



FIGURE 13: ALTERNATIVE D. LOCATIONS OF WETLAND AND GOOSE MANAGEMENT TECHNIQUES, SOUTH AREA

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Goose exclusion fencing would be installed and maintained and new plantings less desirable to geese would be planted. All goose habitat modification elements would be implemented within the first 5 years of this plan/EIS.

Scare and Harassment—No scare and harassment techniques would be implemented under alternative D.

Reproductive Control—The current egg oiling program described in alternative A, the no action alternative would continue under alternative D. Egg addling and oiling would occur during the April nesting season along the tidal Anacostia River corridor from Bladensburg to Poplar Point. No additional reproductive control management techniques would be used under alternative D.

IMPLEMENTATION COST

The total cost of implementing alternative D 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 D 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		\$30,125 (first year only)	\$243,370 (labor + annual costs)	\$3,680,675
2	Population Monitoring	Same as alternative B	\$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	\$32,500	\$0	\$32,500
4	Vegetation techniques		\$946,000	\$7,989	\$1,065,835
5	Wetland restoration	No techniques proposed	\$0	\$0	\$0
6	Park Operations and Maintenance		\$116,940	\$0	\$116,940
7	Lethal Control**	Includes year 1 one costs only	\$12,408	\$0	\$12,408
8	Habitat modification		\$548,813	\$0	\$548,813
9	Scare and harassment	No techniques proposed	\$0	\$0	\$0
10	Reproductive Control**	Includes year 1 one costs only	\$4,970	Unknown	\$4,970
11	Cultural/Educational	Some costs encompassed in salary of labor from #1 above	\$5,000 (signage)	N/A	\$5,000
TOTAL COST FOR ALTERNATIVE D					\$5,617,141†‡

* 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 E: HIGH LEVEL OF WETLAND MANAGEMENT WITH MODERATE GOOSE MANAGEMENT WITH NO LETHAL CONTROL

This alternative combines aggressive wetland management techniques with moderately intensive goose management activities; however, there is no lethal control.

This alternative combines aggressive wetland management techniques with moderately intensive goose management activities; however, there is no lethal control.

WETLAND MANAGEMENT TECHNIQUES

Hydrology—Under alternative E, management techniques for hydrology would be similar to alternative B. Potential locations for these management techniques are shown on figures 14 through 16.

Vegetation—Under alternative E, management techniques for vegetation would be similar to alternative B. Potential locations for the vegetative management techniques are shown in figures 14 through 16.

Restoration—Under alternative E, management techniques for wetland restoration would be similar to alternative B. Potential locations for these management techniques are shown in figures 14 through 16.

Cultural/Educational—Under alternative E, cultural/educational management techniques would be similar to those of alternative B.

Park Management and Operations—Park management and operations would be similar to those described under alternative B. Potential locations for reducing impervious areas are shown in figures 14 through 16.

RESIDENT CANADA GOOSE MANAGEMENT TECHNIQUES

Lethal Control—There would be no initial or follow-up lethal resident Canada goose population reduction associated with alternative E.

Habitat Modification—Management techniques affecting goose safety or habitat preference would be similar to alternative B, except that no existing vegetative buffers would be widened. Principal areas for shoreline plantings or enhancements include the following and are shown in figures 14 through 16:

- The entire west bank of the Anacostia River beginning, from the Capitol Street Railroad Bridge, up to the District/Maryland boundary.
- West bank of the Kingman Marsh along the RFK stadium parking lots.
- All gaps in the existing buffer along the Langston Golf Course.
- Seawall along the west shore of the Anacostia River near Deane Avenue Northeast.
- To reduce the ease of goose access to the plantings for feeding, single or double-stacked coir fiber logs could be installed around the perimeter of all planted areas in the restored wetlands. There would be no repellent applications on turf feeding zones associated with this alternative.

Scare and Harassment—Under alternative E, an intensive program of scare and harassment techniques could be implemented and would be the same as alternative B.



FIGURE 14: ALTERNATIVE E - LOCATIONS OF WETLAND AND GOOSE MANAGEMENT TECHNIQUES, NORTH AREA

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FIGURE 15: ALTERNATIVE E - LOCATIONS OF WETLAND AND GOOSE MANAGEMENT TECHNIQUES, CENTRAL AREA

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FIGURE 16: ALTERNATIVE E - LOCATIONS OF WETLAND AND GOOSE MANAGEMENT TECHNIQUES, SOUTH AREA

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Reproductive Control—Under alternative E, reproductive control management techniques would be the same as those of alternative B.

Cultural/Educational—Under alternative E, cultural/educational management techniques would be the same as those of alternative B.

All of the non-lethal goose management techniques described above for alternative E would be implemented within the first 5 years of this plan/EIS with the exception of reproductive control management techniques.

IMPLEMENTATION COST

The total cost of implementing alternative E 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 E 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	Same as alternative B	\$30,125 (first year only)	\$386,370 (labor + annual costs)	\$5,825,675
2	Population Monitoring	Same as alternative B	\$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	No techniques proposed	\$0	\$0	\$0
8	Habitat modification		\$3,151,102	\$0	\$3,151,102
9	Scare and harassment**	Includes year 1 cost only	\$19,712	Unknown	\$19,712
10	Reproductive Control**	Includes year 1 cost only	\$11,100	Unknown	\$11,100
11	Cultural/Educational	Some costs encompassed in salary of labor from #1 above	\$5,000 (signage)	N/A	\$5,000
TOTAL COST FOR ALTERNATIVE E					\$16,299,543‡

* 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.

HOW ALTERNATIVES MEET OBJECTIVES

As stated in the “Purpose of and Need for Action” chapter, the management alternatives selected for analysis should generally meet all project objectives. The management alternatives must also address the stated purpose of taking action and resolve the need for action. Therefore, the alternatives were individually assessed by how well they would meet the objectives of this plan/EIS. Alternatives that did not meet the objectives were not analyzed further and are discussed in the “Alternatives Eliminated from Further Consideration” section that follows. These specific objectives, and how they are addressed by each proposed alternative, are summarized in table 3.

SUMMARY OF IMPACTS

A summary of wetland management techniques and goose management techniques is presented in tables 4 and 5. The “Environmental Consequences” chapter describes the effects of each alternative on each impact topic, including the impact on recreational values and visitor experience. These impacts are summarized in table 6.

ALTERNATIVES AND TECHNIQUES ELIMINATED FROM FURTHER CONSIDERATION

NO WETLANDS OR GOOSE MANAGEMENT ALTERNATIVE

During the deliberative process of alternative formulation for this plan/EIS, one alternative was dismissed. This alternative was no wetlands management and no goose management. This alternative was dismissed because it would not meet the objectives of this plan/EIS and is therefore unreasonable. In addition, the park would likely always continue to do some management activities such as oiling eggs. Therefore, this alternative was considered but dismissed.

MODERATE LEVEL OF WETLANDS MANAGEMENT WITH HIGH LEVEL OF GOOSE MANAGEMENT

This alternative was removed from further consideration following a detailed analysis of the resources and following the roundtable discussion. It was determined that this alternative had the most controversial goose management techniques and that the alternative in general was very similar to alternative B. This alternative retained the intensive goose management techniques of alternative B, both lethal and non-lethal, and combined it with a less intensive wetlands management plan. This alternative assumed that less aggressive wetland management might be needed if the resident goose population is highly controlled.

