



Shaw's Bridge Park

NATURAL AREA STEWARDSHIP REPORT

July 2014

East Bradford Township, Chester County
(Tax parcels 51-7-122-E)
37.3 acres



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Hildacy Farm Preserve
1031 Palmers Mill Road
Media, PA 19063

610-353-5587
www.natlands.org

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GENERAL PROPERTY DESCRIPTION

Acquired by East Bradford Township in 1996, the 37.3-acre Shaw's Bridge Park (Park) is located in East Bradford Township, Chester County on South Creek Road between Route 842 (South Creek Road and South Bridge Road) to the north and Route 52 (Lenape Road) to the south (see *Location* and *2010 Aerial Photography* maps). The Park is accessible from a parking lot on South Creek Road. In addition to being owned by East Bradford Township, the Park is protected by a conservation easement held by North American Land Trust and is subject to the Land and Water Conservation Fund restrictions. Many of the properties surrounding the Park are protected through East Bradford Township ownership, conservation easements, and homeowner association open space.

Natural Lands Trust staff accompanied by Mandie Cantlin, Assistant Township Manager, conducted a field inspection of the property on November 4, 2013. The Park's natural resources were assessed and documented by field notes and photographs.

TOPOGRAPHY

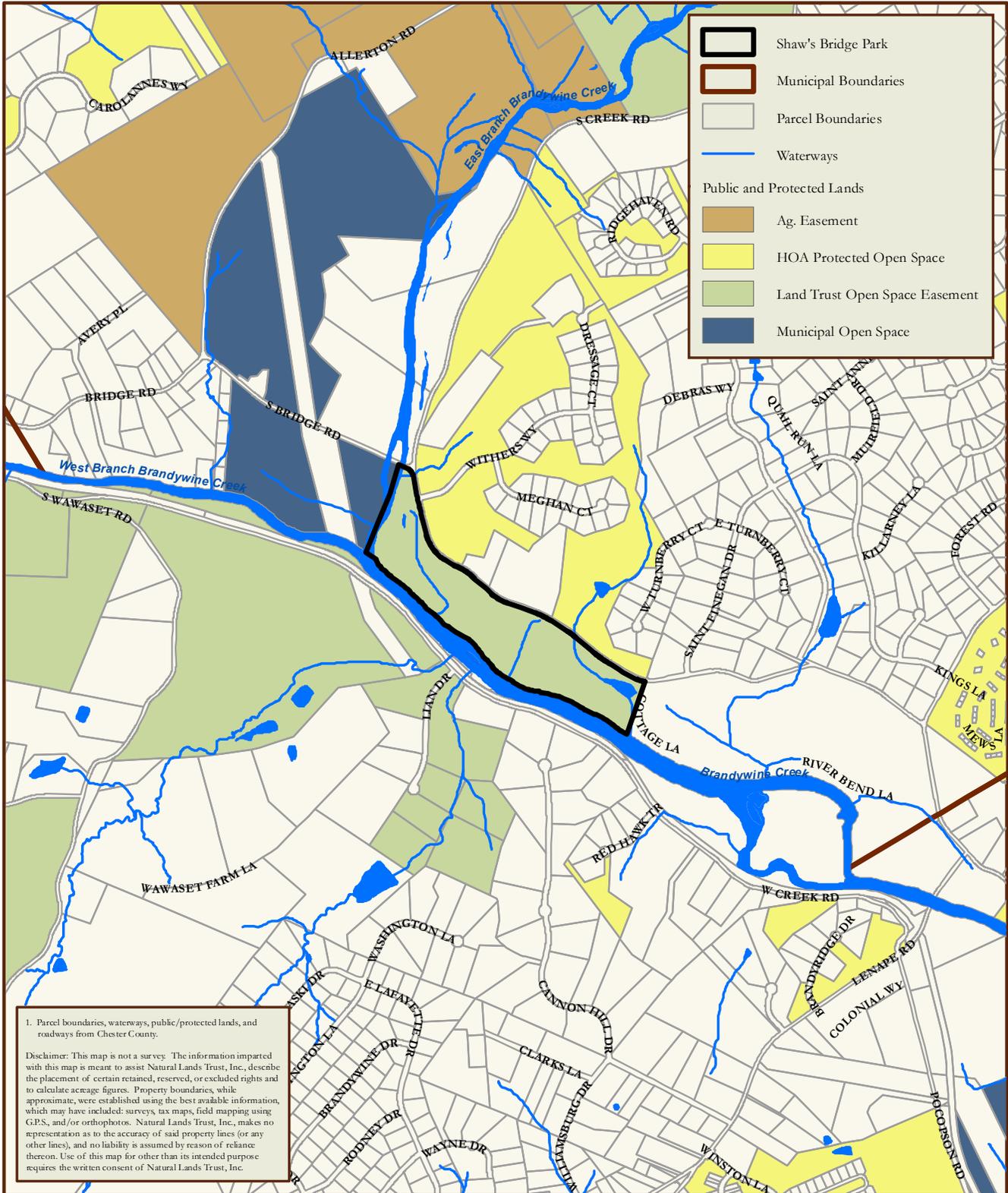
The topography of the property ranges from about 174 to 196 feet above mean sea level (see *Topography and Hydrology* map). The higher elevations are found to the immediate west of the Park's parking lot along the South Creek Road. The lowest elevation is located in the southwest corner of the Park along the East Branch Brandywine Creek. Most of the property is generally flat, but does include steep slopes (15–25% and greater than 25%) along South Creek Road, East Branch Brandywine Creek, and Brandywine Creek.



Entrance sign



View near parking

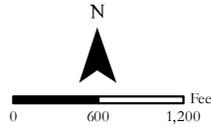




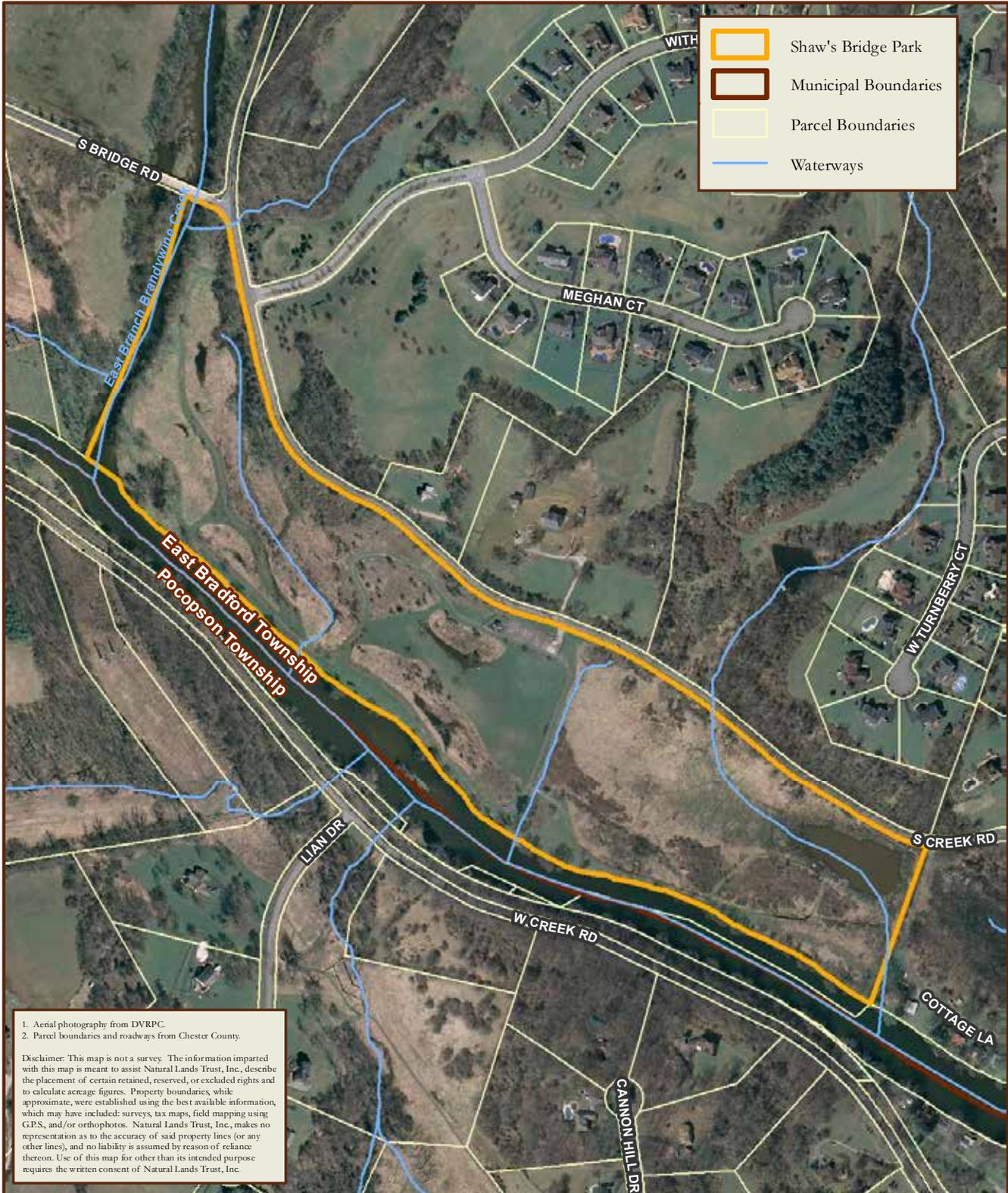
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Location
SHAW'S BRIDGE PARK
 Tax ID: 51-7-122-E (+/- 37.3 acres)
 East Bradford Township, Chester County, PA

N



0 600 1,200 Feet
 Compiled By: MEB 02/13/14



	Shaw's Bridge Park
	Municipal Boundaries
	Parcel Boundaries
	Waterways

1. Aerial photography from DVRPC.
 2. Parcel boundaries and roadways from Chester County.

Disclaimer: This map is not a survey. The information imparted with this map is meant to assist Natural Lands Trust, Inc., describe the placement of certain retained, reserved, or excluded rights and to calculate acreage figures. Property boundaries, while approximate, were established using the best available information, which may have included: surveys, tax maps, field mapping using GPS, and/or orthophotos. Natural Lands Trust, Inc., makes no representation as to the accuracy of said property lines (or any other lines), and no liability is assumed by reason of reliance thereon. Use of this map for other than its intended purpose requires the written consent of Natural Lands Trust, Inc.



