
COMMONWEALTH of VIRGINIA

Pickett's Harbor Natural Area Preserve Migratory Bird Habitat Restoration

Prepared by:
Virginia Department of Conservation and Recreation
Division of Natural Heritage

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United States Department of Commerce
National Oceanic and Atmospheric Administration
and
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Coastal Zone Management Program



**Natural Heritage Technical Report
#14-09
November 2014**



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FINAL REPORT

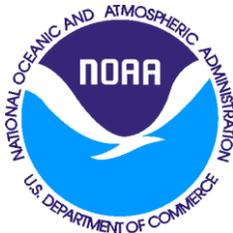
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**VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION
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Dorothy P. Field
November 2014

Pickett's Harbor Natural Area Preserve Migratory Songbird Habitat Restoration

EXECUTIVE SUMMARY

This report describes migratory songbird habitat restoration work undertaken at Pickett's Harbor Natural Area Preserve (PHNAP) by DCR-DNH in 2013-2014.

The Eastern Shore of Virginia is an important stopover area for neo-tropical and temperate songbirds during autumn migration to wintering grounds. The birds congregate in shrub and forest habitats on the southern Delmarva Peninsula to rest and forage before crossing the physical barrier presented by the Chesapeake Bay. To ensure a successful migration, songbirds must consume large quantities of fruits and insects to replenish energy stores needed for long distance flight. This is especially critical to birds stopped on the southern Delmarva Peninsula, as most are inexperienced first-year birds attempting to navigate the migration route for the first time. Inexperience increases the likelihood of inferior habitat selection, leading to the possibility of over expenditure of fat stores needed to reach wintering sites. Increasing the acreage of appropriate migratory songbird stopover habitat on the southern Delmarva Peninsula is, therefore, critical to the stability of neo-tropical and temperate migratory songbird populations and the primary focus of conservation partners on the Eastern Shore of Virginia. The habitat restoration work at PHNAP initiated by this project contributes an additional 62 acres to this effort.

Project Objectives

The objective of the project was to begin the conversion of 62 acres of former agricultural fields to migratory songbird stopover habitat at PHNAP in Northampton County Virginia.

Results

The former agricultural fields at PHNAP were planted first with shrubs and then with tree saplings during two separate planting events. In November 2013, DCR-DNH staff and volunteers planted 2,170 one-gallon containerized southern wax myrtle (*Morella cerifera*) shrubs at a density of 35 plants per acre. In March-April 2014, DCR-DNH staff and volunteers planted 360 balled & burlapped oak (*Quercus spp.*) saplings (1.5-in caliper) at a density of six plants per acre. Oak species planted were white oak (*Q. alba*), water oak (*Q. nigra*) and willow oak (*Q. phellos*). Volunteers contributed 442 hours of labor and enabled project completion.

Planting shrubs and tree saplings in recently-cropped agricultural fields “jump starts” the natural vegetative succession process, providing immediate woody cover and tall perches for migrating songbirds in a setting that otherwise would consist almost entirely of herbaceous vegetation for the first few years. Systematic bird use monitoring was begun at the PHNAP restoration area in August 2014. During the August – October period 27 species of birds were observed using the site, providing an early indication of the project's utility even in its early stage of development. The total cost to establish shrubs and saplings was \$55,590 for the 62-acre project, or \$897 per acre. For comparison, a more traditional restoration approach of establishing planted hardwood seedlings at 15'x15' spacing (194/acre) using tree shelters would have cost \$1,984/acre.

