Relocated eastern box turtles with transmitters for studying settling rates and home range establishment

Chapter 6
Conservation Actions

Natural resource managers in the District of Columbia must coordinate conservation actions that address threats to SGCN and critical habitats in order to preserve, protect, and restore these populations. The long-term security of many SGCN relies on the amount and condition of their habitats, while other SGCN face threats, such as diseases, that are disassociated from their habitats. Similarly, some habitats share conservation needs, such as invasive plants, while others face unique threats. Mitigating threats to SGCN requires coordinated and comprehensive conservation planning and targeted natural resource management that includes many partners and landowners.

Best Practices for Conservation Actions

AFWA (2012) provides guidance to states on best practices for each Required Element. For Conservation Actions, these include:

- Use the hierarchical classification in A Standard Lexicon for Biodiversity Conservation: Unified Classifications of Threats and Actions (Salafsky et al 2008) to categorize and describe conservation actions and projects.
- Use a hierarchical or tiered system to prioritize conservation actions.
- Indicate metrics to measure effectiveness of conservation actions.
- Write conservation actions broadly enough to allow flexibility, yet with enough specificity to measure performance and engage partners.

In this Chapter, we use these best practices to describe the conservation actions in this Plan.

Conservation Action Classification

DOEE identified 22 IUCN Level II threats (Salafsky *et al* 2008) to critical habitats. The top six overarching threats are the following:

1. Invasive species (plants, animals, and pathogens);
2. Urban wastewater;
3. Nutrification/sedimentation;
4. Problematic native species;
5. Ecosystem modifications (aquatic habitats); and
6. Recreational activities/development of recreational infrastructure in critical habitat (vegetative habitats).

To identify conservation actions, DOEE compared and crosswalked the IUCN threats with USFWS-TRACS threats classification (USFWS 2015). USFWS-TRACS threats are mapped directly to Conservation Actions, which are in turn linked to the USFWS-TRACS conservation planning and grant reporting systems. This methodology will allow for easier reporting in USFWS-TRACS, and will enable regional coordination of conservation actions. Some IUCN threats do not map to TRACS threats and actions. In urban areas most of the unmapped IUCN threats appear to relate to ongoing impacts of existing development and infrastructure (such as stormwater runoff, pollution, or ecosystem modifications). In these cases DOEE used actions that address TRACS Resource Threats.

Conservation Action Prioritization

This chapter describes conservation actions that address the six overarching threats to habitats. These overarching threats are the most broad-scale, long-term, and severe. They require immediate attention throughout the District wherever high quality critical habitat is located. These overarching actions have potential to affect all species and habitats, but priority is placed on implementing actions in the eight Conservation Opportunity Areas described in Section 3.6. COAs contain the highest quality habitat and most SGCN. These six actions are also high priority because most are currently being addressed by local and federal agencies or local conservation partnerships.

Habitat-based actions that address lower-level threats within Conservation Opportunity Areas are the next level of priority. These actions are detailed in habitat tables which address every threat to each Macrogroup found in the Conservation Opportunity Areas and identify lead and partner agencies for each action.

Next, Focal Conservation Actions (FCAs) are presented as the next level of priority. FCAs are broad-scale actions that address data deficiencies in developed habitats through citizen science, create or improve habitat in developed or marginal areas, or other direct management actions that will improve or expand habitats. These actions apply to many habitat types, but will target Conservation Opportunity Areas. Species-based actions are presented as the next priority level. It is recognized, however, that adaptive management and external factors will affect the priority implementation order of these

actions as new information or opportunities arise; this SWAP is designed to respond to those needs.

All actions presented in this document are considered priority actions. Those actions that have a greater conservation effect were considered high priority and are presented as overarching actions. Although a variety of agencies are already addressing several overarching actions, additional coordination that takes SGCN into account is necessary. It should be recognized that all these actions are priority actions needed for the conservation of SGCN representing different spatial and temporal needs.

6.1 Overarching Actions

6.1.1 Invasive Species Management

Invasive species are non-native (also known as alien, exotic, or non-indigenous) plants, animals, and pathogens that cause or are likely to cause ecological disruption, economic losses, harm to habitats and wildlife, or harm to human health. Invasive species have been intentionally and accidentally introduced nationally, regionally, and in the District. Invasive species did not evolve in the habitats and ecosystems they have invaded, so most lack the natural population controls that native species have, such as disease, browse, or predation. They tend to out-compete native species for resources and may permanently alter natural ecosystems. Some invasive species have spread to habitats throughout the District, to the extent that complete eradication is unfeasible.

The most effective defense against invasive species is to prevent them from being introduced, which requires monitoring and regulating the pathways by which they arrive. In most instances, however, prevention is not feasible. In these cases, early detection and rapid response (ED/RR) programs are designed to coordinate a response plan to control the initial outbreak and eradicate a new species before it becomes established. Both preventive and rapid response actions require planning, education, a strong commitment of resources, and a coordinated approach among local, state, federal, and private partners.

6.1.1.1 Invasive Plants

The threat of invasive plants in the District is currently addressed by a number of organizations, most of which are members of the District of Columbia Cooperative Weed Management Area (DC-CWMA). The DC-CWMA is a partnership of local and federal agencies, conservation organizations, and academic institutions that work cooperatively to coordinate invasive plant management across political and ecological boundaries to restore habitats and protect biodiversity in the District. Techniques include coordinated volunteer efforts, "Weed Warrior" training events, funding summer invasive plant crews, biological controls, outreach, education, and regulation. The members include DOEE, DDOT, NPS (five units: Center for Urban Ecology, Rock Creek Park, C&O Canal Historical Park, George Washington Memorial Parkway, and National Capital Parks-East), AWS, Rock Creek Conservancy, the University of the District of Columbia-Cooperative Extension Service (UDC), the Casey Trees Foundation, and Washington Parks & People. Affiliated partners who have not signed the MOU include the Student Conservation Association (SCA), USDA National Arboretum, U.S. Botanic Gardens, Dumbarton Oaks Conservancy, Friends of Kenilworth Aquatic Gardens, Metropolitan Washington Council of Governments, Living Classrooms of DC, Anacostia Riverkeeper, Little Falls Watershed Alliance, MD/DC Chapter of The Nature Conservancy, DC Chapter of the MD Native Plant Society, and Department of the Navy. These members work cooperatively and independently to inventory, monitor, and manage invasive plants.


Student Conservation Association interns cutting Japanese knotweed

The DC-CWMA members focus monitoring and management actions on early detection and rapid response (ED/RR) of new invasive plants. Its goal is to prevent new invasive plants from becoming established, and to eradicate small populations of recently introduced invasive plants. In March 2015, a DC-CWMA member reported a newly found plant, incised fumewort (*Corydalis incise)*, to DC-CWMA and the Mid-Atlantic Invasive Plant Council. This plant was recently reported in New York, Pennsylvania, and Virginia, and a region-wide effort is underway to eradicate it from natural areas. Another ED/RR target is wavy-leaf basketgrass (*Oplismenis undulatifolius ssp. undulatifolius*), which grows in shaded forest understories and has been found only in Maryland and Virginia. The NPS EPMT has assessed many other ED/RR target plant species and published 37 fact sheets that are publicly available (NPS, 2015).

DC-CWMA also works to improve habitats through habitat restoration with native plants. DOEE and UDC are constructing a native plant nursery to propagate plants for

restoration activities. Many partners also collect seeds throughout the region for restoration plantings.

Actions

- TRACS 2.8 Invasive plant control
- TRACS 2.10 Planting/seeding
- TRACS 9.3 Species and habitat management planning
- TRACS 3.3 Research, survey or monitoring – habitat
- TRACS 3.5 Techniques development
- TRACS 8.1 Partner/stakeholder engagement

Performance Measures

- Number of new invasive plants considered established (through ED/RR the intent for this to be zero).
- Number of established invasive plants removed from the District or managed to a target level.
    - Area of invasive plants treated
    - Area invasive plants removed
- Number of invasive plant surveys conducted.
    - Area of invasive plants mapped and inventoried
- Number of potential recreational users contacted.
- Number of active volunteers trained.
    - Number of people trained to a specified competency
- Acres revegetated with native plants
    - Habitat quality metrics (e.g., number of native plants).
    - Target species population metrics (e.g., relative abundance, reproductive success)

Action Leaders

DC-CWMA, DOEE, and NPS.

6.1.1.2 Invasive Insects

A number of invasive insects are detrimental to District habitats. Emerald ash borer (*Agrilus planipennis*) is spreading through critical habitats along the Potomac and Anacostia Rivers, including Kenilworth Aquatic Gardens, the National Arboretum and Theodore Roosevelt Island. This Asian native has killed nearly all the white ash (*Fraxinus americana*) and green ash (*Fraxinus pennsylvanica*) trees in those areas.

Early detection and rapid response are imperative to limiting the spread of insects and pathogens to other habitats, including sudden oak death, thousand cankers disease, Southern pine beetle (*Dendroctonus frontalis*) and Asian long-horned beetle (*Anoplophora glabripennis)*. These ED/RR actions require coordination between DOEE, the U.S. Department of Agriculture Animal and Plant Health Inspection Service, NPS, the Maryland Invasive Species Council, and other agencies.


Exit hole of the adult emerald ash borer

Actions

- TRACS 9.3 Species and habitat management planning
- TRACS 3.3 Research, survey or monitoring – habitat
- TRACS 3.5 Techniques development
- TRACS 8.1 Partner/stakeholder engagement

Performance Measures

- Area of insect infestation mapped and inventoried
- Number of infested trees mapped and inventoried
- Number or area of trees and plants treated for infestation/disease

Action Leaders

DOEE, DDOT, and NPS.

6.1.1.3 Invasive Fish

Three damaging invasive fish species have established themselves in the District: northern snakehead, blue catfish, and flathead catfish. At all of their life stages, these non-native fish compete with native species for food and prey upon native wildlife. Their diets consist of zooplankton, insect larvae, small crustaceans, fry, native fish, crustaceans, frogs, small reptiles, and sometimes birds and mammals.

Eradication of these species from District waters is not feasible. Conservation actions focus on mitigating their impacts by encouraging recreational and commercial fishing, population and distribution monitoring, and research into their ecology and potential impacts on prey species. When coupled with the impacts of urban wastewater and other threats to water quality, invasive predatory fish represent both a threat to habitat and to individual animals. Aquatic habitats have lower value when multiple threats are present.

