organizations*
 - Identified impacts to natural and built environment
 - Created Climate Adaptation Working Group
- **ESVA Strategies for Adapting to Climate Change**
 - May 2011
- **High resolution elevation data (LiDAR) for Accomack and Northampton Counties**
 - March 2012



Other Local Adaptation Activities



- **ESVA Ground Water Committee**
 - *Ground Water Supply Protection and Management Plan (2013)*
 - Monitoring regional salt water intrusion into aquifers
- **Conservation Planning**
 - Seaside Special Area Management Plan
 - Southern Tip Partnership
- **Working Waterfronts**
 - Definition and inventory (2012)
 - Marina Needs Assessment (2012)





State Adaptation Activities



- **2007:** Virginia Energy Plan recommended a Climate Change Commission
- **December 2007:** Executive Order No. 59 from then Gov. Kaine established Governor's Commission on Climate Change
- **2008 – 2009:** Commission on CC developed recommendations for adapting to irreversible sea-level rise (2.3-5.2') and warming (5.6°F) in 100 years
 - Few of recommended actions acted upon (policies related to mapping, living shorelines for erosion control, SLR planning for localities, and shoreline management plans including SLR)



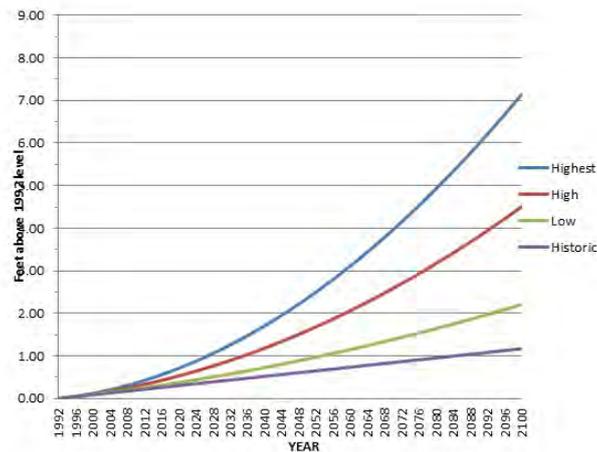
State Adaptation Activities



2011: General Assembly tasks VIMS with conducting Recurrent Flooding Study

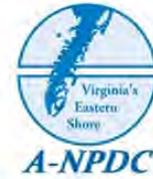
2012: VIMS Recurrent Flooding Study

- **Conclusions:**
 - Recurrent Flooding is significant and projected to worsen in 20-50 years
 - Risks from RF are not similar throughout Tidewater
 - Data are lacking for adequate analysis of risks
 - Implementation of adaptation strategies are possible but 20-30 years is necessary to effectively plan and implement strategies
- **Recommendations:**
 - Immediately begin comprehensive and coordinated planning efforts
 - Initiate identification, collection and analysis of data needed to support planning
 - Assess local government authority to address current and projected flooding risks and enact authorizing legislation
 - Develop a comprehensive state strategy, including prioritization of action and analysis of strategy implementation





State Adaptation Activities



- **2013:** VAC 15.2-2223.2 requires localities to include coastal resource management guidance from VIMS in comp plans
- **2013:** Secure Commonwealth Panel accepts charge of initiating a Recurrent Flooding Sub-Panel as RF was identified in the VIMS RF Study as a real and immediate threat to VA
- **July, 2014:** Gov. McAuliffe signs Executive Order 19 reconvening the Climate Change and Resiliency Update Commission
 - To revisit previous CC Committee recommendations
 - Determine what actions were taken
 - Issue updated final report
- **July, 2014:** General Assembly Joint Subcommittee on Recurrent Flooding established to develop policies that carry out the recommendations of VIMS RF Study, RF Sub-Panel, & CC Committee
- **2014:** Recurrent Flooding Sub-Panel to the Secure Commonwealth Panel publishes comprehensive strategy recommendations based on the VIMS recommendations
- Other important efforts and contributors to recent activities:
 - ODU Mitigation & Adaptation Research Institute
 - VA Coastal Policy Clinic

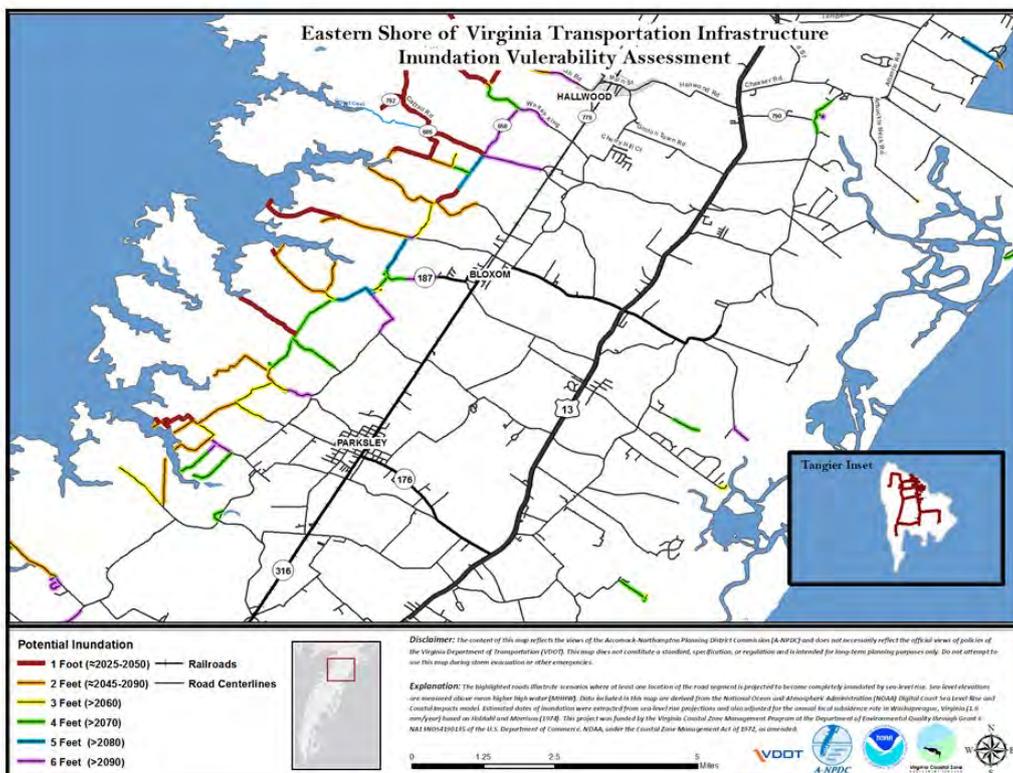
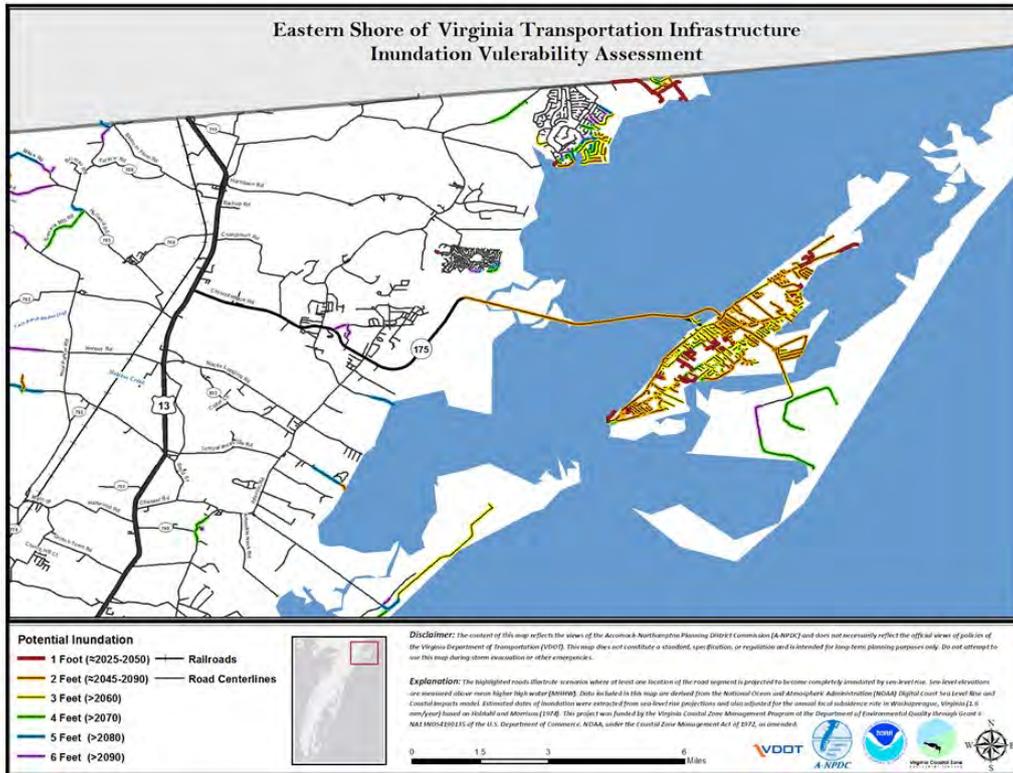


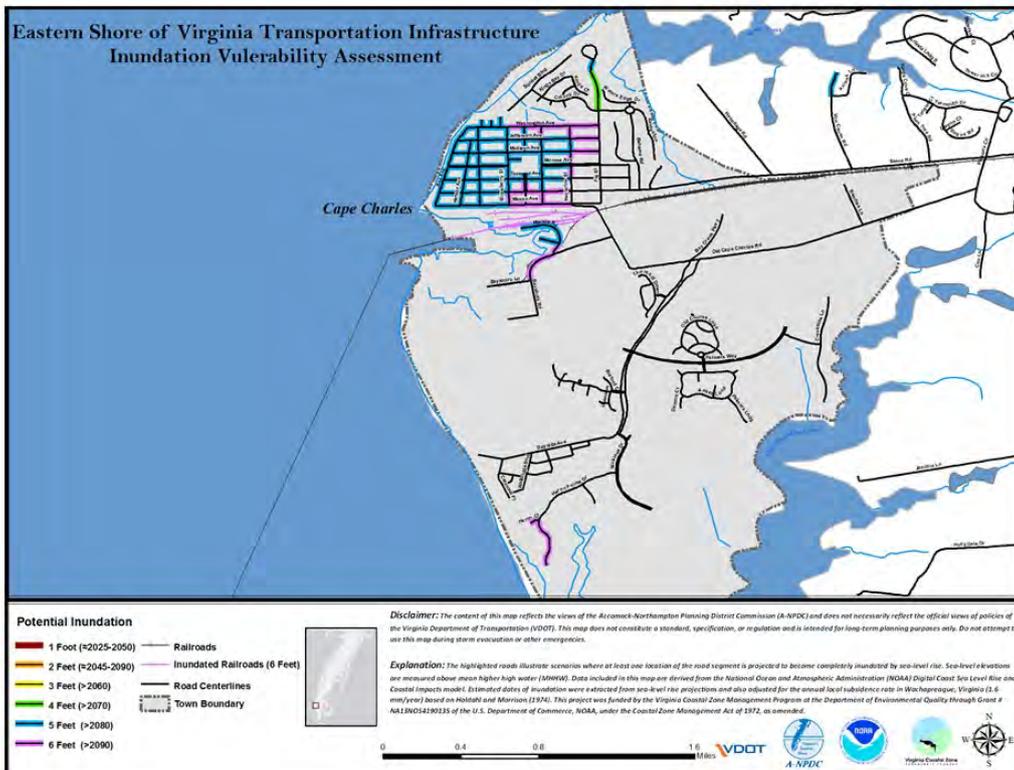
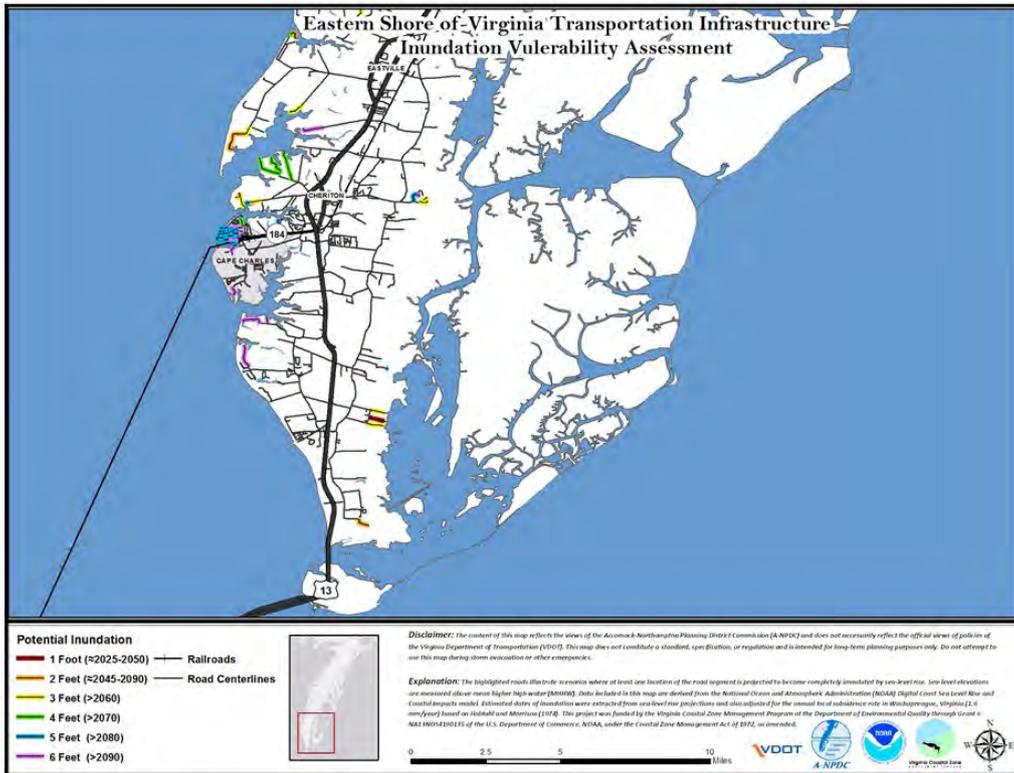
Potential Applications of Coastal Resilience Tool