Pickett's Harbor Natural Area Preserve Migratory Songbird Habitat Restoration

INTRODUCTION

The Eastern Shore of Virginia is an important stopover area for neo-tropical and temperate songbirds during autumn migration to wintering grounds. The birds congregate in shrub and forest habitats on the southern Delmarva Peninsula to rest and forage before crossing the physical barrier presented by the Chesapeake Bay (Mabey et. al., 1993). To ensure a successful migration, songbirds must have adequate stopover habitat to replenish energy stores needed for long distance flight (Ktitorov et. al., 2008). Adequate habitat may be especially critical to birds stopped on the southern Delmarva Peninsula, as most are inexperienced first-year birds attempting to navigate the migration route for the first time. Inexperience increases the likelihood of inferior habitat selection (Buler and Moore 2011), leading to the possibility of over-expenditure of fat stores needed to reach wintering sites. Increasing the acreage of appropriate migratory songbird stopover habitat on the southern Delmarva Peninsula is, therefore, critical to the stability of neo-tropical and temperate migratory songbird populations and the primary focus of conservation partners on the Eastern Shore of Virginia. The habitat restoration work completed as a result of the current project contributes an additional 62 acres to this effort.

Pickett's Harbor Natural Area Preserve (PHNAP) is a 122.5-acre state natural area preserve, managed by the Virginia Department of Conservation and Recreation's Division of Natural Heritage (DCR-DNH) located on the lower Chesapeake Bay side of Northampton County, Virginia. The preserve is within the Southern Tip migratory songbird stopover habitat and the Lower Delmarva Important Bird Area (IBA). The preserve's location within the Southern Tip of the Eastern Shore of Virginia and its proximity to the Chesapeake Bay make it an ideal stopover site for songbirds during the autumn migration period. The DCR-DNH restoration objective was to supplement existing habitat by restoring approximately 62 acres of upland agricultural fields at PHNAP to maritime forest for the benefit of migratory songbirds (Figure 1).

Restoration activities consisted of planting containerized wax myrtle (*Morella cerifera*) shrubs and native oak (*Quercus spp.*) saplings. Oak species included willow oak (*Quercus phellos*), water oak (*Quercus nigra*) and white oak (*Quercus alba*). Wax myrtle is a prominent native shrub species on the Eastern Shore of Virginia that, when planted in restoration settings, provide both immediate and long-term benefits for songbirds. The shrubs grow quickly and are evergreen, providing instant islands of year-round cover. Wax myrtle also matures and reaches fruit-bearing age rapidly, providing a preferred food source within a short period of time. In addition, wax myrtle has nitrogen fixation capabilities and is not mycorrhizae-dependent (Field 1999). These characters increase survival rates in the nutrient-poor, bare soils often associated with former agricultural fields. On the Southern Tip of the Eastern Shore, non-dependence on mycorrhizae is especially important because of the long history of potato cultivation, which requires heavy use of fungicides that negatively impact mycorrhizal spore presence.

Planting oak saplings in restoration fields is a strategy that immediately creates a layer of tall vegetative cover and structure, yielding early establishment of heavy-seeded hardwoods that

otherwise would not be present until much later in the old-field succession process. Planted tree saplings provide immediate structure for bird perches, promoting dispersal and establishment of preferred food plants (e.g. black cherry, black gum, sassafras) into the restoration site by songbirds. Planting tree saplings instead of seedlings eliminates deer browse and vegetative competition, the two mortality factors that so often cause failure in attempts to establish desirable tree species in field settings. DCR-DNH has found this method for converting farm fields to young forests provides for high survival rates of planted stock, increased diversity of preferred bird food plants, enhanced forest structure for bird habitat, and decreased project costs in comparison to planting seedlings in combination with the use of tree shelters.



Figure 1. Location of migratory songbird restoration sites at Pickett's Harbor Natural Area Preserve.

METHODS

Site Preparation

Agricultural fields at PHNAP were taken out of production during the 2013 growing season (Figure 2). In November 2013, fields were delineated into planting strips spaced 30-ft apart. Each strip was mechanically prepared for planting by plowing and disking. Areas between strips were left intact. At 30-ft intervals within strips, a skid-steer with auger attachment was used to dig 18-inch diameter planting holes to accommodate one-gallon container-grown southern wax myrtle shrub. In March-April 2014, 24-inch diameter holes were similarly dug within prepared strips to accommodate balled & burlapped oak saplings. Tree planting holes were prepared in strips set back from field borders to decrease potential for herbicide drift effects from neighboring farm fields and to minimize future overhanging tree branches across an adjacent residential access road.