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2010 Aerial Photography
SHAW'S BRIDGE PARK

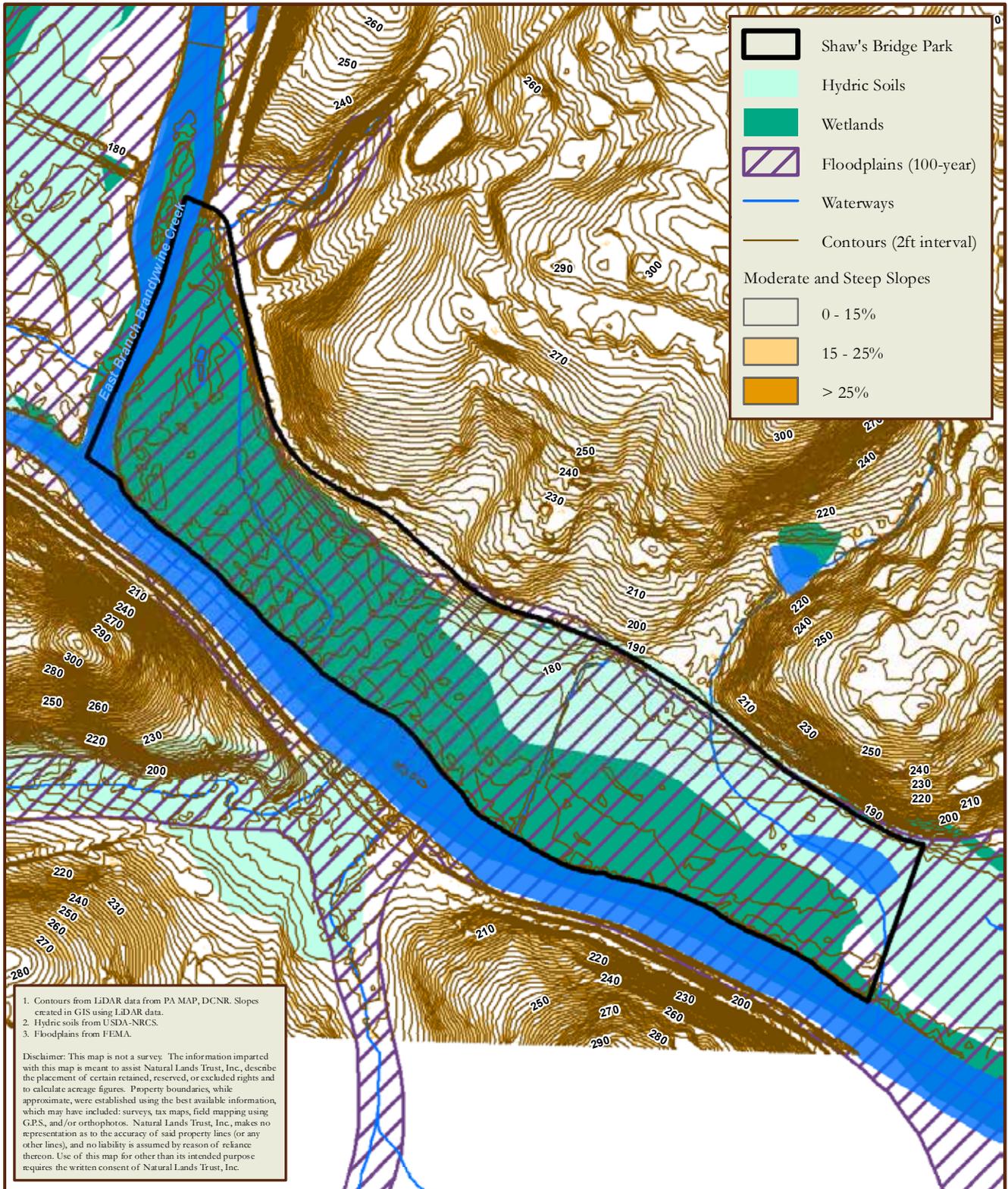
Tax ID: 51-7-122-E (+/- 37.3 acres)
 East Bradford Township, Chester County, PA

N



0 200 400 Feet

Compiled By: MEB 10/23/13



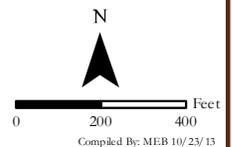
Hydrologic and Topographic Features

SHAW'S BRIDGE PARK

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WATER RESOURCES

The property is located within the Brandywine Creek watershed. The East Branch Brandywine Creek flows north to south across the Park's northern boundary for approximately 916 feet and merges with the West Branch Brandywine Creek at the northwestern corner of the Park. The Brandywine Creek—the confluence of the East and West branches—flows northwest to southeast along the western boundary of the Park for approximately 2,892 feet. The Brandywine Creek joins with the Christina River just before it enters the Delaware River at Wilmington, Delaware.

The Park contains waterways, wetlands, hydric soils, and floodplains. Three small intermittent tributaries flow through the Park into the Brandywine Creek. The two northernmost streams begin in the Park; the southernmost tributary feeds a one-acre seasonal pool in the southeast corner of the Park before it reaches the Creek. With the exception of the steep slopes along South Creek Road, the entire property rests on hydric soils and lies within the 100-year floodplain. Additionally, about two-thirds of the Park contains wetlands as identified in the National Wetlands Inventory (NWI).



Confluence of West and East Branches Brandywine Creek



Large seasonal pool



Small seasonal pool

PLANT RESOURCES

Historically, the property was kept entirely open through agriculture. By 1971 the wet area—where the large seasonal pool is currently located—had begun its succession to wet meadow and forest (see *Historical Aerial Imagery 1937* and *Historical Aerial Imagery 1971* maps). The Park currently contains four plant communities as described below with invasive species highlighted in bold type. They include wet meadow/marsh, riparian floodplain forest, mixed hardwood terrestrial forest/shrubland, and lawn (see *Vegetation Communities* map).