Actions

- TRACS 2.8.3 Invasive Species Control; Animal – mechanical
- TRACS 9.3 Species and habitat management planning
- TRACS 3.3 Research, survey or monitoring – populations
- TRACS 3.5 Techniques development
- TRACS 8.1 Partner/stakeholder engagement

Performance Measures

- Number of new invasive fish considered established (through ED/RR the intent for this to be zero).
- Number of established invasive fish removed from District waters or managed to a target level.
- Area of aquatic habitats surveyed for invasive fish
- Number of invasive fish tagged for study

Action Leaders

DOEE's Fisheries Management Branch.

6.1.1.4 Terrestrial Predators

Free-ranging cats damage bird, mammal, and reptile populations and can represent both a threat to habitat and individual animals. The scope of Trap-Neuter-Return (TNR)

programs sanctioned by the District Government will be revisited and reassessed. DOEE defines "government-sanctioned" as District of Columbia Government funded, endorsed, or allowed on District of Columbia owned or controlled property. DOEE has not promulgated a position on privately funded TNR efforts that do not impact District-owned or controlled property, nor habitats identified as sensitive or critical. Additionally, actions proposed in this plan are administrative in nature with limited practical impact on free-ranging animals.

In revisiting the TNR policy, DOEE will assemble an advisory panel to discuss issues such as increased adoption of non-feral captured free-ranging cats; education and outreach programs supporting indoor pets and pet/wildlife conflict awareness; increased enforcement of existing prohibitions on the uncontrolled release of animals such as DC Code § 8–1831.01 "Release of animals" and § 8–1808 "Prohibited conduct;";goals, outcomes, and effectiveness of TNR programs; identification, mapping, and census of cat populations in wildlife habitat; and benefits or coincidence of TNR to the District of Columbia Government's fish, wildlife, and natural resource conservation responsibilities and initiatives.

European starlings and house sparrows are secondary cavity nesting species, which aggressively displace native species, often killing nestlings and adults in the process. Nest box programs and artificial nesting platforms targeted at SGCN, such as chimney swift towers, wood duck boxes, and purple martin community housing, will provide nesting opportunities for native birds. Education and outreach programs focused on bird houses, feeders, and creating backyard wildlife habitats should be promoted to increase participation by District residents and organizations.

When coupled with the impacts of human recreation, off-leash dogs, and other threats to vegetative habitats, cats represent both a threat to habitat and to individual animals. Terrestrial habitats have lower value when multiple threats are present.

Actions

- TRACS 9.3 Species and habitat management planning
- TRACS 3.3 Research, survey or monitoring – habitat
- TRACS 3.5 Techniques development
- TRACS 8.1 Partner/stakeholder engagement

Performance Measures

- Habitat quality metrics (e.g., population of free-roaming cats in wildlife habitat, population of non-native birds in wildlife habitat).
- Target species population metrics (e.g., reduction in relative abundance, reduction in reproductive success)

- Outreach and education initiatives implemented
- Number of citizens trained to a specified competency
- Number of artificial nesting structures that exclude non-native birds

Action Leaders

DOEE, DOH, and the Washington Humane Society.

6.1.2 Water Quality: Urban Wastewater, Sedimentation, and Nutrification

Most urban wastewater consists of stormwater runoff and sanitary sewage. Stormwater is rainfall that does not infiltrate into the ground, but instead flows over hard, impervious surfaces, carrying trash and pollutants through storm drain channels into the nearest waterbodies. Sanitary sewage is the wastewater from homes and businesses. In certain areas of the city, stormwater and sewage frequently flow untreated into the Potomac and Anacostia Rivers and Rock Creek.

Nutrification is the nutrient loading of waterbodies resulting from excess phosphorus and nitrogen. High nutrient loads are associated with fecal coliforms in urban areas. Rapid nutrification overwhelms natural systems, causing eutrophication (or nutrient enrichment) of waterbodies. Sedimentation is when suspended particles precipitate out of the water column. As a water system slows, these particles are deposited. Erosion, coupled with heavy rainfall events, can lead to increased sedimentation covering large riverbed areas. These impacts can be compounded by CSO events and impervious surfaces. The combination of nutrification and sedimentation can create a hypoxic environment (deprived of adequate oxygen supply) with decreased water transparency.

Actions that address these two overarching threats are combined in this section. In many cases, the same conservation action that addresses urban wastewater also can address sedimentation/nutrification.

DC Water is addressing CSO through its Long Term Control Plan (DC Water 2002) the Clean Rivers Project, which includes deep storage tunnels and Low Impact Development (LID) implementation. The Watershed Protection Division, Water Quality Division, and FWD within DOEE will work to incorporate SGCN impacts/monitoring into Long Term Control Plan implementation and other sewer retrofit or removal projects.

Nutrification is being reduced through regulations requiring the use of low phosphorus fertilizer and limiting nitrogen applications (Anacostia River Clean Up and Protection Fertilizer Act 2012).

DOEE is using a combination of stormwater management regulations, incentive programs, and direct investment in LID, as described in the consolidated Total Maximum Daily Load implementation plan. The District has also initiated a Stormwater Retention Credit trading program for green infrastructure, a Green Area Ratio

sustainable zoning regulation, and has one of the largest green roof programs in the nation (covering over 54 acres).

DOEE is also leading projects to restore and daylight streams, raise eroded creek beds, install regenerative stormwater conveyance systems to slow streams, allow for rainfall to infiltrate soils, and reduce sedimentation during CSO events. FWD will work with other DOEE divisions, DC Water, NPS and other landowners to identify opportunities to install stormwater regeneration and stream day lighting facilities to improve wildlife habitat and incorporate wildlife habitat improvement as a criteria in prioritizing these projects.

There is no TRACS conservation action for this IUCN category. DOEE correlated this threats to TRACS threat "Urban Development/Habitat Degradation" and use appropriate TRACS actions under "Direct Management of Natural Resources" such as "Create new habitat or natural processes", "Hazard or infrastructure removal", and "Instream modification."

Actions

- TRACS 8.1.1 Partner/stakeholder engagement; Government agency
- TRACS 9.3 Species and habitat management planning
- TRACS 1.2 Incentives
- TRACS 2.1 Create new habitat or natural processes; habitat conversion through stream restoration
- TRACS 2.7 Instream modification
    - 2.7.1 Channel reconfiguration
    - 2.7.2 Channel structure placement
    - 2.7.6 Streambank stabilization
- TRACS 2.6 Hazard or infrastructure removal
    - 2.6.2 Degraded land reconstruction
    - 2.6.4 Pavement removal
    - 2.6.7 Solid waste removal
- TRACS 2.10 Planting/seeding

Performance Measures

- Number of acres of impervious surface managed in accordance with the District's retention standards
- Number of gallons of stormwater retained/treated
- Number of CSO events eliminated
- Reduction in floating trash on receiving waters
- Number of feet of streams altered/restored
- Population metrics of SGCN considered in stream restoration projects
- Acres of critical habitat restored or created in association with stream restoration projects

Action Leaders

DOEE's Watershed Protection Division, DOEE's Stormwater Management Division, DC Water, FWD, and NPS.

6.1.3 Problematic Native Species

A problematic native species is a plant, animal, or pathogen that is originally found in a native ecosystem, but has exited its natural range of variation due to some factor or combination of factors and is compromising native habitats. These factors could include changes in range, reaction to climate change, lack of population controls (including predation), or introduction into a new area. There are two main problematic native species in the District: whitetail deer and Canada geese.

Whitetail deer (*Odocoileus virginianus*) are one of the most easily recognized wildlife species in the District. Lack of population controls has allowed whitetail deer populations to increase and severely impact critical wildlife habitats. Deer browsing (eating the leaves, twigs, and buds of woody plants) has degraded SGCN habitats and is restricting the regeneration of hardwood forests. Whitetail deer are also responsible for private property damage, are involved in vehicle collisions, and carry tick-borne illnesses. Deer management and monitoring is ongoing in Rock Creek Park.

NACE has performed deer population counts at Fort Washington and Greenbelt parks, and concluded that white tailed deer are over-abundant in many of its units. NACE may begin to focus on monitoring and management of deer in the Fort Circle Parks, Anacostia Park, and Kenilworth Aquatic Gardens. Monitoring and management are needed in C&O Canal Historical Park, Fort Dupont, Fort Mahan, Fort Chaplin, and Kenilworth Aquatic Gardens.

Canada geese (*Branta canadensis*) are native waterfowl that have historically wintered in the region. In the early 1900s, a subspecies (*Branta canadensis maxima*) was imported to populate wildlife refuges and hunt clubs. This subspecies became non-migratory, and there are currently more than 550 Canada geese that are now resident breeders in the District, leading to herbivory of native plants on mudflats and in emergent wetlands. Goose management is ongoing in East Potomac Park, but is needed along the Anacostia River. The ultimate goal should be to reduce the resident Canada geese population to zero through a variety of non-lethal and lethal control measures. It must be noted that there is a large population of migratory Canada geese present in the District in late fall and winter. This subspecies is native to the Atlantic flyway and shall not be a target for population reduction of any kind in the District.

Actions

- TRACS 2.13 Wildlife damage management
- TRACS 3.3.2 Research, survey or monitoring – habitat

Performance Measures

- Percent reduction in density of whitetail deer
- Percent reduction in density of summer resident Canada geese
- Wetland acres revegetated with native plants
- Habitat quality metrics (e.g., richness/diversity of native plants).
    - Forest regeneration
    - Wetland regeneration/revegetation
- Target species population metrics (e.g., relative abundance, reproductive success).

Action Leaders

NPS, AWS, and DOEE.

6.1.4 Recreational Activities and Infrastructure

Recreational activities impact wildlife habitat when the human population density is high enough that use of the area is almost constant. Recreational infrastructure impacts wildlife though the loss of habitat to new trails, fragmentation and new edges in habitat patches, and the transport of invasive plant materials.

To mitigate these pressures, land owners and regulators should implement adaptable management policies regarding recreational use of critical habitats. The impacts to SGCN and habitats should be a part of trail and recreational infrastructure planning trail

use, and plans would include mitigations for habitat loss. Recreational usage should be restricted to official trails in critical habitats through outreach, elimination of unauthorized trails, and enforcement of regulations and policies that protect habitat integrity. Other actions include education and outreach, such as signage that promotes the value of wildlife in natural areas and explains companion animal leash laws and policies. Trail users must be encouraged to keep dogs on leash through outreach and enforcement. Mowing along trails must be timed to minimize damage to nesting birds and other SGCN.