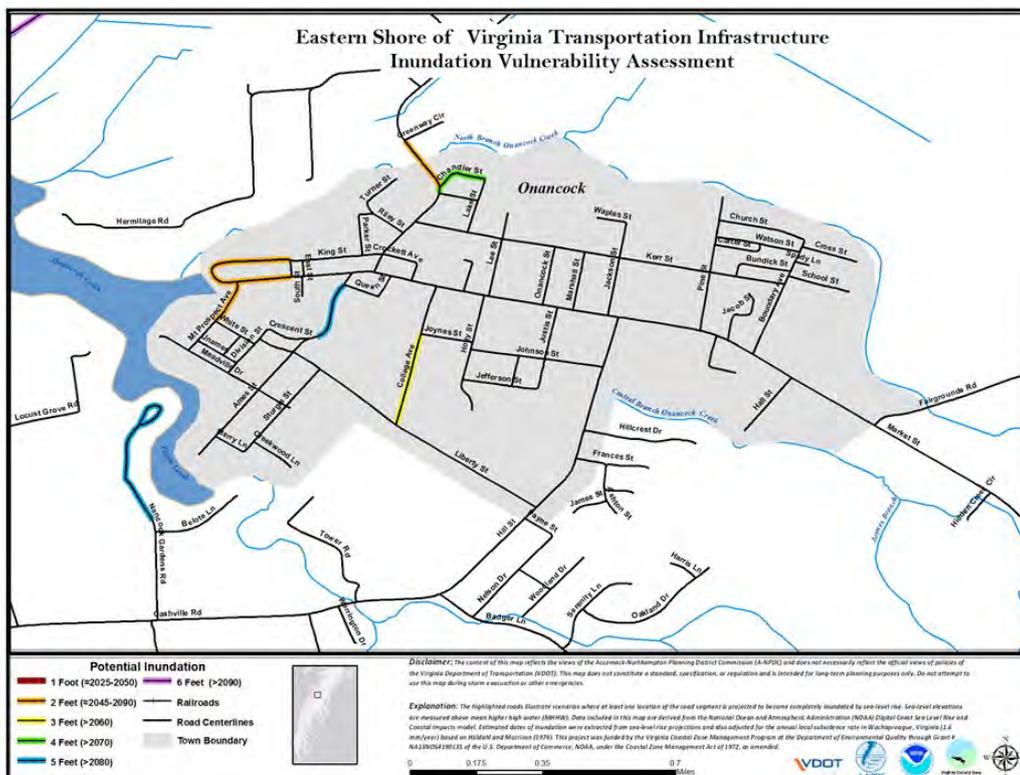


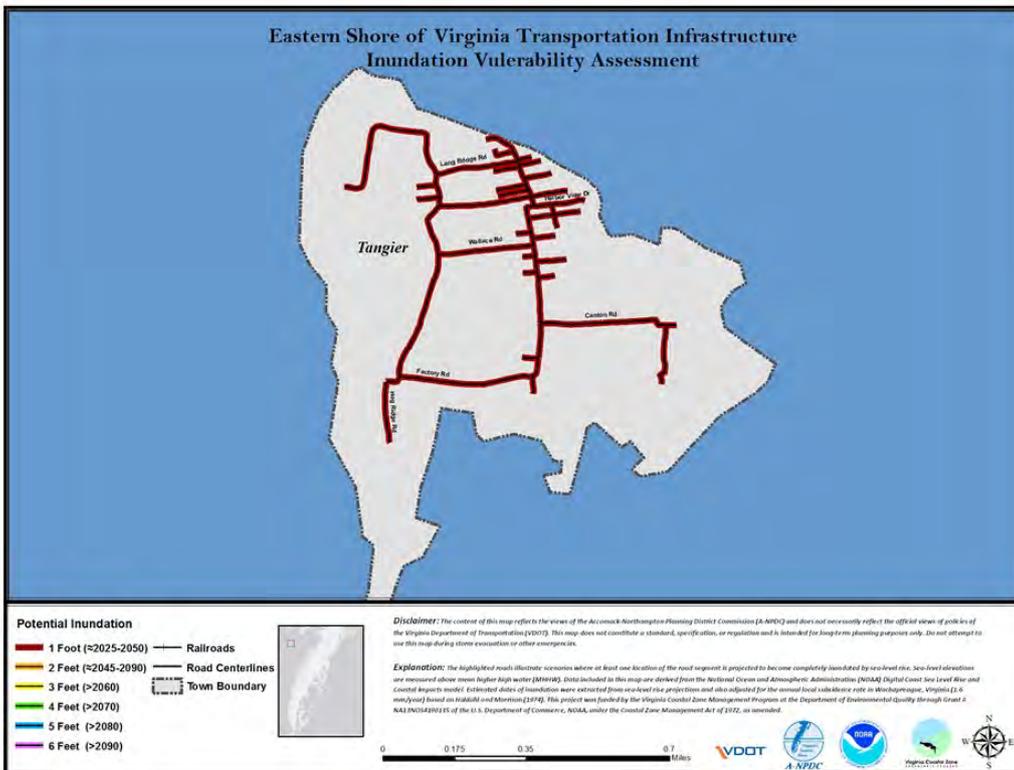
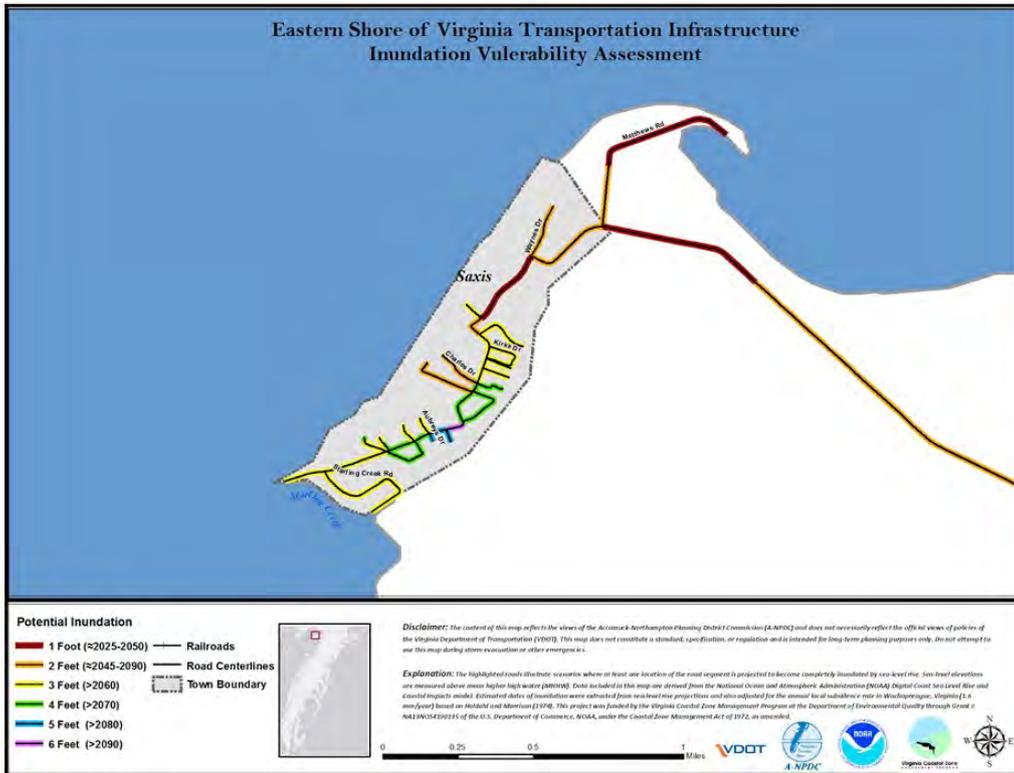
- Customized and centralized local informational resource
- Currently datasets included:
 - Transportation Infrastructure Inundation Vulnerability Assessment (TIIVA)
 - Coastal Change Archive
 - Critical infrastructure
- Potential Planning Uses:
 - More safely site development out of harm's way
 - Hazard mitigation planning
 - Emergency service planning
 - Long-range transportation planning
 - Stormwater management planning
 - Public health
 - Working waterfront/public access adaptation planning
 - Industry adaptation planning: agriculture, aquaculture, tourism











Lessons Learned



Next Steps



Appendix P
VCZMP/Coastal PDC Meeting

Agenda

Summer Coastal PDC Meeting
Hosted by Accomack-Northampton PDC
23372 Front St, Accomac, VA 23301
August 19, 2015
10:30 am – 3:30 pm

- 10:30 Welcome and Introductions– Curt Smith, A-NPDC
- 10:35 CZM Updates and Announcements – April Bahen, VCZM
- 11:00 Coastal Hazards Strategy – Shep Moon, VCZM
- 12:00 Lunch
- 12:45 Working Waterfronts Strategy – Beth Polak, VCZM
- Lewie Lawrence, MPPDC
- 1:45 CSI: Economic Benefits of Natural Resources - Beth Polak, VCZM
- 2:30 PDC Updates
- 3:30 Adjourn

Tangier Site Visit
August 20, 2015
10:00 am – 4:15 pm

- 9:45 Meet at Onancock Wharf
- 10:00 Ferry departs for Tangier
- 11:00 Meet with Tangier Town representatives / tour tangier
- 12:30 Lunch
- 1:30 Working Waterfronts / Coastal Hazards Discussion
- 3:30 Ferry departs for Onancock



Appendix Q

Local Watershed TMDL Working Group Meeting for Little Mosquito and Assawoman Creeks

Little Mosquito Creek and Assawoman Creek DO TMDL
Work Group Meeting
August 26, 2015

Name	Affiliation	Email or Address (preferred contact info)
Irvine Marilyn Ailes	Wastelketchers	marileg@verizon.net
GARNETT A. KELLAN	Land owner	garnettkellan4@gmail.com
Josephine Mooney	RCAD	esrcdc.projectsdirector@gmail.com
Curt Smith	A-NPDC	Csmith@a-npdc.org
Jennifer Howell	DOR-TRO	

Appendix R

Local Watershed TMDL Working Group Meeting for Nassawadox Creeks

Nassawadox Creek and Tributaries Bacteria TMDL

Work Group Meeting
August 26, 2015

Name	Affiliation	Email or Address (preferred contact info)
Jennifer Howell	WADEA-TRBO	jennifer.howell@dcg.virginia.gov
Josephine Morrey	ES RCAD	esredc.projects@director@gmail.com
Paul Young	Resident-NH Co.	ukrenhscreek@verizon.net
Ken DUFFY	Citizens For OPEN COV	envirovaluf@aol.com
Ralph Idd	Farmer/Farm Bureau	rudolde@verizon.net
Calvin Nottingham	Farmer/Farm Bureau	calvinnottingham11@verizon.net
Curt Smith	A-NPDC	Csmith@a-npdc.org
Jennifer Howell	WADEA-TRBO	

Appendix S

Minutes of the November 18, 2014 Eastern Shore of Virginia Ground Water Committee

Minutes of the
Eastern Shore of Virginia Ground Water Committee

The meeting of the Eastern Shore of Virginia Ground Water Committee was held at 10:00 AM on Tuesday, November 18, 2014 in the A-NPDC Conference Room of the Enterprise Building in Accomack, Virginia.

Members Present:

Wanda Thornton, Chairman
Jim Belote
Eugene R. Hampton
Granville Hogg
J. W. Jeffries
Elaine Meil, Secretary

Members Absent:

Grayson Chesser
Richard Hubbard, Vice Chairman
Peter Henderson
Steve Miner
Katherine Nunez

Others Present:

Curt Smith, A-NPDC
Britt McMillan, Arcadis-Malcolm Pirnie
Hank Ghittino, VDEQ
Bob Meyers, Northampton County Citizen
Michael Ward, Northampton Co. Planning Commission
Latonya Justice, ESSWCD
David Liu, NASA

1. Call to Order

Chairman Thornton called the meeting to order at 10:05 AM

2. Minutes of the September 16, 2014 Meeting

The September 16, 2014 minutes were presented.

Committee Member Jeffries moved to approve the Minutes of the September 16, 2014 meeting as presented and Committee Member Belote seconded the motion. The motion carried unanimously.

3. Financial Status Report

The FY 2015 Financial Status Report was presented, showing the Financial Statement ending October 2014.

Bills Payable

Total Bills Payable: \$7,235.00

Committee Member Belote moved to approve the FY 2015 Financial Status Report as presented. The motion, seconded by Committee Member Jeffries carried unanimously.