TABLE 3: THE DEGREE TO WHICH EACH ALTERNATIVE MEETS OBJECTIVES

Objective Areas	Specific Objectives	Alternative A – No Action	Alternative B – High Wetlands & High Goose	Alternative C – Moderate Wetlands, Moderate Goose	Alternative D - Low Wetlands & Low Goose	Alternative E – High Wetlands & Moderate Goose, with No Lethal Control
Overall	<ul style="list-style-type: none">• Ensure actions are consistent with the laws, policies, and regulations that guide the NPS, as defined in chapter 1.	<ul style="list-style-type: none">• Fully meets objectives.	<ul style="list-style-type: none">• Fully meets objectives; permits would be required to implement lethal control.	<ul style="list-style-type: none">• Fully meets objectives; permits would be required to implement lethal control.	<ul style="list-style-type: none">• Fully meets objectives; permits would be required to implement lethal control.	<ul style="list-style-type: none">• Fully meets objectives.
Wetlands	<ul style="list-style-type: none">• Reduce adverse effects of resident Canada goose grazing pressure on restored wetlands to ensure plant regeneration sufficient to reach the desired condition of a functional wetland system.	<ul style="list-style-type: none">• Fails to meet objectives because goose management techniques including egg oiling and goose exclusion fences do not meet desired conditions.	<ul style="list-style-type: none">• Fully meets objectives due to numerous goose management techniques including intensive lethal control, increasing buffers, intensive scare and harassment program, and egg oiling.	<ul style="list-style-type: none">• Fully meets objectives due to numerous goose management techniques including lethal control, increasing buffers, scare and harassment program, and egg oiling.	<ul style="list-style-type: none">• Partially meets objectives because of fewer goose management techniques available. There would be no initial lethal control used. Shoreline buffers would be limited and no scare and harassment program would be initiated. Egg oiling would remain the same intensity as it is currently.	<ul style="list-style-type: none">• Partially meets objectives because of no lethal control – lethal control would be more effective in reducing adverse effects of the geese.
	<ul style="list-style-type: none">• Maintain native wetlands vegetation and manage the encroachment of invasive and exotic plant species.	<ul style="list-style-type: none">• Partially meets objectives due to the reliance on volunteers and partners to continue invasive species management.	<ul style="list-style-type: none">• Fully meets objectives because invasive species will continue to be managed and native species will be restored due to buffering shorelines and executing a high-density planting effort with persistent, native species.	<ul style="list-style-type: none">• Fully meets objectives because invasive species will continue to be managed and natives will be restored by planting shoreline buffers and executing a low-density planting effort with persistent native species.	<ul style="list-style-type: none">• Partially meets objectives due to reduced wetland management. There will be a minor level of invasive species management. There will be no shoreline buffers planted or no new native species planted.	<ul style="list-style-type: none">• Fully meets objectives because invasive species will continue to be managed and native species will be restored due to buffering shorelines and executing a high-density planting effort with persistent, native species.
	<ul style="list-style-type: none">• Restore, protect, and maintain wetland functions.	<ul style="list-style-type: none">• Fails to meet objectives due to limited wetland management. There is currently no wetland restoration or hydrology management at the park.	<ul style="list-style-type: none">• Fully meets objectives due to high wetland management and new wetland restoration efforts. Techniques include preventing erosion and clogging of wetlands, creating tidal guts, daylighting, seawall breaks, and stormwater outfall energy dissipation.	<ul style="list-style-type: none">• Partially meets objectives because of high wetland management but no new restoration efforts are proposed. Techniques include preventing erosion and clogging of the wetlands, and stormwater outfall energy dissipation. No tidal guts, daylighting, or seawall breaks would occur to restore wetlands.	<ul style="list-style-type: none">• Partially meets objectives because of high wetland management but no new restoration efforts are proposed. Techniques include removing structures that clog wetlands. No erosion control, tidal guts, daylighting, or seawall breaks would occur to restore wetlands.	<ul style="list-style-type: none">• Fully meets objectives due to high wetland management and new wetland restoration efforts. Techniques include preventing erosion and clogging of wetlands, creating tidal guts, daylighting, seawall breaks, and stormwater outfall energy dissipation.
Wildlife and Wildlife Habitat	<ul style="list-style-type: none">• Manage the resident Canada goose population within the park such that a viable wetlands habitat can be sustained.	<ul style="list-style-type: none">• Fails to meet objectives because the goose population has limited management resulting in wetlands that are not pre-dominantly self-sustaining.	<ul style="list-style-type: none">• Fully meets objectives because goose population will be highly managed resulting in wetlands that will become pre-dominantly self-sustaining. Goose population will be managed by intensive lethal control, modification of goose habitat, intensive scare and harassment program, and increased egg oiling.	<ul style="list-style-type: none">• Fully meets objectives because goose population will be highly managed resulting in wetlands that will become pre-dominantly self-sustaining. Goose population will be managed by less intensive lethal control, modification of goose habitat, less intensive scare and harassment program, and increased egg oiling.	<ul style="list-style-type: none">• Partially meets objectives because the goose population will be managed but the wetlands may not become pre-dominantly self-sustaining. There will be no initial goose population reduction. Lethal control will be used one time if the habitat modification and current egg oiling do not meet the goose threshold. No scare and harassment techniques will be used.	<ul style="list-style-type: none">• Partially meets objectives because the goose population will be managed but the wetlands may not become pre-dominantly self-sustaining. No lethal control will be used to manage the goose population. Management techniques would include habitat modification, intensive scare and harassment program, and increased egg oiling.
	<ul style="list-style-type: none">• Manage the resident Canada goose population, consistent with the USFWS Resident Canada Goose Management Plan (USFWS 2005).	<ul style="list-style-type: none">• Fails to meets objectives because inconsistent with USFWS 2005 and the Atlantic Flyway Resident Goose Management Plan (Atlantic Flyway Council 1999).	<ul style="list-style-type: none">• Fully meets objectives because consistent with USFWS (2005) and Atlantic Flyway Council (1999). Management techniques were taken from USFWS 2005.	<ul style="list-style-type: none">• Fully meets objectives because consistent with USFWS (2005) and Atlantic Flyway Council (1999). Management techniques were taken from USFWS 2005.	<ul style="list-style-type: none">• Fully meets objectives because consistent with USFWS (2005) and Atlantic Flyway Council (1999). Management techniques were taken from USFWS 2005.	<ul style="list-style-type: none">• Fully meets objectives because consistent with USFWS (2005) and Atlantic Flyway Council (1999). Management techniques were taken from USFWS 2005.
	<ul style="list-style-type: none">• Restore, protect, and maintain wetlands for native fish and wildlife populations.	<ul style="list-style-type: none">• Fails to meet objectives because does not provide wetland habitat or wetland restoration efforts.	<ul style="list-style-type: none">• Fully meets objectives because provides restored wetland habitat and includes new planting efforts. Wetlands restored by preventing erosion and clogging, planting native vegetation, creating tidal guts, and daylighting.	<ul style="list-style-type: none">• Fully meets objectives because provides restored wetland habitat and includes new planting efforts. Wetlands restored by preventing erosion and clogging, and planting native vegetation.	<ul style="list-style-type: none">• Partially meet objectives because of low wetland restoration and planting efforts. Techniques include removing item that clog wetlands. No new native species would be planted and no wetland restoration techniques.	<ul style="list-style-type: none">• Fully meets objectives because provides restored wetland habitat and includes new planting efforts. Wetlands restored by preventing erosion and clogging, planting native vegetation, creating tidal guts, and daylighting.

Objective Areas	Specific Objectives	Alternative A – No Action	Alternative B – High Wetlands & High Goose	Alternative C – Moderate Wetlands, Moderate Goose	Alternative D - Low Wetlands & Low Goose	Alternative E – High Wetlands & Moderate Goose, with No Lethal Control
Visitor Experience	<ul style="list-style-type: none">Enhance visitor experience by restoring, maintaining, protecting, and interpreting wetlands.	<ul style="list-style-type: none">Partially meets objectives due to limited education efforts by park programs. Currently no wetland restoration.	<ul style="list-style-type: none">Fully meets objectives because provides new cultural and educational elements. Wetlands would be restored and enhanced by increasing buffers, managing invasives, and planting native vegetation.	<ul style="list-style-type: none">Fully meets objectives because provides new cultural and educational elements. Wetlands would be restored and enhanced by increasing buffers, managing invasives, and planting native vegetation.	<ul style="list-style-type: none">Partially meets objectives due to limited education efforts by park programs. No new cultural or educational elements would be implemented.	<ul style="list-style-type: none">Fully meets objectives because provides new cultural and educational elements. Wetlands would be restored and enhanced by increasing buffers, managing invasives, and planting native vegetation.
	<ul style="list-style-type: none">Enhance public understanding of the value of wetland restoration and issues associated with the management of resident Canada geese.	<ul style="list-style-type: none">Partially meets objectives because of limited wetland education efforts, but no goose management education and no goose signage.	<ul style="list-style-type: none">Fully meets objectives because of wetland education and goose management education efforts, including goose signage.	<ul style="list-style-type: none">Fully meets objectives because of wetland education and goose management education efforts, including goose signage.	<ul style="list-style-type: none">Partially meets objectives because of limited new wetland and goose management education efforts, but includes goose signage.	<ul style="list-style-type: none">Fully meets objectives because of wetland education and goose management education efforts, including goose signage.
	<ul style="list-style-type: none">During implementation of any management action, minimize disruption to visitor use and experience or adverse impacts to visitor and community safety.	<ul style="list-style-type: none">Fully meets objectives because visitor use and experience is not disrupted and safety is not compromised.	<ul style="list-style-type: none">Fully meets objectives because visitor use and experience is not disrupted and safety is not compromised.	<ul style="list-style-type: none">Fully meets objectives because visitor use and experience is not disrupted and safety is not compromised.	<ul style="list-style-type: none">Fully meets objectives because visitor use and experience is not disrupted and safety is not compromised.	<ul style="list-style-type: none">Fully meets objectives because visitor use and experience is not disrupted and safety is not compromised.
Park Operations	<ul style="list-style-type: none">Consider and plan for impacts from wetland and resident Canada goose management response activities on current park operations, including budget, workload, and visitor experience.	<ul style="list-style-type: none">Partially meets objectives because program relies on volunteers and partners.	<ul style="list-style-type: none">Fully meets objectives because plan/EIS identifies needed budget, impacts to workload and visitor experience.	<ul style="list-style-type: none">Fully meets objectives because plan/EIS identifies needed budget, impacts to workload and visitor experience.	<ul style="list-style-type: none">Fully meets objectives because plan/EIS identifies needed budget, impacts to workload and visitor experience.	<ul style="list-style-type: none">Fully meets objectives because plan/EIS identifies needed budget, impacts to workload and visitor experience.
Cooperation and Coordination	<ul style="list-style-type: none">Cooperate and coordinate with the District, USACE, and other government agencies, as well as other stakeholders currently implementing or interested in implementing a wetlands and resident Canada goose management strategy.	<ul style="list-style-type: none">Fails to meet objectives of the agencies and stakeholders because a strategy is not being implemented and agencies and/or volunteers may get discouraged.	<ul style="list-style-type: none">Fully meets objectives of the agencies and stakeholders due to active, aggressive programs.	<ul style="list-style-type: none">Fully meets objectives of the agencies and stakeholders due to active, aggressive programs.	<ul style="list-style-type: none">Partially meets objectives of the agencies and stakeholders due to less and minimal coordination.	<ul style="list-style-type: none">Fully meets objectives of the agencies and stakeholders due to active, aggressive programs.

