

Chapter 4



Refuge wetlands

Environmental Consequences

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Chapter 4: Environmental Consequences

4.1 Introduction

This chapter describes the environmental consequences we predict from implementing management alternatives presented in chapter 2. Where detailed information is available, we provide a more analytic comparison between alternatives and their anticipated consequences. These consequences are described as impacts or effects. In absence of detailed information, we make comparisons based on professional judgment and strategies of the three alternatives: Current Management (alternative A); Balanced Approach (alternative B); and Reduced Disturbance (alternative C).

The chapter is organized by resource category, with the discussion focused on the direct, indirect, and cumulative impacts of both beneficial and adverse effects likely to occur over the 15-year life span of this CCP. Three tables are provided (Tables 4-1, 4-5, and 4-6) that show in which of the alternative(s) a management action is included, notes which of the resource categories would likely be affected by the action, and summarizes whether the impact is adverse or beneficial to that use. In the text, the actions that cause a particular impact are sometimes referenced by the number listed in the tables, as indicated by “(management action #)”, where it is more efficient or clear to do so rather than to include a lengthy and repetitive description of the impact-causing action. At the end of this chapter, a matrix summarizes the impacts identified for each action alternative by resource topic and allows for a side-by-side comparison.

Consistent with the CEQ and USFWS regulations on implementing NEPA, we assessed the impacts of the alternatives based on their significance, which takes into account context and intensity of the proposed actions for the alternatives. The geographic scale of their context ranges from site-specific to local or region. Although the area of the refuge is only a small percent of the context of its ecosystem or region, we developed all management alternatives to contribute to the many conservation goals in those larger contexts.

We based evaluations of the intensity of the effects of the alternatives on these factors:

- expected degree or percent of change in the resource from current conditions;
- frequency and duration of the effect;
- sensitivity of the resource to such an effect or its natural resiliency to recover from such an effect; and
- potential for implementing effective preventive or mitigating measures to lessen the effect.

The duration of identified effects varies within the 15-year period of this plan, from those occurring only once for a brief period (e.g., the effects of construction for when facilities are expanded) to those occurring more frequently during a given season or year (e.g., observing wildlife from refuge trails).

This chapter does not separately evaluate the consequences of certain types of management actions described in chapter 2 because these actions often have impacts too trivial to matter, and would be categorically excluded if independently proposed, which would exclude them from further analysis or review. Such categorically excluded actions include but are not limited to:

- Conducting environmental education and interpretation programs (unless major construction is involved, or significant increase in visitation is expected);

- Conducting research, inventorying resources, or otherwise collecting resource information;
- Operating and maintaining infrastructure and facilities (unless major renovation or improvements are involved);
- Recurring, routine habitat management actions and improvements;
- Constructing small projects (e.g., fences, berms, interpretive kiosks) or developing access for routine management;
- Planting and restoring native vegetation; and
- Enforcing Federal laws or policies.

The most recent refuge comprehensive plan, the Chincoteague NWR Master Plan (1993), was created after completion of its own EIS, which included analysis of the refuge's current management for impacts under the NEPA process. Alternative A, Current Management, principally uses the 1992 EIS as the baseline for analyses in this document. This document identifies where impacts would remain consistent for alternative A from the assessment conducted for the 1992 EIS, and identifies management actions that have evolved or changed based on refuge needs since 1992. Previous land and wetland acquisition to ensure protection of important habitats for various birds and aquatic species was a high priority in the 1993 Master Plan. Protection and management of these acquired lands would continue to be a high priority for the refuge, making as much suitable habitat as possible available for the varied refuge wildlife.

There are additional actions proposed under the alternatives that are not fully analyzed in this draft CCP/EIS because they would require additional information and a level of analysis that is beyond the scope of this EIS. These larger actions would require further planning by the refuge. Once detailed proposals for these actions have been developed, a separate environmental analysis and associated environmental assessment document would be prepared, which would include public involvement and comment at that time. Where possible, we analyzed these alternative actions based on current information.

4.2 Soils

Soils are an important natural resource of the refuge that serve as a fundamental basis of the physical environment of all habitats. Soil biotic communities consume the wastes and the remains of dead organisms and recycle their constituent materials that are incorporated into the soil for plant productivity. The primary component of the soils found on the refuge is sand and shell (base layer) with various amounts of organic materials forming the different soil types. The refuge must protect these soils to sustain the variety of wetland and upland habitats that would meet refuge goals for habitat and species management. Chapter 3, Affected Environment, provided a profile of soil types on the refuge. This section provides the results of the evaluation of the management actions each alternative proposes for impacts on soils generally.

We reviewed visitor use activities (hunting, fishing and OSV use, recreational beach use, walking, biking, horseback riding) currently occurring on the refuge for impacts to soil. These activities could disturb upper soil layers, thereby increasing the potential for erosion. However, the compaction of soil could result in minor effects to wildlife along heavily used access routes. For hunting, impacts to soil are not significant because the limited amount of hunters in a given season are not enough to cause any permanent impacts, especially since the routes used by hunters to stalk game are often sporadic. Hiking trails, wildlife observation areas, parking areas, and other high-use areas would continue to be well-maintained through distinct paths and areas where

visitors are permitted to traverse, resulting in negligible soil impacts to areas outside specified areas. Soil erosion would not be anticipated; no significant impacts would result on the refuge from these visitor services, although monitoring efforts would continue.