Wet Meadow/Marsh

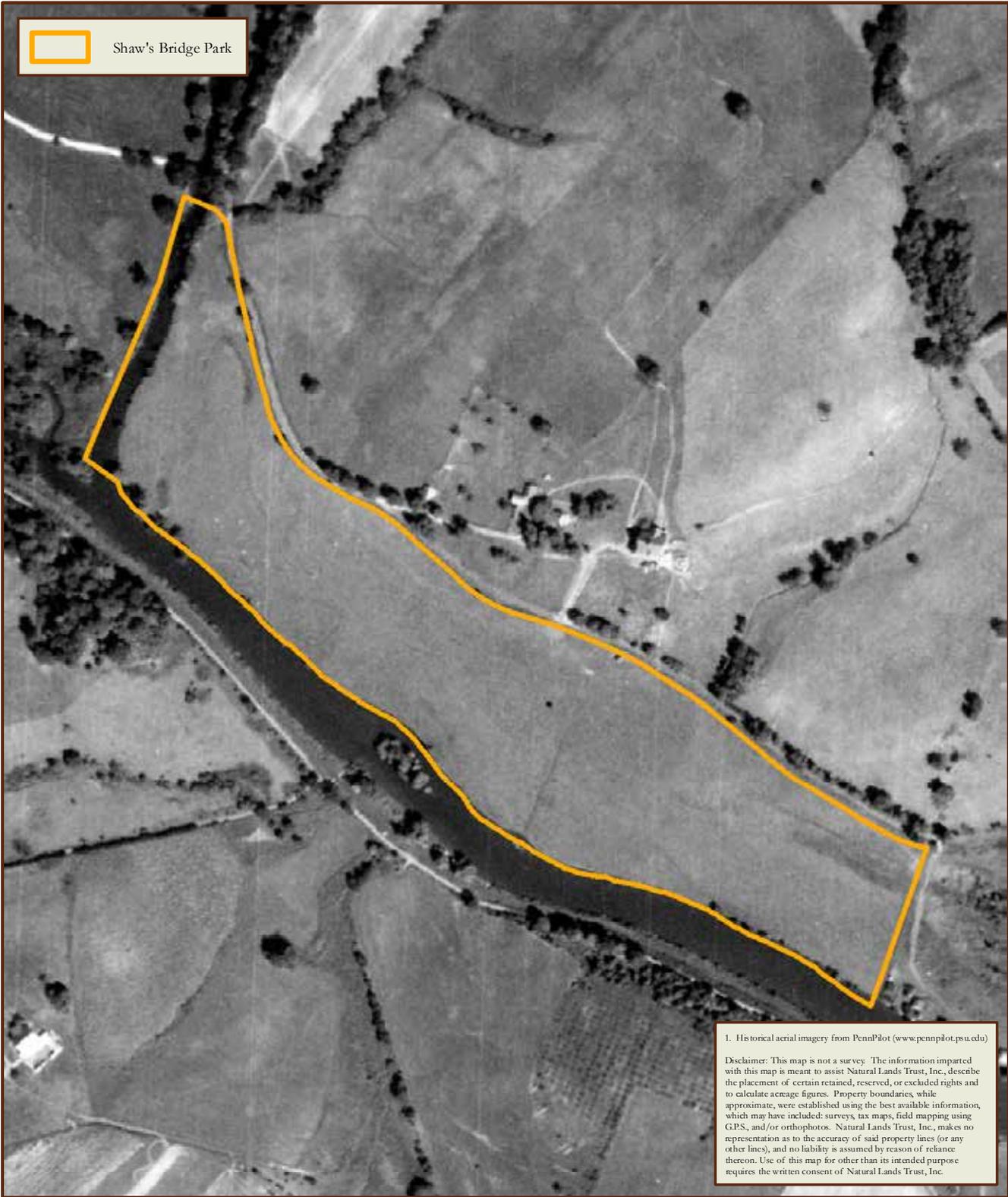
Historical aerial photography shows that the floodplain was more open in the past and likely served as pastureland. This area is now wet meadow/marsh with scattered trees (volunteers and planted) and shrubs. The dominant species observed during the November site visit are reed canary-grass (*Phalaris arundinacea*), stinging nettle (*Urtica dioica*), goldenrods (*Solidago* spp.), sedges (*Carex* spp.), **phragmites** (*Phragmites* sp.), and teasel (*Dipsacus* sp.). The marsh areas are dominated by common cat-tail (*Typha latifolia*) and reed canary-grass. Scattered throughout the floodplain are individuals and patches of trees and shrubs including black walnut (*Juglans nigra*), silver maple (*Acer saccharinum*), willow (*Salix* sp.), red ash (*Fraxinus pennsylvanica*), box-elder (*A. negundo*), **crabapple** (*Malus* sp.), **tree-of-heaven** (*Ailanthus altissima*), **callery pear** (*Pyrus calleryana*), brambles (*Rubus* spp.), false indigo (*Amorpha fruticosa*) **autumn-olive** (*Elaeagnus umbellata*), buttonbush (*Cephalanthus occidentalis*), and silky dogwood (*Cornus amomum*). Additional trees—including silver maple, tuliptree (*Liriodendron tulipifera*), black cherry (*Prunus serotina*)—have been planted and protected with tree shelters. Vines include **Japanese honeysuckle** (*Lonicera japonica*), porcelain-berry (*Ampelopsis brevipedunculata*), and **mile-a-minute weed** (*Persicaria perfoliata*). The meadow also includes a relatively new invasive herb, **poison-hemlock** (*Conium maculatum*), which is highly toxic to animals and humans.



Wet meadow



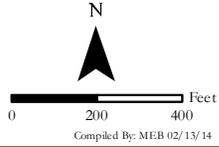
Invasive vines on trees and shrubs




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Historical Aerial Imagery (1937)

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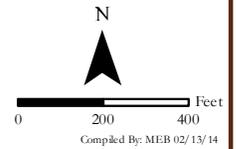


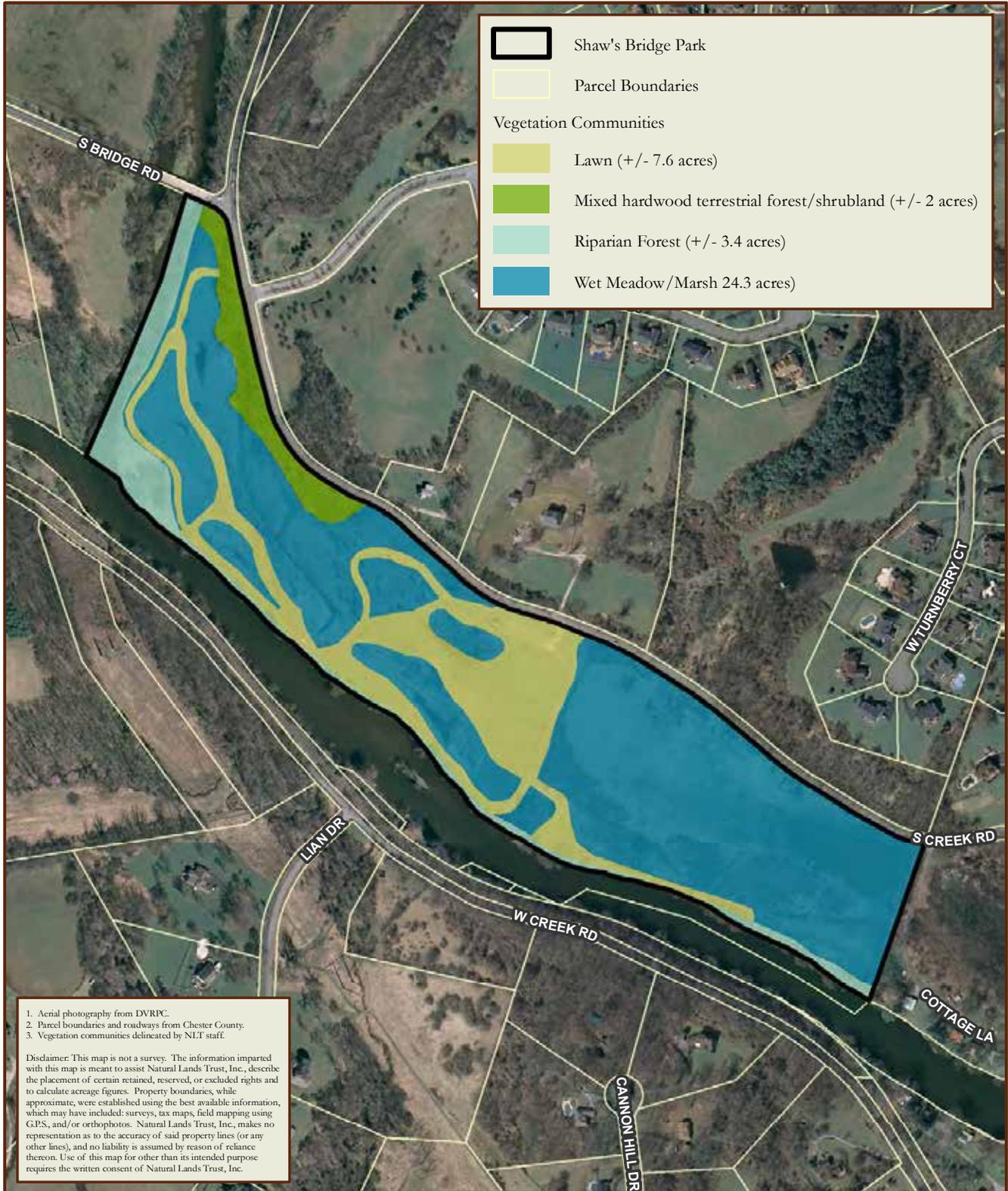

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Historical Aerial Imagery (1971)

SHAW'S BRIDGE PARK

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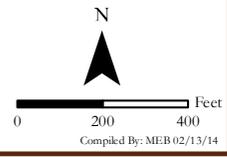


1. Aerial photography from DVRPC.
 2. Parcel boundaries and roadways from Chester County.
 3. Vegetation communities delineated by NLT staff.

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Vegetation Communities
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 East Bradford Township, Chester County, PA



Riparian floodplain forest

A thin maturing sycamore–box-elder floodplain forest hugs the streambank along most of the western border. Tree species include sycamore (*Plantanus occidentalis*), box-elder (*Acer negundo*), red oak (*Quercus rubra*), willow, sugar maple, and black cherry (*Prunus serotina*). The Township has begun to augment the riparian forest through tree plantings. Species planted so far include oaks (*Quercus* spp.), tuliptree, sweetgum (*Liquidambar styraciflua*), bald cypress (*Taxodium distichum*), and silver maple. They are protected from deer browsing by tree shelters.



Thin riparian floodplain forest

Mixed hardwood terrestrial forest/shrubland

A degraded upland forest borders South Creek Road. Canopy trees include black locust (*Robinia pseudoacacia*), red ash, box-elder, black cherry (*Prunus serotina*), **callery pear**, and **tree-of-heaven**. This area is heavily impacted by invasive vines including **oriental bittersweet**, **grape**, **porcelain-berry**, and **mile-a-minute weed**.