Actions

- TRACS 8.1.1 Partner/stakeholder engagement; Government agency
- TRACS 3.3 Research, survey or monitoring – habitat
- TRACS 9.3 Species and habitat management planning
- TRACS 2.6.4 Pavement removal
- TRACS 7.1 Law enforcement
- TRACS 8.1 Outreach; Partner/stakeholder engagement

Performance Measures

- Enforcement initiatives implemented
- Number of miles of social trails eliminated
- Number of acres of wildlife habitat with increased connectivity
- Outreach and education initiatives implemented

Action Leaders

NPS, U.S. Park Police, and DOEE.

6.1.5 Ecosystem Modifications

Ecosystems throughout the District are highly modified. Many of the actions described for urban wastewater and nutrification/sedimentation (see Sections 6.1.2 and 6.1.3) will mitigate threats from ecosystem modifications, but those actions do not specifically address modifications such as changes to hydrology or instream blockages. There are additional actions that can minimize or reverse the impacts of ecosystem modifications in groundwater-fed wetlands, vernal pools, and streams.

Groundwater-fed Wetlands and Vernal Pools

Restore the hydrology of groundwater-fed wetlands in the Oxon Run Magnolia Bog and in Rock Creek Park using stormwater infiltration techniques. Use stormwater infiltration techniques to create or restore vernal pools in areas where the landform and soils might promote their development. Modify landforms to create vernal pools where large-scale stream restoration projects are planned and in other appropriate locations.

Actions

- TRACS 2.1 Create new habitat or natural processes; habitat conversion through landform modification
- TRACS 2.12 Water Management
  - 2.12.1 Ditch plugs
  - 2.12.2 Diversion/headgate
  - 2.12.3 Drainage
  - 2.12.8 Water control structure
- TRACS 2.7 Instream modification
  - 2.7.1 Channel reconfiguration
  - 2.7.2 Channel structure placement
  - 2.7.6 Streambank stabilization

Performance Measures

- Acres of groundwater-fed wetlands restored
- Number of vernal pools created/restored
- Target SGCN population metrics (e.g., relative abundance, reproductive success) in restored groundwater wetlands and vernal pools
- Acres of critical habitat restored or created in association with stream restoration projects

Action Leaders

DOEE and NPS.

Stream Restoration

Minimize critical habitat disturbance and canopy tree removal during stream restoration techniques such as regenerative stormwater conveyance systems, natural stream channel design, and natural stream bank stabilization. Incorporate significant invasive plant management and habitat restoration measures in stream restoration projects. Minimize large-scale changes to forest vegetation composition. Limit the removal of canopy trees in closed canopy forests for any projects, including trails, stream restoration, and development.

Actions

- TRACS 2.1 Create new habitat or natural processes; habitat conversion through stream restoration
- TRACS 2.7 Instream modification
  - 2.7.1Channel reconfiguration
  - 2.7.2 Channel structure placement
  - 2.7.6 Streambank stabilization
- TRACS 2.10 Planting/seeding

Performance Measures

- Acres of critical habitat restored or created in association with stream restoration projects
- Number of feet of streams altered/restored
- Population metrics of SGCN considered in stream restoration projects
- Habitat quality metrics (e.g., richness/diversity of native plants).
- Forest regeneration

Action Leaders

DOEE's Watershed Protection Division and FWD.

Stream Reconnection

Remove cement stream channels and restore natural stream bed, meander, and riparian floodplain to Oxon Run. Reconnect disconnected streams, such as Oxon Run, Pope Branch, and Fort Dupont Creek, using stream daylighting techniques. Remove or modify instream obstructions to restore fish passage.

Actions

- TRACS 2.1 Create new habitat or natural processes; habitat conversion through stream restoration
- TRACS 2.7 Instream modification
  - 2.7.1Channel reconfiguration
  - 2.7.2 Channel structure placement
  - 2.7.6 Streambank stabilization
- TRACS 2.6 Hazard or infrastructure removal
  - 2.6.2 Degraded land reconstruction
  - 2.6.4 Pavement removal
  - 2.6.6 Shoreline armoring removal
  - 2.6.7 Solid waste removal
- TRACS 2.10 Planting/seeding

Performance Measures

- Number of feet of streams altered/restored
- Population metrics of SGCN considered in stream restoration projects
- Acres of critical habitat restored or created in association with stream restoration projects
- Number of acres of impervious surface removed in channel removal

Action Leaders

DOEE and NPS.

6.1.6 Inventory and Monitoring

The District must continue to inventory and monitor species, especially sensitive species (Tier I), in order to effectively implement the SWAP 2015 conservation actions. While SWAP 2005 centered on building a baseline inventory for many species and monitoring the trends of those species, there were still data deficiencies years later for many taxa, including bees, beetles, mussels, snails, crayfish, copepods, and other invertebrates.

Data gaps and performance measures for ongoing and new monitoring projects are discussed in detail in Chapter 7 Monitoring and Adaptive Management.

The District must address the lack of resources needed to support wildlife conservation. Additional funding will be necessary to implement the SWAP 2015 conservation actions. This funding would support additional staff, equipment, and supplies for new projects. Additional funding and grants would also support ongoing monitoring of sensitive species (Tier 1) and allow DOEE to recruit staff or consultants who have the expertise to reduce data deficiencies for less-studied taxa in the District.

Implementing the conservation actions in SWAP 2015 also requires partnerships and coordination with federal and District land managers, in parks where much of the District's wildlife habitats are located. Such partnerships would also help to leverage staff expertise to address data deficiencies and species monitoring.


Northern brown snakes

Actions

- TRACS 1.1 Coordination and Administration
- TRACS 3.2 Research, survey or monitoring – fish and wildlife populations
- TRACS 3.3 Research, survey or monitoring – habitat
- TRACS 3.5 Techniques development

Performance Measures

- Number of surveys directed toward SGCN
- Number of research projects directed toward SGCN

Action Leaders

DOEE and Academic Institutions.

6.2 Regional Conservation Actions and Coordination

The close proximity of many northeastern states has engendered a culture of cooperative and/or complementary management approaches. The Northeast Association of Fish and Wildlife Agencies has traditionally supported a strong technical committee structure to further wildlife conservation. Technical committees are species- or habitat-focused groups that exchange ideas and develop common approaches to wildlife issues. Typically, these conservation actions are implemented by individual states using their own funds; however, in some cases, additional funding has been made available through the Northeast Directors.

The Regional Conservation Needs (RCN) Program formalizes a cooperative approach to address SGCN needs across multiple states. The purpose of the RCN program is to develop, coordinate, and implement conservation actions that are regional/sub-regional in scope, and to build upon the many regional initiatives that already exist. The RCN program utilizes a funding mechanism that is equitable to all Northeast states and the District of Columbia, creating a base of funding for regional projects. Since 2007, 37 different projects have been selected. The resulting reports and products are available at http://RCNgrants.org.

Actions

The District will coordinate with USFWS, the Northeast Association of Fish and Wildlife Agencies, the North Atlantic Landscape Conservation Cooperative, other states in the region to develop and implement conservation actions for threats that are most effectively addressed at a regional or multistate scale. The projects will include the input and involvement of the many parties involved in the creation and implementation of the State Wildlife Action Plans in the Northeast region.

- TRACS 1.1 Coordination and Administration

Performance Measures

- Number of conservation action/research projects selected and completed.
- Number of articles, publications, and technical reports developed annually from funded projects.

- Number of completed projects addressing specific information or management needs (i.e., needs identified by the NEFWDTC) for Regional Species of Greatest Conservation Need (RSGCN).

Action Leaders

Northeast Fish and Wildlife Diversity Technical Committee, USFWS, State Wildlife Action Plan coordinators and Natural Diversity Program leaders, and the Wildlife Management Institute.

6.3 Conservation Actions in Conservation Opportunity Areas

There are numerous additional threats to habitats beyond the overarching threats. This section describes conservation actions to address threats to habitats at the secondary level of priority. These habitat-based actions are prioritized to be targeted to locations where the habitats are found in Conservation Opportunity Areas. Tables 19–30 describe the conservation actions that address all threats to habitats (at the Macrogroup level) in COAs. The tables indicate IUCN or TRACS threats to the habitat and the corresponding TRACS conservation actions. The tables also include columns for lead and partner agencies for each action. The TRACS Level III actions are described with examples of specific activities that address each particular threat.

Action leads and partners are listed only as suggestions, based on past actions of the listed agency or organization, status as major landowners, or other jurisdiction. Listing an agency as a lead or partner does not indicate that that agency is in any way obliged to begin that work, only that that agency or group is the logical one to lead future implementation. For instance, NPS has been identified as the lead agency for a number of conservation actions in several habitats. NPS is the major landowner of these habitats and has sole jurisdiction of wildlife habitat conservation activities on its land. For example, NPS is currently monitoring and managing deer in critical habitat in Rock Creek Park, and DOEE is supporting this activity by monitoring deer in the neighborhoods surrounding Rock Creek Park. DOEE has no authority to manage deer in Rock Creek Park or other habitats that are within NPS's area of jurisdiction. NPS is listed as the lead to conduct future potential deer population monitoring in habitats in Kenilworth Park and Fort Circle Parks. NPS has the sole authority to implement any potential actions, which would be subject to NPS compliance procedures and approval by the relevant park superintendent. Potential deer management activities

outside of NPS property would be the responsibility of DOEE and other landowners. Similarly, AWS is listed as a partner under management of resident Canada geese. AWS has no authority to manage geese on NPS land or in the waters of the District, but AWS was the first organization to recognize the impacts of resident Canada geese on restored wetland habitat and begin monitoring summer goose populations. AWS is a committed partner in restoration of the Anacostia River and is appropriately listed as a partner in implementation of goose management and wetland restoration actions. DOEE will work with all identified lead and partner organizations to begin implementation of identified conservation actions.

