

# **CHAPTER 2: ALTERNATIVES**

This "Alternatives" chapter describes the various actions that could be implemented for current and future management of wetlands and resident Canada geese within Anacostia Park. NEPA requires that federal agencies explore a range of reasonable alternatives and provide an analysis of what impacts the alternatives would have on the natural and human environment. The "Environmental Consequences" chapter of this plan/EIS presents the results of the impacts analyses. The alternatives under consideration must include a no action alternative as prescribed by 40 CFR 1502.14. The no action alternative in this plan/EIS is the

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continuation of the current combination of management actions and practices for wetlands and resident Canada geese within Anacostia Park and assumes that the NPS would not make major changes to the current management efforts.

## **STUDY AREA DEFINITION**

As stated previously in chapter 1, Anacostia Park occupies 1,300 acres along 5 miles of the Anacostia River shoreline. The study area for this plan/EIS includes the entire park, but only those lands within the current NPS jurisdiction of Anacostia Park. The primary focus of the plan/EIS is approximately 100 acres of restored tidal wetlands within Anacostia Park including Kenilworth Marsh, Kingman Marsh, and Fringe Marsh (figure 4). Descriptions of the wetland areas within Anacostia Park can be found in chapter 3, "Wetlands." All other land within Anacostia Park that is subject to special use permits, leases, and concession agreements by the NPS is included as part of the study area covered by this plan/EIS.

## ALTERNATIVES DEVELOPMENT PROCESS

This plan/EIS has been written as an integrated tool designed to allow for the long-term planning and management for both wetlands and resident Canada geese at the park. The alternatives were developed to achieve the desired conditions related to wetland vegetation damage from resident Canada goose herbivory (consumption of plants) and achieve the desired condition of a resident Canada goose population goal in the park. This approach includes a collection of techniques for both wetland management and goose management. Wetland management includes techniques for the following elements: hydrology, vegetation, wetland restoration, cultural/education, and park operations/management. Goose management includes techniques for the following elements: lethal control (killing), habitat modification, scare and harassment, reproductive control, and cultural/education. Specific management techniques included in the plan/EIS are techniques such as erosion control, managing invasive species, and construction of new trails. Details on the wetland and goose management techniques are described below under each alternative description and can be found in tables 1 and 2. Through internal scoping meetings and public comments received during the scoping process, the various management techniques within were packaged into five different management alternatives (alternatives B through E) to provide a maximum amount of variability. Alternatives A through E were then analyzed for potential impacts in detail. Alternatives were reviewed and modified during a roundtable meeting March 8, 2010. Meeting attendees included the project team (Anacostia staff, NPS Regional Director, and representatives from the Center for Urban Ecology [CUE]).



FIGURE 4: LOCATIONS OF RESTORED TIDAL WETLANDS WITHIN ANACOSTIA PARK

Element	Alternative A – No Action	Alternative B –High Wetland, High Goose Management	Alternative C – Moderate Wetland, Moderate Goose Management	Alternative D – Low Wetland, Low Goose Management	Alternative E –High Wetlands, Moderate Goose Management with No Lethal Control
Hydrology	No current actions	<ul> <li>Use erosion control techniques including coir fiber logs, flow deflectors, bog mats, and shoreline steepness reduction*</li> <li>Remove or modify structures that result in erosion and clogging of marsh</li> <li>Create tidal guts*</li> <li>Address upland runoff</li> <li>Investigate possible impact of extreme water level change</li> <li>Consider altering water elevations*</li> <li>Inform DC Harbormaster of importance of enforcing no wake zones</li> </ul>	<ul> <li>Use erosion control techniques including coir fiber logs, flow deflectors, bog mats, and shoreline steepness reduction*</li> <li>Limited removal of structures that result in erosion and clogging of marsh</li> <li>Address upland runoff</li> <li>Limited investigation of possible impact of extreme water level change</li> <li>Inform DC Harbormaster of importance of enforcing no wake zones</li> </ul>	<ul> <li>Remove or modify structures that result in erosion and clogging of marsh</li> <li>Address upland runoff</li> </ul>	Same as alternative B
Vegetation	<ul> <li>Continue current management of invasive species</li> <li>Remove sheet piling along Fringe wetlands*</li> </ul>	<ul> <li>Manage invasive species</li> <li>Mechanical seedbank regeneration*</li> <li>High density planting effort with persistent, native species with high root mats and variable height</li> <li>Remove sheet piling along Fringe wetlands*</li> </ul>	Same as alternative B except a low density planting effort with persistent native species	<ul> <li>Minor level of invasive species management</li> <li>Passive seedbank regeneration</li> <li>Remove sheet piling along Fringe wetlands*</li> </ul>	Same as alternative B
Wetland Restoration	No new restoration efforts	<ul> <li>Consider daylighting*</li> <li>Stream/stormwater outfall energy dissipation modifications*</li> <li>Consider seawall breaks*</li> </ul>	Least invasive stream/stormwater outfall energy dissipation modifications	Same as alternative A (none)	Same as alternative B
Cultural/Education	<ul><li>Continue some education through park programs</li><li>Maintain existing trails at the park</li></ul>	<ul> <li>Increased education and interpretation</li> <li>Construct new boardwalks and trails*</li> </ul>	Increased education and interpretation	Same as alternative A	Same as alternative B
Park Operations and Management	Continue limited trash removal	<ul> <li>Trash management</li> <li>Reduce impervious areas*</li> <li>New rain garden areas*</li> </ul>	Same as alternative B	• New rain garden areas*	Same as alternative B

#### TABLE 1: SUMMARY OF WETLAND MANAGEMENT TECHNIQUES FOR EACH ALTERNATIVE

**Bold** items are techniques that the park would commit to being implemented, other techniques would be implemented on an as needed basis to achieve wetland and goose desired conditions. \*Will require additional NEPA compliance This page intentionally left blank

Element	Alternative A – No Action	Alternative B –High Wetland, High Goose Management	Alternative C – Moderate Wetland, Moderate Goose Management	Alternative D – Low Wetland, Low Goose Management	Alternative E –High Wetland, Moderate Goose Management with No Lethal Control
Lethal Control	No lethal control	<ul> <li>Lethal control to remove 40 to 60 percent of the resident Canada goose population in the park</li> <li>Lethal control <u>throughout life of this plan/EIS</u> until goose population goal is reached</li> <li>Lethal control = round-up, capture, euthanasia, and shooting</li> <li>Lethal control can increase to remove a <u>maximum of 90 percent</u> of the resident Canada goose population in the park if goals are not met in specified timeframe</li> <li>Population monitoring for the life of the plan</li> </ul>	<ul> <li>Lethal control to remove 40 to 60 percent of the resident Canada goose population in the park</li> <li>Lethal control <u>up to five times</u> during life of this plan/EIS</li> <li>Lethal control = round-up, capture, euthanasia, and no shooting would occur</li> <li>Population monitoring for the life of the plan</li> </ul>	<ul> <li>Lethal control to remove 40 to 60 percent of the resident goose population in the park</li> <li>Lethal control <u>up to one time</u> during the life of this plan/EIS</li> <li>Lethal control = round-up, capture, and euthanasia; <u>no shooting would occur</u></li> <li>Population monitoring for the life of the plan</li> </ul>	<ul> <li>No lethal control</li> <li>Population monitoring for the life of the plan</li> </ul>
Habitat Modification	Continue to maintain current goose exclusion fencing	<ul> <li>Plant new 25-50 foot buffers along shorelines throughout the park</li> <li>Install and maintain goose exclusion fencing</li> <li>Install soft armoring around perimeter of restored wetlands</li> <li>Increase width of existing vegetated buffers (25-50 feet)</li> <li>New plantings less desirable to geese</li> </ul>	<ul> <li>Same as alternative B except new 25-50 foot buffers only along shorelines at Kingman Marsh and fringe marshes</li> <li>Apply goose repellents to turf feeding areas yearly</li> </ul>	<ul> <li>Plant new 25-50 foot buffers along shorelines at Kingman Marsh and fringe marshes excluding Langston Golf Course</li> <li>Install and maintain goose exclusion fencing</li> <li>Increase width of existing vegetated buffers (25-50 feet)</li> <li>New plantings less desirable to geese</li> </ul>	Same as alternative B except no increasing width of existing vegetated buffers
Scare and Harassment	No scare and harassment techniques are currently used	Intensive scare/harassment program     (visual deterrents + dogs at four locations)	Less intensive scare/ harassment program with minimized rotation (visual deterrents + dogs at two locations and less often than alternative B)	No scare/harassment program	Same as alternative B
Reproductive Control	Continue yearly egg oiling program	<ul> <li>Increase egg oiling program if population increases after initial reduction</li> <li>Also complete egg addling and egg replacement, if population increases after initial reduction</li> <li>Apply goose hatch material if population increases &gt;20 percent in one year</li> <li>Implement scare tactics prior to nesting season</li> </ul>	<ul> <li>Increase egg oiling program after initial reduction</li> <li>Apply goose hatch materials annually</li> </ul>	Continue current egg oiling program	Same as alternative B
Cultural/Education	Continue park ranger education when     possible	<ul> <li>Install no feeding signage</li> <li>Park to enforce wildlife CFR</li> <li>Park prepare and distribute brochure on goose management</li> </ul>	Same as alternative B	Same as alternative B	Same as alternative B

#### TABLE 2: SUMMARY OF GOOSE MANAGEMENT TECHNIQUES FOR EACH ALTERNATIVE

Bold items are techniques that the park would commit to being implemented, other techniques would be implemented on an as needed basis to achieve wetland and goose desired conditions.

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Project-specific NEPA analysis, when required, would focus on issues, alternatives, and environmental effects unique to the project area, if not already discussed in this plan/EIS and subsequent ROD, and may be categorically excluded or documented in either an EA or an EIS. depending on the significance of the effects. Table 1 documents the management techniques which if implemented would require further NEPA documentation.

Once an alternative is chosen, the NPS would not necessarily be required to implement each of the techniques presented; techniques would be implemented on an "as needed" basis.



Kingman Marsh

The type, number, and intensity of wetland management techniques and goose management techniques within each of the elements differ by alternative. Alternative A, the no action alternative, includes management techniques that are currently occurring as part of current management. Alternatives B through E offer combinations of high and low intensity techniques for wetland and goose management. These alternatives are discussed in more detail in the paragraphs that follow. A summary of alternatives for wetland management can be found in table 1 and a summary of alternatives for resident Canada goose management can be found in table 2. It is important to note that this plan/EIS attempts to present the entire suite of possible techniques for wetland management and for goose management regardless of constraints such as costs and feasibility. Many of these techniques are not mutually exclusive, some of these techniques overlap, and many should be considered in conjunction

with other measures to be most successful. During development, the intent was to choose general techniques that would include the different environments along the Anacostia River but could be applied within any location of the park. This plan/EIS provides the detailed techniques for wetland management and goose management that can be applied, in most cases, in combination with other techniques to meet the goals and objectives of this plan/EIS for the park. Once an alternative is chosen, the NPS would not necessarily be required to implement each of the techniques presented; techniques listed under each alternative would be implemented on an "as needed" basis. This document is a general plan for the management of wetlands and resident Canada geese within the park and evaluates the potential impacts at the programmatic level. Therefore, additional NEPA analysis may be required for some future management projects prior to construction or implementation of these projects. Future NEPA documents would be required for projects that involve management techniques such as day lighting, seawall breaks, and creating tidal guts. Additional NEPA compliance would also be necessary to remove the sheet piling along the Fringe Wetlands. These projects would therefore "tier off of" or reference this plan/EIS.

#### **RANGE/OVERVIEW OF ALTERNATIVES**

Alternative A is the no action alternative. The no action alternative is defined in the NEPA guidelines as "no change" from current management and current conditions. In the impact analysis of no action, the EIS assumes current management would continue as it is now over the lifetime of the plan. The no action alternative is also referred to in an EIS as the baseline, and the impacts of each action alternative are analyzed against those of the baseline for comparative purposes.

Alternative B provides the highest level of wetlands and goose management. This alternative combines the most aggressive wetlands management techniques with intensive goose management (lethal control combined with other non-lethal techniques). Alternative B also considers new wetland restoration options.

Alternative C includes moderate wetlands management with moderate goose management. This alternative combines the second most aggressive wetlands management options with a moderate level of lethal and non-lethal goose management techniques. This alternative assumes that more intensive wetland management would be needed to counteract the resident goose population that would remain in the area.

Alternative D includes a plan for low wetlands management and low goose management. Alternative D combines less aggressive wetlands management options with lethal goose management one time during the plan/EIS and only as a last resort. This alternative offers the lowest cost and management effort for both wetlands and resident geese of all the management alternatives.

Alternative E combines the most aggressive wetlands management techniques with intensive non-lethal goose management techniques (no lethal controls). This alternative considers new wetland restoration options as well.

The following sections describe in detail how these alternatives were developed.

#### **REVIEW OF EXISTING DATA AND APPLICATION OF RESEARCH**

An interdisciplinary planning team of NPS staff was organized to develop a set of alternatives to meet the purpose and need of this plan/EIS. The interdisciplinary planning team was composed of NPS management personnel from a wide range of disciplines with expertise in natural resources and park management. The team also included contractors experienced in NEPA and wetlands management. The team collected information necessary to assist in the development of the alternatives and to complete the environmental analysis for the plan/EIS. The information included a literature review, which focused on wetlands management and restoration, resident Canada geese herbivory, erosion and sedimentation, hydrologic regimes, and invasive and non-native plant species. The team also collected baseline information on wetland elevations, performed an analysis on the hydrologic conditions in the park as well as a wetland functional analysis. The development of alternatives was initiated upon completion of the data research and analysis. The interdisciplinary planning team identified a group of individuals to form a science team as described in chapter 1 "Desired Conditions." Two science team meetings were held during the alternatives development process in September and October of 2008. Results of the discussions with the science team on wetlands and goose management were incorporated into the alternatives.

After considering the data that were collected, the park held an alternatives development meeting in May 2008 to document the range of actions the park could potentially take to manage wetlands and geese in the park. Following that meeting, the park released to the public a summary of the draft alternatives in a brochure to solicit comments from the public on the draft alternatives. After considering all comments received on the draft alternatives, the park revised and finalized the alternatives. In summary, a literature review, hydrologic and wetland functional analysis, public comments, and results from a science team

contributed to the development of the range of alternatives for this wetlands management plan and resident Canada goose management strategies at Anacostia Park.

#### **ADAPTIVE MANAGEMENT**

Adaptive management is an important and effective way to insert variability and flexibility in wetland management and goose management. The alternatives evaluated in this EIS rely on the use of adaptive management to guide the implementation of the preferred alternative. The preferred alternative consists of a series of techniques, available for use by the park to manage wetlands and resident Canada geese within the park.

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Adaptive management is briefly defined as a type of natural resource

management in which decisions are made as part of an ongoing science-based process. Adaptive management involves monitoring, evaluating the effectiveness of applied strategies and incorporating new knowledge and learning into management approaches that are based on scientific findings and the needs of society. This iterative approach uses results to modify management strategies, techniques, and elements (if necessary) due to the uncertainty of ecological responses to management actions. The purpose of adaptive management is not only to facilitate meeting the desired conditions described in this plan/EIS, but also to balance the greater environmental and socioeconomic goals of the Anacostia River.

For this plan, vegetation monitoring will be conducted annually to evaluate the effectiveness of applied strategies. NPS will collect data in accordance with a vegetation monitoring plan developed by U.S. Geological Survey (USGS) for Anacostia (appendix C). The monitoring will document the status of and changes to wetlands vegetation at Anacostia.

Thresholds are used to determine when a resource condition warrants taking action. For this plan, thresholds have been established in a separate report, *Threshold for Taking Action* (NPS 2009b). This document provides detailed information on the science behind thresholds established for vegetation and geese. For this plan/EIS, the vegetation threshold for taking action is when there is a (statistically) significant difference in the amount of plant cover between the open and exclosed plots (NPS 2009b). The threshold for geese population numbers refers to an appropriate number of resident, non-migratory Canada geese that would allow for natural wetland restoration called the goose population goal. This number would be used as a goal under any of the action alternatives. As stated previously in chapter 1, the resident Canada goose population goal of 54 has been established for Anacostia Park. The interdisciplinary team determined, after analyzing information from the Science Team, that the park would use 54 geese as the initial resident Canada goose population goal and that this goal may be adjusted to meet management goals based on the results of vegetation and goose population monitoring (NPS 2009b).

Should the evaluation of monitoring data compared with the thresholds indicate the need for action, NPS will select a management option from those available within the preferred alternative that best responds to the conditions documented by monitoring. For example, if monitoring indicates excessive predation by geese, NPS may elect to implement a goose management strategy. Actions taken as part of adaptive management will be limited to those strategies evaluated as part of the preferred alternative.

# ALTERNATIVE A: (NO ACTION) EXISTING MANAGEMENT

NEPA regulations (40 CFR 1502.14) define the no action alternative as "no change from current management direction or level of management intensity." Therefore, under the no action alternative, there would be no change in the way wetlands and the resident Canada goose populations are managed at the park. Current wetland and goose management at the park includes the following:

- Invasive species management
- Trash management
- Public education
- Goose egg oiling
- Goose population monitoring
- Goose exclusion fencing
- Wetland vegetation planting.

Under the No Action Alternative, there would be no change in the way wetlands and the resident Canada goose populations are managed at the park.

Invasive Species Management—The National Capital Region Exotic Plant Management Team (NCR-EPMT) is responsible for managing exotic pest plants in 14 parks covering nearly 72,000 acres of diverse habitats within the National Capital Region parks (NPS 2006b). The NCR-EPMT inventories and maps exotic vegetation and develops strategies for controlling these plants in D.C., Maryland, Virginia, and West Virginia. Since 2002, the NCR-EPMT began controlling exotic plant species within the wetland areas in Anacostia Park. Common reed (Phragmites australis) and purple loosestrife (Lythrum salicaria) are two target exotic species present in both tidal and non-tidal wetlands in the park. In the five years following the first Anacostia tidal wetland project in 1992 and 1993 (Kenilworth Marsh), the park tried various approaches to dealing with the invasion of exotic plants. Primarily dealing with purple loosestrife, park resource management staff performed manual removal of the plants. Park staff tested "spot spraying" of invasives as well, using glyphosate. Park resource management staff also worked with USGS biologists with performing stump treatments of purple loosestrife, also using glyphosate. These efforts were all within the initial five-year monitoring at Kenilworth Marsh. Shortly after the initial purple loosestrife removal, the NCR-EPMT became involved in the program and started removing common reed at Kenilworth Marsh. The NCR-EPMT spends several days a year treating the wetland areas for invasive species, primarily around the Kenilworth Aquatic Gardens. The NCR-EPMT typically treats common reed, purple loosestrife, and bamboo species (Phyllostachys aurea) with the herbicide rodeo. There was an attempt to use biocontrol, which included introducing a beetle that preys on purple loosestrife; however, it was found to be ineffective. The group has prevented the introduction of new species through partnerships with other organizations in the District. Over the years, park staff has also performed invasive plant management using mechanical means as well as herbicide applications (NPS 2006b).

**Trash Management and Public Education**—Other efforts to help maintain the wetlands at Anacostia Park include trash management and educating the public. Floating trash is a problem throughout the highly urbanized watershed and along the Anacostia River and tributaries. Currently, the USACE skims the river and removes large items that are boating hazards. The District Water and Sewer Authority (DCWASA) operates a trash skimmer on the river, which removes all floating objects. Park staff organizes volunteer programs that remove trash throughout the park. Additionally, to help prevent trash from entering the wetland areas and the river, trash traps have been installed at the ends of some stormwater outfall pipes. In the winter of 2009, the park issued a permit to the District Department of the Environment (DOE) to demonstrate two systems of trash traps on two Anacostia Park tributaries (Watts Branch and Nash Run). The District DOE issued grants to the Earth Conservation Corps and Anacostia Watershed Society (AWS), respectively, for operating the systems, which includes maintaining, collecting, and characterizing the trash collected. The park staff educates the public on the importance of wetlands through park programs including ranger led walks, the Urban Tree House Program, and the Bridging the Watershed Program.

**Goose Egg Oiling**—In June 2010, the mean resident Canada goose population at Anacostia Park was estimated to be 564 birds (Bates 2010a). Since 2004, the park has used egg oiling and fencing as the primary goose management strategies. Egg oiling is a form of egg destruction that stops the development of the egg by coating the egg's outer surface with corn oil, which effectively discontinues the growth process occurring in the inner egg. Egg oiling has been performed according to a protocol specified by the Humane Society and under permit by the USFWS (HSUS 2004a). There have been a number of partners involved in this management activity, including the District, USGS Patuxent Wildlife Research Center, the Prince George's Maryland -National Capital Park and Planning Commission (M-NCPPC), and the AWS. All the groups, including the NPS, were trained by Wildlife Services branch of the USDA, and all groups are included under the USFWS permit. The Wildlife Services program of the USDA responds to requests by the public and agencies in need of help in dealing with wildlife damage. Egg oiling occurs during the April nesting season along the tidal Anacostia River corridor from Bladensburg to Poplar Point (figure 2). The geese nests are located and marked with a numbered flag. The number of eggs in the nest is recorded and the eggs are marked and coated entirely with corn oil by rubbing oil into the egg (AWS 2006). Experience has shown that this must be completed every time the nest is visited, ideally once a week (personal communication Milton 2009). Any new, unmarked eggs are oiled at the next nest visit so no eggs reach maturity. If staff and volunteers are available, the park visits each nest on a weekly basis.

**Goose Population Monitoring**—The AWS and NPS organize resident Canada goose counts in Anacostia Park and recruits volunteers to help in the effort. Goose count methodologies were developed in consultation with the regional wildlife biologist at USGS Patuxent Wildlife Research Center. The Anacostia River between Bladensburg and Poplar Point is divided into sectors and subsectors. Volunteers are assigned one or more subsectors, with the goal of counting all birds in this stretch of the river. Volunteers coordinate their watches and count the geese in their assigned sectors at a designated time for a period of five minutes. Counts have been conducted quarterly each year since 2004. The mean goose count for July (resident goose population) from 2004 to 2008 is 676 geese (NPS 2009a). Counts ranged from 521 geese to 783 geese (NPS 2009a). To improve the accuracy of the population estimate, the goose counting is done over more days to reduce the coefficient of variation in the population. In July 2009, the goose counts were conducted for nine days spanning three weeks during the flightless period instead of one day per quarter. The mean for 2009 was 492 geese within these nine days with a coefficient of variation of 60 percent (NPS 2009a). The mean for 2010 was 564 geese with a coefficient of variation of 17 percent (Bates 2010a). The 2010 mean of 564 resident Canada geese within Anacostia Park is the current number used in this plan/EIS for all sections that follow.

**Goose Fencing**—In order to keep the goose population from entering the restored wetland areas, the AWS has placed circular goose exclusion fencing in various locations throughout the park including:

- Kenilworth Marsh
- Kingman Marsh adjacent to Langston Golf Course
- Kingman Marsh adjacent to the RFK shoreline
- Anacostia River off of River Terrace.

In addition to the circular exclusion fences, the wetlands within Kingman Marsh adjacent to RFK Stadium are protected by a goose exclusion perimeter fence as well as stringing between the posts of the fencing to create internal and overhead barriers to keep the resident Canada geese from entering the wetland and grazing on the plant material. Currently, monitoring, maintenance, and repair of the goose exclusion fence throughout the park are contingent on the availability of AWS, park staff, volunteers, funding, and need. Currently, AWS partners with the park when they share common goals in the watershed; however, they



in the watershed; however, they Photo showing goose exclusion fencing. Anacostia Watershed Society Photo. are not doing any long-term management.

**Wetland Vegetation Planting**—The NPS has removed the most palatable plants to geese from their planting palette in restoration areas subject to aggressive goose herbivory (appendix D). Project partners have transplanted vegetation within selected areas of the restored wetlands destroyed by the resident Canada geese. Volunteers, officials from the partner agencies, and NPS staff have spent hundreds of hours working on goose management related activities as described above. Under current management, vegetation is planted when time and staffing are available.

Under all alternatives (including the no action alternative), the NPS would remove the sheet piling along the River Fringe wetlands. This action would require additional NEPA compliance and is discussed in more detail in the section below titled "Management Techniques Common to All Alternatives."

#### **IMPLEMENTATION COSTS**

Actions associated with alternative A would primarily include invasive species management, egg oiling, resident Canada goose population monitoring, and fence monitoring/maintenance/repair. The majority of these actions is currently undertaken by volunteers or is covered in existing labor costs as shown in the table below.

Action	Assumptions	Annual Cost	Cost for the 15-year Planning Period
Invasive Species Management	NCR-EPMT will continue to treat areas as applicable at no cost to the park	\$0	\$0
Egg oiling	District, USGS Patuxent Wildlife Research Center, M-NCPPC, and the AWS mat continue to oil eggs at the park but is contingent upon volunteers, funding, and materials		\$450,000*
Population Monitoring	AWS and NPS organize resident Canada goose counts in Anacostia Park and recruits volunteers but is contingent upon volunteers	\$30,000	
Fence monitoring, maintenance, and repair	Contingent on the availability of AWS, NPS staff, volunteers, funding, and need		
	\$450,000*		

#### Alternative A Cost Estimate

\*This cost is contingent upon the availability of volunteers, funding, and materials similar to current conditions.

# ELEMENTS INCLUDED WITHIN THE MANAGEMENT ALTERNATIVES

The management alternatives include elements for both wetland management and resident Canada goose management. Five separate elements are considered for the five wetland management alternatives, which include hydrology, vegetation, wetland restoration, cultural/educational, and park operation and management. Hydrology refers to those actions that could restore the natural hydrology of the ecosystem in order to enhance the wetland areas throughout the park. Vegetation refers to the management of the wetland vegetation by removing the existing sheet piling along the fringe wetlands, managing invasive species, seedbank regeneration, installing shoreline buffers, and planting native species. Restoration refers to re-establishing the habitats and functions of a former wetland. Cultural/educational includes education and interpretation related to wetland management efforts. Park operations and management refers to efforts associated with park staff, particularly the maintenance staff, which could improve wetland function at the park.

Resident Canada goose management considers five separate elements for the five management alternatives. The five elements for resident Canada goose management are lethal control, habitat modification, scare and harassment, reproductive control, and cultural/educational. Lethal control (killing of individual animals) includes the lethal reduction methods used to bring the resident Canada goose population to a target goal. Habitat modification includes management techniques that could alter goose habitat, goose surroundings, and modifications to food and water availability. Scare and harassment techniques include visual and or auditory deterrents that are designed to frighten geese away from problem areas. Reproductive control includes techniques that could affect nesting and the ability of geese to reproduce successfully. Cultural/educational includes education and interpretation related to goose management efforts.

Within each wetland or goose element, specific management techniques may be used at varying intensities for each alternative. Specific management techniques are discussed for each alternative below. These techniques are not mutually exclusive and should be considered in conjunction with other measures to be most successful. Each alternative presents a suite of options at varying intensities that would be available to the park for the management of wetlands and geese. Determining which options to use would be accomplished through monitoring and adaptive management.

# MANAGEMENT TECHNIQUES COMMON TO ALL ALTERNATIVES (A THROUGH E)

One of the management techniques presented in this plan/EIS would be the same across all the alternatives (alternatives A, B, C, D, and E). Under all alternatives, the NPS would remove the sheet piling along the River Fringe wetlands. In 2003, the USACE created the River Fringe wetlands along the east bank of the river near Kingman Marsh, between East Capitol Street and the Benning Road bridges. The area was a depositional zone adjacent to the main channel of the river (NPS 2008b). The Fringe Wetland was constructed first by driving sheet piling into the bed of the river and then back-filling on the shore-ward side of the piling with dredged river alluvium than planting the area (NPS 2008b). As part of the original project, the sheet piling was to be removed once the wetland was established, but this removal never occurred. After the piling is removed, the Fringe Wetland would be subjected to normal river processes (NPS 2008b). If it appears that its removal is resulting in increased feeding on the wetland vegetation by the geese, the NPS could install single or double-stacked coir fiber logs in this area. The NEPA process for this project was initiated but not completed. Therefore, additional NEPA compliance would be necessary to remove the sheet piling along the Fringe wetlands.

# MANAGEMENT TECHNIQUES COMMON TO ALL ACTION ALTERNATIVES (B THROUGH E)

Some of the management techniques presented in this plan/EIS would be the same across the management alternatives (alternatives B, C, D, and E). For wetland management, some techniques under the hydrology, vegetation, and park operations and management would be the same. For goose management, some techniques under habitat modification, and cultural/education would be the same. Specific wetland and goose management techniques that are common to all action alternatives are discussed in more detail below; elements that differ in levels of implementation (i.e., passive versus mechanical seedbank regeneration) are discussed by each individual alternative in the sections that follow.

## WETLAND MANAGEMENT TECHNIQUES

**Hydrology**—Hydrology techniques that are common to all action alternatives include addressing upland runoff. Wetlands have an important role in controlling runoff. As runoff water from the surrounding city landscape enters the wetlands, it brings in many chemical and nutrient contaminants and sediment, often at high volumes and velocities. As runoff flows pass through the wetlands, excess nutrients and some pollutants are retained, flows are slowed sown, and the sediment can be reduced. If left unchecked, these pollutants could clog waterways and affect fish and wildlife within the Anacostia River. Too much runoff can cause wetland erosion. To prevent wetlands. A rill is a narrow and shallow incision in the soil resulting from erosion by overland flow. These shallow incisions could be filled and stabilized with seed and matting, which would result in the upland runoff entering the wetlands through sheet flow rather than erosive concentrated flows. During the June 2009 site visit, no rills were identified; however, they may occur in the future.

**Vegetation**—The vegetation technique that is common to all action alternatives includes removing the sheet piling along the River Fringe wetlands as previously described above in the "Common to All Alternatives" section. Under all alternatives, the NPS would remove the sheet piling along the River Fringe wetlands Additional NEPA compliance would be necessary to remove the sheet piling along the River Fringe Wetlands.

**Park Operations and Management**—Park operations and management techniques that are common to all action alternatives include installing new rain gardens or biocells that are created or naturally forming in low areas. Under all action alternatives, the NPS would install new rain gardens. Rain gardens are planted depressions that function as miniature wetlands. Wildflowers or other native vegetation are typically planted in these areas. The rain garden provides a place for stormwater to infiltrate, allowing approximately 30 percent more water to soak into the ground. Following a heavy rain, stormwater will pond in the rain garden and be filtered by the plants and soil rather than running off into the storm drain. Rain gardens would be constructed and designed according to local guidelines. The installation of rain gardens would also help reduce the amount of impervious area in the park. Potential areas for rain gardens or biocells include the Kenilworth-Parkside Recreation Center, Kenilworth Aquatic Gardens parking lot, Langston Golf Course parking areas, parking lots surrounding the Anacostia Park Pavilion, and parking areas north and south of Pennsylvania Avenue. Creating rain gardens would require additional NEPA compliance.

### **RESIDENT CANADA GOOSE MANAGEMENT**

**Population Monitoring**—For all action alternatives regardless of the type and intensity of control proposed under each management alternative, the goose population would be monitored for approximately 15 years to determine post removal success. Population monitoring of resident Canada geese would take place during May and June after migratory flocks have left the park and during the birds' flightless period. The bird counts would include those geese within the park and geese in the vicinity of the park because they could potentially move inside park boundaries. In addition, a yet to be determined percentage of the geese could be captured following similar techniques to those described below under lethal controls (alternative B), marked with collars or other means (e.g. bird banding, radio transmitters), released within the park, and monitored regularly to track local movements. It has been suggested that resident Canada geese generally stay within a 5 to 10 mile radius and during breeding season stay within a 0.25 to 0.5 mile radius (NPS 2010a; Seamans et al. 2009).

Habitat Modification—Habitat modification techniques that are common to all action alternatives include installing and maintain goose exclusion fencing. This technique would be implemented on an as needed basis. Fences prevent geese from walking within wetland areas and grazing on the wetland plants, and prevent or discourage some birds from flying into wetland areas. Fencing materials may include woven wire, chicken wire, plastic snow fencing, construction-site silt fencing, corn cribbing, chain link fencing, netting, mylar tape, monofilament lines, stainless-steel wire, and picket fencing. If implemented, fences could be at least 30 inches tall and long enough to discourage geese from walking around the edges. The openings in the fence materials would be no larger than 3 inches. Some fencing could be installed on top of the wetland areas to prevent the geese from flying into these areas. Fences could be elevated 10-15 centimeters from the wetland substrate to allow other marsh animals and fish passage, while still preventing geese from walking into wetland areas. The fencing could be installed in early spring when non-persistent plants are beginning to emerge. During the spring, geese feed on young and actively growing portions of plants continuously during daytime hours. Spring nesting activities are timed so that the hatching of goslings occurs concurrently with the most vigorous growth of spring vegetation (USFWS 2005). The fencing could be regularly maintained; approximately two times per year throughout the life of the plan.

Under all the management alternatives, any new plantings proposed would be species that are less desirable by Canada geese. Very few species are listed as being not palatable or lightly grazed by geese and other waterfowl. Appendix D includes species that may be planted within the wetland areas at Anacostia Park. In low marsh zones, yellow pond lily (*Nuphar advena*) may be planted with relatively good success. In mid-marsh zones, arrow arum (*Peltandra virginica*) and soft-stem bulrush (*Schoenoplectus tabermontanae*) have been shown to be successful; arrow arum is one of the few wetland

species listed as having foliage and rootstock not palatable to geese. In the high marsh zone, soft rush (*Juncus effusus*), broad-leaved cattail (*Typha latifolia*), rice cutgrass (*Leersia oryzoides*), water purslane (*Ludwigia palustris*), and swamp milkweed (*Asclepias incarnata*), along with several obligate woody shrub species have been successful. Species to avoid during initial plantings unless intensive protection techniques, such as goose exclusion fencing, are installed and regularly maintained, due to the high preference for feeding by geese include pickerelweed (*Pontedaria cordata*), yellow nutsedge (*Cyperus esculentus*), duck potato (*Sagittaria spp.*), common three-square (*Schoenoplectus pungens*), bur-reed (*Sparganium spp.*), spike rush (*Eleocharis spp.*), and wild rice (Hammerschlag et al. 2001 and Thunhorst 1993). These species may be planted in the future, or may come in naturally when goose herbivory is no longer a problem at Anacostia Park.

Cultural/Education—Under all action alternatives, cultural/education techniques that are common to all action alternatives include installing and maintaining signage to discourage park visitors from feeding geese and other wildlife, enforcing the wildlife CFR, and preparing and distributing a brochure on goose management including lethal control, if used. These techniques would be implemented on an as needed basis. Title 36 CFR 2.2 (a)(2) states that the feeding, touching, teasing, frightening, or intentional disturbing of wildlife nesting, breeding, or other activities is prohibited within NPS properties. Feeding waterfowl is a major cause of high urban bird populations (Smith et al. 1999). Resident Canada geese are grazers and therefore do not need handouts to supplement their diets. Feeding waterfowl encourages geese to congregate in areas and can make geese more aggressive toward people. Park visitors caught feeding waterfowl on park property could be approached by park staff and educated on the impact of the feeding and could be issued warnings or citations by the U.S. Park Police. The CUE Research Learning Alliance produces information for parks related to science and may support Anacostia in the development of materials for interpretation and education. CUE may assist park staff in preparing a technical brochure for the public that describes goose management techniques. An understanding of goose biology and behavior can help foster a greater tolerance and willingness to work through the goose management issues.

# ALTERNATIVE B: HIGH LEVEL OF WETLAND MANAGEMENT AND HIGH LEVEL OF GOOSE MANAGEMENT

Alternative B combines the most aggressive wetlands management techniques with intensive goose management techniques (lethal control combined with other techniques). This alternative considers new wetland restoration options as well. Under this alternative, the park would use lethal control to manage the resident Canada goose population as described below. Additionally, the park may choose from a number of other non-lethal techniques to manage the population as described below.

## WETLAND MANAGEMENT TECHNIQUES

**Hydrology**—The overall goal of the hydrology element is to reduce the direct water contact with the banks and slope faces that negatively impact the functionality of the wetlands. Alternative B includes management techniques such as erosion control, shoreline protection, sediment stabilization, and restoration of tidal guts.

Shoreline erosion could be controlled by using techniques that would dissipate erosive forces associated with waves, currents, ice, rainfall/runoff, obstacles in the water, water level fluctuations, and groundwater flow. The primary focus of the shoreline erosion efforts would be on areas of the marsh at low elevations

Alternative B combines the most aggressive wetlands management techniques with intensive goose management techniques (lethal control combined with other techniques). and near the surface where vegetation/mud flat and water interface. The secondary focus would be on the higher wetland/upland interface in areas where the slopes may be failing. Techniques used for erosion control could include the installation of soft armoring, flow deflectors, and bog mats; reducing the steepness of the wetland shoreline; and increased protection in areas with the greatest wave action. Techniques to reduce erosion through managing the amount of stormwater flow into tributaries and the Anacostia River are discussed in "Park Management and Operations."

Soft armoring, such as coir fiber logs, straw bales, or brush bundles, could be placed within the restored wetland areas, including the restored wetlands within Kenilworth Marsh, Kingman Marsh, the fringe wetlands, and any new wetland restoration areas. Coir fiber logs are structures made from natural coconut fiber and are covered by strong coir netting that is typically used to stabilize banks from erosion. If implemented, the coir fiber logs would be staked along the open water/wetland interface so that about half of the log is submerged. The logs would be installed within the mean low water line with small breaks so that fish could pass through, the mean high water line, and the mean tide line. Plants would be installed in an alternating, random planting pattern rather than in a straight row into the top of the log. Plant species would need to be appropriate for the elevations and hydrologic regime in which they are planted and should include species that are less palatable to geese until the population is at a sustainable level. Once the goose population is sustainable, additional plant species may be introduced within the coir fiber logs and the wetlands behind them, including species that may be favored by geese but that have a historic presence within the Anacostia River. Coir fiber logs could be installed in multiple locations in the restored wetlands as identified on figures 5 and 6.

Natural or man-made flow deflectors could be installed along the upstream and possibly the downstream edges of the restored wetlands in high velocity areas to redirect the erosive velocities back to the main river channel and encourage sediment build-up in non-vegetated mud flats, such as the wetland cells constructed in Kingman Marsh. Natural flow deflectors may include log vanes, straw bales, or brush bundles; man-made flow deflectors may include boulder/large rock vanes, or rip rap. The flow deflectors should not be placed in a manner that would result in erosion of wetlands or shoreline on the opposite bank. The natural flow deflectors may eventually degrade naturally; however, the wetland soils should be fully stabilized with plant materials/root mat before degradation occurs. Potential areas for natural flow deflectors may include wetland areas in the northern section of Kenilworth Marsh and the fringe wetlands located in the central region of Anacostia River (figures 5 and 6).

Hydraulic modeling may be necessary, and permit(s) would be required to install the flow deflectors and soft armoring that encroaches into wetlands or waters of the U.S. These approaches would most likely require Nationwide Permit #27: *Aquatic Habitat Restoration, Establishment, and Enhancement Activities* through the USACE for compliance with section 404 of the *Clean Water Act*. However, some larger projects would require an individual permit through the USACE, based upon the acreage and/or linear feet of the project impacts. All projects undertaken within the District must meet the water quality standards set forth in Title 21, Chapter 11 of the *District of Columbia Municipal Regulations*. To verify that these standards are met, the District DOE Water Quality Division must review projects prior to permit issuance when the waters of the District are impacted.

Shoreline protection at the open water/wetland interface would be greatest in those areas that receive the most wave action and erosion. Pre-seeded bog mats with root-mat-forming plant species could be installed along the wetland shoreline. A bog mat is a woven blanket of coconut fibers that are pre-seeded with a variety of wetland margin plants such as arrowhead, cattails, and rushes. These mats are simply rolled across the wetland substrate and backfilled with pea gravel or staked to hold the mat in place. Typically, it takes one full growing season for the plants to establish through the mat and into the underlying sediments. Potential locations for pre-seeded bog mats may include the previously restored

wetland areas in Kenilworth Marsh, the wetland area on the East Bank of the Anacostia River near Kenilworth Marsh, and wetland areas within Kingman Marsh (figures 5 and 6).

In addition to installing fiber logs, flow deflectors, and bog mats, the steepness of the landward banks of the wetlands could be reduced in order to reduce the energy and shear stress on the banks. The steep banks would be graded back or filled to create 3:1 slopes or lower and the area would be planted with species provided in appendix D to reduce the high erosion along the shoreline. Filling of these areas to lessen the slopes would likely require additional permitting if it encroached into the river, wetlands, or the wetland buffer. Also, due to the grading and filling of the land, some erosion control techniques such as shoreline steepness reduction will require additional NEPA compliance. At this time, no steep slopes have been identified; however, due to the erosive forces of the river, potential problem areas may occur in the future and would be determined on an as needed basis.



Photo of a beaver dam obstructing water flow in Kenilworth Marsh

In some areas of the park. structures or obstacles within the wetlands or river cause erosion of the shoreline or wetland. These structures may include shoreline protection features such as groins. revetments. breakwaters, or bulkheads; and natural obstacles including fallen trees, debris, beaver dams, and ice during the winter months. Although revetments, groins, breakwaters, and bulkheads typically protect an area from erosion, they may damage or increase erosion downstream by

redirecting flows to other unstable areas and blocking the transport of sediments along the shoreline. In some instances, natural obstacles such as fallen trees, debris, and ice may be easily removed from the area. Beaver dams may only be removed if their presence is causing an issue. Construction equipment may be needed to remove larger structures such as revetments, bulkheads, and boat docks. Some structures may require further hydraulic evaluation to assess their actual impact on the shoreline and modifications to structures such as bridge piers and operational boat docks, and dams would need to be coordinated with the owners of these structures. In these instances, any structural modifications would require engineering designs that are protective of the shoreline or wetlands.