Riparian tree planting

Lawn

A large lawn area is maintained adjacent to the parking lot as an informal play area for humans and dogs. Lawn is also maintained in the afforestation areas and a swath is mowed regularly along both sides of the trail.



Thin mixed hardwood forest



Lawn by parking lot



Lawn along trail



Lawn in afforestation area

CURRENT USE

The Park is used for passive recreation. A parking lot allows access to the property and the Brandywine Creek for fishing, picnicking, hiking, dog walking, and nature exploration. The Park has an extensive trail system that allows park users to explore the natural resources of the park and provides extensive views of the Creek.

STEWARDSHIP ISSUES, OPPORTUNITIES AND RECOMMENDATIONS

The following stewardship issues and opportunities were observed during the site visit to the Park on November 4, 2013. They are described in the context of two overall stewardship goals for the natural areas on the property: (1) to provide a safe and enjoyable environment for passive and semi-active recreation and educational opportunities; and (2) to protect and enhance plant communities that support resident and migratory wildlife. Each stewardship issue and opportunity is followed by general recommendations to address the issue or fulfill the opportunity.

Invasive Plants

A ubiquitous problem encountered in the stewardship of natural lands in southeastern Pennsylvania—and increasingly recognized as a threat worldwide—is the presence of invasive plant species. An invasive species is one that rapidly spreads and outcompetes multiple native species, chiefly because of the absence of predators, pathogens, and herbivores that keep it in check in its native range. Most invasive plants are particularly well adapted to colonize disturbed areas. In southeastern Pennsylvania, disturbance from human activities, particularly agriculture and, more recently, suburban sprawl, coupled with the rich horticultural history of the southeastern counties, has afforded numerous invasive species the opportunity to become well established throughout the region. Even though the occasional

immigration of new species into plant communities is a normal process, the current high rate of introduction—fueled by the planting of exotic (non-native) species for horticulture, wildlife management, and erosion control—is threatening the integrity of native plant communities and lowering native biodiversity. Not only do invasive plants alter the makeup of the plant communities on a site, but they also may affect soil chemistry and hydrology and are usually less beneficial to wildlife than the native plants they replace, contributing further to the loss of biodiversity. Additionally, vines on trees increase the likelihood of downed trees. This is particularly important near roads, trails, recreational facilities, and structures where damages and injuries may occur from falling trees. Some invasive species—such as poison hemlock—are highly toxic to humans and pets.

In general, the Shaw's Bridge Park property is moderately impacted by invasive plants, with the exception of the area along South Creek Road just north of the parking lot which is heavily impacted. The main concern at this time is invasive trees, shrubs, and vines (listed above) within the wet meadow areas. Highest priority should be given to control of **autumn-olive** and **callery pear**.

RECOMMENDATIONS

Since the diversity of native species in a system is vital to providing suitable habitat for resident and migratory wildlife, as well as providing an enjoyable environment for community residents, we suggest the following measures to control invasive plant species at Shaw's Bridge Park. In general, it is best to address invasive plant control with a top-down (starting in the canopy and working down through understory, shrub, and groundcover layers), least-first strategy (starting in the least impacted areas).

When considering invasive plant control, it is important to keep in mind that effective control of invasive plants, especially in the understory, shrub, and groundcover layers of the forest, will only be possible if implemented in conjunction with a deer management program (see "Forest Sustainability" section below). It is also important to note that the extensive edge area and seed sources in the region and the prolific nature of these plants guarantee that even with complete eradication



Vines in streamside tree



Callery pears in wet meadow

on the property, invasive species can quickly reestablish themselves as a serious stewardship problem if not monitored and addressed on a regular basis.

The following invasive management recommendations for the Shaw's Bridge Park are listed in general order of priority. The "Invasive Vegetation Management" section of Natural Lands Trust's *Land for Life: A Handbook on Caring for Natural Lands* (2014) also provides guidelines for monitoring and controlling invasive plants typical of the southeastern Pennsylvania landscape.

Any volunteer or contractor used for invasive plant control should be able to distinguish native species from invasive species (e.g., **Norway maple** from native maples). In sensitive wetland areas on the property (the headwater stream, seeps, pond), only herbicides approved for aquatic use (e.g., Rodeo) should be applied.

- Monitor forests and meadow and cut vines that are climbing into canopy trees or over young native trees and shrubs. All **oriental bittersweet**, **porcelain-berry**, and **Japanese honeysuckle** vines should be cut and the cut stump treated with a systemic herbicide, if possible. Because the native grape vine is beneficial for native wildlife, only cut grape vines that are climbing into the canopy of the forests and compromising the structural integrity of native trees. Cut stumps of grape vines can be left to re-sprout. Care should be taken not to cut any Virginia creeper or poison ivy vines (unless the poison ivy impacts areas of high public use). These are native species that benefit wildlife and rarely become large enough to compromise canopy trees.
- Manage **tree-of-heaven** with a basal bark application of triclopyr ester (e.g., Garlon 4) herbicide and basal oil. We recommend using a 20–30% mix of triclopyr in basal oil applied in a band around the base of the trunk, avoiding runoff. Depending on the season, it may take time for this treatment to work; for example, a winter application may result in leaf out in spring, followed by defoliation. Once the trees are dead, they can be cut down (if they create a potential hazard for visitors) without stimulating suckering or left as snags for wildlife habitat. Young **tree-of-heaven** (up to 1–2 feet) can be pulled by hand, as long as roots are not broken.
- Control **mile-a-minute** growing on native trees and shrubs. Plants should be pulled (with gloves!) before they flower in the summer.
- Control **poison-hemlock**, particularly along trails, using a glyphosate herbicide suitable for wetland habitats (e.g., Rodeo). For more information, see appendices for the *Monthly Weed Post* dated May 2014.
- Manage **autumn-olive** by cutting to the stump and applying a glyphosate herbicide to the cut stump. Alternatively, after cutting, the shrub can be left to resprout and the young foliage treated with a glyphosate herbicide. In areas near water resources, a glyphosate herbicide suitable for wetland habitats (e.g., Rodeo) should be used.
- The management of **multiflora rose** can be a lower priority because this species will likely be weakened by the rose rosette disease, which is spreading throughout the region.
- Continue tree planting to augment riparian forest and reduce edge. The "Native Plant Materials" section of Natural Lands Trust's *Land for Life: A Handbook on Caring for Natural Lands* (2014) also provides a list of native species that are appropriate.
- New plantings should be protected from deer browsing and rubbing. Protect newly planted trees from deer browse using tree shelters for plants less than 6 feet in height. For trees over 6 feet in height, tree wraps limit damage from buck rubbing.

FOREST SUSTAINABILITY

Deer overabundance is a problem that affects most natural areas in our region. The habitat value of forests is greatest where there is an extensive unbroken canopy of mature trees with a diversity of native understory species that includes tree, shrubs, and herbaceous plants. Deer impact forest health by consuming seeds (particularly acorns) and browsing on seedlings, shrubs, and herbaceous plants. As deer population density increases, this activity can adversely affect populations of other wildlife species, especially songbirds, through a decrease in plant species and structural diversity within the forest.

Another method for determining the level of deer impact that is gaining favor with natural resource professionals (gathering accurate, useful deer density information is often complicated and expensive) is the condition of forest vegetation. A healthy mature forest has structural diversity with well developed herb, shrub, understory, and canopy layers that create a dense curtain of foliage during the growing season. There should be abundant natural regeneration (seedlings and saplings), particularly in forest gaps.

The forest within the property is thin and easily degraded by deer over-browsing. As a result, there is sparse tree regeneration. The afforestation areas are expanding the riparian forest. The township will need to determine the fate of the remainder of the floodplain, particularly the wet meadow. If it is to remain meadow, it will need periodic mowing to control invading trees and shrubs, both exotic and native. If mowing is a problem due to site conditions, it will be helpful to continue tree plantings into these areas.

RECOMMENDATIONS

The recommended deer density to allow for adequate tree regeneration is 20 deer per forested square mile (one deer per 32 acres). However, to perpetuate a healthy native forest with a diversity of native shrubs and wildflowers, the recommended deer density is 10 deer per forested square mile (one deer per 64 acres). With a little more than one acre of forest cover, the property can tolerate very little deer browsing. If the township chooses to allow the wet meadow to succeed, the amount of tolerable browsing will increase.

Our recommendations for addressing the impact of deer overbrowsing are provided below. Additional information about Natural Lands Trust's deer management program and deer management opportunities are included in the "Deer Management Options" section of Natural Lands Trust's *Land for Life: A Handbook on Caring for Natural Lands* (2014).

- It will be difficult to conduct a deer management program at Shaw's Bridge Park following the model used at other East Bradford Township parks. A reduction in deer impact will depend largely on the success of the program on the adjacent Brandywine Farm Park.