Figure 2. Pickett's Harbor restoration fields in early fall 2013 prior to site preparation and shrub planting.

Shrub Planting

Planting of 2,170 containerized wax myrtle shrubs on the 62-acre restoration site began on November 12, 2013 and was completed by DCR-DNH staff and 35 volunteers in two days. Volunteers were recruited from various conservation groups active on the Virginia Eastern Shore (Virginia Master Naturalists Eastern Shore Chapter; Virginia Master Gardeners Eastern Shore Chapter; Chesapeake Bay Foundation Eastern Shore Chesapeake Bay Stewards; Coastal Virginia Wildlife Observatory). Volunteers unloaded wax myrtle shrubs from the delivery truck and transferred them to two open trailers for transporting to field planting locations (Figure 3). Prior to planting, red flagging was tied to each shrub to assist in visually locating them within early succession vegetation in order to assess survival (Figure 4). Shrubs were then transported via trailer to field planting locations. Volunteers worked in two-person teams to remove shrubs from their containers and plant them in pre-dug holes (Figure 5). Shrub planting was completed by the end of the second work day – a feat made possible by 191 hours of contributed volunteer labor.



Figure 3. DCR-DNH staff and volunteers preparing to transfer southern wax myrtle shrubs from delivery truck to planting trailer.



Figure 4. Tying flagging to southern wax myrtle shrubs prior to planting.



Figure 5. A Virginia Master Naturalist volunteer plants a southern wax myrtle shrub at Pickett's Harbor Natural Area Preserve.

Tree Sapling Planting

Planting of tree saplings began on March 19, 2014. Four weekly shipments of 60 tree saplings each were scheduled with the supplier. All saplings were approximately 1.5-inch caliper balled & burlapped saplings from 7- to 9-ft tall. Scheduling shipments/deliveries at one-week intervals allowed for ample planting time and limited the possibility of pre-planting moisture stress to the trees. Saplings were planted in pre-dug holes by 6- to 8-person volunteer crews. Saplings were first off-loaded from the delivery truck using a specially-equipped front-end loader (Figure 6), and then loaded onto a field-transport trailer equipped with a winch (Figure 7). Prior to planting, nails and roping were removed from the burlap. Saplings were transferred into planting holes by attaching the winch to the metal tree root basket and swinging the tree off the trailer. The planting crew centered each sapling above its hole and lowered it into place. Hand tools were used to fill voids and tamp soil surrounding each root ball (Figure 7). Tree planting was completed on April 9, 2014 (Figure 8) and made possible by 21 volunteers contributing a total of 251 volunteer hours.



Figure 6. Off-loading and staging oak saplings in preparation for planting.



Figure 7. Volunteers planting oak saplings at Pickett's Harbor Natural Area Preserve in spring 2014.



Figure 8. Planting crew surrounds the final oak sapling planted at Pickett’s Harbor Natural Area Preserve in April 2014.

Invasive Species Control

Invasive species, including Chinese privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera japonica*) occurring along the perimeter of the project area, were treated with glyphosate during the 2014 growing season in order to reduce rates of spread into restored migratory bird habitat.

Monitoring

The PHNAP migratory songbird habitat restoration project will be monitored for invasive plant species, preferred bird food plant species establishment and use by migratory birds. Comprehensive monitoring for migratory bird utilization began in August 2014. To date, 27 species of birds have been observed utilizing the newly created habitat (Table 1). Monitoring will continue as natural succession, augmented with wax myrtle shrub and oak sapling plantings, proceeds. Vegetation monitoring will be initiated in spring of 2015.