Accomack County FY16 Budget Request

Staff proposed submitting a request for level funding of \$19,721 to the anticipated budget call in December. The scope of work (SOW) replicates the FY15 SOW.

Committee Member Jeffries moved to discuss and approve the FY 2016 Work Plan and submit to Accomack County. The motion, seconded by Committee Member Belote, carried unanimously.

Northampton County FY16 Budget Request

Staff proposed submitting a request for level funding of \$17,885 to the budget call due on December 1. The SOW replicates the FY15 SOW.

Committee Member Belote moved to discuss and approve the FY 2016 Work Plan and submit to Northampton County. The motion, seconded by Committee Member Hogg, carried unanimously.

4. Public Nomination for 2014 Ground Water Award

Staff provided the Committee a list of previous recipients and requested nominations for the 2014 Ground Water Award. The Committee asked Staff to email a list of past nominees yet to receive an award and revisit the nomination during the January Committee meeting.

5. Staff Update

The following Staff Updates were presented:

Committee Attendance Record

The FY2015 Committee Attendance Record was presented.

Environmental Reviews

Wetlands Mitigation Bank Issue

Secretary Meil presented a summary of research findings into wetlands mitigation banks, as requested by the Committee.

VPDES Permits

None

Ground Water Withdrawal Permit Comment Letters

None

Informational Items

None

Other Items

Public Workshops

Staff reported that 30 people attended the Southern Accomack Co. Groundwater Summit (Accomack to Belle Haven) on October 30 at the Eastern Shore Community College. The summit focused on ground water conditions from Belle Haven to Accomack and followed the outline of previous community-based ground water summits. The schedule for the upcoming workshops in the series are:

June 2015 – Central Accomack County. (Accomack to Temperanceville)

October 2015 – Northern Accomack County (Temperanceville to New Church)

Household Hazardous Waste Collection Update

Staff scheduled the next collection for May 2, 2015 at the Chincoteague and Tasley convenience centers in Accomack, and a site to be determined in Northampton. Staff explored options to establish a permanent regional hazardous waste collection site and operating options framework by contacting other localities who attempted to do so. Staff determined a regional collection site was not recommended based on the experiences of other localities.

VAMWON Training and Residential Water Sampling Update

Staff gave a presentation to participants on regional groundwater conditions at an interpretation workshop at ESCC on November 13. The second round of sampling, advertised at \$49/sample, was not conducted because not enough people were willing to pay a higher fee. Staff is seeking funding sources in order to offer the program at a reduced rate in the future.

Of the 250 participants, 148 agreed to a waiver allowing the Committee to use their data to supplement the ES Ground Water Model.

Indoor Plumbing Survey

The windshield survey of the Bayside, conducted during the week of October 6, covered about 16% of the Bayside areas prioritized by A-NPDC Staff. Staff is exploring options to survey the remaining Bayside areas and the Seaside.

Considerations for Amendment Committee Joint Resolution

A unanimously-approved motion during the September 2014 meeting for Staff to recommend additional topics related to water resources that could be considered by the Committee upon an amendment to the Committee Joint Resolution was postponed until January, 2015.

5. Ground Water Consultant's Report

Technical/Regulatory/Educational Items

1. DEQ Groundwater Withdrawal Reductions in the Eastern Virginia Groundwater Management Area (Mainland): Britt reported that DEQ is proceeding with the planned reduction of groundwater withdrawal permits for 10 of the 14 largest groundwater users in the EVGMA. The planned reductions, close to 53 MGD, are approximately 57% of the permitted withdrawal. The basis for the proposed reductions is over-allocation of groundwater withdrawals that, if all users pumped at their full permitted rights, would result in an unsustainable withdrawal. The reduced amount is based on model-predicted impacts compared against the 80% drawdown criterion. DEQ regards these reductions as a first step in developing "long term solutions" that could include: alternate groundwater sources; additional surface water; storage, possibly combined with reuse; and aquifer recharge. To implement these precedent-setting initial reductions, DEQ will meet with the 10 individual permit holders over the next 9 months with a goal to issue permits by the fall of 2015, and ultimately to achieve the reduction goals within the next 5 to 7 years.
2. An Investigation of the Economic Impacts of Coastal Plain Aquifer Depletion and Actions that May Be Needed to Maintain Long-Term Availability and Productivity: DEQ commissioned a study, completed by Virginia Tech and Abt Associates, to evaluate

potential economic impacts from a 55 to 65 MGD reduction in the permitted groundwater withdrawals for the EVGMA. The study focused on 1) large municipal users; 2) large industrial users; 3) small users; and 4) unpermitted systems. The report evaluated potential impacts to individual groundwater users and considered a number of groundwater management strategies including 1) permit timing; 2) group permitting systems; 3) State support for source water development; 4) addressing self-supplied users; 5) State financing for reducing groundwater use; and 6) support for water use trend studies.

3. *Virginia Household Water Quality Program – Sample Results:* Of the residences submitting samples to the Virginia Tech Household Water Quality Program, 148 voluntarily shared results with the Groundwater Committee. The 148 were nearly evenly divided between both counties with 76 from Accomack County and 72 from Northampton County. Overall, groundwater quality was good, with high salt content (dissolved solids) and iron as the constituents that exceeded the drinking water standard most often (10%). In contrast, only 2% of the samples exceeded the drinking water standard for nitrates. A brief summary of the water quality will be presented. The study indicated soil variations between the two counties, with 80% Bojac soils in Northampton, while Accomack has a lower percentage. Over 90% of the pH levels fell within MCLs.

Ground Water Permits

Permit Application

Type	Name	Withdrawal (gal)			Percentile ¹
		Month	Annual	10-Yr	

¹Percentile is the percent ranking of the Draft Annual Withdrawal amount against all the Permitted Withdrawals (e.g., for Bayville Community; 20% of the permitted withdrawals are less than the requested and 80% of the permitted withdrawals are higher). Percentiles are rounded to the nearest 5%.

Committee Work Plan-Related Items

1. *Eastern Shore of Virginia Groundwater Model:* The Eastern Shore of Virginia Groundwater Model, developed by the USGS, was subsequently adopted by DEQ to evaluate impacts from proposed groundwater withdrawals. The USGS version of the model has groundwater withdrawals that extend through 2003, but does not provide the last 10 years of actual use. Additionally, the USGS version incorporates actual use, but does not include the higher Permit Amount.

DEQ's most recent version of the Eastern Shore Model was received on September 30. The new version can evaluate potential impacts to the groundwater resource under full permitted conditions, as opposed to actual 2003 groundwater use. Current permitted use is more than double the 2003 actual use.

Community Presentations

Public Workshops:

1. Present Detail Review of Groundwater Resources Conditions in specific areas of the Shore. The presentation would include available information from research and studies in that area related to:
 - a. Groundwater quality;
 - b. Aquifer yield characteristics, and

- c. Factors influencing sustainability for that specific region.
2. First Workshop, February 12, 2014, targeted the Shore's south end, from Kiptopeke to Eastville.
3. Second Workshop, June 11, 2014, encompassed the area from Eastville to Exmore.
4. Third Workshop, October 30, 2014, covers the area from Belle Haven to Accomack.

Other Items

None.

6. Other Matters

Committee Member Hogg asked about VACO information regarding fracking impacts on Yorktown agriculture in Mathews Co. and discussion ensued.

7. Public Participation

Bob Meyers of Northampton County nominated Northampton County's Board of Supervisors for the 2014 Ground Water Award due to their resolution to amend the Northampton County Zoning Code ordinance to follow Best Management Practices (BMPs) that minimize non-beneficial withdrawal of ground water while still meeting all other applicable design specifications.

8. Schedule Next Meeting & Adjournment

The next Committee meeting is scheduled for January 20, 2014 at 10:00 AM in the A-NPDC Conference Room in Accomack.

There being no further business brought before the Committee, Committee Member Jeffries moved to adjourn the meeting. The motion was seconded by Committee Member Belote and carried by unanimous vote.

Chairman Thornton adjourned the meeting at 12:05 p.m.

Wanda Thornton, Chairman

Copy test:

Elaine K. N. Meil, Secretary

Appendix T

Minutes of the January 20, 2015 Eastern Shore of Virginia Ground Water Committee

Minutes of the
Eastern Shore of Virginia Ground Water Committee

The meeting of the Eastern Shore of Virginia Ground Water Committee was held at 10:00 AM on Tuesday, January 20, 2015 in the Accomack County Administration Building's Board Chambers, 23296 Accomac, Virginia.

Members Present:

Wanda Thornton, Chairman
Richard Hubbard, Vice Chairman
Jim Belote
Eugene R. Hampton
Granville Hogg
J. W. Jeffries
Elaine Meil, Secretary

Members Absent:

Grayson Chesser
Peter Henderson
Steve Miner
Katherine Nunez

Others Present:

Curt Smith, A-NPDC
Britt McMillan, Arcadis-Malcolm Pirnie
Bill Prorise, Northampton County citizen
Hank Ghittino, VDEQ
Spiro Papadopoulos, Town of Chincoteague Planning Commission
Cole Charnock, ESSWCD
Harvey Spurlock, TOC
Susan Sirnon, A-NPDC

1. Call to Order

Chairman Thornton called the meeting to order at 10:03 AM

2. Minutes of the November 18, 2014 Meeting

The November 18, 2014, minutes were presented.

Committee Member Jeffries moved to approve the Minutes of the November 18, 2014 meeting as presented and Committee Member Hampton seconded the motion. The motion carried unanimously.

3. Financial Status Report

The FY 2015 Financial Status Report was presented, showing the Financial Statement ending January 9, 2015.

Bills Payable

Total Bills Payable: \$7,235.00

Committee Member Hubbard moved to approve the FY 2015 Financial Status Report as presented. The motion, seconded by Committee Member Jeffries, carried unanimously.

4. Public Nomination for 2014 Ground Water Award

The Committee discussed the potential nominations and Committee Chairman Wanda Thornton nominated Waste Watchers for the 2014 Groundwater Award. Staff will procure a plaque to present to the award winner.

Committee Member Hampton motioned to approve Waste Watchers for the 2014 Ground Water Award, and Committee Member Belote seconded the motion. The motion carried unanimously.

5. Staff Update

The following Staff Updates were presented:

Committee Attendance Record

The FY2015 Committee Attendance Record was presented.

Environmental Reviews

None

VPDES Permits

None

Ground Water Withdrawal Permit Comment Letters

None

Informational Items

Virginia Rural Water Association Annual Conference

Staff advised the Committee that the Virginia Rural Water Association Annual Conference, scheduled for April 13-15 in Roanoke, is to focus on community drinking and waste water system operations. Additional information is available from staff upon request.

Other Items

Public Workshops

The schedule for the upcoming workshops series is:

June 2015 – Central Accomack County: Accomack to Temperanceville

October 2015 – Northern Accomack County: Temperanceville to New Church

Household Hazardous Waste Collection Update

Staff scheduled the next collection for May 2, 2015 at the Chincoteague and Tasley convenience centers in Accomack, and at the Birdsnest convenience center in Northampton. Staff plans to begin advertising and outreach efforts in the coming weeks.

Consideration to Amend the Committee Joint Resolution

As requested at the September 2014 meeting, A-NPDC staff presented a summary of potential options for amending the Joint Resolution so that it includes additional topics related to natural resources on the Eastern Shore.

Staff indicated that meetings with the Chairman, Vice Chairman, and Secretary of the Committee and staff of the Eastern Shore Soil and Water Conservation District and USDA-Natural Resources Conservation Service had been held to develop potential topics that could

be considered by the Committee in the future. Staff presented these potential topics for consideration by the Committee: ground water, surface water, natural hazards, and land stewardship coordination. Staff recommended that the Committee:

- 1) Reach a consensus on potential topics;
- 2) Consider potential changes to the Committee name;
- 3) Solicit feedback from relevant stakeholders;
- 4) Amend the Joint Resolution to reflect changes;
- 5) Present the changes to the Counties for adoption;
- 6) Revisit and update the By-Laws as needed.

Discussion ensued regarding surface water and culminated in a request for Staff to write to DEQ to rectify issues with the Total Maximum Daily Load (TMDL) process, to coordinate, and to identify ways the A-NPDC can find funds to implement TMDLs. The Committee wants the Eastern Shore to have input on TMDL technical committees and avoid decisions from Richmond that might adversely affect the Eastern Shore.

Staff reviewed how the Committee could serve as a one-stop shop for information about natural hazards, in order to get information to and to update elected officers, and to solicit direction from them. Staff suggested the Committee could take on more of a working group approach to streamline coordination and dissemination of information to local decision makers.

Staff reviewed how the Committee could consider topics related to land conservation and wetlands mitigation as they pertain to overall stewardship of land in the region. It was suggested that the Committee could become involved in special area management planning (SAMP) activities conducted to identify and better understand potential use conflicts, and to develop baseline datasets for where problems occur in order to enhance economic and environmental productivity in a given area. Updating the Committee on the Virginia Outdoors Plan and Virginia Wildlife Action Plan were provided as examples of how Staff would work with the Committee regarding land stewardship.

The Committee reached consensus for Staff to draft an amendment to the Joint Resolution to present to the Counties. Staff was asked to present a draft Joint Resolution to the Committee for review.