We evaluated the management actions for each alternative for their potential to benefit or adversely impact refuge soil, including one or more of the following:

- Prescribed burning, disking, and mowing;
- Removal of vegetation;
- Visitor service activities; and
- OSV and horseback riding use.

Table 4-1 assesses the impact of management actions on soils; management actions are referenced throughout the text by a number and by a (b), (s), or (v) depending on whether they are dealing with biological, socioeconomic, or visitor services resources, respectively.

4.2.1 Impacts on Soils in Alternative A

As stated earlier, current management practices that occur on the refuge were analyzed for impacts in the 1992 EIS and would remain consistent for this document. Impacts on soil under alternative A (“Current Management”) serve as a baseline for comparing and contrasting alternatives B and C to the refuge’s existing management activities. Under alternative A, continuing current management practices will not result in any new or significant impacts to soils. We will continue to use best management practices in all activities that might affect refuge soils to ensure that we maintain soil productivity and do not contribute to erosion or sedimentation.

4.2.2 Impacts on Soils in Alternative B

Proposed management actions in alternative B that would affect soils include three primary changes from alternative A: change in management for the NWF (management actions 22b and 23b), moving of the recreational beach and parking (management action 52b), and widening of the Service Road to permit access to the new recreational beach.

Alternative B proposes changes to visitor services (specifically hunting). These visitor service actions have been analyzed and found to have no significant adverse impacts to soils (management action 68b). The current refuge big game hunting program (deer and sika elk only) would see a slight change in services (but there would be no significant increase in visitation related to hunting). New hunting opportunities under alternative B, including mourning dove and light goose hunting as well as the addition of turkey hunting (big game) would likely result in a negligible increase in visitors related to hunting (management actions 69b, 70b, 71b, 72b). These hunt programs would also be regulated as the current hunt programs are, only allowing a limited amount of permits to be awarded.

Current management of the NWF removes natural scrub shrub vegetation to create more suitable habitat for coastal nesting shorebirds, such as piping plover and American oystercatcher.

Alternative B would cease the vegetation removal and allow for the natural vegetation to grow back in the 300-acre area (management actions 22b and 23b), improving the habitat for spring and fall neotropical migratory birds. This increased amount of natural vegetation would create a significant beneficial impact for the habitat and soil. Increased vegetation in an area would help to prevent soil erosion and disturbance, as well as improve the soils structure and microbial communities by returning nutrients into the ground.

Negative impacts to soil would result from the construction of the new recreational parking as well as the widening of the new beach access road (management actions 49b and 52b). Alternative B provides for 8.5 acres of parking in a new location, for which soil would be impacted. Approximately 18 acres of soil would be impacted from the expansion of the current Service Road to access the new beach parking. Although no soil in either case would be removed from the refuge, leveling and grading practices would be used, with the need to use fill in some areas. If this were to occur, the current soil may be moved or covered with fill. Furthermore, the increased area of hard compact surface (i.e., new road and increased parking) would increase the potential for erosion in those areas during heavy storm and rain events. Mitigation for these impacts would include allowing the natural growth of vegetation around these areas, which would aid for the capture of soil and decreased erosion. Best construction practices would be followed during the parking and road expansions, and mitigation measures such as erosion prevention screens would be employed to minimize impacts. Since the proposed actions associated with the relocated beach parking and road expansion are conceptual and not finalized, specific details for these actions are currently unknown. Further environmental assessments and analysis for impacts on soils would need to be completed prior to construction. Allowing the existing parking site (8+ acres) to revert to natural conditions would result in a positive impact to soils.

Negative impacts to soil would occur from the construction of the 1-acre horse trailer parking at the entrance of Mallard/C Dike (management action 64b). These impacts would not be significant because there would be no removal of soil. The effects of the parked vehicles would be soil compaction, which would result in limited increased runoff and could not be considered significant as the horse trailer parking area is extremely small compared to the overall refuge lands.

Negative impacts would result from the expansion of the OSV zone from the new recreational beach location to the current OSV zone (management action 59b). Adding approximate 2.7 miles that vehicles and horseback riders would be allowed to drive and ride on under alternative B could increase the possibility of destabilization and soil compaction in the coastal habitat. However, OSV users would only be permitted to travel in the intertidal zone, limiting soil disturbance to non-vegetated compact sand. Closures would continue to be instituted during the coastal bird nesting season.

4.2.3 Impacts on Soils in Alternative C

Beneficial impacts to soils would result from the elimination of OSV use and horseback riding (management actions 62b and 65b). This action would allow pioneer beach and dune vegetation growth, consequently encouraging beach ridge and dune development on a currently disturbed barrier island beach. This alternative would virtually eliminate motorized travel on the Overwash and Toms Cove Hook and its negative impacts to beach and dune sand stability. Management access to the Hook would occur via the intertidal zone, limiting soil disturbance to non-vegetated compact sand and not in the sensitive high beach zone.