Table 1. Bird species observed within one monitoring plot at the Pickett’s Harbor Natural Area Preserve habitat restoration site during the period August – October 2014.

| | | |
|----------------------|---------------------|---------------------------|
| American Crow | Common Yellowthroat | Northern Bobwhite |
| American Kestrel | Eastern Bluebird | Northern Flicker |
| American Redstart | Eastern Meadowlark | Palm Warbler |
| Barn Swallow | European Starling | Peregrine Falcon |
| Blue Grosbeak | Field Sparrow | Prairie Warbler |
| Brown-headed Cowbird | Grasshopper Sparrow | Ruby-throated Hummingbird |
| Bobolink | House Sparrow | Savannah Sparrow |
| Carolina Wren | Mourning Dove | Swamp Sparrow |
| Common Grackle | Magnolia Warbler | Tree Swallow |

PROJECT COSTS

Total project cost including administrative expenses to plant containerized wax myrtle shrubs and large oak saplings on 62 acres of old farm fields at the restoration site was \$55,590 or \$897 per acre. Volunteers provided significant labor inputs (442 hours) for planting at no cost to the project. Cost categories are shown below in Table 2.

Table 2. Costs to establish shrubs and tree saplings at Pickett’s Harbor Natural Area Preserve to enhance migratory bird habitat.

| Cost category | Unit cost (\$) | Total cost (\$) | Description/notes |
|-------------------------------|-----------------------|------------------------|--------------------------------------|
| Plant material | | | |
| Shrubs (2,170) | 2.99 | 6,500 | wax myrtle in 1-gal containers |
| Saplings (360) | 77.71 | 27,975 | balled-burlapped oaks (1.5” caliper) |
| Site preparation | | | |
| Equipment | - | 4,300 | skidsteer/auger; tractor/disk |
| DCR operator | 30.00/hour | 5,000 | 167 hours to prepare planting strips |
| Planting supplies & materials | - | 465 | misc. hand tools, lumber, etc. |
| Planting labor | | | |
| Volunteers | (21.00/hour value) | 0 | 442 volunteer hours (no cost) |
| DCR staff | 30.00/hour | 5,300 | 177 hours staff time |
| Administrative costs | 40.00/hour | 6,050 | 151 hours staff time |
| Total cost | | \$55,590 | |

Cost Comparisons with Traditional Restoration Methods

Spending \$897 per acre to establish shrubs and tree saplings for the objective of augmenting natural succession to enhance migratory bird habitat may seem expensive at first glance. However, the cost of this “DCR method” is put in perspective by examining the costs of more traditional alternative approaches used in recent years on the Eastern Shore and elsewhere to restore and enhance migratory bird habitat in open field settings.

Planting unprotected hardwood seedlings

Some bird habitat restoration projects have involved the planting of a high density of tree seedlings – up to 435 per acre (10’x10’ spacing) – with seedlings typically enclosed within tree shelters in order to protect them from deer browse. If tree shelters *are not* purchased or installed, establishing 435 hardwood seedlings per acre, including pre-plant site preparation and 3-year competition control treatments, can cost \$629 per acre (Table 3). In comparison, the recently-completed Pickett’s Harbor project was completed at a cost of \$897/acre with volunteer planting labor. However, heavy deer browse on unprotected planted oak seedlings, plus competition from adjacent vegetation after the third growing season would in all likelihood result in few unprotected seedlings surviving and making height growth rapidly enough to become canopy components of a fast-developing young successional forest. Heavy deer browse coupled with competition from light-seeded, fast-growing tree species such as sweetgum and loblolly pines would cause most planted seedlings in field restoration settings to die or be permanently relegated to suppressed, shaded positions within the young forest tree canopy.

Table 3. Estimated costs to establish hardwood tree seedlings at a planting density of 435 per acre (10'x10' spacing) within recently-cropped farm fields to enhance migratory bird habitat *without* deer browse protection.

| <u>Cost category</u> | <u>Unit cost (\$)</u> | <u>Cost/acre (\$)</u> | <u>Description/notes</u> |
|--------------------------|-----------------------|-----------------------|--------------------------------------|
| Plant material | | | |
| Hardwood seedlings | 0.35 | 152 | 2014 price for 2-0 oaks @ 435/acre |
| Site preparation | | | |
| Mowing + disking strips | - | 75 | estimated contract cost for 62 acres |
| Planting seedlings | 0.50 | 217 | estimated contract planting cost |
| Contractor oversight | 30.00/hour | 20 | 40 hours landowner staff time |
| Herbicidal weed control | - | 150 | Apply 3 times @ \$50/yr |
| Landowner administrative | 40.00/hour | 15 | 24 hours landowner staff time |
| Total cost | | \$629 | |