TABLE 4: SUMMARY OF WETLAND MANAGEMENT ALTERNATIVES*

Wetland Management Element	Management Technique	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	Erosion Control Techniques	--	F	F	--	F
	Remove Items that Clog Marsh	--	F	L	F	F
	Create Tidal Guts	--	F	--	--	F
	Upland Runoff	--	F	F	F	F
	No Wake Zones	--	F	F	--	F
	Water Level Change	--	F	L	--	F
	Wetland Elevations	--	F	--	--	F
Vegetation	Invasive Species	L	F	F	L	F
	Remove Sheet Piling		F	F	F	F
	Seedbank Regeneration	--	F	F	L	F
	Buffer Shoreline	--	F	F	--	F
	Planting Effort	--	F	L	--	F
Wetland Restoration	Daylighting	--	F	--	--	F
	Stream and Stormwater Outfall Dissipation	--	F	L	--	F
	Seawall Breaks	--	F	--	--	F
Cultural/ Educational	Education and Interpretation	L	F	F	L	F
	Boardwalks and Trails	--	F	--	--	F
Park Operations and Management	Rain Gardens	--	F	F	F	F
	Trash Management	L	F	F	--	F
	Impervious Areas	--	F	F	--	F

F=alternative includes a full effort
L=alternative includes a limited effort

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TABLE 5: SUMMARY OF GOOSE MANAGEMENT ALTERNATIVES*

Wetland Management Element	Management Technique	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
Lethal Control	Round-up, Capture, Euthanasia	--	F	L	L	--
	Lethal Removal by Shooting	--	F	--	--	--
	Monitor population	--	F	F	F	F
	Maintain population	--	F	L	--	--
Habitat Modifications	Plant vegetative buffer	--	F	L	L	F
	Install/maintain new fencing	L	F	F	F	F
	Install Soft armoring	--	F	L	--	F
	Increase width of buffers	--	F	F	F	F
	New plantings unpalatable	--	F	F	F	F
	Application of repellents	--	--	F	--	--
Scare and Harassment	Scare and harassment techniques	--	F	L	--	F
Reproductive Control	Egg oiling	L	L	F	L	L
	Apply goose hatch control	--	L	F	--	L
	Implement scare techniques	--	F	--	--	F
Cultural/Educational	Signage	--	F	F	F	F
	Enforce NPS policy	--	F	F	F	F
	Technical brochure	--	F	F	F	F

F=alternative includes a full effort
L=alternative includes a limited effort

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TABLE 6: ALTERNATIVES COMPARISON TABLE AND SUMMARY OF ENVIRONMENTAL CONSEQUENCES

Resource	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	
Soils	Long-term moderate adverse	Soil erosion and runoff would continue from lack of vegetative buffer, causing a change in soil character	Beneficial	Wetland improvement, herbivory reduction, and erosion control would stabilize soils	Beneficial	Vegetation planting and reduced herbivory would improve the soil	Long-term minor adverse	One-time goose population reduction would lower herbivory but would not provide long lasting benefits to soils	Negligible	Vegetative buffers and wetland restoration would aid bank stabilization, but herbivory would continue to occur
Cumulative impacts	Long-term minor adverse cumulative impacts		Beneficial cumulative impacts		Beneficial cumulative impacts		Negligible cumulative impacts		Beneficial cumulative impacts	
Hydrology	Long-term minor adverse	Continued vegetation loss and wetland soil erosion would result in continued impacts on hydrology	Beneficial	Wetland restoration, revegetation, stabilization, and structure removal would all benefit hydrology, and stream flow	Beneficial	Wetland and goose management would locally improve hydrology from better stormwater infiltration	Negligible	One-time goose population reduction and no erosion control techniques would make no changes to hydrologic conditions	Negligible	Vegetative buffers and wetland restoration would trap pollutants, but herbivory would continue, resulting in no change to hydrologic conditions
Cumulative impacts	Beneficial cumulative impacts		Beneficial cumulative impacts		Beneficial cumulative impacts		Beneficial cumulative impacts		Beneficial cumulative impacts	
Water Quality	Long-term minor adverse	A continued loss of vegetation from herbivory, pathogen introduction, and continued erosion would cause turbidity and reduced water quality	Beneficial	Improved wetlands would reduce urban runoff and sedimentation, and reduced herbivory, fecal matter, and erosion control would improve turbidity and water quality	Beneficial	Reduction of urban runoff, a decrease in soil erosion, and a reduction in herbivory and fecal matter would improve water quality	Long-term minor adverse	One-time population reduction would cause short-term reduction in herbivory and fecal matter, but would result in no wetland restoration and long-term changes to water quality	Negligible	Wetland restoration would trap urban runoff, but goose herbivory and fecal matter addition would continue, resulting in no discernable change to water quality
Cumulative impacts	Negligible cumulative impacts		Beneficial cumulative impacts		Beneficial cumulative impacts		Negligible cumulative impacts		Beneficial cumulative impacts	
Floodplains	Long-term minor adverse	Herbivory and continued erosion would result in a further loss of the floodplain	Beneficial	Reconnection of wetland with river and wetland restoration would improve floodplain function	Negligible	Floodplain function would only be slightly improved by management techniques	Long-term minor adverse	Limited wetland management would result in localized benefits, but no overall improvement of floodplain function	Negligible to beneficial	Reconnection of wetland with river and wetland restoration would improve floodplain function
Cumulative impacts	Long-term minor adverse cumulative impacts		Beneficial cumulative impacts		Negligible cumulative impacts		Long-term minor adverse cumulative impacts		Negligible cumulative impacts	
Wetlands	Long-term moderate adverse	Herbivory, invasive species, erosion, and loss of wetland function would result in continued degradation of wetlands and water quality	Beneficial	Decreased herbivory would allow revegetation in wetlands, and wetland restoration and erosion control would improve functionality	Beneficial	A reduction in herbivory, and some wetland management techniques would improve wetland function	Beneficial (following goose reduction activities)/Long-term minor adverse	A reduction in herbivory and some goose management provide short-term benefit, but wetland functionality, abundance, and diversity would still be decreased	Long-term minor adverse	Benefits from wetland management on vegetation would be largely offset by large goose population size, even with non-lethal goose management measures
Cumulative impacts	Long-term minor adverse cumulative impacts		Beneficial cumulative impacts		Beneficial cumulative impacts		Negligible cumulative impacts		Negligible cumulative impacts	
Aquatic Resources	Long-term moderate adverse	Herbivory would continue to reduce wetland quality and quantity and lower water quality, resulting in further loss of aquatic habitat	Beneficial	Revegetation, stabilization, and hydrology changes would improve habitat and food sources for aquatic resources	Beneficial	Wetland improvements would have detectable improvements on food sources or aquatic habitats	Negligible	No wetland restoration techniques would result in no change or improvement of food sources or aquatic habitat	Negligible	No detectable or measureable improvements to food sources and habitat quality of macroinvertebrates
Cumulative impacts	Long-term minor adverse cumulative impacts		Beneficial cumulative impacts		Beneficial cumulative impacts		Beneficial cumulative impacts		Beneficial cumulative impacts	