WATER QUALITY AND ECOLOGY

Riparian buffers help to safeguard water quality, stabilize stream channels and maximize infiltration and groundwater recharge that feed the stream. The riparian vegetation also benefits the aquatic ecology by shading the stream and adding organic matter (leaves, branches) that provide structure and nutrients for aquatic organisms. The Township has been planting trees along Brandywine Creek to expand the thin riparian buffer. A mown lawn is maintained currently around the trees. This does not provide the benefits associated with established riparian buffers that include trees, shrubs, and herbaceous vegetation. After the trees have created a closed canopy, the township can work toward a more diverse understory to improve water quality benefits of the buffer.

In general, the trail is in very good condition, despite lying mostly on the floodplain. Bridges and culverts have been installed that carry pedestrians and equipment over the headwater streams. (The trail does not cross the bridge, but rather crosses over the culvert. The bridges appear to be in good condition. It is likely that the bridges were installed first but are not wide enough to allow the mowing equipment to cross. Due to this, the trail has been diverted away from the bridge.) Only one area of soil disturbance and one area of channel erosion were witnessed during the site visit.

Given the generally wet condition and susceptibility to flooding of the Park, the trails should be monitored regularly to quickly correct any erosion and prevent degradation of natural resources.

Although the pond dries out in the summer months, it holds water the rest of the year. The mostly exposed surface increases the water temperature of pond outflow, which could degrade the water quality and habitat for many aquatic organisms downstream.

The open lawn area of the Park is frequented by picnickers and dog owners. While these activities are allowed at the Park, it is important that users pick up their trash and clean up their dog's poop. Trash and dog waste can be a health hazard.



Stream crossing



Soil disturbance in trail



Erosion channel

There are two primary canoe/kayak launching areas at the Park. These areas are suffering significant erosion and are therefore expanding as people look to enter/exit the Creek in areas that offer traction.

RECOMMENDATIONS

The property should be carefully managed to protect and enhance the water quality of on-site and downstream water resources associated with the Brandywine Creek and to realize the many wildlife benefits and ecosystem services these resources provide.

- Improve the riparian buffer along both East Branch Brandywine Creek and Brandywine Creek main stem by planting additional trees, shrubs, and herbaceous vegetation. Discontinue frequent mowing under the trees that have been planted after canopy closure.
- Monitor trail system regularly to correct any erosion and natural features degradation.
- The trail disturbance noted above should be addressed through rerouting the trail, hardening the surface (boardwalk, stone), or temporarily closing trails if the area is too wet in order to prevent erosion.
- Redirect pedestrian traffic over the bridge instead of the adjacent culvert by providing a point of interest, such as an interpretive sign, and by not mowing over the culvert.
- Determine whether the pond will be a permanent feature of the Park. Consider converting the pond to a wetland.
- Install signage about the importance of picking up trash and dog waste.
- Consider installing concrete fords at the two primary canoe/kayak launching sites to assist in stabilizing the streambank and preventing further erosion. The concrete ford also allows water to pass freely over it.

WILDLIFE ENHANCEMENT

Additional opportunities for enhancing wildlife habitat on the property are described below:

- Provide educational signage for park users related to the effects of leaving their dogs off-leash—including disturbance of wildlife and concerns of other park users.
- Determine the future management of the wet meadows. The wet meadows on the property provide specialized habitat for plants and animals. However, it is also a natural process for them to revert to scrub/shrub or forest. Consider surveying the wet meadows to determine if they contain plant species of special concern that might warrant management to maintain as wet meadows. If not, consider converting to forest through tree plantings. Habitat diversity could be enhanced under either scenario by protecting and expanding the patches of shrubland already established within the meadow.
- Determine if the entire lawn area should remain as mown lawn or if there are portions that can be converted to meadow.
- Leave dead down wood within the forests as it serves as the base of the forest food web and a nutrient reservoir for living trees. Dead standing trees (snags) should also be left if they are located in areas that are not heavily used by the public. Snags benefit wildlife by providing cavities and loose bark for nesting and shelter, perching sites, and decaying wood for numerous insects that provide food for woodpeckers and nuthatches. See attached article “Critter Condos-Managing Dead Wood for Wildlife” for more information about these wildlife enhancements.
- Consider installing nest boxes for Wood Ducks along Brandywine Creek in the southern part of the Park. See attached article about Wood Ducks published by the Natural Resources Conservation Service and the Wildlife Habitat Council.
- Consider installing nesting boxes for Eastern Bluebirds and American Kestrels along the forest edge. Bluebirds nest in tree cavities, but in the

absence of these natural niches, these species readily adopt nest boxes to raise their young and reduce competition for cavities with other birds. See two attached articles for more information: (1) “Artificial Nesting Structures” published by the Natural Resources Conservation Service Wildlife Habitat Management Institute and the Wildlife Habitat Council (under separate cover), and (2) “Managing Habitat for American Kestrels” Pennsylvania Wildlife Fact Sheet No. 13.

- Support pollinator (bees, butterflies, and other insects) habitat by mowing current meadows in late winter.

HAZARDS, DEBRIS, AND VANDALISM

A few hazards exist at Shaw’s Bridge Park, including roadway parking, deteriorating structures, and possible hazard trees. Additionally, various types of debris and streamside trash are scattered within the Park, particularly along the Creek.

Due to the intense use during the summer, the parking lot fills to capacity and park users begin to park their vehicles on South Creek Road and the adjacent streets. It is illegal to park on these roadways for safety and use restriction reasons.

Two structures present potential safety hazards. A stairway leading from South Creek Road into Shaw’s Bridge Park is located in the northern portion of the Park across from Withers Way. Additionally an old platform is located at the seasonal pond. Both the stairway and the platform are deteriorating.

There is a potential for hazard trees along roadways, trails, and other locations where the public might pause for any extended time—such as a sign, bench, or picnic table. As a landowner, East Bradford Township is responsible for preventing trees and branches from falling into the adjacent right-of-way on the bordering roads through the monitoring and removal of hazard trees (trees that due to structural defects could fall in part or whole on a “target” such as a road, residence, or person).

The restrooms at the Park are a recent addition, but have been closed due to vandalism. Portable toilets have replaced the restrooms.

Finally, the township has an ongoing problem with park users installing a rope swing on a large tree at the Creek.

RECOMMENDATIONS

- Check the stairway for structural integrity and safety. Perform required maintenance or replace to meet safety standards.
- Consider additional parking options during heavy summer use. These might include directing park users to the proposed East Bradford Township dog park or to open an overflow parking area on the other side of the restrooms and accessed from the existing parking lot.
- Remove the old platform at the seasonal pool.
- Monitor potential hazard tree areas along public roads, trails, lawn areas, and places where people may linger—such as benches, picnic tables, or interpretive signs—by foot once each year and following severe storms and address potential hazard trees (pruned or removed) as needed. Ideally, a certified arborist should be hired to complete this task and address any identified hazards through pruning or removal. See the “Hazard Tree Monitoring Program” section of Natural Lands Trust’s *Land for Life: A Handbook on Caring for Natural Lands* (2014) for information about procedures for hazard tree monitoring. In addition, Morris Arboretum in Philadelphia offers courses on identifying hazard trees.
- Remove scattered debris and streamside trash.
- Consider instituting monitoring of the restrooms at the Park. This could be accomplished by volunteers having a visual presence at the Park.



Streamside trash



Rope swing

BOUNDARY ENCROACHMENT

Proper maintenance of property boundaries is an important stewardship priority on open space parcels. These undeveloped properties are often subject to unwarranted (and frequently unintentional) use by neighbors (e.g., dumping of yard waste) due to poorly marked boundaries.

RECOMMENDATION

Where needed, survey and post the boundaries of Shaw's Bridge Park to assist in preventing encroachment issues and to inform passing motorists about the location of the public open space. Signs could be small (3 ¾" x 3 ¾", 0.12 gauge aluminum diamond shape signs) and should indicate East Bradford Township ownership. Posting every 50–100 feet is adequate and particularly important where the property abuts private land.

ENVIRONMENTAL EDUCATION AND VOLUNTEERS

The natural communities, water resources, and scenic landscape within Shaw's Bridge Park provide good opportunities to connect the community to their natural surroundings and provide meaningful volunteer and educational experiences. The following suggestions could further enhance community educational opportunities on the property.

RECOMMENDATIONS

- Install interpretive signs in key areas along the future trail that describe the natural resources (e.g., vegetation communities, wildlife habitat, floodplains, water quality) or stewardship initiatives (e.g., deer management, invasive plant management).

- Label healthy examples of native trees along the future trail with scientific and common names in a manner that will not harm the trees.
- Invite Township residents to participate in natural areas stewardship projects. Schedule "workdays" on environmentally friendly days such as Earth Day or Arbor Day. Volunteers, including local scout troops, hiking clubs, birding groups, schools, and businesses could be recruited to assist with projects recommended in this report, including:
 - Cutting vines from trees
 - Planting the riparian buffer with native tree, shrub, and herbaceous plant species
 - Building, installing, and maintaining a kiosk
 - Building and installing nesting boxes
 - Maintaining trails
 - Removing debris and streamside trash
 - Providing a presence at the Park, particularly during the summer heavy use season
- Encourage local schools, environmental groups, and birding groups to schedule educational walks on the property including water studies (chemistry, aquatic invertebrates), native plant and tree identification, and bird identification.