6. Ground Water Consultant's Report

Technical/Regulatory/Educational Items

The Consultant reviewed and the Committee discussed six pieces of proposed legislation that are groundwater-use related, noting some directly affect and others could set policy that indirectly affects the ES. House Bill 1871 proposes to amend the code of Virginia to require registration of private wells. House Bill 1870 amends the code of Virginia to address concerns about large centralized systems by requiring subdivisions using private wells to obtain a groundwater permit if the estimated aggregated withdrawal exceeds 300,000 gallons per month.

The Consultant also cited three joint resolutions that require a Joint Legislative Audit and Review Committee (JLARC) review of water resource programs administered by the state.

All three joint resolutions similarly address potential impact from decreasing groundwater use and the impact of unsustainable groundwater withdrawal. The Consultant posited that it is likely that a joint resolution will come out of the legislative process that is due to be complete by November 2015.

House Bill 1924 creates an Eastern Virginia Ground Water Management Area (EVGMA) Advisory Committee to help DEQ review, develop, and implement a groundwater management strategy, but applies only to Eastern Virginia and not the Eastern Shore. The Consultant noted that the proposed purposes of the EVGMA Committee would be of direct interest, but not necessarily have direct impact to the Eastern Shore.

An Investigation of the Economic Impacts of Coastal Plain Aquifer Depletion and Actions that May be Needed to Maintain Long-Term Availability and Productivity:
The Consultant will review this study at the February meeting.

Ground Water Permits

Permit Application

Type	Name	Withdrawal (gal)			Percentile ¹
		Month	Annual	10-Yr	
CWS	Bayview Community	880,000	10,560,000		20%

¹Percentile is the percent ranking of the Draft Annual Withdrawal amount against all the Permitted Withdrawals (e.g.; for Bayview Community; 20% of the permitted withdrawals are less than the requested and 80% of the permitted withdrawals are higher). Percentiles are rounded to the nearest 5%.

Britt reviewed the Bayview application for groundwater withdrawal and a brief discussion ensued. The Committee will not make a recommendation until a draft permit is submitted.

Committee Work Plan-Related Items

Eastern Shore of Virginia Groundwater Model: No updates.

Saltwater intrusion monitoring discussion: Discussion of saltwater intrusion monitoring was postponed until the February meeting.

Other Items

None.

7. Other Matters

None.

8. Public Participation

None.

9. Schedule Next Meeting & Adjournment

The next Committee meeting is scheduled for February 17, 2015 at 10:00 AM in the ANPDC Conference Room in Accomack.

There being no further business brought before the Committee, Committee Member Jeffries moved to adjourn the meeting. The motion was seconded by Committee Member Belote and carried by unanimous vote.

Chairman Thornton adjourned the meeting at 11:45 p.m.

Wanda Thornton, Chairman

Copy test:

Elaine K. N. Meil, Secretary

Appendix U

Minutes of the March 17, 2015 Eastern Shore of Virginia Ground Water Committee

Minutes of the
Eastern Shore of Virginia Ground Water Committee

The meeting of the Eastern Shore of Virginia Ground Water Committee was held at 10:00 AM on Tuesday, March 17, 2015 in the A-NPDC Conference Room of the Enterprise Building in Accomack, Virginia.

Members Present:

Wanda Thornton, Chairman
Richard Hubbard, Vice Chairman
Jim Belote
Grayson Chesser
Granville Hogg
J. W. Jeffries
Elaine Meil, Secretary

Members Absent:

Eugene R. Hampton
Steve Miner
Katherine Nunez

Others Present:

Curt Smith, A-NPDC
Britt McMillan, Arcadis-Malcolm Pirnie
Bill Prorise, Northampton County citizen
Hank Ghittino, VDEQ
Tammy Stephenson, VDEQ
Cole Chamock, ESSWCD
Harvey Spurlock, Town of Chincoteague
Owen Hooks, NASA
Jon Richardson, ES Health District
Greg Duncan, Accomack County
Dirk Lynch, MSA, P.C.

1. Call to Order

Chairman Thornton called the meeting to order at 10:00 AM

2. Minutes of the January 20, 2015 Meeting

The January 20, 2015 minutes were presented.

Committee Member Jeffries moved to approve the Minutes of the January 20, 2015 meeting as presented and Vice Chairman Hubbard seconded the motion. The motion carried unanimously.

3. Financial Status Report

The FY 2015 Financial Status Report was presented.

Bills Payable

Total Bills Payable: \$0.00

Vice Chairman Hubbard moved to approve the FY 2015 Financial Status Report as presented. The motion, seconded by Committee Member Jeffries, carried unanimously.

4. Staff Update

The following Staff Updates were presented:

Committee Attendance Record

The FY2015 Committee Attendance Record was presented.

Ground Water Withdrawal Permit Comment Letters

None.

Environmental Reviews and Permits

VA Pollutant Discharge Elimination System Program:

- o None

VA Pollution Abatement Program:

- o Del Monte Production Facility, Bloxom – Staff reviewed the application and indicated public comments were due by Mar. 30

Informational Items

Research and News Articles:

- o WaterSavers Program of the International Carwash Association – Staff presented an overview of the program which promotes reduced use of fresh water and proper handling of used water. Local businesses could seek certification in the program and access other resources at the resources included in the attached document.

Upcoming Events:

- o March 22 - World Water Day. Staff indicated that the annual worldwide event was designated by the United Nations since 1993. More information on the history of the event and the observances and activities for this year is available at the World Water Day Web site: <http://www.worldwaterday.org/>. March 22 also starts the annual World Water *Monitoring* Day period, running through the officially observed day of September 18 and ending December 31 (see below, Sep. 18). More information on World Water Monitoring Day is available at <http://www.worldwatermonitoringday.org/About.aspx>.
- o Mar. 31-Apr. 2, 2015, Virginia Military Institute, Lexington: 25th Annual Environment Virginia Symposium. Organized by the VMI Center for Leadership and Ethics. More information: <http://www.vmi.edu/environmentva>.

Other Items

Public Workshops

Staff indicated the schedule for the upcoming workshops series is:

June 2015 – Central Accomack County: Accomack to Temperanceville

October 2015 – Northern Accomack County: Temperanceville to New Church

Household Hazardous Waste Collection Update

Staff presented an event flyer and reported that the next collection is scheduled for May 2, 2015 at the Chincoteague and Tasley convenience centers in Accomack, and at the Birdsnest

convenience center in Northampton. Staff reported that advertising and outreach efforts are planned to begin in the coming weeks.

Consideration to Amend the Committee Joint Resolution

Staff reported that a draft Joint Resolution with all requested amendments was developed and distributed to Committee members for review. The Committee will continue reviewing the document and incorporate any necessary changes prior to presenting to the Counties for consideration.

ES Master Gardeners Presentation

Curt reported that he is scheduled to give an overview presentation on local ground water resources on March 25 at the Virginia Tech AREC in Painter.

VPDES General Permit for Domestic Sewage Discharges TAC Meeting

Staff presented draft minutes from the 1st meeting of the technical advisory committee in January. Staff reported that the TAC was established to assist in the development of necessary amendments to and reissuance of 9VAC25-110, Virginia Pollutant Discharge Elimination System General Permit for Sewage Discharges Less Than or Equal to 1,000 gallons per day. Staff reported that the 2nd TAC meeting in February was cancelled. Discussion ensued regarding septic permitting requirements including comments on how onerous the permitting process is.

5. Ground Water Consultant's Report

Technical/Regulatory/Educational Items

1. House Bill 1924: Status (2/9/2015): House passed 90-Y 0-N. Delegate Hodges introduced legislation (HB 1924) to establish an "Eastern Virginia Groundwater Management Advisory Committee" to assist DEQ in developing, revising, and implementing a management strategy for groundwater in the EVGMA. Status (2/9/2015): House passed 90Y 0N. The Committee would consider 1) option for developing long-term alternative water sources; 2) local and regional water supply plans to determine water demand and possible solutions for meeting that demand; 3) potential funding options for study and implementation of management options; 4) alternative management structures, including water resource trading program, formation of a long-term groundwater management committee, and water management strategies; 5) additional data needed to fully assess aquifer health and sustainability; and 6) current groundwater permitting criteria. Discussion ensued about potential implications to the Eastern Shore of Virginia Ground Water Committee resulting in consensus among the Committee that the Committee should be represented at the meetings of the Technical Advisory Committee.

Vice Chairman Hubbard moved to have the Britt McMillan represent the Committee at future meetings of the Eastern Virginia Groundwater Management Advisory Committee and provide regular updates to the Committee. The motion, seconded by Committee Member Hogg, carried unanimously.

2. House Bill 1870: Status (2/10/2015): Left in Subcommittee. Delegate Bulova introduced legislation (HB 1870) to require developers of new subdivisions in a groundwater management area to obtain a withdrawal permit if the total volume projected to be withdrawn by all individual wells equal or exceed 300,000 gallons per month.

3. House Bill 1871: Status (2/9/2015): House passed 78-Y 19-N. Delegate Bulova introduced legislation (HB 1871) to require registration of all new wells within 30-days of construction in groundwater management areas and requires VDH 1) annually provide DEQ with a list of all wells permitted in the previous year and 2) provide DEQ copies of all historical VDH well construction records.
4. House Joint Resolution 623: Status (2/9/2015): House adopted resolution 85-Y 7-N. Delegate Hodges introduced House Joint Resolution 623 directing JLARC to study Virginia's water resource planning and management, particularly with regard to groundwater.
5. House Joint Resolution 595: Status (2/6/2015): Incorporated into HJ 623 by voice vote. Delegate O'Bannon introduced House Joint Resolution 595 directing JLARC to study Virginia's water resource planning and management. The JLARC study would 1) assess the extent to which ground and surface water consumption is unsustainable, the potential effects of unsustainable consumption, and the risk of overconsumption in the future; 2) assess the effectiveness of the state's permitting process for ground and surface water withdrawals; 3) assess effectiveness of state and local water resource planning, including the role state and local plans play in water withdrawal permitting; 4) examine adequacy of funding and staff for managing Virginia's water resources; and 5) consider the need for strategies and practices to increase ground and surface water available for consumption.
6. Senate Bill 1341: Status (2/10/2015): Senate passed 37-Y, 0-N. Senator Norment introduced Senate Bill 1341 to establish the Eastern Virginia Groundwater Management Advisory Committee (the Committee) to assist the Department of Environmental Quality (DEQ) in developing, revising, and implementing a management strategy for ground water in the Eastern Virginia Groundwater Management Area. The bill has a sunset date of January 1, 2018.
7. Senate Joint Resolution 272: Status (2/6/2015): Agreed to by Senate by voice vote; House referred to Committee on Rules. Senator Norment introduced Senate Joint Resolution 272 directing JLARC to study Virginia's water resource planning and management, particularly with regard to groundwater and surface water.
8. DEQ Groundwater Withdrawal Reductions in the Eastern Virginia Groundwater Management Area (Mainland): Britt reported that DEQ is proceeding with the planned reduction permitted groundwater withdrawals for 10 of the 14 largest groundwater users in the EVGMA. The planned reductions amount to approximately 57% of the permitted withdrawal, or close to 53 MGD. The basis for the proposed reductions is an over allocation of groundwater withdrawals that, if all users pumped at their full permitted rights, would result in an unsustainable withdrawal. The reduced amount is based on model predicted impacts compared against the 80% drawdown criterion. DEQ views these reductions as the first step in development of "long term solutions" that may include alternate groundwater sources, additional surface water, storage possibly combined with reuse, and aquifer recharge. To implement the initial reductions, DEQ has initiated meeting with the 10 individual permit holders over the next 9 months with the goal of issuing permits by the fall of 2015 and achieving reduction goals within the next 5 to 7 years.
9. An Investigation of the Economic Impacts of Coastal Plain Aquifer Depletion and Actions that May Be Needed to Maintain Long-Term Availability and Productivity: Britt briefly

reviewed the study commissioned by DEQ and completed by Virginia Tech and Abt Associates evaluates the potential economic impacts from a 55 to 65 MGD reduction in the permitted groundwater withdrawals for the EVGMA. The study focused on 1) large municipal users; 2) large industrial users; 3) small users; and 4) unpermitted systems. The report evaluated potential impacts to individual groundwater users and considered a number of groundwater management strategies including 1) permit timing; 2) group permitting systems; 3) State support for source water development; 4) addressing self-supplied users; 5) State financing for reducing groundwater use; and 6) support for water use trend studies.

10. Virginia Household Water Quality Program – Sample Results: Britt reported that of the residences submitting samples to the Virginia Tech Household Water Quality Program, 149 voluntarily elected to share results with the Groundwater Committee. The 149 were nearly evenly divided between the two counties: 76 from Accomack County and 73 from Northampton County. Overall groundwater quality was good, with high salt content (dissolved solids) and iron the constituents exceeding the drinking water standard most often (10%). In contrast, only 2% of the samples exceeding the drinking water standard for nitrates. Britt indicated that this dataset needs to be qualified prior to being incorporated into and used in the Eastern Shore groundwater model.

Ground Water Permits

Permit Application

Type	Name	Withdrawal (gal)			Percentile ¹
		Month	Annual	10-Yr	
Ag	Ivy Farm		10,000,000		15%

¹Percentile is the percent ranking of the Draft Annual Withdrawal amount against all the Permitted Withdrawals (e.g., for Ivy Farm; 15% of the permitted withdrawals are less than the requested and 80% of the permitted withdrawals are higher). Percentiles are rounded to the nearest 5%.

Britt reviewed the Ivy Farm application for groundwater withdrawal and a brief discussion ensued. The Committee will not make a recommendation until a draft permit is submitted.