Planting hardwood seedlings with tree shelter protection

With the objective of increasing survival and recruitment of planted seedlings into the next forest, some habitat managers on the Eastern Shore and elsewhere have used tree shelters and between-row mowing as a strategy to eliminate deer browse and competition effects, in order to achieve planting success. The cost of using shelters is high. To reduce costs, tree seedlings/tree shelters are often planted/installed at wider spacing (lower planting density) than in the example above. A 15'x15' spacing (194 seedlings/acre) is used in the cost analysis shown in the example provided in Table 4. Even at this wider spacing the total cost per acre approaches \$2,000.

Table 4. Estimated costs to establish hardwood tree seedlings at a planting density of 194 per acre (15'x15' spacing) within recently-cropped farm fields to enhance migratory bird habitat using tree shelters for deer browse protection.

| <u>Cost category</u> | <u>Unit cost (\$)</u> | <u>Cost/acre (\$)</u> | <u>Description/notes</u> |
|--------------------------|-----------------------|-----------------------|---|
| Plant material | | | |
| Hardwood seedlings | 0.35 | 68 | 2014 price for 2-0 oaks @ 194/acre |
| Site preparation | | | |
| Mowing/disking strips | - | 75 | estimated contract cost for 62 acres |
| Planting seedlings | 0.50 | 97 | contract planting cost |
| Contractor oversight | 30.00/hour | 38 | 80 hours landowner staff time |
| Tree shelters | | | |
| Shelters | 4.00 | 776 | 2014 price for 5' tubex w/shipping |
| Wooden stakes | 1.33 | 258 | 2014 price for 5' oak stakes (tubex) |
| Installing tree shelters | 2.00 | 407 | Assumes 2-person crew @ \$42/hour can install 20 stakes/shelters per hour |
| Weed control | | | |
| Mowing | - | 100 | Apply 2 times @ \$50/ac |
| Herbicidal | - | 150 | Apply 3 times @ \$50/ac |
| Landowner administrative | 40.00/hour | 15 | 24 hours landowner staff time |
| Total cost | | \$1,984 | |

SUMMARY AND CONCLUSIONS

Beginning in November 2013 and ending in April 2014, 62 acres of former agricultural fields were planted with southern wax myrtle shrubs and oak saplings at Pickett's Harbor Natural Area Preserve. Planting was completed in two separate operations: two days for shrub planting in November 2013 and over the course of a four-week period in March and April 2014. Work was completed in-house by DCR-DNH staff with planting labor provided by 56 hard-working and dedicated volunteers contributing a total of 442 hours of labor at no cost to the project. Just one year after conversion from bare farm fields, the restoration site is already being utilized by at least 27 species of migratory birds (Table 1). These early results illustrate the effectiveness of this method to quickly enhance habitat value for songbirds during autumn migration on the Delmarva Peninsula, and the cost savings that can be realized by developing and utilizing a strong, organized network of dedicated volunteers to assist with conservation initiatives. Pioneer plant species that naturally colonize recently cropped fields in combination with widely-spaced planted shrubs and tree saplings provides preferred bird habitat quickly and develops rapidly into exceptionally high value cover (Figure 9).



Figure 9. Pickett's Harbor Natural Area Preserve bird habitat restoration area as it appeared in August 2014.

Total cost for the 62-acre project was \$55,600 or about \$900 per acre to enhance natural succession by planting 2,170 (35/acre) containerized wax myrtle shrubs and 360 (6/acre) large balled & burlapped oak saplings. For comparison, planting hardwood seedlings at a density of 434/acre (10'x10' spacing) would have cost about \$630 per acre. Even with two years of follow-up weed control treatments, most seedlings would not be recruited into the new forest canopy due to slow growth and mortality caused by deer browse and competition from adjacent vegetation.

If DCR-DNH had planted hardwood seedlings at a density of 194/acre (15'x15' spacing) and installed 5' tree shelters to protect seedlings from deer browse, the cost would have been \$1,984/acre or \$123,000 for the 62-acre project at Pickett's Harbor.