6.3.1 Central Oak-Pine and Northern Hardwood & Conifer

The conservation actions for the two main upland forest Macrogroups, Central Oak-Pine and Northern Hardwood & Conifer habitat, are the same. Central Oak-Pine includes Central Appalachian Dry Oak-Pine and Southern Interior Low Plateau Dry-Mesic Oak forests. This habitat can be found in these COAs: Kenilworth and Fort Lincoln Wetland Complex, Large Fort Circle Parks, Northern Rock Creek Park, Oxon Run Magnolia Bog and Forests. Northern Hardwood and Conifer habitat includes Southern Atlantic Coastal Plain Mesic Hardwood Forest, the most extensive vegetative habitat in the District. This habitat can be found in these COAs: Large Fort Circle Parks, Northern Rock Creek Park, and Theodore Roosevelt Island Area. Conservation Actions for these habitats are listed in Table 19.

Table 19 Conservation Actions to address threats to Central-Oak Pine and Northern Hardwood and Conifer forest habitats in the Kenilworth and Fort Lincoln Wetland Complex, Large Fort Circle Parks, Northern Rock Creek Park, Oxon Run Magnolia Bog, and Forest COAs

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Invasive Non-Native Species	Invasive plants	Invasive species control	See Section 6.1.1		
Problematic Native Species	Whitetail deer overabundance /overbrowse	Wildlife damage management	See Section 6.1.3		
Tourism and Recreational Areas	Pressures from Tourism and Recreational Infrastructure	Regulations	See Section 6.1.4		
		Direct resource management			
Recreation	Pressures from Tourism and Recreational Activities	Education and outreach			
		Regulation			
Residential, commercial, industrial, and recreation development	Fish and wildlife habitat loss or degradation	Create new habitat or natural processes	Habitat conversion; reforestation, reduce fragmentation	DOEE	NPS
		Fish and wildlife habitat structures	Locate and protect hibernacula	DOEE	NPS
			Nesting habitat improvements; artificial structures, passageways, bat houses, birdhouses	DOEE	NPS
		Planting/ seeding	Plant propagation/ nursery	NPS	DOEE
			Herbaceous vegetation	DOEE	NPS
			Trees/shrubs	NPS	DOEE
Transportation corridors	Fish and wildlife habitat loss or degradation	Dam and barrier removal	Wildlife corridors and crossings; wildlife underpasses, culverts, closed forest canopy over roadways	DOEE, DDOT	NPS, City Wildlife

6.3.2 Riparian Forests and Forested Wetlands

The Northeastern Floodplain Forest Macrogroup includes these riparian forest systems: Central Appalachian River Floodplain forests, Central Appalachian Stream & Riparian forests, and Northern Atlantic Coastal Plain Stream & River forests. These habitats can be found in seven COAs: Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Potomac River and Floodplain, Theodore Roosevelt Island Area, Northern Rock Creek Park, Oxon Run Magnolia Bog and Forests, and Large Fort Circle Parks. Conservation Actions for these habitats are listed in Table 20.

Table 20 Conservation actions to address threats to Northeastern Floodplain Forest habitats in the Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Potomac River and Floodplain, Theodore Roosevelt Island Area, Northern Rock Creek Park, Oxon Run Magnolia Bog and Forests, and Large Fort Circle Parks

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Invasive Non-Native Species	Invasive Plants	Invasive species control	See Section 6.1.1		
Problematic Native Species	Whitetail deer overabundance/ overbrowse	Wildlife damage management	See Section 6.1.3		
Tourism and Recreational Areas	Pressures from tourism and recreational infrastructure	Regulations	See Section 6.1.4		
Recreation	Pressures from tourism and recreational activities	Education and outreach			
Ecosystem Modifications	Hydrological alterations/ stormwater	Instream modification	See Section 6.1.5		
Domestic and Urban Wastewater	Runoff	Water management	See Section 6.1.2		
	Sewage				
Garbage and Solid Waste	Plastic, Styrofoam, and other trash	Hazard or infrastructure removal	Regulate plastic bottles; bottle deposit to encourage recycling	DOEE	AWS, Groundwork Anacostia
			Enforcement of bag and foam laws	DOEE	

The Coastal Plain Swamp Macrogroup includes these riparian forest systems: Northern Atlantic Coastal Plain Tidal Swamp, and Successional Woody Wetland. These habitats can be found in five COAs: Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Theodore Roosevelt Island Area, Oxon Run Magnolia Bog and Forests, and Poplar Point. Conservation Actions for these habitats are listed in Table 21.

Table 21 Conservation Actions to address threats to Coastal Plain Swamp habitat in the Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Theodore Roosevelt Island Area, Oxon Run Magnolia Bog and Forests, and Poplar Point COAs

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Invasive Non-Native Species	Invasive Plants	Invasive species control	See Section 6.1.1		
Problematic Native Species	Whitetail deer overabundance/ overbrowse	Wildlife damage management	See Section 6.1.3		
	Canada goose overabundance/ overbrowse				
Tourism and Recreational Areas	Pressures from tourism and recreational infrastructure	Regulations	See Section 6.1.4		
Recreation	Pressures from tourism and recreational activities	Education and outreach			
Ecosystem Modifications	Hydrological alterations/ stormwater	Instream modification	See Section 6.1.5		
Domestic and Urban Wastewater	Runoff	Water management	See Section 6.1.2		
	Sewage				
Garbage and Solid Waste	Plastic, Styrofoam, and other trash	Hazard or infrastructure removal	Regulate plastic bottles or add deposit to encourage recycling	DOEE	AWS, Groundwork Anacostia
			Enforcement of bag and foam laws	DOEE	
Agricultural and Forestry Effluents	Soil erosion and sedimentation	Instream modification	See Sections 6.1.2 and 6.1.5		

6.3.3 Freshwater Emergent Marshes

The Freshwater Emergent Marsh Macrogroup includes these wetland systems: Northern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh, Introduced Wetland and Riparian Vegetation, and Modified/Managed Marshes. These habitats can be found in six COAs: Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Theodore Roosevelt Island Area, Oxon Run Magnolia Bog and Forests, Poplar Point, and Potomac River and Floodplain. Conservation Actions for these habitats are listed in Table 22.

Table 22 Conservation actions to address threats to Freshwater Emergent Marsh habitat in the Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Theodore Roosevelt Island Area, Oxon Run Magnolia Bog and Forests, Poplar Point, and Potomac River and Floodplain COAs

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Invasive Non-Native Species	Invasive plants	Invasive species control	See Section 6.1.1		
	Invasive fish and turtles				
Problematic Native Species	Canada goose overabundance/ overbrowse	Wildlife damage management	See Section 6.1.3		
Tourism and Recreational Areas	Pressures from tourism and recreational infrastructure	Education and outreach	See Section 6.1.4		
		Direct resource management			
		Regulations			
Recreation	Pressures from tourism and recreational activities	Education and outreach			
		Regulation			
Ecosystem Modifications	Hydrological alterations/ stormwater	Instream modification	See Section 6.1.5		
Domestic and Urban Wastewater	Runoff	Water management	See Section 6.1.2		
	Sewage				
Garbage and Solid Waste	Plastic, Styrofoam, and other trash	Hazard or infrastructure removal	Regulate plastic bottles; deposit to encourage recycling.	DOEE	
			Enforcement of bag and foam laws	DOEE	
Agricultural and Forestry Effluents	Soil erosion and sedimentation	Instream modification	See Sections 6.1.2 and 6.1.5		

6.3.4 Rivers, Creeks, and Ponds

The conservation actions for the large open water Macrogroups, Great River, Small River, and Creek & Headwater, are the same. Tidal, open water habitats are found in the Potomac River, Anacostia River, and a small segment of Rock Creek. These habitats can be found in five COAs: Potomac River and Floodplain, Theodore Roosevelt Island Area, Kenilworth and Fort Lincoln Wetland Complex, and Kingman and Heritage Islands and Tidal Wetlands. Creek and headwater habitats are found in six COAs: Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Large Fort Circle Parks, Northern Rock Creek Park, Oxon Run Magnolia Bog and Forests, and Potomac River and Floodplain. Conservation Actions for these habitats are listed in Table 23.

Table 23 Conservation actions to address threats to Great River and Small River habitats in the Potomac River and Floodplain, Theodore Roosevelt Island Area, Kenilworth and Fort Lincoln Wetland Complex, and Kingman and Heritage Islands and Tidal Wetland

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Fishing and Harvesting of Aquatic Resources	Illegal take	Biological resource management	Regulations and law enforcement	DOEE	NPS
Invasive Non-Native Species	Invasive predatory fish	Invasive species control	See Section 6.1.1		
Recreation	Pressures from tourism and recreational activities	Education and outreach	See Section 6.1.4		
Dams and Water Management/Use	Dams (size unknown)	Dam and barrier removal	Obstruction removal, creation of fish passage areas	DOEE	NPS
Resource Information Collection Needs	Lack of initial baseline inventory	Research, survey, or monitor habitat	See Section 6.1.6		
Education Needs	Lack of aquatic resources and wildlife education facilities	Student training	Aquatic resource education programs	DOEE	AWS, DCPS

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Commercial and Industrial Areas	Development	Wildlife management areas	Restoration or creation of new SAV areas to replace recent losses (Reagan National Airport runway extension, hurricanes, flood events)	DOEE	
Domestic and Urban Wastewater	Runoff	Water management	See Section 6.1.2		
	Sewage				
Garbage and Solid Waste	Plastic, Styrofoam, and other trash	Hazard or infrastructure removal	Regulate plastic bottles or add deposit to encourage recycling.	NPS	AWS, DOEE
			Enforcement of bag and foam laws	DOEE	
Agricultural and Forestry Effluents	Soil erosion and sedimentation	Water treatment	See Section 6.1.2 and Section 6.1.5		
	Nutrient loads				

The pond Macrogroup includes Riverine Ponds, Embayed River Areas, and Freshwater Ponds. These habitats can be found in three COAs: Potomac River and Floodplain, Kenilworth and Fort Lincoln Wetland Complex, and Kingman and Heritage Islands and Tidal Wetlands. Conservation Actions for these habitats are listed in Table 24.