Committee Work Plan-Related Items

Eastern Shore of Virginia Groundwater Model: No updates.

Saltwater intrusion monitoring discussion: Discussion of saltwater intrusion monitoring was postponed until the April meeting.

Other Items

None.

6. Other Matters

None.

7. Public Participation

Bill Prorise stated that the county assessor’s offices may have beneficial data for the Health Department’s permitting programs.

Tammy Stephenson of VDEQ stated that State Water Supply Plan is being presented for public comment in the coming week and she will ensure that the Committee will receive the document.

8. Schedule Next Meeting & Adjournment

The next Committee meeting is scheduled for April 21, 2015 at 10:00 AM in the A-NPDC Conference Room in Accomac.

There being no further business brought before the Committee, Committee Member Jeffries moved to adjourn the meeting. The motion was seconded by Committee Member Belote and carried by unanimous vote.

Chairman Thornton adjourned the meeting at 11:15 p.m.

Wanda Thornton, Chairman

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Elaine K. N. Meil, Secretary

Appendix V

Minutes of the April 21, 2015 Eastern Shore of Virginia Ground Water Committee

Minutes of the
Eastern Shore of Virginia Ground Water Committee

The meeting of the Eastern Shore of Virginia Ground Water Committee was held at 10:00 AM on Tuesday, April 21, 2015 in the A-NPDC Conference Room of the Enterprise Building in Accomack, Virginia.

Members Present:

Wanda Thornton, Chairman
Richard Hubbard, Vice Chairman
Jim Belote
Granville Hogg
Elaine Meil, Secretary

Members Absent:

Grayson Chesser
J.W. Jeffries
Eugene R. Hampton
Steve Miner
Katherine Nunez

Others Present:

Curt Smith, A-NPDC
Hank Ghittino, VDEQ
Taylor Dukes, Town of Exmore
Dirk Lynch, MSA, P.C.
Ken Dufty, Northampton County citizen
Cole Charnock, ESSWCD
Britt McMillan, Arcadis-Malcolm Pirnie
Deborah Christie, Rep. Rigell

1. Call to Order

Chairman Thornton called the meeting to order at 10:05 AM

2. Minutes of the March 17, 2015 Meeting

The March 17, 2015 minutes were presented.

Vice Chairman Hubbard moved to approve the Minutes of the March 17, 2015 meeting as presented and Committee Member Hogg seconded the motion. The motion carried unanimously.

3. Financial Status Report

The FY 2015 Financial Status Report was not available and will be provided at May's meeting.

4. Staff Update

The following Staff Updates were presented:

Committee Attendance Record

The FY2015 Committee Attendance Record was presented. The record was amended to include term expiration dates for Committee members.

Ground Water Withdrawal Permit Comment Letters

None.

Environmental Reviews and Permits

VA Pollutant Discharge Elimination System Program:

- o Chesapeake Bay Bridge and Tunnel District: The public comment period was announced. No Committee action was taken.

VA Pollution Abatement Program:

- o None

Informational Items

2013 Virginia Toxics Release Inventory Report – DEQ 3/15 -- Several tables summarizing the toxics released by jurisdiction and facility from 2008 to 2013 were presented and discussed. The Committee requested that the staff's summary be distributed to members of both the Accomack and Northampton County Boards of Supervisors.

Research and News Articles:

- o Report: Environmental impact of Wallops explosion, *ES News* 4/15/15 -- The article summarized a VA Commercial Space Flight Authority report on environmental impacts from the October 2014 explosion, citing specifically the levels of perchlorate found in soil and water at and near the site.
- o A March 29, 2015 Bay Journal article discussed how the Eastern Shores' nutrient woes are exacerbated by local topography because slow-moving groundwater hampers reduction efforts, while proximity to the Bay hastens runoff.

Upcoming Events:

- o None

Other Items

Public Workshops

Staff noted that the Central Accomack Ground Water Summit is scheduled for Tuesday, June 16 from 6:30-8:00 pm at Metompkin Elementary School in Parksley. The customized summit will cover the area from Accomack to Hallwood. Staff will promote the event during May.

The upcoming workshop series schedule is as follows:

October 2015 – Temperanceville to New Church (Northern Accomack)

Household Hazardous Waste Collection

Staff noted that the May 2, 2015 household hazardous waste collection, with sites this year at Chincoteague, Tasley, and Birdsnest convenience centers, is being advertised heavily, and that outreach will continue.

Considerations for Amending Committee Joint Resolution

Considerations to amend the Committee Joint Resolution were postponed while the Chairman reviews Committee members' comments. The Amendment is expected to be discussed in May.

ES Master Gardeners Presentation

Staff reported that they presented an overview on local ground water resources to 15 Master Gardener trainees, on March 25 at the Northampton County Extension Office in Machipongo.

VPDES General Permit for Domestic Sewage Discharges TAC Meeting

No new updates. The next meeting is scheduled for April 21 in Richmond. Staff will present an update on the meeting's outcomes at the May meeting.

5. Ground Water Consultant's Report

Technical/Regulatory/Educational Items

1. Draft Virginia Water Resources Plan: DEQ issued a draft of the State Water Resources Plan. The Plan is open for public comment through May 8, 2015. Components of the Plan that apply to the Eastern Shore of Virginia were reviewed and the Consultant will revisit the subject during the May meeting.
2. USGS CIR 1405 (2015) Understanding Nutrients in the Chesapeake Bay Watershed and Implications for Management and Restoration – the Eastern Shore: The Consultant presented a review of the report which focused on nutrient contributions from the Eastern Shore with a focus on Chesapeake Bay TMDL and point sources. The USGS reported that, for some tributaries, the major source of nitrogen is from groundwater. Discussion ensued regarding the USGS findings and the basis supporting the report conclusions. The Consultant noted data gaps in the Study, and suggested collecting another round of data. The Committee suggested research on the impact of wildlife is needed.

Ground Water Permits

No new applications.

Committee Work Plan-Related Items

FY2016 Targeted Issues:

The Consultant presented the following topics for consideration as potential Work Plan items:

- *Eastern Shore of Virginia Groundwater Model*: The Eastern Shore of Virginia Groundwater Model, developed by the USGS was adopted by DEQ to evaluate impacts from proposed groundwater withdrawals. USGS's model for the Eastern Shore contains groundwater withdrawals that extend through 2003, but do not contain the more recent 10 years of actual use. The USGS version incorporates actual use and does not include the higher, permitted amount. DEQ's updated model shows permitted use up to 2013.

The most recent (September 30, 2014) version of the Eastern Shore Model used by DEQ can be used to evaluate potential impacts to the groundwater resources under full permitted conditions, in contrast to actual 2003 groundwater use. Current permitted use is more than twice the 2003 actual use. The Consultant suggested looking at three different scenarios: the base line level, the permitted level, and the current (2013) use level.

- *Saltwater intrusion monitoring discussion:* The USGS initiated a saltwater intrusion monitoring program using geophysical methods suitable to track changes in the vertical position of the saltwater / freshwater interface over time. The DEQ is also re-instating its routine groundwater monitoring program. Both programs provide complementary information on saltwater intrusion on the Eastern Shore, although one does not completely replace the other. To examine trends over time, the Consultant recommended collecting another round of data since the last study was conducted 8 years ago.
- *Update current status of the resource:* It has been at least five years since the Consultant looked at water level trends, changes in water use, and compared actual groundwater use to measured water levels and water quality trends over time. The Consultant recommended a study to update use and trends. Measured water level and water quality trends are useful metrics to determine if use is approaching sustainable, steady-state conditions.
- *Evaluate opportunities to promote key groundwater research:* The Water Resource Sustainability Plan identified the following key research needs: 1) Paleochannels; 2) Freshwater-Saltwater Transition; 3) Aquifer and Confining Unit Hydraulic Characteristics; 4) Characteristics of the Deep Aquifers; 5) Existing Contaminants; 6) Emerging Contaminants; and 7) Climate Change.

This effort can help develop quality research partnerships with universities, and will require finding necessary funding. The Consultant recommended the Committee reach out to universities and professors and support their research.

The Committee postponed consideration until the May meeting.

Community Presentations

Public Workshops:

1. Present Detail Review of Groundwater Resources Conditions in specific areas of the Shore. The presentation would include available information from research and studies in that area related to:
 - a. groundwater quality,
 - b. aquifer yield characteristics, and
 - c. factors influencing sustainability for that specific region.
2. Initial Workshop completed February 12, 2014 and targeted the southern end of the Shore, encompassing the area from Kiptopeke to Eastville.
3. Second Workshop completed June 11, 2014 and encompassed the area from Eastville to Exmore.
4. Third Workshop completed October 30, 2014 and encompassed the area from Belle Haven to Accomac.
5. Fourth Workshop is scheduled June 16, 2015.

Other Items

None.

6. Other Matters

None.

7. Public Participation

Ken Dufty posed a Freedom of Information Act (FOIA) request with questions regarding the 2001 Malcolm Pimie study, *Technical Analysis and Justification for Groundwater Ordinance on the Eastern Shore of Virginia*. The report discusses a draft ordinance with groundwater protection measures and restrictions that Northampton County was considering, and recommends additional water testing. Mr. Dufty asked whether Northampton County adopted the ordinance, and if not, would the Committee recommend that the County adopt the groundwater measures and health testing recommendations. A-NPDC Staff indicated that a written response with information about the status of the report, who to contact at Northampton County, and whether the Committee had considered the matter in the past or would in the future would be provided to Mr. Dufty.

Another question from Mr. Taylor Dukes pertained to water quality, well-depth, and expenses. Discussion regarding the topic ensued.

Mr. Dufty commented on and asked about dead zones in Northampton Creeks where algal blooms and nitrification can effect Northampton County's aquaculture industry. Discussion regarding the topic ensued.

8. Schedule Next Meeting & Adjournment

The next Committee meeting was scheduled for May 19, 2015 at 10:00 AM in the A-NPDC Conference Room in Accomac.

There being no further business brought before the Committee, Committee Member Belote moved to adjourn the meeting. The motion was seconded by Vice Chairman Hubbard and carried by unanimous vote.

Chairman Thornton adjourned the meeting at 11:51 a.m.

Wanda Thornton, Chairman

Copy test:

Elaine K. N. Meil, Secretary

Appendix W

Minutes of the May 13, 2015 Eastern Shore of Virginia Ground Water Committee

Minutes of the
Eastern Shore of Virginia Ground Water Committee

The meeting of the Eastern Shore of Virginia Ground Water Committee was held at 10:00 AM on Tuesday, May 19, 2015 in the A-NPDC Conference Room of the Enterprise Building in Accomac, Virginia.

Members Present:

Wanda Thornton, Chairman
Eugene Hampton
Richard Hubbard, Vice Chairman
Granville Hogg
Steve Miner
John Salm

Members Absent:

Jim Belote
Grayson Chesser
J.W. Jeffries
Elaine Meil, Secretary
Katherine Nunez

Others Present:

Curt Smith, A-NPDC (Alternate for Secretary Meil)
Leslie Mason, A-NPDC
Hank Ghittino, VDEQ
Taylor Dukes, Town of Exmore
Bill Prorise, Northampton County Citizen
Jim McGowan, The Nature Conservancy
Jill Bieri, The Nature Conservancy
Karen Johnson, The Nature Conservancy
Delegate Robert Bloxom, Virginia's 100th House District
Britt McMillan, Arcadis-Malcolm Pirnie
Harvey Spurlock, Town of Chincoteague
Spiro Papadopoulos, Town of Chincoteague Planning Commission
Josh Bundick, NASA-Wallops Flight Facility
Ben Willis, A-NPDC

1. Call to Order

Chairman Thornton called the meeting to order at 10:02 AM and welcomed newly appointed Committee Member, John Salm.

2. Minutes of the April 21, 2015 Meeting

The April 21, 2015 minutes were presented.

Vice Chairman Hubbard moved to approve the Minutes of the April 21, 2015 meeting as presented and Committee Member Hogg seconded the motion. The motion carried unanimously.

3. Financial Status Report

The FY 2015 Financial Status Report was presented.

Bills Payable

Total Bills Payable: \$8,943.95 for Household Hazardous Waste Collection expenditures, Ground Water Consultant services, and A-NPDC staff services.

Committee Member Hampton moved to approve the FY 2015 Financial Status Report as presented. The motion, seconded by Committee Member Jeffries, carried unanimously.

4. Staff Update

The following Staff Updates were presented:

Committee Attendance Record

The FY2015 Committee Attendance Record was presented. The record was amended to include term expiration dates for Committee members.

Ground Water Withdrawal Permit Comment Letters

None.

Environmental Reviews and PermitsVA Pollutant Discharge Elimination System Program:

- o None

VA Pollution Abatement Program:

- o None

Total Maximum Daily Load/Implementation Plans:

- o Little Mosquito and Assawoman Creeks (Dissolved Oxygen): It was noted that DEQ plans to kickoff this new TMDL with a meeting of a newly created local technical advisory committee.
- o Nassawadox Creek (Bacteria): It was noted that DEQ plans to kickoff this new TMDL with a meeting of a newly created local technical advisory committee. Previous TMDLs had been developed for impairments within specific tributaries of Nassawadox Creek and this plan will address the watershed in its entirety.