STEWARDSHIP PRIORITIES AND IMPLEMENTATION SCHEDULE

PRIORITY ¹	STEWARDSHIP RECOMMENDATIONS	SEASON	WHO COULD IMPLEMENT?
<i>Invasive Plants</i>			
1	Cut vines on forest canopy trees and young native trees and shrubs in meadow	Fall and Winter	Volunteers
1	Control poison-hemlock	Spring	Municipal staff ² or contractor
1	Manage tree-of-heaven	Fall	Municipal staff ² or contractor
1	Manage mile-a minute	Spring	Volunteers
1	Manage invasive shrubs in forest and meadow	Fall	Municipal staff or contractor
<i>Water Quality and Ecology</i>			
1	Continue to expand riparian buffer with native trees and shrubs	Spring or Fall	Volunteers
2	Discontinue frequent mowing under riparian buffer plantings after canopy closing	Anytime	Municipal Staff
1	Monitor trail system regularly for erosion	Anytime	Volunteers or Municipal Staff
1	Re-route, harden the surface, or temporarily close trails to prevent further erosion	Anytime	Volunteers or Municipal Staff
1	Redirect pedestrian traffic over the bridge instead of the adjacent culvert	Anytime	Volunteers or Municipal Staff
2	Determine if the large seasonal pool will be permanent or if it will be converted to wet meadow/marsh	Anytime	Municipal Staff

2	Install signage about picking up trash and dog waste using Leave No Trace messaging	Anytime	Municipal Staff
1	Consider installing a concrete apron or gravel at the two primary canoe/kayak launching sites	Anytime	Municipal Staff
Wildlife Enhancement			
2	Install signage about the effects of having dogs off-leash using Leave No Trace messaging	Anytime	Municipal Staff
2	Determine if the entire lawn area should be maintained as lawn or if portions can be converted to meadow	Anytime	Municipal Staff
1	Install nesting boxes for Bluebirds, Kestrels, and Wood Ducks	Late Winter	Volunteers
1	Support pollinator habitat in meadow by installing bee nest boxes	Anytime	Volunteers
Hazards			
1	Check stairway for structural integrity and safety	Anytime	Municipal Staff or Contractor
1	Consider additional parking options	Summer	Municipal Staff
1	Remove old platform at large seasonal pool	Anytime	Municipal Staff or Contractor
1	Continue to remove rope swings from streamside trees	Anytime	Municipal Staff or Contractor
1	Monitor roadside boundaries and high use areas for hazard trees	Late Winter-Early Spring	Municipal staff
2	Remove scattered debris and streamside trash	Anytime	Municipal staff and volunteers
1	Consider instituting monitoring at park restrooms	Anytime	Volunteers or Municipal Staff

continued

Boundaries			
2	Post boundaries to assist in preventing encroachment	Anytime	Municipal staff
Public Access and Environmental Education			
3	Install interpretive signs in key areas	Spring-Fall	Municipal staff
3	Label healthy examples of native trees	Spring-Fall	Municipal staff and volunteers
2	Invite residents to participate in stewardship projects	Spring-Fall	Municipal staff (oversees)
2	Encourage local groups to schedule nature walks	Spring-Fall	Municipal staff (oversees)

¹ 1 = high priority (implemented within 1-3 years);
 2 = mid-priority (implemented within 3-5 years);
 3 = low priority (implemented within 5 years)

² Must have PA Pesticide Applicator Certification to apply herbicides on public property

Poison hemlock (*Conium maculatum*)

History: Poison hemlock was first introduced to North America in the 1800's and has since become widely naturalized. This species is extremely toxic, and it has a disreputable history as a source of poison. For example, its extract was used to execute criminals (as well as a notable philosopher) in ancient Greece, and Native Americans used it to make poisoned arrows.

Identification: Poison hemlock is a member of the carrot or parsley (Apiaceae) family. It is a tall statured biennial or perennial species. In its first year, it produces a basal rosette (Fig. 1). In its second year, it is distinguished by its long white taproot, hollow stem with purple spots (Fig. 2), highly dissected carrot-like leaves, large white umbrella-like inflorescence, and a foul smell when crushed.

Impacts: Toxicity of this species is a concern for human and animal health. Humans are at risk partly because of its resemblance to edible plants in the Apiaceae family such as parsley and carrot. Children have been poisoned from using the hollow stem as a flute or pea shooter. It is toxic to cattle, sheep, horses, pigs, goats and poultry. Poisoning can cause death, offspring deformities, abortion, or decreased milk and meat production. Cattle have been fatally poisoned by eating as little as 0.5% of their body weight, but livestock do not generally eat the plant when green. However, they can be poisoned by eating hay or silage contaminated with poison hemlock.

Habitat: Disturbed, relatively moist areas like ditch, stream and river banks, pastures, meadows, cropland edges, and along roads and trails are the best habitats for poison hemlock. It has been considered a serious cropland weed in the past, but less so now that cultivation of these habitats is prevalent and is an effective means of control.

Spread: Poison hemlock reproduces only by seed. Most seeds fall near the parent plant resulting in dense stands (Fig. 3), but some are dispersed by water, birds, or rodents. Dispersal occurs over a relatively long time period from fall through early spring due to a persistent flowering stalk that remains upright through much of the winter. About 85% of seeds will germinate as soon as conditions are favorable, while the remaining seeds exhibit some dormancy and remain viable for up to three years. Seedling establishment is rapid on disturbed sites and increases with some shade.

Management Priorities: In Montana, poison hemlock is listed as a county noxious weed in several counties, and neighboring states have listed it. As with many taprooted species, hand pulling is effective for controlling small populations. Wearing gloves and long sleeves is recommended. The hemlock moth is a biocontrol agent that defoliates plants; its success has been variable. Chemical control options include products containing chlorsulfuron, metsulfuron, glyphosate, or 2,4-D applied prior to flowering. Poison hemlock can also be controlled by cultivation in croplands. Mowing will not kill poison hemlock, but it can be used to prevent seed production and remove growth that may otherwise be eaten by livestock. Multiple applications of any method may be necessary to deplete the seed bank, and establishing or encouraging desired vegetation is critical to reduce re-invasion potential.



Figure 1. First year rosettes resemble a carrot, and leaves are highly dissected.



Figure 2. Purple-spotted stems are characteristic of poison hemlock.



Figure 3. Most seeds fall near the parent plant, forming dense stands.



Bluebird Nesting Boxes

INSTALLATION GUIDELINES

Time: It is best to erect the box by the first week of March. Male bluebirds will begin box selection as early as mid-March.

Location: Open mowed fields
120 feet from wooded edge
Boxes 100 yards apart
One box per acre

Placement: Face hole away from prevailing wind
Entrance hole 4–6 feet above the ground
Place within 50 feet of a perch (natural or manmade)

POTENTIAL COMPETITORS

Several other bird species may attempt to utilize your bluebird nesting box. The following will assist you in identifying the species.

Tree Swallow

nesting material: dry grass with feathers
eggs: pure white

Chickadee

nesting material: moss and hair
eggs: dull white with brown spots

House Wren

nesting material: small twigs
eggs: red and brown spots

House Sparrow

nesting material: dried plants with feathers
eggs: dull white with olive spots

NESTING INFORMATION

Dry grasses are the materials most commonly used by bluebirds. Although when made near evergreens, pine needles may be used. Nest building begins in early April. It takes five to fourteen days for bluebirds to complete a nest.

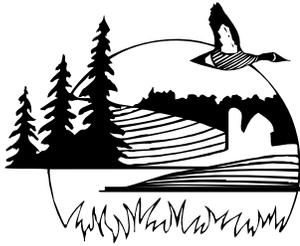
A single egg is laid each day. The eggs are approximately $\frac{3}{4}$ " by $\frac{2}{3}$ " and are normally clear blue. The female incubates the eggs for about 14 days. After hatching, the young will leave the nest in approximately 17 days.

After the young have fledged, remove the used nesting material. Bluebirds nest two to three times a season, building a new nest each time.

Monitor the nesting boxes once a week, between early April and late August.