Table 24 Conservation Actions to address threats to pond habitats in the Potomac River and Floodplain, Kenilworth and Fort Lincoln Wetland Complex, and Kingman and Heritage Islands and Tidal Wetlands COAs

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Invasive Non-Native Species	Invasive plants	Invasive species control	See Section 6.1.1		
	Invasive fish and turtles				
Problematic Native Species	Canada goose overabundance/ overbrowse	Wildlife damage management	See Section 6.1.3		

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Tourism and Recreational Areas	Pressures from tourism and recreational infrastructure	Regulations	See Section 6.1.4		
		Direct resource management			
Recreation	Pressures from tourism and recreational activities	Education and outreach			
		Regulation			
Ecosystem Modifications	Hydrological Alterations/ stormwater	Pond Modification	See Section 6.1.5		
Domestic and Urban Wastewater	Runoff	Water management	See Section 6.1.2		
	Sewage				
Garbage and Solid Waste	Plastic, Styrofoam, and other trash	Hazard or infrastructure removal	Regulate plastic bottles or add deposit to encourage recycling	DOEE	AWS, DOEE
			Enforcement of bag and foam laws	DOEE	
Agricultural and Forestry Effluents	Soil erosion and sedimentation	Pond modification	See Section 6.1.2 and 6.1.5		
Commercial and Industrial Areas	Development	Wildlife management areas	Restoration or creation of new SAV areas to replace losses	DOEE	
Dams and Water Management/ Use	Dams (size unknown)	Dam and barrier removal	Obstruction removal, creation of fish passage areas	DOEE	
Resource Information Collection Needs	Lack of initial baseline inventory	Research, survey, or monitor habitat	See Section 6.1.6		
Fishing and Harvesting of Aquatic Resources	Illegal take	Biological resource management	Regulations and law enforcement	DOEE	NPS

6.3.5 Vernal Pools, Springs & Seeps, and Intertidal Habitats

Vernal Pools are found in four COAs: Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Potomac River and Floodplain, and Northern Rock Creek Park. Conservation Actions for this habitat are listed in Table 25.

Table 25 Conservation actions to address threats to vernal pool habitats in the Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Potomac River and Floodplain, and Northern Rock Creek Park COAs

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Invasive Non-Native Species	Invasive plants, fish, turtles	Invasive species control	See Section 6.1.1		
Tourism and Recreational Areas	Pressures from tourism and recreational infrastructure	Regulations	See Section 6.1.4		
Recreation	Pressures from tourism and recreational activities	Education and outreach			
		Regulations			
Ecosystem Modifications	Hydrological alterations/ stormwater	Modification	See Section 6.1.5		
	Historical habitat loss	Vernal pool creation			
Agricultural and Forestry Effluents	Soil erosion and sedimentation	Modification	See Section 6.1.2 and Section 6.1.5		
Housing and Urban Areas	Human cities, towns and settlements, encroachment	Wildlife management areas	Partnerships, administrative, land acquisition, translocation, best management practices	DOEE, DDOT, DPR	
Domestic and Urban Wastewater	Runoff	Water management	See Section 6.1.2		
Transportation corridors	Fish and wildlife habitat loss or degradation	Dam and barrier removal	Wildlife corridors and crossings	DOEE, DDOT	NPS, City Wildlife

Springs and seeps are critical habitat for a federally listed species. Conservation actions for these habitats are a high priority regardless of if they are found outside of COAs. Springs and seeps are found in three COAs: Potomac River and Floodplain, Northern

Rock Creek Park, and Oxon Run Magnolia Bog and Forests. Conservation Actions for this habitat are listed in Table 26.

Table 26 Conservation actions to address threats to springs and seeps in Potomac River and Floodplain, Northern Rock Creek Park, and Oxon Run Magnolia Bog and Forests COAs, and other habitat areas.

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Invasive Non-Native Species	Invasive plants	Invasive species control	See Section 6.1.1		
Tourism and Recreational Areas	Pressures from tourism and recreational infrastructure	Regulations	See Section 6.1.4		
Recreation	Pressures from tourism and recreational activities	Education and outreach			
		Regulations			
Ecosystem Modifications	Hydrological alterations/ stormwater	Modification	See Section 6.1.5		
Domestic and Urban Wastewater	Runoff	Water management	See Section 6.1.2		
	Sewage				
Industrial and Military Effluents	Groundwater contamination	Regulations	Enforcement and spill response	DOEE	DC Water
Agricultural and Forestry Effluents	Soil erosion and sedimentation	Modification	See Section 6.1.2 and Section 6.1.5		
Resource Information Collection Needs	Lack of initial baseline inventory	Research, survey, or monitor habitat	Baseline inventory for species with data gaps	DOEE	

Intertidal Shore habitats include Intertidal Mudflats, Rocky Shoals, and SAV Beds. These habitats are located in four COAs: Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Potomac River and Floodplain, and Theodore Roosevelt Island Area. Conservation Actions for these habitats are listed in Table 29.

Table 27 Conservation actions to address threats to Intertidal Shore habitats Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Potomac River and Floodplain, and Theodore Roosevelt Island Area COAs.

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Garbage and Solid Waste	Plastic, Styrofoam, and other trash	Hazard or infrastructure removal	Regulate plastic bottles or add deposit to encourage recycling	DOEE	AWS, DOEE
			Enforcement of bag and foam laws	DOEE	
Tourism and Recreational Areas	Pressures from tourism and recreational infrastructure	Regulation	See Section 6.1.4		
Recreation	Pressures from tourism and recreational activities	Education and outreach			
Domestic and Urban Wastewater	Runoff	Water management	See Section 6.1.2		
	Sewage				
Agricultural and Forestry Effluents	Soil erosion and sedimentation	Modification	See Section 6.1.2 and Section 6.1.5		
Industrial and Military Effluents	Historical and contemporary contamination	Regulations	Enforcement and spill response	DOEE	DC Water
Resource Information Collection Needs	Lack of initial baseline inventory	Research, survey, or monitor habitat	See Section 6.1.6		
Ecosystem Modifications	Hydrological alterations/ stormwater	Modification	See Section 6.1.5		
		Wood duck boxes			
		Planting/ Seeding, SAV Restoration			

6.3.6 Semi-Natural Habitats

Plantation and Ruderal Forest habitats include Introduced Shrubland systems and ruderal forests (Northern and Central Hardwood and Conifer - Ruderal Forest system). These habitats are found in all eight COAs.

Table 28 Conservation actions to address threats to Plantation and Ruderal Forest habitats in all eight COAs.

Identified Threats	Description	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Invasive Non-Native Species	Invasive plants	Invasive species control	See Section 6.1.1		
Problematic Native Species	Whitetail deer overabundance/ overbrowse	Wildlife damage management	See Section 6.1.3		
Tourism and Recreational Areas	Pressures from Tourism and Recreational Infrastructure	Regulations	See Section 6.1.4		
		Direct resource management			
Recreation	Pressures from Tourism and Recreational Activities	Education and outreach			
		Regulation			
Residential, commercial, industrial, and recreation development	Fish and wildlife habitat loss or degradation	Create new habitat or natural processes	Habitat conversion	DOEE	NPS
		Fish and wildlife habitat structures	Hibernacula	DOEE	NPS
			Nesting habitat improvements	DOEE	NPS
		Planting/seeding	Herbaceous vegetation	NPS	DOEE
			Plant propagation/ nursery	DOEE	NPS
			Trees/shrubs	NPS	DOEE
Transportation corridors	Fish and wildlife habitat loss or degradation	Dam and barrier removal	Wildlife corridors and crossings	DOEE, DDOT	NPS, City Wildlife

Ruderal upland/Old Field habitats are meadow and scrub habitats found in six COAs: Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Large Fort Circle Parks, Oxon Run Magnolia Bog and Forests, Poplar Point, and Potomac River and Floodplain.

Table 29 Conservation actions to address threats to Ruderal upland/Old Field habitats in Kenilworth and Fort Lincoln Wetland Complex, Kingman and Heritage Islands and Tidal Wetlands, Large Fort Circle Parks, Oxon Run Magnolia Bog and Forests, Poplar Point, and Potomac River and Floodplain COAs.

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Invasive Non-Native Species	Invasive plants	Invasive species control	See Section 6.1.1		
Tourism and Recreational Areas	Pressures from tourism and recreational infrastructure	Regulations	See Section 6.1.4		
		Direct resource management			
Recreation	Pressures from tourism and recreational activities	Education and outreach			
		Regulation			
Ecosystem Modifications	Historical habitat loss and changes to fire regimes	Meadow creation	Meadow restoration	DOEE	NPS, AWS
	Fish and wildlife habitat loss or degradation	Planting/seeding	Herbaceous vegetation	NPS	DOEE
			Plant propagation/ nursery	DOEE	NPS

Maintained Grasses and Mixed Cover habitats are developed habitats that include Canopy Trees and Recreational Grasses, and Urban and Recreational Grasses. They are found in all eight COAs. Conservation Actions for these habitats are listed in Table 30.

Table 30 Conservation actions to address threats to Maintained Grasses and Mixed Cover habitats in all eight COAs

Identified Threats	Description (IUCN Lev. 1 or TRACS Lev. 1)	TRACS Level 2 Action	TRACS Level 3 Action	Lead	Partners
Invasive Non-Native Species	Invasive Plants	Invasive species control	See Section 6.1.1		
Problematic Native Species	Whitetail deer overabundance/ overbrowse	Wildlife Damage Management	See Section 6.1.3		
	Canada Goose overabundance/ overbrowse	Wildlife Damage Management			
Tourism and Recreational Areas	Pressures from tourism and recreational Infrastructure	Regulations	See Section 6.1.4		
Recreation	Pressures from tourism and recreational activities	Education and Outreach			
Housing and Urban Areas Development	Human cities, towns, and recreational areas	Regulations	Include mitigation of impacts to SGCN and critical habitats in all development planning	DOEE	DCOP
Commercial and Industrial Areas	Industrial and other commercial development				
Ecosystem Modifications	Hydrological alterations/ stormwater	Instream Modification	See Section 6.1.5		
	Loss of tree canopy	Vegetation Planting			
Domestic and Urban Wastewater	Runoff	Water Management	See Section 6.1.2		
	Sewage				
Garbage and Solid Waste	Plastic, Styrofoam, and other trash	Hazard or infrastructure removal	Regulate plastic bottles or add deposit to encourage recycling	DOEE	
			Enforcement of bag and foam laws	DOEE	
Agricultural and Forestry Effluents	Soil erosion and sedimentation	Instream Modification	See Sections 6.1.2 and 6.1.5		

6.4 Non-Habitat/Species Based Actions

6.4.1 Invasive Species

See Section 6.1.1.3 Invasive Fish and Section 6.1.1.4 Terrestrial Predators.