Informational Items

None

Other ItemsPublic Workshops

Staff noted that the Central Accomack Ground Water Summit is scheduled for Tuesday, June 16 from 6:30-8:00 pm at Metompkin Elementary School in Parksley.

Household Hazardous Waste Collection

Staff reported that the 2015 collection was a success with nearly 100 citizens bringing in 3,402 lbs. (1.5 tons) of hazardous waste. Staff presented a table summarizing the program's success since its inception in 2004. The program has engaged nearly 600 citizens who have helped prevent 14.7 tons of hazardous waste from entering our sole source aquifer system and wrongfully entering local landfills. Discussion ensued regarding disposal of paint and the Committee reached consensus that Staff publish an educational press release detailing local proper methodology for solidification and disposal of paint.

Considerations for Amending Committee Joint Resolution

Considerations to amend the Committee Joint Resolution were deferred until a future meeting after Committee Officers and County Administrators have had additional opportunity to review.

FOIA Request

Staff reported that a response to Mr. David Lindsey of the Virginia Marine Resources Foundation was submitted on April 28.

Public Notice for Participation in Regulatory Advisory Panel to Assist in the Development of Regulatory Amendments Relating to Local Monitoring of Industrial Waste Permits and Fees for the Land Application of Industrial Wastes

Staff reported that DEQ was seeking interested persons to serve on a RAP regarding the issue.

VPDES General Permit for Domestic Sewage Discharges TAC Meeting

Staff presented the minutes from the recent meeting and a brief summary of outcomes and requested the Committee provide direction concerning public comment on the final draft regulation considering the next Committee meeting (August 18) will likely fall near the end of the public comment period. Discussion ensued and the Committee did not decide to pursue drafting and submitting comments.

5. Presentation on the Virginia Aquatic Resources Trust Fund

Karen Johnson of the The Nature Conservancy gave a presentation to the Committee summarizing the VARTF program. Questions from the Committee and audience were related to creation of mitigation banks, financing for the program, credits for agricultural BMPs, and how localities could utilize the program for hazard mitigation in low-lying areas.

6. Ground Water Consultant's Report

Technical/Regulatory/Educational Items

- o *Draft Virginia Water Resources Plan:* The Consultant reviewed components of the plan that apply to the Eastern Shore and noted additional information that will need to be compiled prior to the next draft due date in 2018. Additional information included compiling use data for towns and communities that did not report data for the current plan.
- o *Eastern Shore of Virginia Groundwater Model:* The Consultant suggested that the model be utilized to simulate impacts from actual (measured) water withdrawals and water quality to develop an understanding of availability with regards to the DEQ quantitative 80% drawdown criteria. The Committee agreed by consensus that this work would be beneficial to understanding where current ground water resources are relative to the criteria and requested that it be included in the FY 2016 work plan.

Ground Water Permits

No new applications.

Committee Work Plan-Related Items

o *FY2016 Targeted Issues:*

The Consultant presented the following topics for consideration as potential Work Plan items:

- Eastern Shore of Virginia Groundwater Model
- Saltwater intrusion monitoring

- Update current status of the resource: A comparison of water level trends, changes in water use and actual groundwater use to measured water levels and water quality trends over time. The Consultant recommended a study to update use and trends. Measured water level and water quality trends are useful metrics to determine if use is approaching sustainable, steady-state conditions.
- Evaluate opportunities to promote key groundwater research

The Committee requested that the Consultant work with Staff to develop a detailed work plan and budget which is to be considered by the Committee during its August, 2015 meeting.

7. Other Matters

Ben Willis, a law student at William & Mary who is interning with the A-NPDC during the summer, was introduced to the Committee.

8. Public Participation

None.

9. Schedule Next Meeting & Adjournment

The Committee scheduled a public workshop in place of the June, 2015 meeting and cancelled the July, 2015 meeting. The next Committee meeting was scheduled for August 18, 2015 at 10:00 AM in the A-NPDC Conference Room in Accomack.

There being no further business brought before the Committee, Committee Member Jeffries moved to adjourn the meeting. The motion was seconded by Vice Chairman Hubbard and carried by unanimous vote.

Chairman Thornton adjourned the meeting at 11:55 a.m.

Wanda Thornton, Chairman

Copy test:

Elaine K. N. Meil, Secretary

Appendix X

Minutes of the August 18, 2015 Eastern Shore of Virginia Ground Water Committee

Minutes of the
Eastern Shore of Virginia Ground Water Committee

The meeting of the Eastern Shore of Virginia Ground Water Committee was held at 10:00 AM on Tuesday, August 18, 2015 in the A-NPDC Conference Room of the Enterprise Building in Accomack, Virginia.

Members Present:

Jim Belote
Eugene Hampton
Richard Hubbard, Vice Chairman
Granville Hogg
J.W. Jeffries
Elaine Meil, Secretary
John Salm

Members Absent:

Grayson Chesser
Steve Mizer
Katherine Nunez
Wanda Thornton, Chairman

Others Present:

Curt Smith, A-NPDC
Hank Ghittino, VDEQ
Taylor Dukes, Town of Exmore
John J. McCormie, Public
Janet Sturgis, Public
Britt McMillan, Arcadis-Malcolm Pirnie
Harvey Spurluck, Town of Chincoteague
Deborah Christie, Congressman Rigell Staff
Jon Richardson, ES Health District
Efillary Essig, Public

1. Call to Order

Chairman Thornton called the meeting to order at 10:02 a.m.

2. Elections of FY2016 Committee Officers

Staff requested nominations for FY2016 Committee Officers from the floor.

Committee Member Belote moved to nominate Richard Hubbard for Chairman and Committee Member Salm seconded the nomination. The motion carried unanimously with Committee Member Hubbard abstaining.

Committee Member Belote nominated Wanda Thornton to be Vice Chairman, and Committee Member Jeffries seconded the nomination. The motion carried by unanimous vote.

Vice Chairman Hubbard was elected as Chairman by acclamation. Chairman Thornton was elected as Vice Chairman by acclamation.

3. Minutes of the May 13, 2015 Meeting

The May 13, 2015 minutes were presented.

Committee Member Jeffries moved to approve the Minutes of the May 13, 2015 meeting as presented and Committee Member Hogg seconded the motion. The motion carried unanimously.

4. Financial Status Report

The final FY 2015 Financial Status Report was presented.

Bills Payable

Total Bills Payable: \$16,057.76 for Household Hazardous Waste Collection expenditures, Ground Water Consultant services, and A-NPDC staff services.

Committee Member Jeffries moved to approve the FY 2015 Financial Status Report as presented. The motion, seconded by Committee Member Sahn, carried unanimously.

Proposed FY2016 Annual Budget

The proposed FY 2016 Annual Budget was presented with a request to approve.

Committee Member Hogg moved to approve the proposed FY2016 budget as presented. The motion, seconded by Committee Member Sahn, carried unanimously.

5. Staff Update

The following Staff Updates were presented:

Committee Attendance Record

The final FY2015 Committee Attendance Record and FY2016 record were presented.

Ground Water Withdrawal Permit Comment Letters

None.

Environmental Reviews and Permits

VA Pollutant Discharge Elimination System Program:

- o Hampton Inn, Chincoteague – Staff reviewed the reapplication for discharge of treated wastewater into Chincoteague Channel.

VA Pollution Abatement Program:

- o None.

Total Maximum Daily Load/Implementation Plans:

- o Little Mosquito and Assawoman Creeks (Dissolved Oxygen): Staff reviewed the kickoff meeting and notified the Committee of a second meeting on August 26.
- o Nassawadox Creek (Bacteria): Staff reviewed the kickoff meeting and notified the Committee of a second meeting on August 26.

Informational Items

Staff presented five research and news articles regarding groundwater modeling, wastewater treatment, paleochannel management, and water recycling and conservation.

Other Items

Public Workshops

Staff presented a summary of the Central Accomack Ground Water Summit and a summary of participation at the Ground Water Summit series.

Considerations for Amending Committee Joint Resolution

Considerations to amend the Committee Joint Resolution were deferred until a future meeting after Committee Officers and County Administrators have had additional opportunity to review.

VPDES General Permit for Domestic Sewage Discharges TAC Meeting

Staff notified the Committee of a 60-day public comment period regarding the draft regulation presentation to the State Water Control Board.

A-NPDC Regional Plan Survey

Secretary Meil notified the Committee of the development of the Eastern Shore's first regional plan and the current public survey being conducted to supplement the process.

6. Ground Water Consultant's Report

Technical/Regulatory/Educational Items

- o Eastern Virginia Groundwater Management Advisory Committee: The Consultant reviewed the purpose of the Advisory Committee and its potential relevance to the Eastern Shore of Virginia Groundwater Management area. It was noted that Chairman Thornton has been selected to serve on the EVGMAC.
- o Annual Report Review for FY2015: The Consultant reviewed activities accomplished by the Ground Water Committee in FY2015 (July 2014 through July 2015).
- o FY2015 Groundwater Use Report: The Consultant presented a draft of the annual report for the Committee's review. Discussion ensued regarding the utility and relevance of the report and it was agreed that this was a worthy activity for the Committee and Consultant to continue in the future. It was suggested that the report include links to the Committee's website and other pertinent online sources. Staff will publish will make the final report publically available upon completion of the suggested edits.

Ground Water Withdrawal Permits

- o Pacific Tomato Growers Strippe Camp: The Consultant presented a review of the application, which is the smallest permitted amount in the region. It was noted that while this withdrawal is relatively small, it is in the vicinity of a paleochannel where additional information regarding vertical movement of groundwater is needed to enhance the groundwater model.

Committee Work Plan-Related Items

- o FY2016 Work Plan: After receiving feedback on potential target issues from the Committee during the May 2015 meeting, the Consultant presented a work plan for FY2016 incorporating all comments. The work plan was presented as follows:
 - i. Promote methods to increase use of the Columbia aquifer and surface water irrigation ponds
 - ii. Monitor and review Federal and State activities related to groundwater on the Eastern Shore
 - iii. Coordinate and/or track independent research on the Eastern Shore
 - iv. Annually update groundwater withdrawals and groundwater use including hydrographs for permitted user
 - v. Represent the Groundwater Committee on a single State or Federal Committee at the request of the Groundwater Committee.
 - vi. Community Presentations - At the request of the Groundwater Committee, participate in two public meetings/workshops with one optional meeting that highlights critical groundwater resource protection issues. For the 2016 Fiscal

Year, the Committee will consider having ARCADIS participate in the development of informational materials in lieu of one meeting/workshop. If desired by the Committee, ARCADIS' work on this content will not exceed 16 hours.

Priorities which will require additional funding to implement, and should be pursued by the Committee to the extent possible are:

- i. Eastern Shore of Virginia Groundwater Model - Execute an Eastern Shore Groundwater Model run simulating the regional aggregate permitted demand for 2013. The model run outcomes will be presented at a Committee meeting and will be accompanied by a summary report including maps showing the model results and discussion of areas where groundwater availability may be limited. This will be supported via a one-time lump sum payment of \$3,000 to Arcadis.
- ii. Support saltwater intrusion monitoring conducted by the USGS. Funds have not been budgeted for this.

Discussion ensued regarding the FY2016 Public Workshop schedule. Committee members agreed that a current and increasingly relevant topic was expansion of the poultry industry and potential impacts to ground water quantity and quality. Potential workshops included:

- c. a Poultry Industry Summit which would be presented by the A-NPDC pending an approval and featuring the Consultant who would represent specific local groundwater issues; and
- c. a Fertilizer Workshop led by the Ground Water Committee that could feature representatives from the poultry industry and the academic realm and address issues regarding poultry litter.

It was requested that the Consultant, Staff, and Secretary Meil develop a specific workshop plan and bring back recommendations to the Committee during the September 2015 meeting.

Committee Member Salm moved to approve the FY2016 Work Plan as presented. The motion, seconded by Committee Member Hogg, carried unanimously

7. Other Matters

None.

8. Public Participation

Staff read a letter into the record from Pat Parrish regarding concerns stemming from currently proposed poultry houses in the vicinity of her property in Accomack County. It was requested that Staff forward the letter to both counties' BOS for reference.

9. Schedule Next Meeting & Adjournment

The next Committee meeting was scheduled for September 15, 2015 at 10:00 a.m. in the A-NPDC Conference Room in Accomac.

There being no further business brought before the Committee, Committee Member Jeffries moved to adjourn the meeting. The motion was seconded by Committee Member Salm and carried by unanimous vote.

Chairman Hubbard adjourned the meeting at 11:46 a.m.

Appendix Y

Minutes of the September 16, 2014 Eastern Shore of Virginia Ground Water Committee

Minutes of the
Eastern Shore of Virginia Ground Water Committee

The meeting of the Eastern Shore of Virginia Ground Water Committee was held at 10:00 AM on Tuesday, September 15, 2015 in the A-NPDC Conference Room of the Enterprise Building in Accomac, Virginia

Members Present:

Jim Belote
Eugene Hampton
Elaine Meil, Secretary
Grayson Chesser
Richard Hubbard, Chairman
Wanda Thornton, Vice Chairman
Eugene Hampton
John Salm
Granville Hogg

Members Absent

J.W. Jeffries
Katherine Nunez
Steve Miner

Others Present:

Curt Smith, A-NPDC
Pat Parish, Public
Holly Swift, Public
Hank Ghittino, VDEQ
Taylor Dukes, Town of Exmore
Kevin Dufty, Public
John J. McCormick, Public
Jon Richardson, ES Health District
Joe Valentine, Public
Cole Channock, ESSWCD
Anne Godwin, Public
Jane Corson-Lassiter, USDA-NRCS
Jay Ford, Virginia Eastern Shorekeeper
Britt McMillan, Arcadis-Malcolm Pirnie

1. Call to Order
Called the meeting to order at 10:00 AM

2. Minutes of the August 18, 2015 Meeting
The August 18, 2015 minutes were presented.

Committee Member Salm moved to approve the Minutes of the August 18, 2015 meeting as presented and Committee Member Hampton seconded the motion. The motion carried unanimously with Vice Chairman Thornton abstaining due to not being present on August 18, 2015.