Resource	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	
Vegetation	Long-term minor adverse	Continued herbivory and increased coverage of invasive species would impact native vegetation	Beneficial	Wetland management, herbivory reduction, habitat modification, and new planting would improve native vegetation	Beneficial	Wetland management and reduced herbivory, and invasive species control would benefit native vegetation	Long-term minor adverse	Goose herbivory may increase the cover of invasive vegetation, and reduce the abundance and diversity of native vegetation	Negligible	Continued goose herbivory would offset native planting buffers, resulting in an immeasurable change in the vegetation
Cumulative impacts	Long-term minor adverse cumulative impacts		Negligible cumulative impacts		Negligible cumulative impacts		Long-term minor adverse cumulative impacts		Long-term minor adverse cumulative impacts	
Wildlife (not including resident Canada geese)	Long-term minor adverse	Vegetation loss and erosion in wetlands due to wildlife grazing (primarily resident Canada geese) negatively affects aquatic-dependent wildlife species that utilize wetlands, such as waterfowl and migrant Canada geese	Beneficial	Improvements to habitat (both terrestrial and wetlands) and food sources could positively affect population numbers/structure of wildlife species in the park	Beneficial	Improvements to habitat (both terrestrial and wetlands) and food sources could positively affect population numbers/structure of wildlife species, including those listed by the District WAP	Long-term minor adverse	Food sources and habitat quality would be improved through plantings, but may be offset or reduced by the lack of lethal reduction activities; small changes to population numbers, structure, genetic variability, and other demographic factors might occur	Negligible	Food sources and habitat quality would be improved through plantings, but may be offset by the lack of lethal reduction activities, resulting in an immeasurable change to population numbers or structure of wildlife in the park
Cumulative impacts	Long-term minor adverse cumulative impacts		Negligible cumulative impacts		Negligible cumulative impacts		Long-term minor adverse cumulative impacts		Long-term minor adverse cumulative impacts	
Resident Canada Geese	Negligible impact	Intensive population reduction strategies are not proposed and the goose population would remain above the recommended 54 resident Canada geese within the park	Long-term major adverse impact on geese in the park	Population would be reduced and maintained at a lower level than current numbers throughout the life of the plan/EIS	Long-term moderate adverse impact on geese in the park	Population would be reduced at a lower level than current numbers up to five times throughout the life of this 15-year plan/EIS	Short-term, major, adverse impacts on geese in the park	A one-time, lethal population reduction could occur, but would not be maintained over the long-term	Negligible, impact on geese in the park	Population reduction strategies would not occur under alternative E; the goose population would likely remain above the recommended 54 resident Canada geese within the park
			Overall long-term moderate adverse impact	Impacts to the population of resident Canada geese within the park would be detectable, and these impacts would be perceptible at the Maryland or DC resident Canada goose population level, but not at the Atlantic Flyway resident Canada goose population levels	Overall long-term minor adverse impact	Impacts to the population of resident Canada geese within the park would be detectable, but these impacts would not be perceptible at the Maryland, DC, or at the Atlantic Flyway resident Canada goose population levels	Overall negligible impact	There would be no observable or measurable impacts to the population of resident Canada geese within the park or to the Maryland, DC, or Atlantic Flyway resident Canada goose populations	Overall negligible impact	There would be no observable or measurable impacts to the population of resident Canada geese within the park or to the Maryland, DC, or Atlantic Flyway resident Canada goose populations
Cumulative impacts	Long-term, major, adverse cumulative impacts		Long-term, major, adverse cumulative impacts		Long-term, major, adverse cumulative impacts		Long-term, major, adverse cumulative impacts		Long-term, major, adverse cumulative impacts	
Historic Districts and Structures	No Effect	Current and continued management practices would not result in any impacts to historic structures and districts.	Negligible to long-term moderate adverse*	Wetland and goose management techniques would somewhat alter setting near Kenilworth Gardens, Langston Golf Course and Anacostia Park causing negligible impacts; future wetland management could have a long-term, moderate impact on the Anacostia River Seawall	Negligible	Wetland and goose management techniques would somewhat alter setting in the vicinity of Kenilworth Gardens, Langston Golf Course and Anacostia Park causing negligible impacts	Negligible	Limited wetland and goose management techniques would somewhat alter the setting in the vicinity of Kenilworth Gardens, Langston Golf Course and Anacostia Park causing negligible impacts	Negligible to long-term moderate adverse*	Wetland and goose management techniques would somewhat alter setting near Kenilworth Gardens, Langston Golf Course and Anacostia Park causing negligible impacts; future wetland management could have a long-term, moderate impact on the Anacostia River Seawall
Cumulative impacts	Long-term moderate adverse cumulative impacts		Long-term moderate adverse cumulative impacts		Long-term moderate adverse cumulative impacts		Long-term moderate adverse cumulative impacts		Long-term moderate adverse cumulative impacts	

Resource	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	
Archeological Resources	No Effect	Current and continued management practices would not result in any impacts to archeological resources.	Long-term, minor to moderate adverse *	High effort wetland and goose management techniques would require ground-disturbing activities that could impact known and unknown/undiscovered archeological resources	Long-term minor adverse*	High effort wetland and moderate effort goose management techniques would require ground-disturbing activities that could impact known and unknown/undiscovered archeological resources	Long-term minor adverse	Goose herbivory may increase the cover of invasive vegetation, and reduce the abundance and diversity of native vegetation	Negligible	Continued goose herbivory would offset native planting buffers, resulting in an immeasurable change in the vegetation
Cumulative impacts	Long-term moderate adverse cumulative impacts		Long-term moderate adverse cumulative impacts		Long-term moderate adverse cumulative impacts		Long-term moderate adverse cumulative impacts		Long-term moderate adverse cumulative impacts	
Park Management and Operations	Long-term minor adverse	Maintenance requirements could increase if the resident Canada goose population in the park exhibits an overall increase	Long-term moderate adverse	Increased staff and resources would be necessary to implement new management techniques and measures required to ensure a safe and beneficial experience for park visitors	Long-term moderate adverse	Increased staff and resources would be necessary to implement new management techniques and measures required for the alternative	Long-term minor adverse	Food sources and habitat quality would be improved through plantings, but may be offset or reduced by the lack of lethal reduction activities; small changes to population numbers, structure, genetic variability, and other demographic factors might occur	Negligible	Food sources and habitat quality would be improved through plantings, but may be offset by the lack of lethal reduction activities, resulting in an immeasurable change to population numbers or structure of wildlife in the park
Cumulative impacts	Long-term moderate adverse cumulative impacts		Long-term moderate adverse cumulative impacts		Long-term moderate adverse cumulative impacts		Long-term moderate adverse cumulative impacts		Long-term moderate adverse cumulative impacts	
Visitor Use and Experience	Beneficial for visitors who enjoy Canada geese at the park	Visitors could continue to view goslings and adult resident Canada geese year round in large numbers	Beneficial for visitors who enjoy Canada geese at the park	Visitors would continue to view goslings and adult Canada geese year round within the park	Beneficial for visitors who enjoy Canada geese at the park	Visitors would continue to view goslings and adult Canada geese year round within the park	Short-term, major, adverse impacts on geese in the park	A one-time, lethal population reduction could occur, but would not be maintained over the long-term	Negligible, impact on geese in the park	Population reduction strategies would not occur under alternative E; the goose population would likely remain above the recommended 54 resident Canada geese within the park
	Long-term minor adverse for visitors who do not enjoy Canada geese at the park	Goose population would not be drastically reduced; Some visitors may avoid the Langston Golf Course or this area because of the high number of resident Canada geese that utilize turf areas of the golf course.	Beneficial for visitors who do not enjoy Canada geese at the park	Goose population would be reduced; management techniques would make Langston Golf Course and other areas less attractive to resident geese	Beneficial for visitors who do not enjoy Canada geese at the park	Goose population would be reduced; management techniques would make Langston Golf Course and other areas less attractive to resident geese	Overall negligible impact	There would be no observable or measurable impacts to the population of resident Canada geese within the park or to the Maryland, DC, or Atlantic Flyway resident Canada goose populations	Overall negligible impact	There would be no observable or measurable impacts to the population of resident Canada geese within the park or to the Maryland, DC, or Atlantic Flyway resident Canada goose populations
Cumulative impacts	Beneficial cumulative impacts for visitors who enjoy geese at the park Negligible cumulative impacts for visitors who do not enjoy geese at the park		Beneficial cumulative impacts for visitors who enjoy geese at the park Beneficial cumulative impacts for visitors who do not enjoy geese at the park		Beneficial cumulative impacts for visitors who enjoy geese at the park Beneficial cumulative impacts for visitors who do not enjoy geese at the park		Beneficial cumulative impacts for visitors who enjoy geese at the park Negligible cumulative impacts for visitors who do not enjoy geese at the park		Beneficial cumulative impacts for visitors who enjoy geese at the park Negligible cumulative impacts for visitors who do not enjoy geese at the park	

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TECHNIQUES DISMISSED FROM FURTHER CONSIDERATION

Several techniques that were considered for the alternatives were also dismissed during the process of alternative formulation. The following techniques were eliminated from further consideration for the management of wetlands and resident Canada geese at Anacostia Park.

WETLAND MANAGEMENT TECHNIQUES

Maintenance Dredging—The alternatives described above include the creation of tidal guts in areas of the wetlands that do not continuously receive tidal water flow. These tidal guts would be created through a one-time dredging activity. The NPS has eliminated maintenance dredging of the existing and created tidal guts due to the high costs associated with the effort. This element is not economically feasible.

Hard Containment—Hard containment, including sheet piling and rip-rap would not be used to completely surround wetland areas. The purpose of containment is to temporarily hold sediment in place. Hard containment surrounding the entire wetland has been dismissed since sheet piling and rip rap are typically permanent materials. This element is not technically or economically feasible.

RESIDENT CANADA GOOSE MANAGEMENT TECHNIQUES

Harassment Techniques—Harassment techniques that involve the use of pyrotechnics, propane cannons, distress calls, and lasers were dismissed. Due to the concerns discussed below, these types of harassment techniques were dismissed as reasonable alternative elements. In general, harassment techniques provide a short-term temporary relief. Success of harassment techniques will vary depending on the size of the property, size of goose population, and time of year the harassment techniques are used (Paulin and Drake 2004). Pyrotechnics, propane canons, and distress calls were dismissed because they conflict with and up-to-date or valid park plan, statement or purpose and significance, or other policy, such that a major change in the plan or policy would be needed to implement the elements. Specifically, the use of soundmaking devices does not assist the park in protecting natural sounds. (NPS 2006a). The use of lasers and hazing with water spray would cause great environmental impacts. Below is a short description of harassment techniques that were dismissed.

Pyrotechnics—Pyrotechnics are devices that make a loud noise intended to scare geese away from an area. Pyrotechnics include screamers and banger shells (shot out of a starter-type pistol) and shell crackers (shot out of a 12-gauge shotgun). Detonating pyrotechnics would be loud and irritating to the surrounding communities.

Propane Cannons—Propane cannons are devices that ignite propane gas to produce a loud explosion at timed intervals. This technique is extremely loud. The park is urban and the use of propane cannons would disturb surrounding residences and communities.

Distress Calls—This element involves using a recording of distress calls of Canada geese. Distress calls are most effective when played back loud enough to be heard by geese at a distance. When using this element, geese will quickly habituate to distress stimulus (French 2001).

Lasers—Lasers used as a harassment tool are relatively low power, long-wave length lasers that can disperse species under low light conditions. Lasers cannot be pointed directly at people, roads, and aircraft (French 2001). This technique may be an acceptable tool; however, public safety is a concern and this technique can be costly.

Hazing with Water Spray Devices—In public use areas, this is not a viable tool due to increased noise levels that could disturb the surrounding residences. In addition the use of a water spray device would likely create areas of ponding throughout the park, including the recreation fields.

Noisemaking devices that could be mounted on vehicles, hand-held, or operated remotely such as emergency sirens, nautical horns, and electric whistles played at loud levels to scare geese were dismissed. Firing non-projectile blanks from firearms or starter guns and firing bangers, screamers, and whistle bombs from a 15-millimeter launcher are additional scare and harassment devices that were also dismissed from further consideration. It is likely that the resident Canada goose population would habituate to these noisemaking harassment techniques. While some of these devices are occasionally used in other parks, Anacostia Park's location within the metropolitan area and the public's close proximity to areas where these devices would be used makes these devices too disruptive. Visitors playing golf or on adjacent playing fields would be constantly disrupted by noise.

Nest Destruction—Nest destruction and nest removal would require a federal permit. Resident Canada geese typically nest within 150 feet of the water (Smith et al. 1999). When goose nests are destroyed, Canada geese may re-nest in or near the first or original nest. Re-nesting is more common when nest failure occurs early in the egg-laying period. If nest destruction occurs after more than one week of egg incubation, re-nesting is rare (Smith et al. 1999).

Tolerance Zones—NPS personnel considered establishing areas within the park that would be considered resident Canada goose nesting tolerance zones and non-tolerance zones. The purpose of the tolerance zone is to allow resident Canada geese to continue to reproduce and sustain a viable population. The purpose of the non-tolerance zone is to focus goose management efforts in those areas identified for wetland management and restoration. The tolerance zones would include areas set aside where geese would be allowed and they would not be disturbed by the management techniques discussed in each alternative. These sites would be easily accessible and would offer the geese preferred habitat for foraging and nesting. The sites would include feeding areas, good sight lines, and access to bodies of water. The non-tolerance zones would not allow geese to nest or forage in the selected areas. Nesting areas would be visited on a daily basis; those nests built within the no tolerance zones would be removed and destroyed. This alternative was not considered technically viable since it would be impossible to keep geese from any given area because there is no fencing within the park and geese could move in and out of areas by flying. In addition, moving geese would shift the problems associated with the geese to other areas within the park or neighboring property, which would not meet the project objectives or resolve the need.

Exclusion Techniques (electric fencing)—There are many safety concerns associated with the use of electric fencing for goose management. Fences may need to be placed in public areas since resident Canada geese are found throughout Anacostia Park. Other types of exclusion fencing do not pose the same harm to visitors and can be effective deterrents. Therefore, because of public safety concerns and other adverse environmental affects (Drake and Paulin 2003), this type of exclusion fencing was dismissed.

Capture and Relocation—This technique includes capturing geese and relocating them to an area of sufficient distance from the park to ensure that they would not return. Capturing geese within Anacostia Park and relocating them would be in violation of NPS Policy regarding translocation. Relocating geese to a different area would require permits. In addition, if geese were to relocate, they may ultimately cause similar problems within the new location. Due to the concerns discussed above relating to policy and feasibility, capture and release was dismissed as a reasonable alternative element. This would be in conflict with up-to-date and valid park plan, statement of purpose and significance, or other policy, such that a major change in the plan or policy would be needed to implement.

Introduction of Mute Swans—This technique involves the introduction of mute swans to Anacostia Park. Swans are characterized as aggressive birds and will defend their territory, especially during breeding seasons. Mute swans are more tolerant of other waterfowl and may only defend the immediate area around their nest. This is not a viable technique because mute swans may act as decoys and can attract geese to waterbodies (USDA 2002). In addition, it is against NPS policy to introduce a non-native species (NPS 2006a). This is not technically or economically feasible and would be in conflict with up-to-date and valid park plan, statement of purpose and significance, or other policy, such that a major change in the plan or policy would be needed to implement.

Lure Crops—This technique includes fields of grain that have been planted and purposefully left for geese to consume. Due to the need of the park to have to use a nearby agricultural field located outside of park boundaries, this technique was dismissed. In addition, this technique may lead to an increase in bird density locally because birds are attracted to the abundance of food (French 2001). This was dismissed because it is not technically feasible and it may lead to other adverse environmental impacts outside the park.

PREFERRED ALTERNATIVE

The selection of the preferred alternative was accomplished during a roundtable meeting on March 8, 2010. Meeting attendees included the project team (Anacostia staff, NPS Regional Director, and representatives from CUE). During the roundtable meeting, the project team discussed how each of the alternatives fully meets, partially meets, or fails to meet the project objectives. The results of the roundtable discussion concluded that alternative B is the preferred alternative. Alternative B fully meets all the project objectives listed above due to the high number of goose management techniques including lethal control, scare and harassment program, habitat alteration, and egg oiling. This alternative also proposes extensive wetland restoration opportunities including managing invasive species, creating new shoreline buffers with native species, creating tidal guts, and daylighting. Other alternatives proposed did not fully meet each of the objectives.

*Alternative B fully meets
all project objectives;
alternative B is the
preferred alternative.*

In addition, to meeting the project objectives, all impacts to natural resources, (with the exception of resident Canada geese) are beneficial as a result of alternative B and include the following: soils, geology, water quality, floodplains, wetlands, aquatic resources, terrestrial vegetation, and wildlife (not including the resident Canada goose). These resources are described in more detail in the paragraphs that follow.

The majority of the wetland and goose management techniques included under alternative B would not diminish the character-defining features or the overall integrity of historic resources and would have negligible impacts (*no adverse effect* for Section 106) on historic structures and districts. However, seawall breaks and daylighting, which are future wetland management techniques considered under alternative B, could have up to a long-term moderate adverse impact (*adverse effect* for Section 106) on the Anacostia River Seawall, which is potentially eligible for the NRHP. Future NEPA compliance would be necessary to assess possible impacts to the Anacostia River Seawall in the event that NPS implements the seawall breaks and daylighting associated with the alternative. Similarly, some of the management techniques under alternative B would require ground-disturbing activities that could result in direct, long-term minor to moderate adverse impacts (*adverse effect* for Section 106) to archeological resources. Additional documentation of archeological resources and NEPA compliance would be necessary to assess possible impacts to archeological resources as a result of alternative B. If impacts to cultural resources were found to be of such magnitude that a finding of *adverse effect* under Section 106 of the National Historic Preservation Act results, then NPS would consult with the District of Columbia State Historic Preservation Office and the Advisory Council. Adverse effects under Section 106 would be mitigated by

context sensitive design or other measures developed during future Section 106 consultation as stipulated in a formal Memorandum of Agreement.

Although it is possible that adverse effects could occur to cultural resources as a result of alternative B, the following beneficial impacts to natural resources would occur:

- **Soils**—Beneficial impacts as a result of wetland and goose management techniques proposed, which would improve the existing wetlands, create new wetlands, and reduce goose herbivory of wetlands which would increase wetland vegetation and rootmass, thus stabilizing soils adjacent to the river and reducing actual soil loss during rain events.
- **Hydrology**—Beneficial impacts as a result of the suite of potential techniques to improve the hydrology of the watershed including: erosion control techniques; removing/modifying structures that negatively affect the marsh; creating tidal guts; potential enforcement of no wake zones along the River; investigating the effects of extreme water level change; and considering altering water elevations; the combination of these techniques would infiltrate stormwater into soils, thus mimicking natural drainage processes and reducing the volume of stormwater runoff that enters the Anacostia River during rain events; stream and channel flow would also be improved by removing and/or modifying structures that impede flow.
- **Water Quality**—Beneficial impacts through reducing the resident Canada goose population in the park which would decrease the number of fecal droppings and decrease the amount of erosion from excessive grazing, thus improving water quality through decreased pathogens and sedimentation; new wetlands proposed or restored can serve as a trap for nutrients and sediment (and associated pollutants and pathogens binding to sediment) carried by runoff from surrounding uplands or contiguous wetlands, thereby improving water quality in the Anacostia River.
- **Floodplains**—Floodplain function would improve in localized areas of the park through improvements to wetlands; additional vegetative buffer plantings along the river; and the removal of impervious surface in the watershed as well as potential flood attenuation through wetland restoration techniques.
- **Wetlands**—The high wetland and goose management techniques proposed would enhance existing wetland areas at the park and restore or create new wetland areas resulting in beneficial impacts; it is expected that with rapidly reduced goose browsing pressure, the herbivory previously observed in wetland vegetation would start to reverse and may allow the vegetation to become more resilient (through increased rootmass and propagules) to goose herbivory the following spring.
- **Aquatic Resources**—For alternative B, improvements to wetland vegetation through restoration and resident Canada goose management would indirectly benefit aquatic resources, including finfish, benthic macroinvertebrates, and shellfish because revegetation, stabilization, and changes to hydrology would improve habitat and food sources for aquatic species.
- **Terrestrial Vegetation and Wildlife**—Alternative B would result in overall beneficial impacts on vegetation due to wetland management practices, new plantings, and a reduction in herbivory which would improve native vegetation communities; this alternative would also result in beneficial impacts on wildlife (not including resident Canada geese) because improvements to habitat and food sources would positively impact population structure and numbers in the park.

The only adverse impact to natural resources as a result of alternative B includes adverse impacts to resident Canada geese within the park due to lethal reduction activities. Alternative B proposes more intense management techniques, and therefore, has a long-term moderate to major adverse impact on the resident Canada goose in the park because the population would be lethally reduced and maintained at a

lower level than current numbers throughout the life of the plan/EIS; impacts to the population of resident Canada geese within the park would be detectable, and these impacts would be perceptible at the Maryland or DC resident Canada goose population level, but not at the Atlantic Flyway resident Canada goose population levels.

For visitor use and experience, there would be different expectations for different users of the park. For alternative B, it is the intent of NPS to maintain a population of resident Canada geese within the park. For this alternative, impacts to visitors who enjoy seeing resident Canada geese at the park would continue to be beneficial. Similarly, impacts to visitors who do not enjoy resident Canada geese at the park would be beneficial since the goose population would be reduced under alternative B.

SUMMARY—CONSISTENCY WITH SECTIONS 101(B) AND 102(1) OF NEPA

The NPS requirements for implementing NEPA include an analysis of how each alternative meets or achieves the purposes of NEPA, as stated in sections 101(b) and 102(1). Each alternative analyzed in a NEPA document must be assessed as to how it meets the following purposes:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
2. Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
4. Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.
5. Achieve a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities.
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Council on Environmental Quality (CEQ) Regulation 1500.2 establishes policy for federal agencies' implementation of NEPA. Federal agencies shall, to the fullest extent possible, interpret and administer policies, regulations, and public laws of the United States in accordance with the policies set forth in NEPA (sections 101(b) and 102(1)); therefore, other acts and NPS policies are referenced as applicable in the following discussion.

Fulfills the Responsibilities of each Generation as Trustee of the Environment for Succeeding Generations

Alternatives B, C, D, and E provide increased protection to wetlands at Anacostia Park by establishing wetland and resident Canada goose management guidelines that reduce impacts on the restored wetlands from the resident Canada geese. Applying both resident goose and wetland management techniques would not only benefit the restored wetlands in the park when compared to the no action alternative, but would also provide protection to other resources including soils, water quality, vegetation, and wildlife.

Alternative B provides the highest level of wetlands and resident Canada goose management by combining the most aggressive wetland techniques with intensive goose techniques including lethal

control. Alternative B would reduce herbivory on wetland vegetation by implementing an intensive lethal control program, altering the preferred habitat of resident Canada geese, and establishing a scare and harassment program. Alternative B would also implement various wetland management techniques, including use of erosion control techniques, creating tidal guts, and considering daylighting and seawall breaks, that would restore, protect, and maintain wetland functions. Restoring wetlands would also benefit other wildlife within the area. Alternative B would fully meet the purpose of fulfilling the responsibilities of each generation as trustee for the environment.

Alternative C includes moderate wetlands management with moderate resident Canada goose management. This alternative assumes that more intensive wetland management would be needed to counteract the resident goose population that would remain in the area. Alternative C would include a variety of goose management techniques including lethal control, increasing vegetative buffers, and implementing a scare and harassment program. Overall, these techniques would reduce the amount of herbivory by geese within the restored wetland areas. Wetland techniques would restore, protect, and maintain the wetland functions, including hydrology and vegetation. Techniques may include erosion control, planting efforts, and managing invasive species. Wetland restoration would also benefit other wildlife in the area. Consequently, alternative C would also fully meet the purpose of fulfilling the responsibilities of each generation as trustee of the environment.

Alternative D includes a plan for low wetlands management and low goose management. Alternative D combines less aggressive wetland management techniques with lethal goose management one time during the life of the plan if necessary. Wetland management techniques include managing invasive species, considering new rain garden areas, and removing or modifying structures that result in erosion or clogging the marsh. Goose management techniques include minimal alteration of preferred habitat, and continuation of the park's egg oiling program. Although, wetland and goose management techniques would improve conditions when compared to the no action alternative, benefits would be short-term and wetland functionality would continue to decrease. Consequently, alternative D would only meet the purpose of fulfilling the responsibilities of each generation as trustee of the environment to a moderate degree.

Alternative E combines the most aggressive wetlands management technique with intensive non-lethal goose management techniques. Alternative E restores, protects, and maintains wetland functions by using erosion control techniques, creating tidal guts, and considering daylighting and seawall breaks. Although goose management techniques would not include lethal control, benefits to the wetlands could result from modifying preferred goose habitat, initiating an intensive scare and harassment program, and continuing reproductive controls. The benefits from wetland management would continue to be largely offset by the large size of the goose population at the park. Therefore, alternative E would only meet the purpose of filling the responsibilities of each generation as trustee of the environment to a moderate degree.

Alternative A, the no action alternative, would not change the current wetland and goose management at the park. The park would continue to maintain the current goose exclusion fencing and conduct yearly egg oiling. Goose herbivory, invasive species, erosion, and loss of wetland function would result in further degradation of wetlands, water quality, and wildlife habitat. Due to the continued degradation of the wetlands and wildlife habitat, alternative A would not fully meet the purpose of fulfilling the responsibilities of each generation as trustee for the environment.

Ensure for all Americans Safe, healthful, Productive, and Aesthetically and Culturally Pleasing Surroundings

Alternatives B and C would fully meet the purpose of ensuring for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings. Alternatives B and C would include

high to moderate goose management techniques as described above. Minimizing the size of the resident Canada goose population at the park, would reduce the amount of goose feces throughout the park lands. This reduction would improve the health and safety of visitors at the park and the natural aesthetics of the park. The wetland and goose management techniques would also improve the aesthetics of the area by restoring the wetlands and other vegetation throughout the park.

Alternatives D and E would meet the purpose of ensuring for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings, but only to a moderate level. Alternative E would include low wetland and goose management as described above. If needed a one-time lethal control effort would be implemented. The reduction of the population would reduce the amount of goose feces throughout the park, which would benefit the health and safety of park visitors and natural aesthetics. However, since other goose management strategies would be minimal, it is likely that the population may re-establish. Alternative E includes high wetland management and low goose management as described above. Since no lethal control would be used in alternative E, it is likely that the large resident goose population at Anacostia would continue to destroy wetlands and goose droppings throughout the park grounds would continue to be a problem. The wetland management techniques would restore and protect the wetlands; however, the benefits to the wetlands would be offset by the large goose population size.

Alternative A would not fully meet the purpose of ensuring for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings. Alternative A includes minimal wetland and goose management techniques. The resident Canada goose population would continue to destroy the wetlands throughout the park. In addition, goose feces throughout the park lands would continue to be a problem, which would increase health and safety concerns and decrease the aesthetic and cultural landscape of the park.

Attain the Widest Range of Beneficial Uses of the Environment without Degradation, Risk of Health or Safety, or other Undesirable and Unintended Consequences

Alternatives B and C would fully meet the purpose of attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences. Alternatives B and C would continue to allow a wide range of visitor use opportunities. The decrease in the goose population would improve the health and safety of recreating at the park, by reducing the amount of goose feces throughout the park lands, including the playing fields which are used for multiple sporting events. These alternatives have been designed to allow multiple uses of the park without further degradation of water quality, vegetation, wildlife, and special status species. Alternative B offers additional uses of the park if new boardwalks and trails were constructed.

Alternatives D and E would meet the purpose of attaining the widest range of beneficial uses of the environment without further degradation, risk of health and safety, or other undesirable or unintended consequences, but only to a moderate level. Alternatives D and E would continue to allow a wide range of visitor use opportunities; however, the health and safety of individuals would continue to be an issue since, the large resident goose population would most likely continue. Alternative D would only allow a onetime lethal control reduction and alternative E would not include lethal control. Goose feces throughout the park would continue to be high and reduce the river's water quality. In addition, it is likely that the goose population would continue to destroy the wetland areas.

Alternative A would not fully meet the purpose of attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences. Under the no action alternative, the park would continue minimal wetland and goose management strategies including maintaining goose exclusion fencing, egg oiling, and removal of invasive species. The resident goose population would continue to destroy the wetlands throughout the

park. Goose feces would continue to be a problem throughout the park including the playing fields and Langston Golf Course. Visitors would continue to recreate at the park; however, health and safety of visitors would continue to be a concern.

Preserve Important Historic, Cultural, and Natural Aspects of our National Heritage and Maintain, wherever Possible, an Environment that Supports Diversity and Variety of Individual Choice

Alternatives B and E would meet the purpose of preserving important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice, but only to a moderate level. Alternatives B and E include a high level of wetland and goose management techniques (no lethal control for alternative E). Some of the proposed techniques may adversely impact the historic and archeological resources throughout the park. The wetland and goose management techniques may alter the historic setting in the vicinity of Kenilworth Gardens, Langston Golf Course, and Anacostia Park. Some techniques such as, daylighting, seawall breaks, and creating tidal guts may require ground disturbing activities that could impact known or undiscovered archeological resources. However, restoring the wetlands throughout the park would benefit the natural aspects of the park including water resources, vegetation, wildlife habitat, and special status species.

Alternatives C and D would meet the purpose of preserving important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice, but only to a moderate degree. Alternatives C and D include wetland and management techniques that would benefit the overall natural environment, including water resources, vegetation, wildlife habitat, and special status species. The wetland and goose management techniques proposed under alternative C and D would require a limited scope of ground disturbing activities that could impact known or unknown archeological resources. In addition, the limited techniques proposed would create negligible impacts to the historic setting of Kenilworth Gardens, Langston Golf Course, and Anacostia Park.

Alternative A would meet the purpose of preserving important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice, but only to a moderate level. Under alternative A, the park would continue to manage wetlands and goose population through maintaining goose exclusion fencing, egg oiling, and managing invasive species. The continuation of the current management practices would not result in impacts to the historic structures and districts or to archeological resources. However, the natural aspects of the park would continue to degrade. The resident Canada goose population would continue to destroy the wetland areas throughout the park. In addition, water resources, vegetation, and wildlife habitat would continue to degrade.

Achieve a Balance between Population and Resource use that would Permit High Standards of Living and a Wide Sharing of Life's Amenities

Balancing population and resource use under the plan/EIS would include protecting the resources unimpaired for the enjoyment of present and future generations and providing access for visitors to experience the natural resources of the park. NPS *Management Policies 2006* states that the enjoyment that is contemplated by the *Organic Act* is broad; it is the enjoyment of all the people of the United States and includes enjoyment both by people who visit parks and by those who appreciate them from afar. It also includes deriving benefit (including scientific knowledge) and inspiration from parks, as well as other forms of enjoyment and inspiration. Congress, recognizing that the enjoyment by future generations of the national parks can be ensured only if the superb quality of park resources and values is left

unimpaired, has provided that when there is a conflict between conserving resources and values and providing for enjoyment of them, conservation is to be predominant. As discussed above, alternatives B and C would continue to provide a variety of visitor activities throughout the park. Alternatives B and C would implement a variety of wetland and goose management techniques that would restore and protect the wetland areas throughout the park. In addition, alternatives B and C would reduce the resident Canada goose population using lethal control and maintain the population through the life of the plan. Alternatives B and C would have the greatest benefit to the natural resources of the park including water resources, vegetation, wildlife habitat, and special status species. Given this, alternatives B and C would fully meet this purpose because each action alternative would provide the public access to share the park's amenities and would protect the resources so that they would be available for future generations.

Alternatives D and E would meet the purpose of achieving a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities, but only to a moderate level. Alternatives D and E would implement a limited number of wetland and goose management techniques described above. Since lethal control would be limited in alternative D and prohibited in alternative E, it is likely that the large size of the resident goose population at the park would continue. Although portions of the wetlands throughout the park may be restored, it is likely that the benefit would only be short-term, due to the continuation of the large goose population. Alternatives D and E would continue to offer a variety of visitor uses, however, portions of the park would continue to degrade.

Alternative A would not fully meet the purpose of achieving a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities. Under the no action alternative, the park would continue minimal wetland and goose management techniques including maintaining goose exclusion fencing, egg oiling, and managing invasive species. The resident goose population would remain in large numbers and goose herbivory would continue to threaten wetland vegetation. Canada geese would continue to deplete the wetlands and cause adverse impacts to water resources and wildlife habitat. Although, visitors would have the opportunity to use the park for a variety of uses, resources would continue to degrade.

Enhance the Quality of Renewable Resources and Approach the Maximum Attainable Recycling of Depletable Resources

Action alternatives B, C, D, and E would fully meet the purpose of enhancing the quality of renewable resources and approach the maximum attainable recycling of depletable resources. For the reasons discussed above, each alternative would enhance the quality of and protect the park's biological and physical resources to some extent. Alternatives B and C would provide the greatest protection of these resources since it would allow for the most wetland and goose management techniques and it would allow lethal control throughout the life of the plan. Alternatives D and E would protect the park's biological and physical resources, but to the least degree when compared to the other action alternatives. Alternative E would include the least amount of wetland and goose management techniques. Lethal control could only be used one time throughout the life of the plan if necessary. Wetland management would also be minimal; however, the park would still plant and widen vegetated buffers, use passive seedbank restoration efforts, address upland runoff, and create new rain gardens. These techniques would benefit the park's resources. Although alternative E would not allow lethal control, this alternative would allow high wetlands management and moderate goose management. Restoring the park's wetlands would enhance other resources including water resources, vegetation, and wildlife habitat.

Alternative A would not meet the purpose of enhancing the quality of renewable resources. Under the no action alternative, the resident Canada goose population would continue to thrive and deplete the wetlands throughout the park. Other resources including water resources, vegetation, and wildlife would also continue to degrade.

The second purpose, “approach the maximum attainable recycling of depletable resources,” is less relevant to the wetland and resident Canada goose management plan, as it is geared toward a discussion of “green” building or management practices. Alternatives B and E may include the construction of new boardwalks and trails. Environmentally appropriate design standards and materials would likely be used to minimize impacts to depletable resources. There would be no construction related to the no action alternative (alternative A), so this purpose would not apply.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The NPS is required to identify the environmentally preferred alternative in its NEPA documents for public review and comment. The NPS, in accordance with the U.S. Department of the Interior policies contained in the Department Manual (515 DM 4.10) and CEQ’s Forty Questions, defines the environmentally preferred alternative (or alternatives) as the alternative that best promotes the national environmental policy expressed in NEPA (section 101(b)) (516 DM 4.10). The CEQ’s Forty Questions (Q6a) further clarifies the identification of the environmentally preferred alternative stating, “this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources” (CEQ 1981).

Alternative B has been selected as the environmentally preferred alternative because it is the alternative that would best protect the biological and physical environment by ensuring an immediate as well as a long-term reduction in resident Canada geese within the park that could be sustained over the life of the plan and allow the wetland vegetation to recover from goose herbivory. All impacts to natural resources, (with the exception of resident Canada geese) are beneficial as a result of alternative B and included the following: soils, geology, water quality, floodplains, wetlands, aquatic resources, terrestrial vegetation, and wildlife (not including the resident Canada goose). These resources are described in more detail in the paragraphs that follow. Although alternatives B and C are very close in meeting the goal that identifies the environmentally preferred alternative, alternative B was selected primarily because of its greater certainty in achieving the resident Canada goose goal through high wetland and high goose management techniques and all of the beneficial impacts associated with alternative B for natural resources.

Alternatives A, D, and E were not considered environmentally preferred because of their lack of effect on resident Canada goose numbers in the park through low goose management or lack of lethal reduction activities, which would result in potential adverse effects on the biological and physical resources of the park over the life of the plan.

The majority of the wetland and goose management techniques included under alternative B would not diminish the character-defining features or the overall integrity of historic resources and would have 1 negligible impacts (*no adverse effect* for Section 106) on historic structures and districts. However, seawall breaks and daylighting, which are future wetland management techniques considered under alternative B, could have up to a long-term moderate adverse impact (*adverse effect* for Section 106) on the Anacostia River Seawall, which is potentially eligible for the NRHP. Future NEPA compliance would be necessary to assess possible impacts to the Anacostia River Seawall in the event that NPS implements the seawall breaks and daylighting associated with the alternative. Similarly, some of the management techniques under alternative B would require ground-disturbing activities that could result in direct long-term minor to moderate adverse impacts (*adverse effect* for Section 106) to archeological resources. Additional documentation of archeological resources and NEPA compliance would be necessary to assess possible impacts to archeological resources as a result of alternative B. If impacts to cultural resources were found to be of such magnitude that a finding of *adverse effect* under Section 106 of the National Historic Preservation Act results, then NPS would consult with the District of Columbia State Historic Preservation Office and the Advisory Council. Adverse effects under Section 106 would be mitigated by

context sensitive design or other measures developed during future Section 106 consultation as stipulated in a formal Memorandum of Agreement.

Although it is possible that adverse effects could occur to cultural resources as a result of alternative B, the following beneficial impacts to natural resources would occur, thus justifying alternative B as the environmentally preferred alternative:

- **Soils**—Beneficial impacts as a result of wetland and goose management techniques proposed which would improve the existing wetlands, create new wetlands, and reduce goose herbivory of wetlands which would increase wetland vegetation and rootmass, thus stabilizing soils adjacent to the river and reducing actual soil loss during rain events. Alternative B is the most beneficial to soils compared all other alternatives because this alternative proposes the most hydrology techniques, greatest planting density effort, most wetland restoration projects in combination with lethal population reduction activities for geese to reduce grazing pressure of vegetation from resident Canada geese.
- **Hydrology**—Beneficial impacts as a result of the suite of potential techniques to improve the hydrology of the watershed including: erosion control techniques; removing/modifying structures that negatively affect the marsh; creating tidal guts; potential enforcement of no wake zones along the River; investigating the effects of extreme water level change; and considering altering water elevations; the combination of these techniques would infiltrate stormwater into soils, thus mimicking natural drainage processes and reducing the volume of stormwater runoff that enters the Anacostia River during rain events; stream and channel flow would also be improved by removing and/or modifying structures that impede flow. Even though alternatives B and E propose the most intensive hydrology techniques, alternative E does not include lethal population reduction activities for geese to reduce grazing pressure of vegetation from resident Canada geese. Therefore, alternative B is the most beneficial alternative to hydrology.
- **Water Quality**—Beneficial impacts through reducing the resident Canada goose population in the park which would decrease the number of fecal droppings and decrease the amount of erosion from excessive grazing, thus improving water quality through decreased pathogens and sedimentation; new wetlands proposed or restored can serve as a trap for nutrients and sediment (and associated pollutants and pathogens binding to sediment) carried by runoff from surrounding uplands or contiguous wetlands, thereby improving water quality in the Anacostia River. Alternative B is the most beneficial to water quality compared all other alternatives because this alternative proposes the most hydrology techniques, greatest planting density effort, most wetland restoration projects in combination with lethal population reduction activities for geese to reduce grazing pressure of vegetation from resident Canada geese.
- **Floodplains**—Floodplain function would improve in localized areas of the park through improvements to wetlands; additional vegetative buffer plantings along the river; and the removal of impervious surface in the watershed as well as potential flood attenuation through wetland restoration techniques. Alternative B is the most beneficial to floodplains, because alternative C includes only limited removal of structures and least invasive stream/stormwater outfall modifications and no seawall breaks and no daylighting are proposed for alternative C to reconnect the floodplain with the Anacostia River. Although alternative E proposes similar techniques compared to alternative B, the floodplain benefits from a full suite of wetland management techniques proposed without a resident Canada goose population (lethal) reduction may be either completely offset or take longer to realize for alternative E.
- **Wetlands**—The high wetland and goose management techniques proposed would enhance existing wetland areas at the park and restore or create new wetland areas resulting in beneficial impacts; it is expected that with rapidly reduced goose browsing pressure, the herbivory

previously observed in wetland vegetation would start to reverse and may allow the vegetation to become more resilient (through increased rootmass and propagules) to goose herbivory the following spring. Compared to alternative B, which is the most beneficial to wetlands, alternative C would not include creating tidal guts and would not consider stream daylighting or seawall breaks and planting efforts would be at a lower density. Although alternative E proposes similar techniques compared to alternative B, the benefits to wetlands from a full suite of wetland management techniques proposed in alternative E without a resident Canada goose population (lethal) reduction would not have a beneficial impact on wetlands.

- **Aquatic Resources**—For alternative B, improvements to wetland vegetation through restoration and resident Canada goose management would indirectly benefit aquatic resources, including finfish, benthic macroinvertebrates, and shellfish because revegetation, stabilization, and changes to hydrology would improve habitat and food sources for aquatic species. Alternative B is the most beneficial to aquatic resources compared all other alternatives because this alternative proposes the most wetland techniques in combination with a lethal population reduction activities for geese to reduce grazing pressure of wetland vegetation from resident Canada geese.
- **Terrestrial Vegetation and Wildlife**—Alternative B would result in overall beneficial impacts on vegetation due to wetland management practices, new plantings, and a reduction in herbivory which would improve native vegetation communities; this alternative would also result in beneficial impacts on wildlife (not including resident Canada geese) because improvements to habitat and food sources would positively impact population structure and numbers in the park. Alternative B is the most beneficial to terrestrial resources compared all other alternatives because this alternative proposes the most techniques that will benefit vegetation and wildlife in combination with a lethal population reduction activities for geese to reduce grazing pressure of vegetation from resident Canada geese.

The only adverse impact to natural resources as a result of alternative B includes adverse impacts to resident Canada geese within the park due to lethal reduction activities. Alternative B proposes more intense management techniques, and therefore, has a long-term moderate to major adverse impact on the resident Canada goose in the park because the population would be lethally reduced and maintained at a lower level than current numbers throughout the life of the plan/EIS; impacts to the population of resident Canada geese within the park would be detectable, and these impacts would be perceptible at the Maryland or DC resident Canada goose population level, but not at the Atlantic Flyway resident Canada goose population levels.