6.4.2 Diseases and Pathogens

A host of pathogens are either currently found in the District or may expand their range to impact the region in the near future. As with invasive plants, a timely response is paramount for effective actions. ED/RR can reduce spread and contain outbreaks. Decontamination protocols that include decontamination of equipment between visits to field will limit spread of diseases between habitats. Locations that have been identified as sources of diseases or pathogens should be quarantined until a strategic response can be implemented.

Importation of exotic animals is a common source of emerging diseases. The pet trade within the District and importation of animals and animal parts must be regulated. Collaboration with other District, regional, and federal agencies is required to address diseases and limit their impacts.

Performance Measures

- Number of decontamination protocols implemented District-wide
- Number of monitoring (regional) protocols implemented

6.4.3 Endocrine Disruption

Collaboration between the District and regional agencies is necessary to ensure continued monitoring for organic pollutants, metals, and pesticides that may alter endocrine activity. The District will continue to monitor SGCN species that are exposed to these sources or exhibit physiological changes from endocrine disruptors.

Performance Measures

- Decrease in levels of endocrine disruptors found in species

- Decrease in levels of endocrine disruptors found in water bodies

6.4.4 Noise Pollution

While it may not be possible to reduce noise pollution in a completely urban environment, the District can target residents and commercial enterprises through education and outreach.

6.4.5 Light Pollution

The multiple sources of light pollution in urban areas include street lights, electronic signs, buildings, sports venues, and towers. With so many different sources contributing to urban light pollution, it is not practical to eliminate all sources. Light pollution can be reduced through Low Impact Design (LID) strategies, downward-facing street illumination, and reducing light output from commercial and government buildings during migration periods. Lights Out programs, such as the program operated by City Wildlife in the District, use education and outreach to encourage residents and businesses to turn lights off during peak migration periods (City Wildlife 2015). This program should be expanded.

DOEE will work with DDOT to incorporate down-shielding lights whenever possible. Work within the Sustainable DC plan to meet Energy and Built Environment goals that would reduce light pollution.

Performance Measures

- Number of buildings participating in light reduction programs
- Number of buildings participating in light-reducing LID strategies
- Percentage of street lights employing light pollution reduction technology

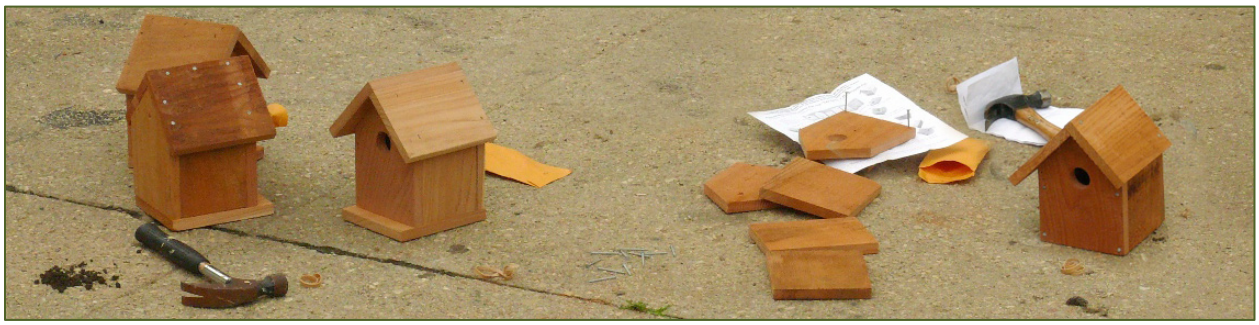
6.4.6 Collisions with Glass and Buildings

Urban habitats are full of buildings with glass windows and other structures that are threats to migratory and resident wildlife; however, a number of strategies can reduce collisions. Long-term solutions include smart design and bird-safe options, such as opaque, etched, stained, frosted, translucent, or fritted glass. The use of secondary facades, netting, screens, shutters, and exterior shades are also considered bird friendly design. There are also less expensive actions such as installing window decals, tempera paint, bird tape, and other window-marking films. The American Bird Conservancy's Bird Friendly Building Design guide offers additional solutions (Sheppard 2011).

Performance Measures

- Reduction in number of building/window strikes as monitored through programs such as Lights Out DC
- Number of buildings participating in bird friendly design programs
- Number of buildings implementing LEED pilot credit PC #55: Bird Collision Deterrence

6.5 Focal Conservation Actions



Focal Conservation Actions are broad-scale conservation actions that can apply to many habitat types or that may be extensions of or additions to other actions. For instance, invasive plant management must be performed in many habitat types, and it should be followed by habitat restoration with native plants.

The following Focal Conservation Actions address habitat- and non-habitat-based threats throughout the District, including historical habitat loss through urbanization and land reclamation. These actions represent on-the-ground natural resource management projects that will move the DOEE Fisheries and Wildlife Division's Wildlife Management Branch beyond the baseline inventory and monitoring actions that have dominated the majority of its effort under SWAP 2005. The District's Focal Conservation Actions include restoring meadows and tidal wetlands, propagating native plants, creating vernal pools, installing artificial nesting and roosting structures, establishing wildlife protections and protected areas, expanding the Citizen Science Program, and identifying wildlife corridors.

6.5.1 Meadow Restoration

DOEE will begin restoring meadows in grassy areas where mowing can be significantly reduced and native plants can be reintroduced. Restoring these meadows will provide highly valuable edge and meadow habitat for a diversity of wildlife, including small mammals, birds, and reptiles. Healthy, productive, native meadows are composed of highly diverse herbaceous plants and include a number of foundation grasses and wildflowers, such as Virginia wild rye (*Elymus virginica*), little bluestem (*Schizachryum scoparium*), common milkweed (*Asclepias syriaca*), ironweed (*Vernonia noveboracensis*), fleabane (*Erigon annuus*), and others.

DOEE will use two primary management actions to restore mowed areas and create meadows. Depending on the current species present in each of the highest priority mowed sites, one of these methods will be suitable:

- Restrict mowing to once per year, preferably in the early spring or late fall. This action will allow perennial herbaceous grasses and wildflowers to establish while keeping woody shrubs and trees from succeeding into the meadows.

- Combine weed control with planting of native grasses and wildflowers to selectively augment plant diversity at meadow sites.

  On very large sites, several small plots (16 ×16 feet or 20 × 20 feet) throughout the restoration area can be cleared by tilling, solarization, herbicides, or hand pulling, and planted with native plants (seeds, plugs, or potted plants).

  On smaller sites the existing grass can be killed using an herbicide and those areas sown with a native seed mix of annual and perennial grasses and wildflowers. The seeds should be covered with straw for three to six weeks and kept from drying out completely. This method has the advantage of reducing the potential for erosion of tilled areas.

Maintenance is critical during the post-planting establishment period. For the first two to three years, regular site maintenance must occur to ensure plant survival and to control invasive plants. Maintenance can be minimized after the plants have fully established. Maintenance of an established native meadow consists of once-annual mowing. In some cases, mowing can be reduced to every two to three years with an annual effort to remove woody plants (trees and shrubs) that may try to establish in the meadow; they can be removed by cutting them, digging them up, or applying herbicides.

DOEE has surveyed potential meadow restoration sites using a geographic information system (GIS) analysis coupled with on-the-ground inspections. Figure 26 shows 71 prioritized meadow restoration sites that are located on District property or in District Department of Transportation (DDOT) rights-of-way. 64 additional sites on federal and institutional property have not yet been prioritized. DOEE prioritized sites based on patch size and connectivity to natural habitat. Table 31 describes the 30 highest priority meadow restoration sites.

The size criteria were

- Very large: 7–12 acres

- Large: 3–7 acres

- Medium: 1–3 acres

- Small: <1 acre

The connectivity criteria were

- Connected: directly connected to existing patches of forest or meadow habitat
- Adjacent: near to patches of forest or meadow habitat, but disconnected by a road or other obstruction
- Disconnected: disjunct from any habitat patches, surrounded by roads or developed land

Performance Measures

- Number of acres of meadow restored or created
- Increase in grassland/meadow habitat associated SGCN populations

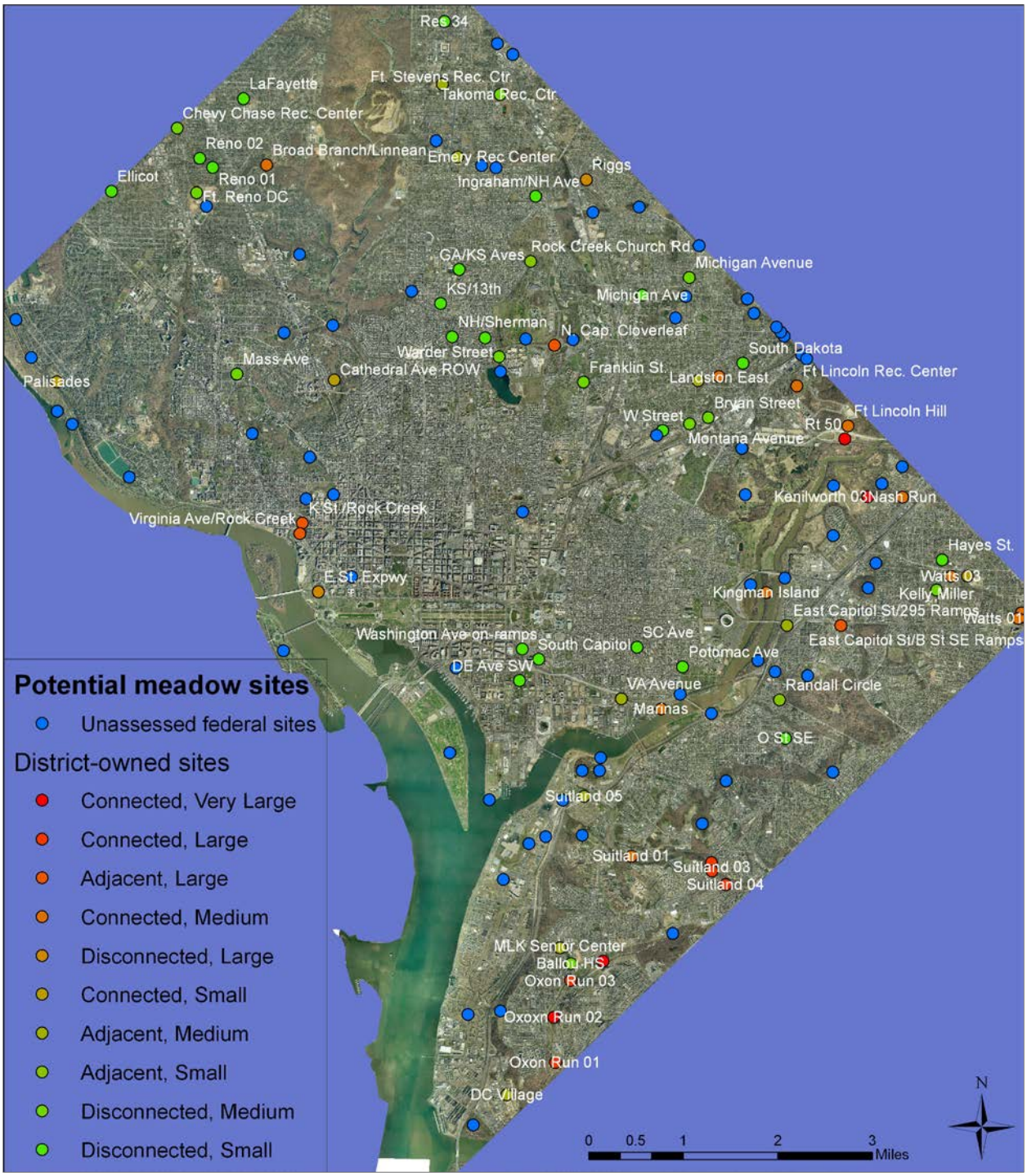


Figure 26 Potential District-owned meadow restoration sites prioritized by habitat connectivity and estimated size.

Very large = >7 acres; large = 3–7 acres; medium = 1–3 acres; small = <1 acre.
Connected = directly connected to existing patches of forest or meadow habitat; adjacent = near patches of forest or meadow habitat, but disconnected by a road, obstruction, or other development; disconnected = disjunct from any habitat patches, surrounded by roads or developed land.

Table 31 District of Columbia Highest Priority Meadow Restoration Sites.

Priority	Name	Estimated Area	Connectivity	Location	Ownership
High	Oxon Run 02	Very Large (>7 acres)	Connected (directly connected to existing patches of forest or meadow habitat)	1st and Atlantic Streets SE	DGS/DPR
	Kenilworth 03			Kenilworth-Parkside Recreation Center NE	DDOT right-of-way
	Route 50			Rt. 50 and South Dakota Avenue on-ramp area NE	
	Oxon Run 04			Wheeler and Valley Avenues SE	DGS/DPR
	East Capitol Street/295	Large (3–7 acres)		East Capitol Street and 295 access ramps SE	DDOT right-of-way
	Oxon Run 03			Mississippi Avenue and Wheeler Street SE	DGS/DPR
	Oxon Run 01			South Capitol Street and Southern Avenue SE	DDOT right-of-way
	Suitland 03			Suitland Parkway and Alabama Avenue access ramp northwest area SE	
	Suitland 02			Suitland Parkway and Alabama Avenue access ramp southwest area SE	
	Suitland 04			Suitland Parkway and Alabama Avenue access ramps northeast area SE	
	East Capitol Street/B Street SE Ramps		Adjacent (near patches of forest or meadow habitat, but disconnected by a road, obstruction, or other infrastructure)	East Capitol Street and B Street access ramps adjacent to Benning Stoddert Recreation Center SE	
	K Street/ Rock Creek			K Street/Water Street and Rock Creek Parkway interchange access ramp NW	
	North Capital Cloverleaf			North Capitol Street and Irving Street interchange cloverleaf and ramp NW/NE	
	Virginia Avenue/ Rock Creek			Virginia Avenue and Rock Creek Parkway interchange access ramp NW	
Medium	Broad Branch/ Linnean	Medium (1–3 acres)	Connected	Along Broad Branch daylighting, Broad Branch and Linnean Avenues NW	DDOT right-of-way
	Watts 03			Along Watts Branch between 50th and Division Streets SE	DGS/DPR
	Watts 01			Along Watts Branch between 58th and 61st Streets NE	

Priority	Name	Estimated Area	Connectivity	Location	Ownership
	Watts 02			Along Watts Branch between 58th and 61st Streets NE	
	Nash Run			Between Ord and Douglas Streets NE	
	Langston East			Fields near Langston Pool in NE	
	Ft. Lincoln Recreation Center			Grassy area along Ft. Lincoln Drive NE	
	Ft. Lincoln Hill			Hillside east of Costco next to Route 50 access ramp to South Dakota Avenue NE	
	Suitland 01			Inbound Suitland Parkway NW of Stanton Road SE	DDOT right-of-way
	Kingman Island			South of 3100 Benning Road on Kingman Island NE	DGS/DPR
	Marinas			Seafarers Marina and District Yacht Club areas SE	
	DC Village		Adjacent	Fields in DC Village/Fire Academy area SW	
	MLK Senior Center			MLK Jr. Avenue and Trenton Place SE	
	Suitland 05			Suitland Parkway and 295 cloverleaf areas SE	DDOT right-of-way
	E Street Expressway	Large	Disconn-ected (disjunct from any habitat patches, surrounded by roads or developed land)	E Street and I-66 access ramp grassy areas NW	
	Riggs			Riggs Road and South Dakota Avenue, east of interchange NE	

6.5.2 Tidal Wetland Restoration

The Anacostia River was once part of a larger functioning ecosystem of freshwater tidal wetlands. Originally, these wetlands comprised more than 2,000 acres within the tidal portions of the river. From the 1890s through the 1940s, the U.S. Army Corps of Engineers (ACoE) filled the wetlands with dredge material from the Anacostia shipping channel to reclaim land for development and to minimize the impacts of raw sewage and malaria. ACoE redirected portions of the river in Prince George's County, Maryland and constructed a seawall on both banks of the river along its entire length in the District; they constructed Kingman and Heritage Islands, and created Kingman Lake. Dredge

material was used as fill for these projects. Few acres of emergent tidal wetland remain (Hammerschlag et al, 2004).

Figure 27 shows an approximation of the original extent of the wetlands of the upper Anacostia River in the District based on two maps housed at the Library of Congress: "Map of Anacostia River in the District of Columbia and Maryland / surveyed under the direction of Lieut. Colonel Peter C. Hains, Corps of Eng'rs." (1891) and "Part of the District of Columbia: June 1896 /compiled and drawn at the Office of the Engineer Commissioner, District of Columbia" (Library of Congress Geography and Map Division Washington, 2015).

In 1993, ACoE, NPS and the Metropolitan Washington Council of Governments constructed 32 acres of wetland in Kenilworth Park (Hammerschlag et al, 2004). ACoE also constructed an additional 14 acres of wetland in Kingman Lake in 2000 and 15 acres in the main stem of the Anacostia River in 2003 (Hammerschlag et al, 2009). 30 acres of tidal wetlands have also been restored near Bladensburg, Maryland in Prince George's County (MD DNR, 2001).

DOEE's Fisheries and Wildlife Division and Watershed Protection Division will work together to seek grants and other funding to plan and implement new tidal wetland restoration projects. DOEE will focus restoration efforts on locations where native, natural soils and seed banks may remain where historical wetlands were reclaimed from the 1890s to 1940s. Figure 27 shows six potential tidal wetland restoration sites (blue circles) in locations that may contain natural historic wetland soils and seed banks.

Performance Measures

- Number of acres of tidal wetlands restored or created
- Increase in tidal wetland habitat associated SGCN populations

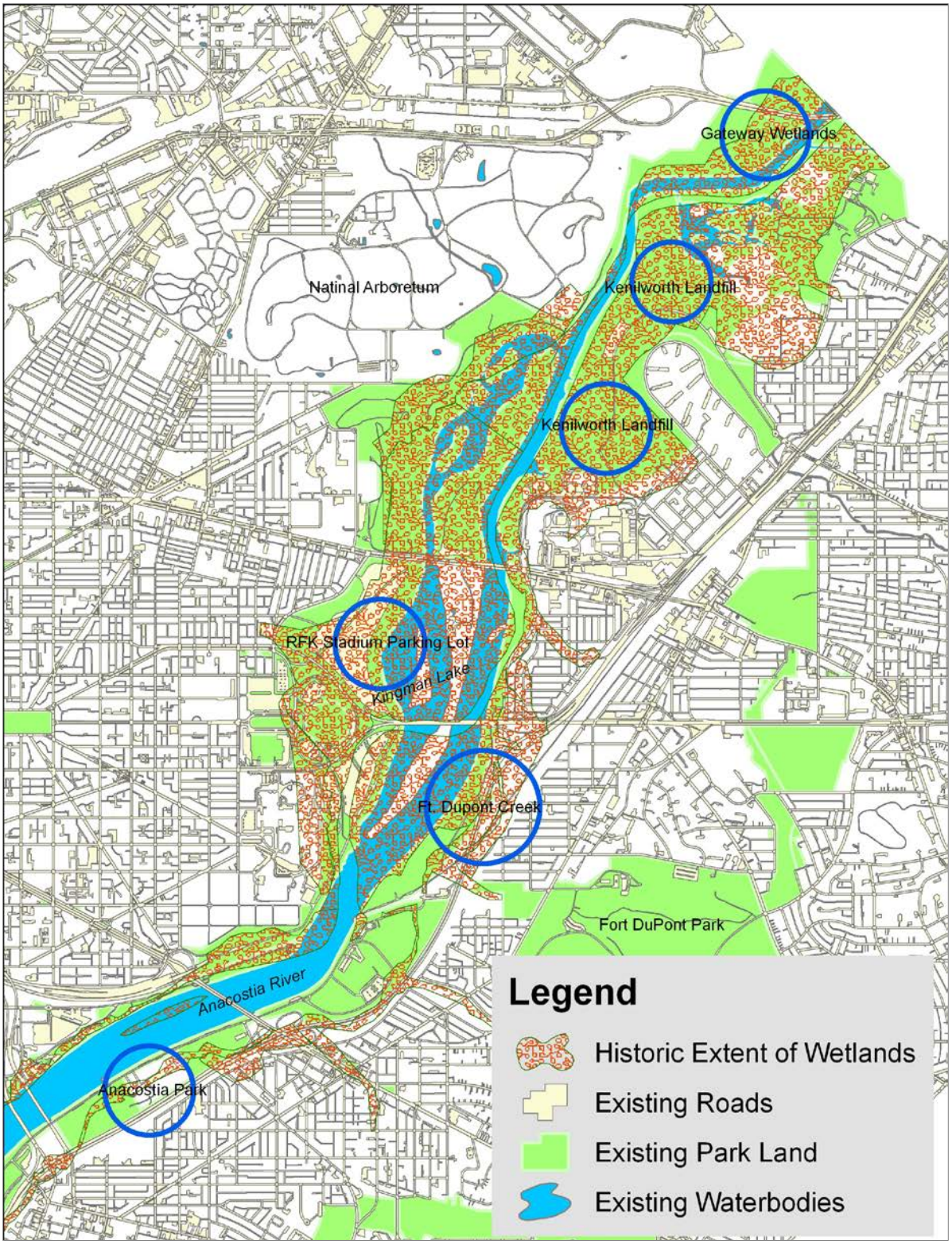


Figure 27 An approximation of the original extent of the wetlands of the upper Anacostia River in the District based on historic maps. Blue circles indicate six potential tidal wetland restoration sites in locations that may contain natural historic wetland soils.

6.5.3 Native Plant Propagation

Using a capital grant from the Sustainable DC grant program, the University of the District of Columbia (UDC) Cooperative Extension Service and DC-CWMA have collaborated to build a greenhouse and establish a native plant nursery at the UDC Bertie Backus Campus. The site will produce native plants and seeds needed to restore biodiversity to local habitats, following invasive plant management, stream restorations, and meadow restoration projects in natural areas throughout the District. The site will also serve as a training facility, where students can gain technical job skills such as greenhouse management, plant production, invasive plant management, and habitat restoration.

UDC will operate the native plant nursery with assistance from DC-CWMA members and will provide plants and seeds to DC-CWMA members and the District government. The nursery may also sell plant materials for general landscaping purposes to District government agencies and the general public; proceeds must support greenhouse operations and management.

The nursery will offer training in specialized skills needed for employment in the invasive plant management field, the landscape industry, and the greenhouse industry. DC-CWMA currently provides free invasive plant management training events two times per year and will add training—at the nursery and in the field—for native plant propagation and habitat restoration. Existing green job training programs, including those run by local nonprofits, will have the opportunity to participate in all phases of greenhouse management, plant propagation, invasive plant management, and habitat restoration.


New York ferns salvaged from a stream restoration contruction site

Performance Measures

- Number of attendees to native plant propagation training classes
- Number of plants produced by native plant nursery
- Number of habitat restoration projects utilizing plants from native plant nursery

6.5.4 Vernal Pool Creation


A vernal pool

Vernal pools are a unique type of seasonal wetland. These ephemeral pools are often shallow and small with no inflow or outflow of a permanent water source. They can occur in a variety of landscapes, including uplands, floodplains, parts of streams and seepage systems, or as a part of a larger wetland complex.

Because of the short hydroperiod of vernal pools, predators such as fish are unable to inhabit the system. As a result, they are important breeding habitats for species such as wood frogs and spotted salamanders, whose eggs and tadpoles are vulnerable to such predators. Eggs hatch and tadpoles quickly develop into small frogs and salamanders before the pools dry up in the summer months.

Urbanization, development, impervious surfaces, and groundwater depletion are among the top threats to vernal pool ecosystems. Many amphibians will return to the same pool annually to breed; therefore, the threats of development can lead to the permanent loss of a population. Wetland regulations would help protect vernal pool habitats.

DOEE's Fisheries and Wildlife Division will collaborate with other DOEE divisions, DC Water, NPS, and others to incorporate vernal pools into stream restoration designs. DOEE will organize workshops on vernal pool creation to encourage multiple partners to participate in creating vernal pool habitats within the District.

Performance Measures

- Number of acres of vernal pools restored or created
- Increase in vernal pool habitat associated SGCN populations

6.5.5 Artificial Nesting Structures and Opportunities

Habitat loss and competition from invasive species have decreased nesting opportunities and shelter for a variety of mammals and birds. The use of artificial nesting structures for cavity nesting birds is a widely accepted tool for wildlife management and a cost-effective method to assist in species recovery. Boxes can provide secure nesting sites in urban areas and degraded habitats where natural cavities are limited, as long as the structures are properly placed and maintained.


Osprey nesting platform at Heritage Island

Ten bird SGCN species have been shown to use artificial nesting structures: wood duck, purple martin, eastern screech-owl, red-headed woodpecker, prothonotary warbler, chimney swift, American kestrel, peregrine falcon, brown creeper, and bald eagle. Structures include nest boxes, colonial housing towers, chimney towers, ledge scrapes, and platforms.

Artificial structures are not only important for nesting, but can provide shelter. While bats migrate or hibernate in caves during the winter months, summers are spent in trees, under bridges, or in abandoned structures. Bat boxes mimic the space between tree trunks and bark shingles and have a 52% success rate of occupation (Kennedy et al 2013). Creating bat boxes provides more bat habitats, which assists in reducing the number of bats found in human-occupied dwellings. During the breeding season, bat houses can provide a place for female bats to roost and establish maternity colonies for pups. The southern flying squirrel (*Glaucomys volans*) also utilizes nest boxes for breeding and as wintering dens for small groups. Several parks in the District have nest boxes occupied by flying squirrels.

Artificial nesting structures are a cost-effective method for providing nesting assistance to SGCN. Nest box programs can supplement tree snags, cavities and other natural nesting opportunities, but nest boxes should not be viewed as a remedy for the chronic problem of habitat loss and degradation (Fiehler, Tietje, and Fields 2006).

Performance Measures

1. Number and type of nesting structures installed
2. Number of nesting structures utilized by target species
3. Number of successful nesting attempts by target species in artificial structures

6.5.6 Natural Resource Protection

Mayor's Order 2011-96 designated the Director of the DOEE as the Natural Resources Trustee for the District of Columbia in accordance with 42 U.S.C. § 9607(f)(2)(B) and 40 C.F.R. § 300.605. DOEE will begin working within sister agencies to become the District of Columbia government's recognized and asserted natural resources authority. On September 21, 2015 a bill titled "Fisheries and Wildlife Omnibus Amendment Act of 2015" (B21-0386) was introduced in the Council of the District of Columbia. The Bill Summary describes the intent of the legislation:

As introduced, this bill makes various changes to the law regarding wildlife and natural resources. It designates the American shad and Hay's Spring amphipod as the official fish and amphipod of the District, respectively; establishes an Aquatic Resources Education program to be administered by the District Department of the Environment (DOEE); authorizes the Mayor to draft and enforce rules to restrict, prohibit, regulate, and control the sale, possession, exhibition, hunting , fishing, and taking of wildlife in the District, inclusive of fees and for certain civil and criminal offenses; and establishes a special purpose fund, the Fishing License Fund. The bill also includes provisions that govern the licensure and stewardship of watercrafts, and prohibits the sale of personal care products that contain plastic microbeads (Council of the District of Columbia 2015).

This bill would allow DOEE, under the authority of the Mayor, to implement conservation protections for rare animals and allow certain invasive wildlife control techniques.


Nest box for monitoring the southern flying squirrel

Additionally, there are a number of District and federally owned natural spaces throughout the District that, with protection and proper management, could become prime wildlife habitat. These parcels could be converted to state parks or state conservation areas through legislation, Mayor's orders or Memoranda of Understanding.

These parcels include but are not limited to the following:

- Pope Branch
- Kingman and Heritage Islands
- Suitland Parkway Buffer Area
- Dalecarlia Parkway Buffer Area
- Langdon Recreation Center Forest
- Hillcrest Recreation Center Forest
- Alger Park
- Undeveloped Fort Lincoln Forest
- National Zoo

- Naval Observatory
- Joint Base Bolling
- Armed Forces Retirement Home
- Oxon Run

Performance Measure

- Introduction and passage of species protections
- Number of acres under management as habitat

6.5.7 Citizen Science Program

Citizen science is a method of study in which the public collects and forwards specific data to the principal scientist. This method has proven to be a beneficial resource. It encourages the public to observe and learn about area wildlife and is a relatively efficient way to provide biologists with crucial data.

In the fall of 2013, DOEE initiated the first Citizen Science Program, seeking volunteers for assistance in reporting on the eastern cottontail rabbit (*Sylvilagus floridanus*), an SGCN species. The public responded positively and the program continues to flourish. Community members report sightings that provide biologists with crucial data needed to determine the abundance, density, and distribution of the eastern cottontail rabbit. Due to the success of this project, DOEE plans to expand the Citizen Science Program to other SGCN species.

Other potential projects include expanding the George Washington Memorial Parkway citizen science program that focuses volunteer efforts on invertebrate data in a "Bug Lab", citizen science biodiversity observations using iNaturalist (https://www.inaturalist.org), butterfly monitoring, plant phenology and others.

Performance Measures

- Number of participants in citizen science programs
- Number of species accounts collected through citizen science programs

6.5.8 Wildlife Corridors

Due to urbanization, growing human populations, and ever present infrastructure, contiguous tracts of habitat have become broken or fragmented. Fragmentation, a threat to wildlife and habitat, occurs when roads transect wildlife travel corridors or bisect home ranges. Fragmentation effectively divides territories, changes home ranges, and alters species movements. When roadways are built in wildlife travel

corridors, animals increasingly use roads for passage and inevitably come in contact with vehicles. For both wildlife management and human safety, there is a need to track conflicts between wildlife and vehicles and to design and implement measures to reduce these potentially dangerous interactions.

To address this concern, DOEE will identify areas—known as hotspots—where wildlife-vehicle collisions are likely to occur. DOEE will design measures to reduce vehicle strikes, increase the safe passage of wildlife, and reduce risks to public safety in these particular areas.

Performance Measures

- Number of collision records collected
- Number of hotspots identified
- Number of preventative measures taken (wildlife underpasses, culverts, closed forest canopy over roadways, etc.)
- Number of new roads with wildlife crossings (wildlife underpasses, culverts, etc.)
- Number of new roads or other infrastructure in existing habitats (goal is zero)