3. Financial Status Report
The FY 2016 Financial Status Report was presented.

Bills Payable
Total Bills Payable: \$0.00

Committee Member Hampton moved to approve the FY 2016 Financial Status Report as presented. The motion, seconded by Vice Chairman Thornton, carried unanimously.

FY 2016 Budget and Work Plan Amendment for USGS Saltwater Intrusion Monitoring
Staff reviewed the budget and work plan and requested the Committee consider approving an expenditure of \$14,000 from existing remaining balances to conduct a second round of saltwater transition zone monitoring. Discussion ensued regarding the necessity of performing this research and the benefits to the entire region. It was requested that Staff request a provision be added to the contract that would require USGS to submit a final report and give a presentation to the Committee upon completion of the research.

Vice Chairman Thornton moved to approve the proposed FY 2016 Budget and Work Plan Amendment to include the expenditure of \$14,000 from existing remaining balances to the USGS for conducting a second round of saltwater transition zone monitoring. The motion, seconded by Committee Member Chesser, carried unanimously.

4. Staff Update
The following staff updates were presented:

Committee Attendance Record
The FY2016 record was presented.

Ground Water Withdrawal Permit Comment Letters
None.

Environmental Reviews, Permits, & Planning EffortsVA Pollutant Discharge Elimination System Program (see attached)

- None

VA Pollution Abatement Program

- None

Total Maximum Daily Load/Implementation Plans

- Little Mosquito and Assawoman Creeks (Dissolved Oxygen): Staff reviewed the working group meeting and notified committee that DEQ will compile all solicited information and conduct a public meeting in October.
- Nassawadox Creek (Bacteria): Staff reviewed the working group meeting and notified committee that DEQ will compile all solicited information and conduct a public meeting in October.

Informational ItemsResearch and News Items

- Staff presented two news articles regarding the poultry industry.

Upcoming Events

- Staff informed the Committee of events regarding recycling prescription drugs in Eastville and a conference on water resources.

Other ItemsPublic Workshops

Staff briefed the Committee regarding the upcoming Northern Accomack County Ground Water Summit and presented a summary of participation at the Ground Water Summit series.

Considerations for Amending Committee Joint Resolution

Staff suggested that the discussion continue to be deferred to allow for additional opportunity to review and consider the proposed changes.

Stormwater Stakeholder Advisory Group

Staff notified the Committee of an advisory group tasked with considering ways to streamline and clarify the Stormwater Management Act, Erosion and Sediment Control Law, and Chesapeake Bay Preservation Act. The minutes from the most recent meeting were presented and it was noted that the SAG is to submit a final report with recommendations during Fall 2015. Discussion ensued regarding the lack of local representation on the Stormwater SAG and other DEQ advisory groups.

Vice Chairman Thornton moved to draft a letter to DEQ encouraging that the Eastern Shore of Virginia be invited to participate in all future DEQ advisory groups. The motion, seconded by Committee Member Salm, passed unanimously.

Leaking Heating Oil Tanks Cleanup Program Stakeholder Working Group

Staff notified the Committee of the passing of HB1400 which requires DEQ to form a stakeholder working group to advise DEQ regarding current policy governing the cleanup of petroleum releases. DEQ is to submit a report with recommendations by November 30, 2015.

Joint Legislative Audit and Review Commission (JLARC) Study of Virginia's Water Resources Planning and Management

Staff notified the Committee that the 2015 General Assembly passed HJ623 which directs the JLARC to study the Commonwealth's water resources planning and management, particularly with regard to groundwater. The JLARC study has not started to date, but staff will continue to track and report on progress.

A-NPDC Hires New Coastal Resources Program Manager

Staff reported that Hillary Essig was hired with a scheduled start date of September 16. Hillary will be involved in coordinating Committee meetings and carrying out Committee activities.

5. Ground Water Consultant's Report

Technical/Regulatory/Educational

- Eastern Virginia Groundwater Management Advisory Committee: The consultant presented a summary of the EVGMAC meeting outcomes from August 18, 2015.

Ground Water Permits

- The consultant presented a review of two applications.
 - Kuzzens Machipongo Farm is renewing and increasing an existing permit.
 - Existing permit is for 50 million gallons per year and the new permit would be 65 million gallons per year from one active well in the Columbia Aquifer and two active wells in the Yorktown. DEQ explained that unexpected issues at the farm resulted in the operation not working at full production, but more water is anticipated to be necessary as they return to full production in the coming years
 - Kuzzens Christian Ames Complex is renewing and increasing an existing permit.
 - Existing permit allows for a total of 56 million gallons per year for irrigation only and they want to increase to 100 million gallons per year to support both irrigation and housing needs.
 - The complex uses 29 active wells with 7 screened in the Columbia Aquifer and the remaining in the Yorktown Aquifer. The Consultant reported that it was believed that the new permitted amount would be sustainable.
 - Discussion ensued regarding potential impacts related to the paleochannel in existence in the vicinity of the complex.
 - Discussion ensued regarding success in moving Columbia wells to Yorktown wells. Hank Ghittino of DEQ stated that currently there are no enforceable policies regarding it, but new applications are encouraged to use the Columbia whenever possible.

Committee Work Plan-Related Items

- FY2016 Public Presentations
 - The Committee discussed subject matter for the second public presentation for FY2016. Options considered included:

- Poultry and Groundwater on the Eastern Shore of Virginia - Roundtable discussion with scientists, industry representations, and regulators
- Nutrient use and nutrient management on groundwater quality and interactions at the groundwater/surface water interface.
- Development of informational materials.

After discussing the various options, the Committee decided to focus on addressing the poultry issues as they pertain to the groundwater supply. It was noted that the topic should be presented as part of a larger discussion and that the A-NPDC was the appropriate group to host the event. In addition to the workshop, the Committee agreed that the remaining time in Britt's budget be utilized to help with developing information materials for the Committee website.

Vice Chairman Thornton moved that Staff make a request to the A-NPDC on behalf of the Committee to host a public workshop regarding the regional poultry industry and include Britt McMillan as representative for the Committee. Seconded by Committee Member Belote, the motion passed unanimously.

- The committee also reviewed the draft outline for the groundwater availability analysis that uses the Eastern Shore of Virginia Groundwater Material. The model is now complete and will be presented at the November Committee meeting.

6. Other Matters
None.

7. Public Participation
Vice Chairman Thornton asked all members of the public to introduce themselves and many made comments regarding the poultry industry.

8. Schedule Next Meeting & Adjourn
The next committee meeting was scheduled for November 22 at 10:00 AM in the A-NPDC Conference Room in Accomac. The Northern Accomack County Ground Water Summit on October 22, 2015 will be held in place of the regular October Committee meeting.

There being no further business brought before the Committee, Chairman Hubbard adjourned the meeting at 11:57 AM.

Appendix Z

Shore Big Tree Outreach and Implementation

Shore Big Tree Implementation Plan

1 INTRODUCTION

The Accomack-Northampton Planning District Commission (A-NPDC) established the “Shore Big Trees” program in 2013 in partnership with the Virginia Coastal Zone Management Program (VCZMP), the Virginia Department of Conservation and Recreation (VDCR), and the Eastern shore Soil and Water Conservation District (ESSWCD) as part of the successful *Plant ES: Natives: They’re Shore Beautiful* campaign. In 2014, three “Shore Big Trees” were planted and dedicated in public spaces on the Eastern Shore with financial assistance from NOAA and VCZMP. The dedication sites were chosen due to their location where previous ES Natives demonstration gardens were in existence and maintenance plans were already in place. Each site included an engraved stone marker which identified the tree, listed its expected height and lifespan, and recognized it as a tree native to the Eastern Shore.

While exploring opportunities to acquire funding necessary to further develop and implement the program, A-NPDC staff realized that additional site planning was necessary to meet the requirements of various applicable funding programs. As such, the A-NPDC set out to engage local entities interested in participating in the program and develop implementation plans for specific sites that would ultimately better position the program for various funding opportunities.

2 OUTREACH

The A-NPDC conducted surveys of local governments to gauge interest in the program. The pamphlet, which was distributed to two counties and nineteen incorporated towns, can be seen below. Out of these localities Accomack County Public Schools, Accomack County Public Works, Parksley, and Exmore responded and expressed interest in participating in the program. The only other locality to respond was Onley which indicated that they were not interested in participating in the program at this time. Considering the minimal number of returned responses, additional attempts were made to contact the following local entities whom had previously expressed interest in the program: Chincoteague, Eastern Shore Community College, NASA Wallops, Northampton County, and Cape Charles. Despite these additional efforts, no responses were received.

The next step for the interested localities was to create a site specific implementation plan with information necessary to seek grant funding. These plans can be seen in Part 3 of this report. The report includes locations for plantings, number of trees, tree species, and a maintenance plan.

We want your community to be the next to receive a Shore Big Tree on the Eastern Shore!



The A-NPDC wants to make it easy for you and plans to do all the work! Please read the following and take a moment to complete the attached survey.

Many Eastern Shore residents can attest to knowing of and taking pride in the largest and oldest trees on our peninsula. These trees conjure up connections to our past and hold a special place in our communities. The "Eastville Willow Oak" and the "Accomack Bicentennial Sycamore" are familiar examples of trees that have achieved iconic statuses not only within our communities but on state and national tree registries. These trees are becoming increasingly rare and it is important that future generations have an opportunity to

experience these awe-inspiring trees that serve as cornerstones of our communities.

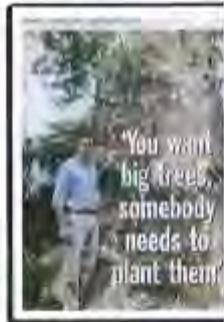
The Shore Big Tree Program is a new addition to the successful *Plant ES Natives: They're Stars Beautiful* Campaign. The program aims to raise awareness of the benefits of our largest and oldest native trees through education, outreach, and planting of native trees in public places with the intent that they will one day become "Shore Big Trees". The program was kicked off in 2014 with planting and dedication of a Shore Big Tree in town parks in Oranock and Wachapreague, and at the Accomack-Northampton Planning District Commission office in Accomack.

Once the planting location was identified by the partnering community/agency, the tree species was selected with advice from experts from the VA Department of Conservation & Recreation and the ES Soil & Water Conservation District. Each tree was dedicated with a customized stone marker indicating the species, planting date, and anticipated lifespan and size. The program kick-off was featured in an October 2014 edition of the *Eastern Shore News* (left and above).

The A-NPDC is seeking communities interested in planting and dedicating a Shore Big Tree as a community landmark that can be enjoyed for generations to come. The A-NPDC plans to pursue grant funds to cover costs for additional plantings but we need to have commitments and plans for design and maintenance in place to have projects in place and eligible to receive these funds.

What you need to know:

- Wachapreague, Oranock, & the A-NPDC office received the first Shore Big Trees during the Shore Big Tree Program's kickoff in 2014.
- The A-NPDC wishes to pursue grant funds for planting & dedicating more Shore Big Trees in public places. We need to know which communities desire their own tree in order to have planting & maintenance plans in place when applying for grant funds.
- If interested, please take a moment to complete the survey on the backside of this paper & return using the stamped envelope provided.



Educational hand out for Shore Big Tree outreach

3 IMPLEMENTATION

3.1 EXMORE

Location (City/Community): Exmore Town Park

Watershed: Chesapeake Bay and Atlantic Ocean

Owner of Property: Town of Exmore

Number of Trees: 3

Species: Willow Oak

Brief Description of Project: Exmore recently acquired a parcel of land adjacent to the Exmore Town Park that is currently being adjoined to the existing park with a gravel parking lot, community events building, open-air stage, and additional greenspace. The Town is interested in planting native trees along with native landscaping both within the recent addition and within the established park. Exmore wants to plant one tree in the park and two in planters within the parking lot. The tree will be maintained by the Town of Exmore Public Works Department which has many years of experience in landscape maintenance.

Funding Options: The town has committed to purchasing their own trees and are interested in leveraging these funds into additional trees and signage. The town also expressed interest in planting only natives at the park. Funding options rely on either donations by private entities or local concrete companies to donate the foundations for the educational plaques and markers.



Exmore Park Aerial

3.2 PARKSLEY

Location (City/Community): Parksley Town Park

Watershed: Chesapeake Bay

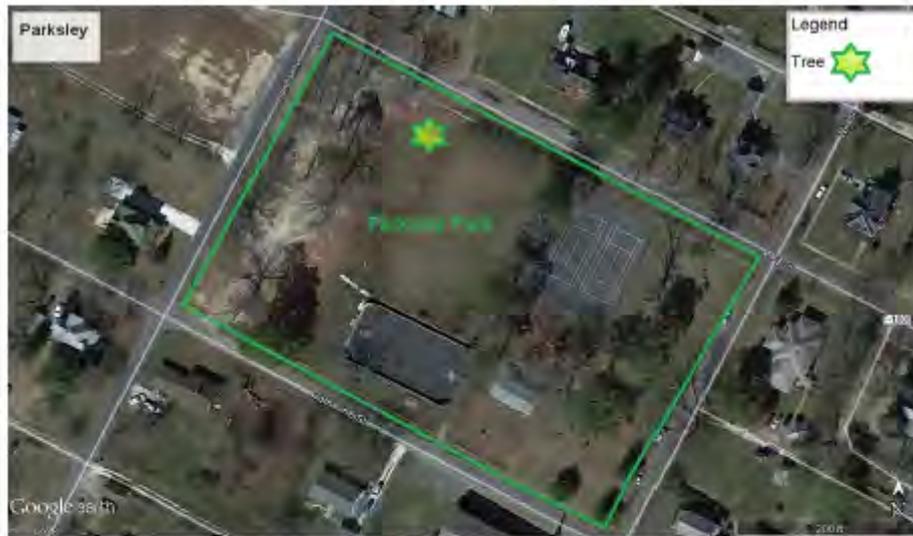
Owner of Property: Town of Parksley

Number of Trees: The Town has not made a decision regarding the number of trees, but it is anticipated that the number will be fewer than five. The park does have a number of mature trees and the number of trees and their locations is going to be contingent upon a site visit by either VDCR or ESSWCD staff and their recommendation.

Species: The Town has been provided a species list but has not made a decision yet.

Brief Description of Project: Parksley Park is an existing park near the downtown area. The tree will be maintained by the Parksley Public Works Department, which has historically been responsible for landscape maintenance in the town.

Funding Options: The Town could not commit to expending the necessary funds and are reliant upon donations and grants for both the tree and educational plaque.



Parksley Park Aerial

3.3 ACCOMACK COUNTY PUBLIC SCHOOLS

Location (City/Community): Accomack County

Watershed: Chesapeake Bay and Atlantic Ocean

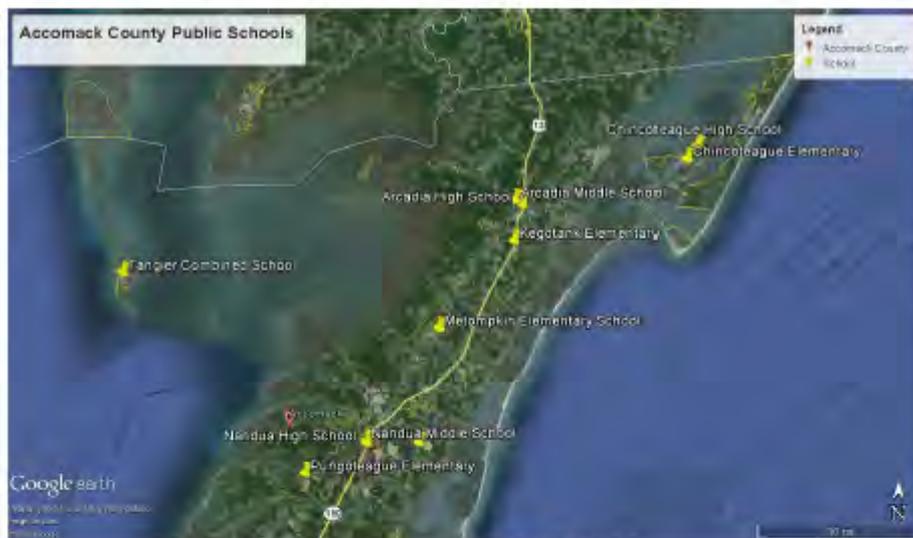
Owner of Property: Accomack County Public Schools

Number of Trees: 11 Trees Total with one tree per school property.

Species: NA, will vary by location. Site visits and recommendations from either VDCR or ESSWCD staff will be necessary.

Brief Description of Project: Accomack County Public Schools agreed to plant one tree at each location. The biggest limiting factor for grants for the schools is that the schools will not expend the funds on a maintenance plan.

Funding Options: Funding options include looking for grants that either omit a maintenance plan or provide maintenance options for Accomack County Public Schools. The School Board has informed the A-NPDC that maintenance varies by school, and the board cannot meet the match on purchasing the tree or its maintenance.



Accomack County Public Schools Aerial

3.4 ACCOMACK COUNTY CENTRAL PARK

Location (City/Community): Accomack County

Watershed: Atlantic Ocean

Owner of Property: Accomack County

Number of Trees: There is no specific number yet, depends on the match and grants available.

Species: No specific species have been chosen yet. Tree species will need to be chosen after a sight visit from VDCR or ESSWCD.

Brief Description of Project: Accomack County acquired 15.25 acres to accommodate recreational activities including a walking/biking trails that are ADA accessible, play areas, baseball fields, soccer fields, basketball fields, tennis courts, and other recreational facilities. The park is interested in planting both native trees and native landscaping in the park. All landscaping and trees will be maintained by the Accomack County Parks and Recreation Department and Public Works Department, which has many years of experience in landscape maintenance.

Funding Options: This project is large scale enough to hopefully be applicable for grants. The Clean Water grant only applies to woody trees and not landscaping and educational materials. This is a prime project for a large scale native plant effort if the funding becomes available.



Accomack County Central Park Aerial

4 NATIVE TREE OPTIONS

Dot Field of the VA Department of Conservation and Recreation provided a native tree list that interested localities can use to pick a tree:

- White Oak (*Quercus alba*),
- Southern Red Oak (*Q. falcata*),
- Northern Red Oak (*Q. rubra*),
- Willow Oak (*Q. phellos*),
- Water Oak (*Q. nigra*)
- Sycamore

All species listed are recommended for upland areas with any soil type in any sunlight condition. Sycamores are the only trees suggested for planting in flood-prone areas that regularly are inundated with freshwater. Options for trees that can tolerate saltwater flooding were not provided; however, the Shore Big Tree dedicated in the Wachapreague Town Park was a Water Oak and this was planted knowing that the site would experience tidal flooding at some point in the future which it could tolerate.

5 PLAQUE OPTIONS

There are two options available for educational plaques. One option is to pursue local donations from concrete producers and bolt a cheaper plaque purchased online. Total cost of this kind of plaque is around 100 – 200 dollars.



Example of a concrete base with a less expensive plaque

The other option is to use the more expensive plaques used in previous Shore Big Tree plantings. These plaques cost upward of 600 dollars.



Example of the more expensive plaque option used previously

The concrete base option is the most cost-friendly in that it's almost 400 dollars cheaper than the 600 dollar engraved stone. Localities will be given the option between both, and choose based upon their individual budgets and needs.

6 NEXT STEPS

It was determined that the state funding programs for native landscaping are prohibitive for smaller-scaled projects such as the ones developed here. Being such, it may be beneficial to pursue other avenues of funding and additional partnerships to leverage the materials and funds necessary for each site. Specifically, funding options for trees and signage could come from local nurseries, conservation groups, crowd source funding, and/or corporate sponsorships.

More cost effective options for signage could include exploring partnerships with local concrete manufacturers. Bayshore Concrete has donated materials for public works projects in the region historically and may be willing to provide the concrete foundations to be used for the educational plaques. If the materials for the foundations were donated, then the costs for the plaques would be relatively affordable.

While most localities interested in participating are willing to provide the long-term maintenance needed, additional options for maintaining trees at Accomack County Public Schools will be necessary to satisfy grant requirements.

Appendix AA

Benefits Accrued from Prior VCZMP Grants

<u>VCZM Grant #</u>	<u>NOAA Grant #</u>	<u>Project Title</u>	<u>Description of Benefits Accrued</u>
FY2002, Task 12.09	NA17OZ2355-01	Seaside Heritage Program: Ecotourism Access Improvements	Two floating docks were constructed in Chincoteague and Wachapreague resulting in enhanced access for paddlers. This infrastructure has been critical for the Seaside Water Trail and Camping Accommodation Implementation Plan
FY2003, Task 12.11	NA03NOS4190104	Seaside Heritage Program: Ecotourism Access Improvements	One floating dock was constructed in Willis Wharf resulting in enhance access for paddlers. The infrastructure has been critical for the Seaside Water Trail and Camping Accommodation Implementation Plan
FY2004, Task 11.10	NA04NOS4190060	Seaside Heritage Program: Ecotourism Access Improvements	Supplies purchased for the Willis Wharf Observation Deck led to construction using VCZM funds in FY05. The project also funded the construction of a floating dock in Quinby resulting in enhanced access for paddlers. This infrastructure has been critical for the Seaside Water Trail and Camping Accommodation Implementation Plan
FY2004, Task 83.06	NA04NOS4190060	Chesapeake Bay Buffer Land Classification Project	Project outcomes were built upon during FY06 TA Grant. Is regularly used for land use decisions by localities and available on Coastal GEMS
FY2004, Task 41	NA04NOS4190060	A-NPDC Technical Assistance Program	The ES Ground Water Committee leveraged work from this year's grant to complete additional and ongoing tasks during the subsequent year's grant.
FY2005, Task 41	NA05NOS4191180	A-NPDC Technical Assistance Program	The ES Ground Water Committee leveraged work from this year's grant to complete additional and ongoing tasks during the subsequent year's grant.
FY2006, Task 41	NA06NOS4190241	A-NPDC Technical Assistance Program	The ES Ground Water Committee leveraged work from this year's grant to complete additional and ongoing tasks during the subsequent year's grant.
FY2007, Task 41	NA07NOS4190178	A-NPDC Technical Assistance Program	The Seaside Water Trail Historic Resources Project has leveraged additional VCZM Grants associated with the trail.

<u>VCZM Grant #</u>	<u>NOAA Grant #</u>	<u>Project Title</u>	<u>Description of Benefits Accrued</u>
FY2008, Task 14	NA08NOS4190466	Wachapreague Seaside Park Plant ES Natives Demonstration Garden	A sub-program for Plant ES Natives, called Shore Big Trees, was established and a native tree was leveraged in the Wachapreague.
FY2008, Task 41	NA08NOS4190466	A-NPDC Technical Assistance Program	The Chincoteague Tour Training Guide was leveraged into additional work during TA Program grants in subsequent years. The ES Ground Water Committee leveraged work from this year's grant to complete additional and ongoing tasks during the subsequent year's grant.
FY2009, Task 41	NA08NOS4190163	A-NPDC Technical Assistance Program	The ES Ground Water Committee leveraged work from this year's grant to complete additional and ongoing tasks during the subsequent year's grant.
FY2010, Task 41	NA10NOS4190205	A-NPDC Technical Assistance Program	The ES Ground Water Committee leveraged work from this year's grant to complete additional and ongoing tasks during the subsequent year's grant.
FY2010, Task 41	NA10NOS4190205	A-NPDC Technical Assistance Program	The ES Ground Water Committee leveraged work from this year's grant to complete additional and ongoing tasks during the subsequent year's grant.
FY2010, Task 96.01	NA10NOS4190205	Seaside SAMP Phase 3 Technical Assistance	This project led to additional VCZM grants related to assessing Recreational & Commercial uses on the Seaside to enhance coastal management. The work also led to VCZM funding for the establishment of restoration goals for SAV on the Seaside.
FY2011, Task 41	NA11NOS4190122	A-NPDC Technical Assistance Program	The Boating and Marina Needs Enhancement Assessment was leveraged into subsequent VCZM grants related to Working Waterfronts
FY2011, Task 96	NA11NOS4190122	Seaside SAMP Recreational Use Assessment and SAV Restoration Goals	This work was leveraged into subsequent VCZM funding for an assessment of commercial use and exploration of state-policy for establishment of SAV restoration set-aside areas for Seaside.

<u>VCZM Grant #</u>	<u>NOAA Grant #</u>	<u>Project Title</u>	<u>Description of Benefits Accrued</u>
FY2012, Task 41	NA12NOS4190168	A-NPDC Technical Assistance Program	The ES Ground Water Committee leveraged work from this year's grant to complete additional and ongoing tasks during the subsequent year's grant.
FY2012, Task 96	NA12NOS4190168	Seaside SAMP Recreational & Commercial Use Assessment and SAV Restoration Goals	The Commercial Fishing Use Assessment was leveraged into additional planning work funded by BOEM and VDMME regarding commercial and recreational fishing activities within the Virginia Wind Energy Area
FY2012, Task 51	NA12NOS4190168	Eastern Shore Water Trails Association Development & Seaside Water Trail Camping Accommodation Implementation Plan	No work leveraged from grant to date.
FY2013, Task 41	NA13NOS4190135	A-NPDC Technical Assistance Program	The Proceedings of the Eastern Shore Land Protection Working Group Report identified additional economic impact studies needed in the region. The work has been leveraged for FY15 through a VCZMP grant. The ES Ground Water Committee leveraged work from this year's grant to complete additional and ongoing tasks during the subsequent year's grant.
FY2013, Task 53	NA13NOS4190135	Eastern Shore Transportation Infrastructure Inundation Vulnerability Assessment	The report has been regularly utilized to leverage and enhance federal and state transportation funding applications.
FY2014, Task 41	NA14NOS4190141	A-NPDC Technical Assistance Program	The special project, Shore Big Trees Implementation Plan, has led to native tree plantings in local communities. The ES Ground Water Committee leveraged work from this year's grant to complete additional and ongoing tasks during the subsequent year's grant.