Even with this high expense, experience has shown that the use of tree shelters in field establishment plantings does not guarantee that high numbers of planted seedlings will be recruited into the new forest canopy. Low recruitment is common, due to the extremely fast growth of uncontrolled adjacent vegetation. In particular, naturally-seeded fast-growing loblolly pine, sweetgum and red maple frequently overtop planted, shelter-protected trees even after many years of maintenance by mowing and continued monitoring/repair of malfunctioning shelters. Additional costs and drawbacks of tree shelter use include: 1) the on-going labor costs associated with shelter monitoring, replacement of broken stakes, and placement/removal of bird netting, 2) costs of multi-year post-planting vegetation control by mowing or herbicide use, 3) compaction effects on soils from multi-year post-planting mowing and associated equipment passage, 4) songbird mortality – especially of insectivores such as Eastern Bluebirds and Indigo Buntings – caused when birds enter tree shelters to forage for larvae in wasp nests built within shelters, 5) the need to clean up shelter debris once they begin disintegrating and/or to remove old, intact shelters once seedlings have emerged and no longer benefit from shelter protection.

DCR-DNH is conducting on-going monitoring work to track vegetative development and bird use at the four Eastern Shore state natural area preserves where shrub and/or shrub + tree plantings have been used to augment old field succession for the objective of restoring migratory bird habitat. Essential funding support from NOAA through the VCZMP at DEQ made possible this effort to restore habitat at PHNAP, covering all costs of plant materials. In addition, partner organizations and volunteers combined to make this project a success (Figure 10).

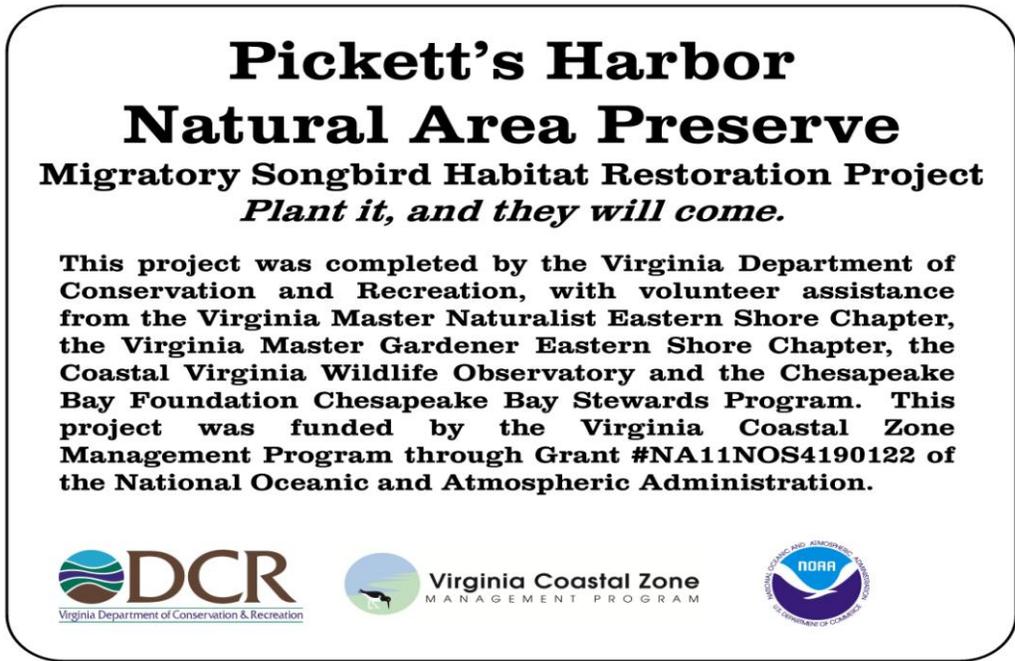


Figure 10. Signage acknowledging NOAA/VCZMP funding and volunteer support.



Figure 11. Installed signage acknowledging NOAA/VCZMP funding and volunteer support.

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