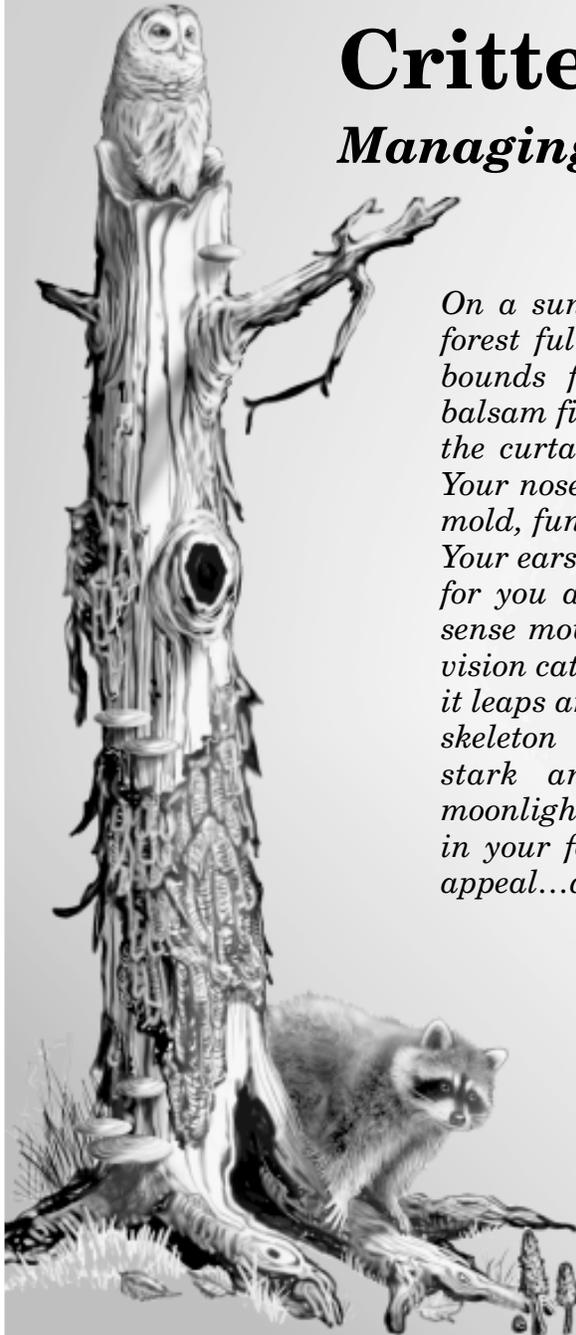


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Critter Condos

Managing Dead Wood for Wildlife



On a sunset stroll through your woods, you find a forest full of activity...full of life...a snowshoe hare bounds for cover, a red squirrel scampers up a balsam fir, a blue jay scolds from a branch above. As the curtain of darkness falls, your senses heighten. Your nose intercepts the pungent, earthy odor of leaf mold, fungi, and rotting wood drifting on the breeze. Your ears snatch a few “who cooks for you, who cooks for you all?” notes of a barred owl. Suddenly, you sense movement overhead! Turning, your peripheral vision catches the floating form of a flying squirrel as it leaps and glides from a snag. The smooth, barkless skeleton of this dead tree stands stark and whitewashed in the moonlight. It’s then you realize that in your forest, even dead things have appeal...a life of their own....



Snags. By night, they look ghostly in the misty, moonlit darkness. In reality they teem with life. Over 70 kinds of Wisconsin mammals, birds, reptiles and amphibians, not to mention swarms of insects, spiders, millipedes and other invertebrates use snags...dead or dying trees. These critter condos provide den, nest and feeding sites, as well as sites for food storage, perching, preening and courtship rituals. This publication illustrates the variety of dead wood that benefit wildlife and the ways you can manage for it.



Managing Habitat for American Kestrels

American kestrels are small, swift, powerful birds of prey, with brilliant coloring. Formally known as sparrow hawks, these hunters are one of Pennsylvania's most common raptors, and many are year-round residents.

Kestrels are easily identified. Once you become familiar with their size, blue and rusty coloring, and hunting habits, you'll recognize their forms as they hover over fields in search of prey.

Given the right habitat, American kestrels can co-exist with humans, and landowners will find that these birds always pay the rent. Not only are they enjoyable to watch, but kestrels are effective at catching insects and small mammals that feed on agricultural crops. From their place near the top of the food chain, kestrels are also one of Pennsylvania's best bioindicators of ecological health.

Identification

Kestrels are about the size of a blue jay. Their backs and tails are a reddish brown or rusty color with dark spotting or bar patterns. The bird's underside is a lighter, tawny color with some darker streaking. Its face features two dark, moustache-like stripes against a white background. A kestrel also sports two dark "eye spot" markings on the back of the head. These markings may help prevent strikes from kestrel predators, which include larger birds of prey and even crows.

Females are slightly larger than males, but color variation is the easiest way to determine the sex of a kestrel. Males have blue gray or slate-colored wings, while females' wings are rust colored. Males have rust-colored tails with a prominent black band across the end. Females have rust-colored tails with numerous thin black bars.

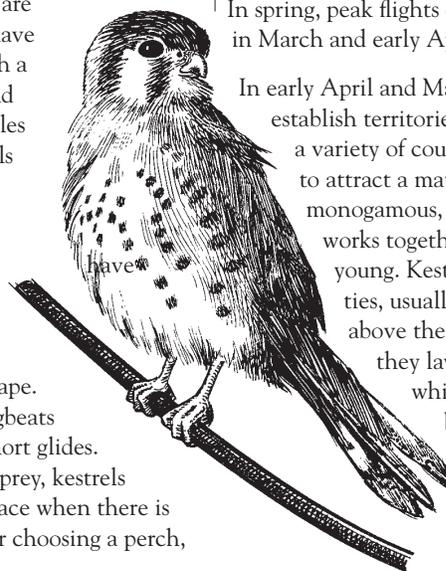
In flight, kestrels have a notably stream-lined appearance, their slender wings curved in a sickle shape. Their fluttering wingbeats are punctuated by short glides. While searching for prey, kestrels may also hover in place when there is adequate wind. After choosing a perch,

kestrels perform a characteristic series of tail bobs. A high-pitched "klee, klee, klee, klee, klee, klee" or "killy, killy, killy," whether the bird is perched or in flight, is a giveaway that the bird you're observing is an American kestrel.

General Biology

American kestrels are found throughout Pennsylvania. They require open habitat, so they are rare in the heavily forested regions of the north and central parts of the state. Some kestrels are year-round residents in Pennsylvania. Others breed here and winter to our south, while still others breed north of us and winter in the Commonwealth. In fall, migrating kestrels pass through the state in September and early October. In spring, peak flights of migrants occur in March and early April.

In early April and May, male kestrels establish territories and conduct a variety of courtship displays to attract a mate. Kestrels are monogamous, and the pair works together to raise the young. Kestrels nest in cavities, usually 10 to 30 feet above the ground, where they lay four to five eggs, white to pale with brown speckling. In the north-eastern United States, kestrels usually raise only



one brood per year. After 27 to 31 days of incubation, the young hatch in their nest cavity, where they will remain for a month before fledging. The male brings his nest-tending mate food until a week or two after the young hatch, when feeding becomes a shared task between the parents.

After leaving the nest cavity, the young stay nearby and are fed by their parents for another month. The young kestrels leave the nesting area as fall approaches, ready for life on their own. Many kestrels migrate to the southern United States, Mexico, and Central America, while others remain in Pennsylvania. Many young kestrels succumb to accidents or predation by snakes, raccoons, and raptors, but those surviving that first difficult year usually have a life span of at least three years.

Habitat Requirements

When choosing their home range, kestrels look for an area with open spaces for hunting and cavities for nesting. Pastures, agricultural fields, and forest clearings usually meet their needs, although some individuals have been found to colonize golf courses, reclaimed strip mines, drained wetlands, and even small urban areas. A pair of kestrels may defend a breeding area as large as 250 acres.

Cover and Nesting Sites

Kestrels do not construct nests; they search for cavities where they can lay their eggs and rear their young, safe from predators and the elements. These nesting sites can be natural tree cavities, abandoned woodpecker holes, cavities in human-made structures, and nest boxes. Forest edges and tree lines often provide the cover they seek. Kestrels also use trees or telephone poles as hunting perches.

Food

A kestrel's summer diet is largely made up of insects, especially grasshoppers, moths, caterpillars, beetles, and crickets. The birds can take their prey while in flight, but they make most of their larger kills on the ground. In winter, they are more reliant on small birds and mammals, upon which they dive with their talons, then use their hooked bills to break their prey's neck. Kestrels are also known to feed on lizards, carrion, amphibians, bats, earthworms, and spiders, striving daily to consume the 20 to 25 percent of their body weight they need to survive.

Water

There is little information on drinking and the use of water by kestrels. Kestrels can obtain most or all of the water they need from their food. However, they probably still benefit from avail-

able water either directly by using it for bathing or indirectly because of the variety of potential prey species the water attracts.

Management Practices

To attract and keep American kestrels in your area, your land management plan should support open, vegetated fields for kestrels to use as hunting grounds. Kestrels also require nesting cavities and perching locations. Adding nest boxes often makes previously unsuitable habitat suitable.

Maintain Open Areas

Kestrels generally hunt in open fields where they can detect the mice, voles, insects, and small birds that they prefer to dine on. Agricultural fields, forest clearings, pastures, or abandoned meadows on your property would all suit this need.

Maintain Forest Edges

Keeping any forested-field edge intact provides kestrels with natural perches from which they can hunt. Forested edges can also supply nesting cavities, and scattered trees within a clearing or field make excellent perch locations.

Add Perches to Open Areas

Fields lacking trees or other natural perches leave kestrels without a place to



survey their hunting grounds. While the birds will hunt by hovering when wind conditions are right, installing artificial perches in open areas increases the likelihood they will choose your field or clearing for catching their prey. One plan for constructing perches calls for installing a ½-inch-diameter PVC pipe, 12 to 15 feet in length, upright in the ground. A foot-long piece of pipe should be affixed to the top of the longer piece, forming a “T-shaped” perch.