Negative impacts to soils would occur from the creation of beach parking at the new recreational beach (management actions 49b and 52b). These impacts would be similar as those assessed for the relocated beach parking and widened beach access road in alternative B; however, the extent of the impacts to soils under alternative C would be decreased since the parking area would be approximately half the size. Since the proposed actions associated with the relocated beach parking and road expansion are conceptual and not finalized, specific details for these actions are currently unknown. Further environmental assessments and analysis for impacts on soils would

need to be completed prior to construction. All other soil impacts resulting from alternative C would be the same as alternative B.

4.3 Air Quality

Chapter 3, Affected Environment, discusses the status of air quality on and near the refuge. This section provides the results of the evaluation of the management actions each alternative proposes for impacts on air quality. Table 4-1 assesses the impact of management actions on air quality; management actions are referenced by number throughout the text.

4.3.1 Impacts on Air Quality in Alternative A

With the exception of continued high visitation by vehicles, current management activities neither substantially benefit nor adversely affect local and regional air quality. There are no changes as a result of the No Action Alternative and therefore, no impacts. Continuing current management practices as proposed under alternative A will not result in any new or significant impacts to air quality.

4.3.2 Impacts on Air Quality in Alternative B

Alternative B would relocate the beach parking north approximately 1.5 miles from its current location (management actions 49b and 52b). The final location of the relocated beach parking lots may result in an overall decreased VMT (vehicle miles travelled) of passenger vehicles, a positive outcome. However, new uses such as space tourism and separation of existing uses (recreational beach from crabbing and clamming areas) could cause additional vehicle use by visitors and create seasonal or temporal decreases in air quality from increased VMT.

The main source of emissions at Chincoteague NWR is from gasoline operated passenger cars and trucks, from which the main pollutant is carbon monoxide (management action 48b). Alternative B would not have a significant impact on air quality due to the minor changes in vehicle activity and because the area surrounding Chincoteague NWR meet the National Ambient Air Quality Standards set by EPA as required by the Clean Air Act. Localized increases in emissions from visitors' vehicles would be negligible compared to current off-refuge contributions to pollutant levels and likely increases in air emissions in the Accomack County airshed from land development over the next 15 years. Any adverse effects on air quality from refuge activities would be more than offset by the benefits of maintaining the refuge in natural vegetation.

4.3.3 Impacts on Air Quality in Alternative C

Alternative C would move the beach parking area approximately 1.5 miles north from its current location (management actions 49b and 52b) and would maintain 480 parking spaces, half the number under alternative B (management action 51b). Similar to alternative B, the final location of the relocated beach parking lots may result in an overall decreased VMT of passenger vehicles, a positive outcome. Additionally, institution of a shuttle service during peak visitation (management action 50b) would have a slight negative impact on air quality, but the increase in emissions associated with a shuttle vehicle would be partially if not completely offset with the reduction in passenger vehicles and their associated VMT, which would be greater than that under alternative B. OSVs would be discontinued (management action 62b), thus further reducing VMT and resulting in a positive impact on air quality.

4.4 Hydrology/Water Quality

We evaluated the alternatives for their potential to help maintain or improve the hydrology and water quality of the Delmarva coastal area watershed and identify any impacts to water quality. The area of primary focus would extend from Chincoteague Bay south through the coastal bays and waterways to the southern end of Cedar Island and to the Atlantic Ocean fronting the coastal barrier islands.

The refuge manages 13 impoundments totaling 2,650 acres that are designed to hold freshwater of which the sole water source is precipitation. Precipitation is relatively unpredictable, and each spring and summer managers must weigh the benefits and disadvantages of releasing this water to tidal waters, thereby lowering water levels in the impoundments. Low soil moisture due to insufficient precipitation negatively impacts the growth of moist soil plants with possible consequences to the production of wildlife food and cover. Inadequate late summer and fall precipitation limits the ability to capture fresh water within the impoundments for wintering waterfowl, the primary purpose for which the impoundments were built.

None of the proposed refuge management activities in any alternative should adversely affect local or regional hydrology and water quality. None would violate Federal or state standards for contributing pollutants to water sources, and all three alternatives would comply with the Clean Water Act.

The Sea Level Affecting Marshes Model (SLAMM) analysis suggests that within the next 100 years, significant marsh loss with subsequent gains in open water would be very likely to occur (Nieves 2009). For example, a modeled scenario of one meter sea level rise and a marsh accretion rate of 3.1 mm/year could result in a projected 20 percent loss of upland habitats, 14 percent loss in forested wetlands and scrub-shrub habitats, with an increase from current open water component of 15 percent to 88 percent of the entire refuge, over the next 100 years.

Table 4-1 assesses the impact of management actions on hydrology and water quality; management actions are referenced by number throughout the text.

4.4.1 Impacts on Hydrology/Water Quality in Alternative A

Existing management activities do not adversely affect local or regional hydrology and water quality. