**FIGURE 5: ALTERNATIVE B - LOCATIONS OF WETLAND AND GOOSE MANAGEMENT TECHNIQUES, NORTH AREA**

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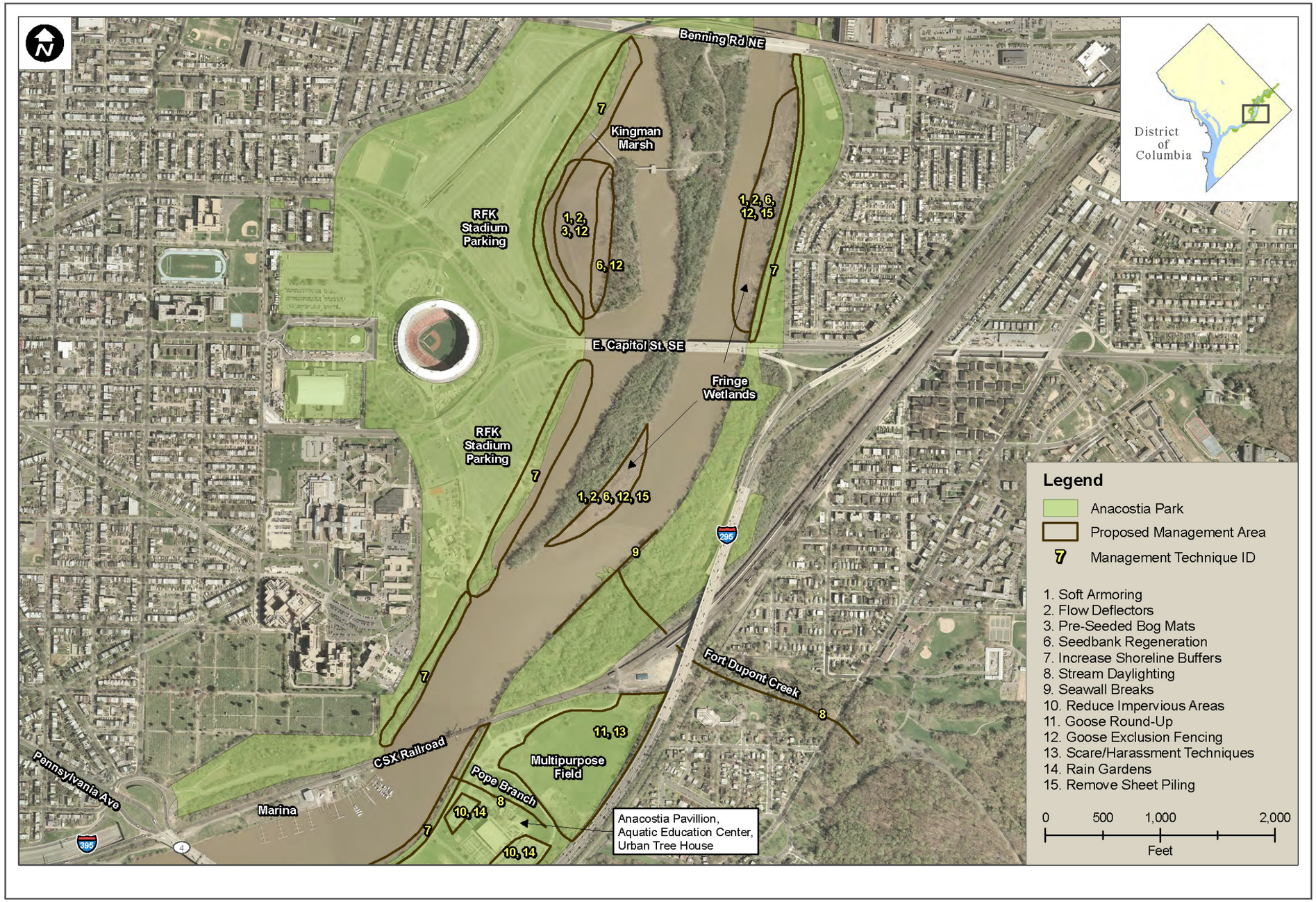


**FIGURE 6: ALTERNATIVE B - LOCATIONS OF WETLAND AND GOOSE MANAGEMENT TECHNIQUES, CENTRAL AREA**

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The park would need to identify and focus on areas that create eddy currents that impact the wetland or banks stability. In addition, modifying and removing structures and obstacles, park personnel and volunteers could remove items, such as woody debris, which clogs the openings of the marshes and negatively impacts hydrology. During a site visit in June 2009, beaver dams located in Kenilworth Marsh were identified as obstructing water flow in and out of wetland areas.

In order to help restore the Anacostia to a more natural condition, the NPS could maintain existing tidal guts and create new tidal guts where appropriate. Many of the tidally influenced wetlands within the park are not receiving regular daily tidal flushing and remain relatively dry except during spring or maximum high tides or following large storm events when large amounts of fresh water from upstream portions of the watershed flood the lower Anacostia River. Tidal guts could be created within these dryer areas of the wetlands by excavating portions of the marsh by dredging. Dredging operations may occur within the marsh in order to connect the wetland with other wetter areas of the wetlands of the Anacostia River. By creating tidal guts, these dry areas of the marshes would continually receive water that improves the hydrology and functionality of the wetlands, and may reduce some of the invasive species that have become established in the high parts of these marshes. Native wetland plants could be installed in these areas. If implemented, dredging would be a onetime operation as no maintenance dredging would be required in future years. The exact location of where the tidal guts should be created and the sizing of the tidal guts will need to be determined based on bathymetric and vegetative surveys and hydraulic modeling information for the created marshes. Potential locations could include two areas within Kenilworth Marsh (figure 5). Additional NEPA compliance would be required for the creation of tidal guts.

Shoreline erosion can be caused by wind driven waves and by wakes from passing boats or by flash, or surge, flows from stormwater runoff. When the banks are continuously hit by wave action, the bank and beaches become undercut, which leads to bank slumping and the removal, transport, and deposition of the bank sediments along the shoreline (MDE 2006). The District's Metropolitan Police Department has designated the Anacostia River as a no wake zone, within the city limits. The Maryland Department of Natural Resources (DNR) has designated the no wake zone in the Maryland reach of the river. To help manage the size of the wakes from boats, the NPS would encourage the District Harbormaster to enforce the no wake zone in the areas where the wetland edge may be affected. These areas would include the river fringe marshes, Kingman Marsh, RFK shoreline, Kenilworth Marsh, and areas adjacent to the Kenilworth Aquatic Gardens.

Tidal wetlands along the Anacostia River have water level changes of approximately 3 feet twice daily. On occasion the tidal wetlands may have an extreme water level change greater than 3 feet that may affect vegetation establishment. Extreme water level changes may be a result of an increase or decrease in precipitation, snowmelt, groundwater inflow, surface runoff entering the wetland, clogging or erosion of an outfall of the wetland, beaver or muskrat activity, lack of a sufficient hydrologic source during the growing season, or evaporation. Under alternative B, NPS could monitor the non-tidal wetlands within the park to determine if the establishment of wetland vegetation is being impacted by extreme water level changes and could propose remedial actions to address the particular cause(s) of the problems.

Surface elevations that help to determine the frequency and duration of inundation within a tidal wetland, based on tidal cycles, control the vegetation community and resultant habitat within a wetland. Wetland plants installed in restored tidal wetlands are designed to be placed in planting zones based on the hydrologic regime or specific flooding tolerance levels of the particular species selected for that zone. If the marsh surface elevation is too low or too high for a particular plant species, it would likely not survive within that planting area and other non-target or undesirable/invasive species may begin to dominate the planting zone or the area may become unvegetated mudflat. The establishment of vegetation within the mid and high marsh vegetation zones has been shown to be more successful than in the low marsh zones during monitoring of the restored wetlands (Hammerschlag et al. 2001). This may be in part due to the

ease of access that the resident Canada geese have for feeding on the vegetation in the low marsh zone. Where surface elevations are determined to be unsuitable for vegetative establishment within the restored wetlands, the NPS could consider altering wetland elevations on a case-by-case basis to achieve more mid to high marsh zones, improve vegetation establishment success, and to provide additional habitat. Potential locations for altering wetland surface elevations would include areas identified in Kenilworth Marsh on figure 5. Altering surface elevations would require additional NEPA compliance.

**Vegetation**—Alternative B would include managing invasive species and planting native species. Alternative B could include mechanical seedbank regeneration on an as needed basis. The NCR-EPMT currently treats exotic plant species within National Capital Parks - East as time and schedule allows (NPS 2006b). In the past several years, their treatment has gone towards controlling the Park's priority common reed, purple loosestrife, and bamboo at Kenilworth Aquatic Gardens. Treatment methods and strategies for these species have consisted of herbicide spraying with extended hoses from a land-based truck. As part of wetland management efforts at the park, the NPS would continue the treatment of these invasive species at a high level beyond the efforts of the NCR-EPMT if more money and staff are available.

There are currently existing seedbanks located throughout wetland areas within the park, including the restored wetlands. To make seedbank growth more successful, the park could use mechanical seedbank regeneration techniques as needed. Mechanical seedbank regeneration techniques could involve churning the soil with rakes or other hand held tools and removing unwanted vegetation in areas to allow the seeds to regenerate naturally. Potential areas for mechanical seedbank regeneration may include most of the wetland areas in Kenilworth Marsh, the east bank wetlands along the Anacostia River near Kenilworth Marsh, wetland areas in Kingman Marsh, and the fringe wetlands. These areas are shown on figures 5 and 6. Mechanical seedbank regeneration would require additional NEPA compliance because of surface and subsurface archeological resources.

The park would increase the number of plantings under this alternative throughout all the wetlands to maximize the percent basal area (a measure of tree density calculated from the diameter at breast height of all trees within a plot) cover. Plantings may include species with high root mass forming abilities, such as rhizomatous species, or species with strong root structure to increase the sediment-root matrix and overall wetland soil stability. Plant heights would be variable; the average plant height would be equal to or taller than the average high water level. The park would select persistent vegetative perennial species so that the plants would remain standing during both the growing and non-growing seasons. Plantings could be placed mostly in areas of the wetlands that receive longer hours of direct sunlight and less in areas that are shaded most of the day. Potential locations for the techniques mentioned above are shown on figures 5 through 7.

**FIGURE 7: ALTERNATIVE B - LOCATIONS OF WETLAND AND GOOSE MANAGEMENT TECHNIQUES, SOUTH AREA**

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**Restoration**—Under alternative B, wetland restoration techniques could be performed as needed in areas throughout the park including the Kenilworth Marsh, Kingman Marsh, RFK shoreline, river trail wetlands, and fringe wetlands (figures 5 through 7). To restore these former wetland areas, the park could consider areas for daylighting streams with natural channel design techniques including floodplain access for the restored channel. Daylighting is the act of removing streams from underground pipes and culverts and restoring some of the form and function of the historic stream. Daylighting opportunities in the future would attenuate flows in the restored wetlands along the lower portions of the tributaries. Stream daylighting would require additional NEPA compliance. Potential streams proposed for daylighting may include Pope Branch and Fort Dupont Creek. The area proposed for Pope Branch could include the land north of Pennsylvania Avenue near the recreational fields (figures 6 and 7). The area proposed for Fort Dupont Creek could include the land north of the CSX Railroad Bridge crossing (figure 6). If implemented, daylighting would provide new wetland areas that would provide new wetland functions such as water quality and habitat benefits, which would re-create, to some extent, what previously existed. Daylighting would also create additional tidal marshes at the mouth of a stream or river.

In addition to daylighting, the park could install as needed stream/stormwater outfall energy dissipation modifications, such as installing plunge pools or a series of step-pools at the end of any outfalls identified as requiring repair to remediate for erosive velocities. An inventory of these outfalls would need to be completed by the NPS in the future. This action would also require further NEPA compliance.

Another wetland restoration action could include installing seawall breaks as needed in the existing seawall in those areas adjacent to former wetlands. Seawall breaks have the potential of giving the river more access to its floodplain and reclaiming tidal connectivity, thus encouraging more wetland functionality behind the seawall. This would re-water former wetland areas such as those along the west bank of the Anacostia River near the District property line. Potential areas for seawall breaks are identified on figures 5 and 6. These areas include the west bank of the Anacostia River near Kenilworth Marsh and the east bank of the shoreline just north of the CSX Railroad Bridge crossing. Seawall breaks would require additional NEPA compliance.

**Cultural/Educational**—Under alternative B, wetland management techniques would include an increase in educating the public by adding additional boardwalks, interpretive trails, waysides, and exhibits throughout the wetland areas for this alternative. This action would include developing more printed materials on wetlands for park visitors to read at the visitor centers. Park staff would educate the public on the importance of wetlands in the environment through formal programs, dissemination of printed materials, and through impromptu interpretation by roving park staff and volunteers. Park rangers could educate children by visiting schools, teaching at the Urban Tree House, and participating in the Bridging the Watershed program. The park could also encourage the public to volunteer for planting new vegetation, maintaining fencing, and studying water quality in the wetlands. This would be achieved by coordinating with the District and other partner agencies to direct interested environmental organizations and other volunteers to direct their efforts toward wetland management actions. Similarly, wetland management activities could be linked with park ranger programs at the various park sites.

The addition of boardwalks and interpretive trails is a wetland management technique that would be an as needed action to maintain the cultural values of the park by reducing the urban influences on hydrology. New boardwalks and trails may be considered for some wetland areas to reduce the foot traffic. Potential locations for new boardwalks may include areas of the River Trail in Kenilworth Marsh that intercept a wetland. Additional NEPA compliance would be required for the construction of new trails and boardwalks.

**Park Management and Operations**—Under alternative B, management techniques would include the reduction of impervious areas, the installation of new rain gardens, and the implementation of trash management techniques. All of these techniques would be performed under alternative B. The District DOE is responsible for managing stormwater pollution in the District. DOE has recently changed the stormwater fee to be based upon how much impervious area or hard ground is located on the property. Reducing impervious areas throughout the park would enhance the park and improve water quality of the receiving wetlands and Anacostia River. Areas of impervious surfaces, such as roadways, parking lots, and sidewalks would be reconstructed to semi-pervious or pervious areas, where feasible. Impervious areas would be replaced with materials such as gravel, cobble, pervious pavers, wood chips, or grass. Reducing the amount of impervious area throughout the park would help increase rainwater infiltration and would help minimize erosion of the shorelines from stormwater runoff and would require additional NEPA compliance. Potential areas that have been identified for reducing impervious areas include the Kenilworth Parkside, Langston Golf Course parking lots, and parking lots surrounding the Anacostia Park Pavilion (figures 5 through 7). Any new development in the park would include innovative, environmentally sensitive designs that reduce imperviousness or increase perviousness.

Large amounts of trash along the river, open areas, and in the wetlands have been a problem for the park in the past years. Large amounts of unsightly trash fosters negative perceptions of the River, can clog infrastructure and streams, and can affect wetland habitat. Under alternative B, trash management would include placing trash traps at the stormwater inlets and outlets throughout the park, increasing the use of trash booms on the river, and increasing the volunteer opportunities to help clean up the park. In addition, more trashcans would be installed in heavily used areas and more frequent trash removal would be implemented.

## RESIDENT CANADA GOOSE MANAGEMENT

**Lethal Control**—Population objectives for resident Canada geese have been described by both the Atlantic Flyway Council (1999) and the USFWS Final EIS for Canada Geese (2005). Resident Canada geese are not only a nuisance within Anacostia Park but in all the Mid-Atlantic states as well as regionally in the Atlantic Flyway. Based upon resident Canada goose population estimates and population objectives by Flyway, the USFWS (2005, I-20) suggests a 54 percent reduction in the Atlantic Flyway. Additionally, the Atlantic Flyway Council recommended that a 60 percent reduction in resident Canada geese be undertaken to decrease the population, assuming a moderate recruitment (20 to 30 percent of the current adult population) of goslings and new adults (Atlantic Flyway Council 1999). The goose population goals suggested in this plan/EIS have been developed specifically for Anacostia Park. In general, population objectives for resident Canada geese are different by location, including state and region, as described by both the Atlantic Flyway Council (1999) and the USFWS Final EIS for Canada Geese (2005) because these documents considered much larger areas in their objectives. The interdisciplinary team determined, after analyzing information from the science team, that the park would use 54 resident Canada geese within the park be used as the initial goose population goal for Anacostia Park (NPS 2010c). Resource managers would use the initial goal of 54 resident Canada geese, although this number may be adjusted using adaptive management to meet management goals based on the results of vegetation and resident Canada goose population monitoring. Follow-up lethal reduction methods would be used to maintain the population of 54 resident Canada geese in order to minimize the impacts to wetland vegetation.

Under alternative B, the number of resident Canada geese to be removed by lethal control would be based upon the prior season's spring goose count results the year this plan/EIS is implemented. Lethal control would be used throughout the life of this plan/EIS. The initial goose population goal of 54 resident Canada geese may be adjusted based upon results of monitoring and adaptive management strategies. The following actions are included under alternative B regarding goose management:

1. Lethal control would begin at 40 to 60 percent removal of the resident Canada goose population in the park (based on the annual spring count) and this removal range would continue until the goose population goal of 54 is reached or vegetation monitoring and adaptive management indicate a different goose population goal is appropriate.
2. If after 5 years of removing 40 to 60 percent of the resident Canada goose population does not result in sustainable vegetation, the lethal control would increase up to a 90 percent removal of the resident Canada goose population in the park.
3. If after 2 years of removing 40 to 60 percent of the resident Canada goose population, the influx of resident Canada geese in the park causes the population level to remain within 50 percent of the population prior to implementing this plan/EIS, the lethal control would increase by up to 10 percent each year to a maximum of 90 percent.

Two lethal control methods would be used at the park, including goose round-up, capture, and euthanasia, and lethal removal by shooting. Lethal control techniques would be implemented during the summer months when migratory geese do not occur at the park. A vegetation monitoring plan has been established and implemented to provide background information on damage caused to wetland plants by resident Canada geese and to monitor the results of any future management actions on wetland vegetation. Vegetation indicators would point to the management thresholds. The vegetation monitoring plan is located in appendix C.

Goose round-ups would occur during the summer months when adult geese are molting and flightless (starting June 15 in Mid-Atlantic) and before juveniles are able to fly. The geese would be herded into specially designed nets by walking slowly toward the geese with hands widespread or by using remote control boats, remote control cars, or remote control airplanes. The nets would be placed in dry, flat areas away from roads or other areas that may injure the geese. The nets would be approximately 48 inches tall and supported every 15 to 20 feet with poles so that the geese do not become injured while scraping against the nets. Once the geese are trapped inside the net, trained wildlife officials would capture the geese by hand and take them off-site to be euthanized. In accordance with the American Veterinary Medicine Association guidance (AVMA 2007), efforts would be made to ensure actions are conducted as humanely as possible to minimize goose suffering. Juvenile geese would be removed from the net before the adults to prevent trampling. In addition to the round-up nets, flightless geese located in open water or wetland areas may be captured using long-handled dip nets (Smith et al. 1999). Potential locations for goose round-ups would include open field areas in the park, such as the ball fields adjacent to the river, the grass field north of the Langston Golf Course parking lots, and the grass field north and west of the 11$^{th}$ Street bridge (figures 5 through 7).

If goose round-ups occur outside of the molting period, the geese capable of flight would need to be sedated prior to capture. In order to sedate the geese, alpha-chloralose, a sugar and chloral hydrate combination that immobilizes birds approximately 30 to 90 minutes after ingestion, would be placed in bait bread. Alpha-chloralose is closely controlled by USDA-Animal and Plant Health Inspection Service (APHIS) Wildlife Services and requires operator certification. Once the geese are sedated, they would be captured by trained wildlife officials and would be taken off-site to be euthanized (Smith et al. 1999). Any remaining bread would be collected and removed from the site.

The meat from the geese captured during the round-ups would be donated to local food banks in the District area. Only the breast meat would be donated which reduce the chances of contamination. Toxicity tests would be performed on approximately 10 percent of the captured birds prior to donating the meat to the local food banks. Toxicity testing would follow APHIS standard operating procedures. If donation were not possible, the euthanized birds would be deposited in a landfill.

An additional means of lethal control that would be used includes shooting of the geese for isolated incidences only. This activity would occur in a controlled manner, as qualified federal employees would be used for this action. Employees would be park officials that are trained, experienced, and licensed to use a firearm. Training would include safety measures to protect both visitors and NPS employees. Park officials would coordinate all details related to the removal by shooting action, including locating the geese, shooting, and disposition of the geese. In most cases, high power, small caliber rifles would be used from close range. Geese injured during the operation would be put down as quickly as possible to minimize suffering. Noise suppression devices would be used to reduce the disturbance to the public. Activities would be in compliance with all federal firearm laws administered by the Bureau of Alcohol, Tobacco, and Firearms. Areas where lethal removal by shooting may occur would be temporarily closed to the public. The public would be notified of any park closures in advance when feasible. The NPS and U.S. Park Police would patrol public areas to ensure compliance with park closures and public safety measures. Single geese removed from the park in this manner would be buried and not donated to local food banks.

**Habitat Modification**—Alternative B includes management techniques that would alter goose habitat, goose surroundings, and modifications to food and water availability. Resident Canada geese tend to choose open areas with few obstructions to give them views of potential predators (Smith et al. 1999). During the Canada goose molting period, geese become extremely vulnerable to predators because they are completely flightless. Habitat modification includes eliminating, modifying, or reducing access to areas that currently attract the geese such as the Langston Golf Course. To reduce goose access to the wetlands and to increase the risk of fear of goose predation by eliminating site lines of potential predators, existing vegetative buffers would be widened and new vegetative buffers would be planted to act as barriers to the geese. River shorelines and wetland shorelines would be buffered with additional vegetation. The park would plant herbaceous materials closer to the bank's edges and woody material farther away. Species with fibrous roots would be more beneficial for the shoreline stabilization rather than sparser woody roots. Plants would be dense and high enough (2.5 feet) to prevent the geese from seeing through or over them or walking through gaps in the plantings. Wide plantings (20 to 30 feet wide and 2.5 feet tall) would be more successful than narrower ones (Smith et al. 1999). A list of herbaceous and woody species that may be planted along the river and wetland shorelines is available in appendix D. Species selected would be less palatable to the resident Canada geese. Common button bush (*Cephalanthus occidentalis*), swamp rose (*Rosa palustris*), and crimsoneyed rosemallow (*Hibiscus moscheutos*) may be planted within the high marsh zones and southern arrowwood (*Viburnum dentatum*), dogwood species (*Cornus* sp.), and black willow (*Salix nigra*) would be planted along the wetland/upland margin. Vegetative buffers would be implemented within the first 2 years of the plan/EIS.

Principle areas of new vegetative buffers or increasing the width of existing vegetative buffers are proposed at the following areas:

- The entire west bank of the Anacostia River north of the CSX Railroad Bridge.
- All gaps in the existing buffer along Langston Golf Course.
- Areas between the east bank of the Anacostia River and Anacostia Drive Southeast, below the railroad bridge.

- Shoreline along the east bank of the Anacostia River near Kenilworth Marsh.
- Shorelines along RFK Stadium parking lots.
- Seawall along the east shore of the Anacostia River near Deane Avenue Northeast.

Typically, adult geese move their broods to areas chosen for the presence of suitable food, visibility of predators, and proximity to water (Smith et al. 1999). Management techniques that could modify food availability and water accessibility would include installing and maintaining goose exclusion fencing in wetland areas, installing soft armoring (vegetative barriers) around the perimeter of the wetland areas, placement of new plantings that are less desirable to geese, and increasing the width of vegetated buffers.

Soft armoring such as single or double stacked coir fiber logs could be installed as needed around the perimeter of all planted areas in the wetlands to reduce the ease of goose access to the vegetation for feeding. The coir fiber logs would be adequately staked into the ground to ensure that the logs are not dislodged from the shoreline. More stakes would be used in those areas that are influenced by stronger tides. The logs would be placed so that about half of the log is submerged and plants would be installed in an alternating, random planting pattern into the top of the log. Plants to be installed would include those species that are less desirable to geese and those species that are mid- to high-marsh plants (appendix D). By planting mid- to high-marsh plants, geese would have a difficult time accessing the shoreline. Locations where soft armoring and existing buffers could be widened are shown in figures 5 through 7.

**Scare and Harassment**—Scare and harassment techniques are designed to frighten geese away from problems areas. As long as Canada geese are not touched or handled by a person or agent of a person (trained dog), it is permissible to harass Canada geese without a federal or state permit. Scare and harassment techniques could be implemented as needed in open grassy areas of the park where geese tend to congregate and in areas adjacent to the wetlands (figures 5 through 7). Scare and harassment techniques would not be used within the wetland areas because they could potentially disturb other wildlife. If scare and harassment techniques drive the geese into the wetland areas, the use of these techniques would be discontinued.

Under alternative B, an intensive scare and harassment program could be implemented. Visual deterrents such as mylar tape, flags, balloons, and dogs can be used to scare and harass the resident Canada geese. Mylar tape is a reflective tape that is typically silver on one side and red on the opposite. The tape would be used as streamers on poles or strung between fence posts. When the wind blows, the tape rotates, creating a flash, which makes geese shy away from the area. Mylar flagging has been reported effective at reducing resident Canada goose damage to crops (USFWS 2005). Red, blue, black, and orange flagging can be hung on poles in large open areas. These flags would help discourage resident Canada geese from landing on park property. Flagging is usually two feet by three feet and stapled to wooden poles approximately four feet in height. Mylar balloons and helium-filled eye-spot balloons can be tethered approximately 10 feet above the ground in open areas. Balloons would not be placed near trees, shrubs, or other objects that may puncture them. Eye-spots on balloons have been seen to elicit a flight response from resident Canada geese (Smith et al. 1999).

Potential areas for the implementation of scare and harassment techniques are shown on figures 5 through 7. Scare and harassment techniques could be used in the open grassy areas where geese commonly conjugate in Langston Golf Course and along the Anacostia Drive. These techniques would be rotated or altered every few months to avoid goose adaptation or indifference. Techniques would be experimented with to determine which ones or combination of tactics would be the most effective. Additional scare and harassment techniques may be implemented as new innovative technologies become available. New techniques may require additional NEPA analysis.

Dogs could be used throughout the Langston Golf Course to chase geese. Dogs, especially border collies have been effective in keeping golf courses and other properties free of geese (Smith et al. 1999). The National Arboretum has used dogs to scare away resident Canada geese in the past and was successful. Dogs could be used both on land and in the water in late spring and summer. More than one dog may be used the first two days of implementing this strategy. After the initial few days, only one dog would be released daily for two to three weeks to ensure that the geese keep off the golf course area. By federal law, dogs may not be used to catch or harm the geese; therefore, they would not be used during the goose molting period, when the birds are flightless.

**Reproductive Control**—Under alternative B, management techniques would include egg oiling, egg addling, and egg replacement. Additional techniques could include the use of goose hatch control products and scare tactics as needed. Limiting the growth of flocks can stabilize the goose population and influence site fidelity (HSUS 2004b). Resident Canada geese are often philopatric, meaning they return to their birth site to nest when they become sexually mature. Reducing the number of geese born at the site would decrease the number of adults returning to the site to nest.

Oiling eggs prevents gases from diffusing through an egg's outer membranes and pores in the shell, thereby causing the embryo to die of asphyxiation (Smith et al. 1999). Eggs would be removed from the nest, covered with an oily substance (100 percent food-grade corn oil) by brushing, dunking, or spraying, and then the eggs would be returned to the nest. The park uses guidelines for egg oiling set forth in the USFWS permit. The permit allows leaving the eggs in the nest after 14 days. Addling eggs would involve vigorously shaking the eggs until sloshing is heard, which indicates that the embryo has been destroyed. These techniques would be performed as early in the egg incubation period as possible. The nest would be marked with flagging approximately 30 feet from the nest. The treated eggs in the nest would be marked with a lead pencil. It is recommended that this must be completed every time the nest is visited, ideally once a week (personal communication Milton 2009). Any new eggs found during the subsequent visits would be oiled in the same manner. As stated above, the park would implement the vegetative buffers within the first 2 years of this plan/EIS and continue egg oiling at current levels or may also increase egg oiling to achieve the goose population goal and to meet the desired conditions for wetlands.

Other options were considered to achieve the desired conditions for this plan/EIS. In addition to oiling/addling, some eggs could be removed from the nest and replaced with wooden, plastic, or unfertilized eggs. This would result in the goose continuing to incubate the eggs and not re-nesting in a different area. In Toronto, Canada, 72 percent of the nests that contained artificial eggs continued to be incubated for an average of 38 days (Smith et al. 1999).

Alternative B, current egg oiling would continue as stated in alternative A, the no action alternative. If the resident Canada goose population increases greater than 20 percent in any given year of the management plan after the initial population reduction, there could be an increase in the current egg management program for the following year. The initial goose population goal of 54 resident Canada geese may be adjusted based upon results of monitoring and adaptive management strategies. If an increase in egg oiling were needed, the NPS would hire seasonal staff for the spring months to perform additional egg oiling, egg addling, and egg replacement as needed. Egg oiling would remain the major management effort.

*Oiling Eggs*

In addition to the egg oiling/addling, approved goose hatch control materials, such as OvoControl® G may be used. OvoControl® G is a specially formulated product to help control the hatchability of the eggs from

geese. OvoControl® G is fed as palatable bait during the nesting season, and it prevents eggs from hatching. The product's active ingredient is nicarbazin and is registered by the USEPA and supported by the Humane Society and People for the Ethical Treatment of Animals (Innolytics 2007). A total of 50 grams of OvoControl® G must be consumed every day for three weeks prior to nesting. Afterwards, an unspecified amount needs to be consumed for eight to ten weeks. This product would affect all bird species if consumed; the label instructions must be followed to minimize ingestion by non-target species. To prevent consumption by other bird species, OvoControl® G has been designed with the following characteristics:

- The bread-like bait is large, suitable for geese but not to songbirds.
- The bait is fed on a restricted use basis at dawn in the vicinity of overnighting geese. Experience shows that geese are habituated to the bait; it is consumed quickly leaving little opportunity for non-target feeding.
- Geese are commensal feeders, aggressively chasing most other species out of their immediate feeding areas.
- A daily dose is required during the breeding season. If non-target species receives an occasional dose, the product would have no effect.
- Resident geese breed earlier in the season when compared to other waterfowl. If other waterfowl ingest the product, it will likely be excreted by the time they reach their respective breeding season.
- Raptors will not consume bread-cased bait (Innolytics 2007).

Additional reproductive control measures may be implemented as new innovative technologies and products become available that are more effective and controlled by the USEPA. Under alternative B, these products could only be used during years following an increase in population. An approved depredation permit, identical to the one required for oiling or addling eggs, is required from USFWS prior to the use of OvoControl® G.

Alternative B could also include implementing scare tactics as needed as discussed above prior to the nesting season. This may prevent some geese from building nests within the park property.

## IMPLEMENTATION COST

The total cost of implementing alternative B includes both wetland and goose management techniques over the life of this plan/EIS. Estimates of these costs are included in the table below.

## Alternative B Cost Estimate

| # | Action | Assumptions | Implementation of Technique (one-time cost)* | Implementation of Technique (annual cost) | Cost for the 15-year Planning Period† |
|---|---|---|---|---|---|
| 1 | Vegetation monitoring and invasive plant species management | Costs include initial equipment cost + salary of labor | $30, 125 (first year only) | $386,370 (labor + annual costs) | $5,825,675 |
| 2 | Population Monitoring | Quarterly surveys annually | $0 | $10,000 | $150,000 |
| 3 | Hydrology techniques | Cost does not include design and permitting; some costs encompassed in salary of labor from #1 above | $2,968,750 | $0 | $2,968,750 |
| 4 | Vegetation techniques | | $2,002,384 | $26,630 | $2,401,834 |
| 5 | Wetland restoration | Cost does not include design and permitting | $1,348,000 | $0 | $1,348,000 |
| 6 | Park Operations and Maintenance | | $268,820 | $9,970 | $418,370 |
| 7 | Lethal Control** | Includes year 1 one costs only | $14,872 | Unknown | $14,872 |
| 8 | Habitat modification | | $3,193,630 | $0 | $3,193,630 |
| 9 | Scare and harassment** | Includes year 1 one costs only | $19,712 | Unknown | $19,712 |
| 10 | Reproductive Control** | Includes year 1 one costs only | $11,100 | Unknown | $11,100 |
| 11 | Cultural/Educational | Some costs encompassed in salary of labor from #1 above | $5,000 | N/A | $5,000 |
| **TOTAL COST FOR ALTERNATIVE B** | | | | | **$16,356,943‡** |

* Exact year of implementation unknown at this time; cost does not include maintenance or repair, if applicable.

** Includes cost for year 1 only; adaptive management will determine if technique will be required and to what extent in subsequent years.

† One-time cost + (annual cost*15 yrs)

‡ Total cost for 15 years assumes all proposed wetland and goose management techniques would be implemented during the life of the plan/EIS.

# ALTERNATIVE C: MODERATE LEVEL OF WETLAND MANAGEMENT COMBINED WITH MODERATE LEVEL OF GOOSE MANAGEMENT

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

*Alternative C combines aggressive wetlands management options with a moderate level of lethal and non-lethal goose management techniques.*

## WETLAND MANAGEMENT TECHNIQUES

**Hydrology**—Alternative C includes many of the same management techniques as alternative B but the techniques would be in fewer locations compared to alternative B. Under alternative C, the park may use erosion control techniques including the installation of coir fiber logs; installation of natural or manmade flow deflectors; installation of pre-seeded bog mats; and reductions to steepness of the wetland shoreline. Increased protection could be directed to those areas that receive the greatest wave action. The District Harbormaster would be encouraged to enforce the no wake zones in areas where the wetland edge may be affected. Potential locations for these techniques are shown on figures 8 through 10. Alternative C would not include creating tidal guts or altering water elevations as proposed in alternative B. The park may remove or modify structures or obstacles that result in moderate or severe erosion of the shoreline or wetland; however, removal would be located in fewer locations when compared to alternative B. Items that clog the marshes, such as beaver dams, may be removed if their presence is causing an issue. The park may investigate areas for extreme water level changes that may be affecting vegetation establishment; however, this would be done only in select and limited locations.

**Vegetation**—Under alternative C, techniques would be the same as alternative B, except instead of a high density planting effort throughout the wetlands, the park would plant at a lower density when compared to alternative B.

**Restoration**—Restoration efforts under alternative C could include the installation of stream/stormwater outfall energy dissipation modifications as needed at the ends of any outfalls identified as requiring repair to remediate for erosive forces. If needed, these areas may be determined in the future. Alternative C would include techniques that disturb smaller areas of land and water compared to alternative B. For example, alternative C would not include stream daylighting or seawall breaks as described in alternative B; these techniques normally impact more natural resources and require more involved construction activities.

**Cultural/Educational**—Under alternative C, and similar to other management alternatives, this alternative includes an increase in educating the public through wetland programs and interpretive activities that present Anacostia River history, traditional ranger-led programs, interpretive waysides and printed material, that include the evolution of the Anacostia River watershed. These efforts would include wetland restoration work and associated issues, challenges, and current management activities. This alternative would not include constructing new boardwalks or trails as described under alternative B.

**Park Management and Operations**—Under alternative C, park management and operations to improve the quality of wetlands could include the same techniques as alternative B. Figures 8 through 10 show potential locations for reducing impervious areas.

## RESIDENT CANADA GOOSE MANAGEMENT TECHNIQUES

**Lethal Control**—Under alternative C, lethal control of the resident Canada goose population at Anacostia Park would include a less intensive population reduction when compared to alternative B. Alternative C proposes population reduction for the resident Canada goose within the park, through removal of 40 to 60 percent of the resident Canada goose population within the first year of the plan/EIS as the first phase towards meeting the initial goal of 54 resident Canada geese. Although monitoring may be conducted yearly, lethal control of 40 to 60 percent of the resident Canada goose population would only be used up to five times throughout the life of this plan/EIS following the initial reduction, and only if the population exceeds the initial goal of 54 resident Canada geese within the park or if vegetation monitoring and adaptive management indicate a different goose population goal is appropriate. The technique used to reduce the population would include round-up, capture, and euthanasia. Lethal removal by shooting would not be used under this alternative. The population would be maintained at a sustainable goose population goal using a similar lethal method. Locations for goose round ups are shown on figures 8 through 10.

**Habitat Modification**—Management techniques would be the same as alternative B except that new shoreline buffers would only be planted along Kingman Marsh and the fringe marsh areas (new buffers in fewer locations compared to alternative B). These areas are shown on figures 8 through 10. An additional technique that may be implemented under alternative C to prevent geese from grazing within the turf areas, could include applying approved goose repellents to problem areas. Goose repellents are typically products applied to vegetation so that geese find it inedible. Repellents, such as Goose Chase, could be used according to the label instructions and would not be harmful to humans. If the use of the repellent on the turf area drives the geese to the wetland areas, then the use of the repellent would be discontinued.

**Scare and Harassment**—A less intensive scare and harassment technique program could be implemented under alternative C as needed. The scare and harassment techniques are similar to those in alternative B; however, they would only be implemented in areas closest to the restored wetlands (only two locations) and techniques would be rotated less often compared to alternative B if implemented. Locations where scare and harassment techniques may be implemented are shown in figures 8 through 10.

**Reproductive Control**—Following the initial reduction in population size using lethal controls (killing), the current egg management program would be intensified to allow more time and effort. The NPS may hire two additional seasonal staff dedicated to work in this program each spring during the remaining years of the management plan to focus their time on egg management techniques. Application of goose hatch control materials (OvoControl® G) may be implemented annually if needed. Alternative C would not include implementing scare tactics prior to the nesting season.

**FIGURE 8: ALTERNATIVE C - LOCATIONS OF WETLAND AND GOOSE MANAGEMENT TECHNIQUES, NORTH AREA**

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