Install Nest Boxes

While kestrels can adapt to hunting in suburban and agricultural areas, these places often do not offer enough natural cavities to make them suitable habitats. In the absence of natural cavities, kestrels readily adopt nest boxes to rear their young. Providing boxes also helps lessen competition between kestrels and an introduced competitor, the European starling, for nesting cavities.

Making a nest box is a project that even beginning woodworkers can complete. One plan for constructing a kestrel box appears at right. Detailed construction plans and information on box installation are available from the Pennsylvania Game Commission and Hawk Mountain Sanctuary (see Sources of Additional Information).

Nest boxes can be placed in open areas as well as woodland edges, and mounted on posts or trees. Mount boxes 15 to 30 feet above the ground. Some people suggest including two or three inches of wood shavings in the box each year before the nesting season.

Depending on the location, other animal species such as screech owls, Northern saw-whet owls, squirrels, and bluebirds may use kestrel nest boxes. If you observe European starlings or house sparrows using the box, you may remove their nests since they are nonnative species not protected by law. All other species are protected and may not be disturbed if they are using the box.

Kestrel Box Design

A nest box needs to provide a safe, quality environment for parents and young alike. Consider the following suggestions for the nest box you construct or purchase.

Material: Use untreated wood, preferably pine or cedar, which weathers well. Box walls should be at least ¾ inch thick for temperature insulation. Do not paint or treat the box with a wood preservative.

Construction: Use galvanized screws or nails. An extended back panel can be included to help with the mounting process. Avoid using outside perches; they may attract unwanted species.

Access: A door with hinges should be included in one side of the box to allow for cleaning and

monitoring. You can use a scaffold nail to keep the door closed.

Dimensions: Total box height should be 14 to 16 inches, and the entry hole should be 3 inches in diameter. The height of the entry hole should be 10 to 12 inches above the floor. Floor dimensions should measure approximately 9 by 9 inches to 10 by 10 inches.

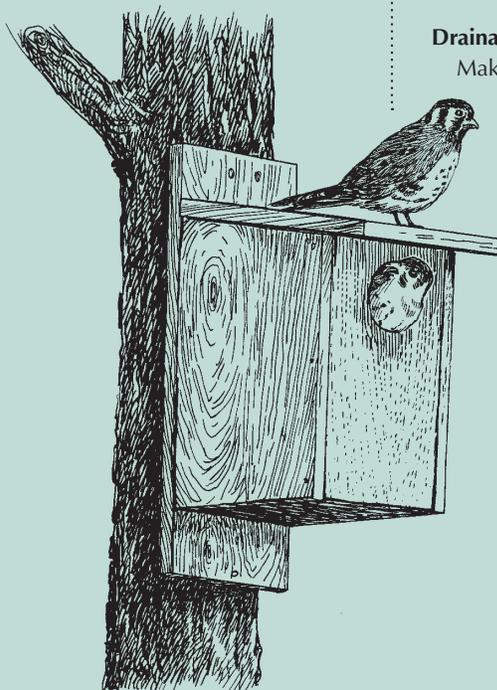
Roof: The roof should be sloped with the lower side at front and should be extended past the box entrance to protect the fledglings from predators and the elements.

Interior: Walls should be rough or scored on the inside to provide fledglings with a foothold as they leave the nest. You may also place a small interior perch about 3 inches below the entrance.

Drainage and ventilation:

Make drainage holes at the floor corners, and add a small ventilation space between each side wall and the roof. You can seal these ventilation gaps with weatherstripping during the winter months, but you will need to remove it when the weather grows warmer.

Floor: The floor must be recessed and covered by walls on all sides to prevent eggs from getting wet. (See Sources of Additional Information to obtain actual box designs.)



Maintain Cavity Trees

Cavity trees contain natural cavities where a branch has broken off or woodpeckers have drilled holes. These trees provide nest sites for kestrels and other wildlife. They also serve as hunting perches.

Restore Grassland Conditions on Idle Land

Consider planting grasses on fallow agricultural fields or other unused portions of your property. Grassy areas provide excellent habitat for kestrel prey species and an assortment of other grassland birds.

Minimize Pesticide Use

American kestrels have been affected by compounds like DDT and other agricultural and home lawn chemicals that can cause reproductive failures. Pesticides also affect smaller birds that kestrels may prey upon. Minimize or eliminate the use of pesticides in your kestrel habitat, especially in the vicinity of nest boxes and known cavities. Alternative pest control methods combined in an integrated pest management (IPM) plan can reduce pesticide needs.

Maintain Good Conservation Practices

If your property includes agricultural areas, practicing good soil and water conservation will have a positive effect on your kestrel habitat. Conservation tillage, planting cover crops, and installing buffer strips, to name just a few practices, benefit all kinds of wildlife species.

Support Kestrels from Afar

Even if your property is not suitable for kestrels, you can easily support kestrel programs in other locations.

For instance, Hawk Mountain Sanctuary in Kempton, Pennsylvania, is known worldwide for its research on raptor biology and habitat needs. Hawk Mountain maintains over 200 kestrel nest boxes where researchers study kestrel nesting success and the ecology of kestrels wintering in the area. People from around the world can sponsor these birds through Hawk Mountain's Adopt a Kestrel Nestbox program. (For more on this program, see Sources of Additional Information.)

Sources of Additional Information

For additional information about American kestrel biology and habitat management, as well as details on the Adopt a Kestrel Nestbox program, contact Hawk Mountain Sanctuary or explore their web site, which also offers live images taken from kestrel nest box cameras. Hawk Mountain Sanctuary, 1700 Hawk Mountain Road, Kempton, PA 19529-9449; 610-756-6961; www.hawkmountain.org

To obtain a copy of the Pennsylvania Game Commission's guide, *Woodcrafting for Wildlife*, send \$6.00 to the Pennsylvania Game Commission, Department MS, 2001 Elmerton Avenue, Harrisburg, PA 17110. This book includes 26 different plans for nest boxes and other nesting structures (including kestrel boxes), plus information on proper installation procedures and how to choose the correct sites for boxes. Downloadable at www.pgc.state.pa.us/pgc/cwp/browse.asp?A=3.

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Wood Duck

(*Aix sponsa*)

Fish and Wildlife Habitat Management Leaflet



General Information

The wood duck is considered by many bird watchers to be North America's most colorful waterfowl species. Its scientific name, *Aix sponsa*, translates into "waterbird in bridal dress." Today the wood duck is one of the most common waterfowl species breeding in the United States. However, this was not always the case. Writings from the early 19th century indicate that wood ducks were in abundant supply and very popular for their tasty meat and bright decorative feathers. By the late 1880's, unregulated hunting and destruction of

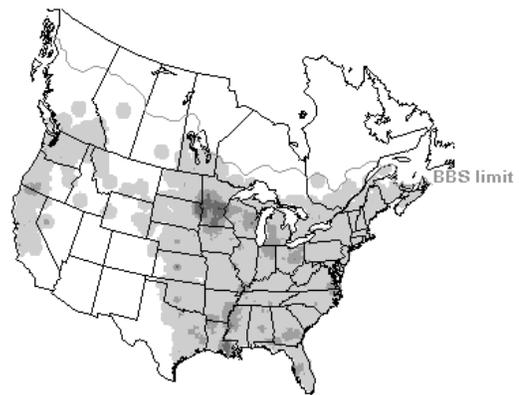
woodland and wetland habitat had caused the wood duck population to decline to alarmingly low levels. By the beginning of the 20th century, wood ducks had virtually disappeared from much of their former range.

In response to the Migratory Bird Treaty established in 1916 and enactment of the Federal Migratory Bird Treaty Act in 1918, wood duck populations began to slowly recover. By ending unregulated hunting and taking measures to protect remaining habitat, wood duck populations began to rebound in the 1920's. The development of the artificial nesting box in the 1930's gave an additional boost to wood duck production. Wood ducks eagerly accepted boxes as suitable nesting sites, and over the following fifty years, conservation groups and individuals helped increase numbers of wood ducks by preserving habitat and erecting nest boxes. The combination of hunting restrictions and habitat conservation and management measures enabled wood duck populations to rebound enough to support conservative hunting in the 1940's. The story of the wood duck is an example of how active wildlife management techniques can have a tremendous effect on the overall success of an individual species.

This pamphlet is designed to serve as an introduction to the habitat requirements of the wood duck and to assist in the development of a comprehensive wood duck management plan. The success of any individual species management plan depends on targeting the specific needs of the species and analyzing the designated habitat areas as a whole to ensure that all habitat requirements are present. This guide also provides recommendations for monitoring the program to ensure successes are documented and problems are addressed before they impact the success of the overall management plan.

Range

The wood ducks' range extends on the east coast from Nova Scotia west to the north central U.S. and south to Florida and the Gulf of Mexico. Birds nesting in New England winter in the Atlantic states from the Carolinas southward. Midwestern wood ducks winter in the area extending from Georgia west to Texas. On the west coast, the wood ducks' range extends from British Columbia



Breeding Range

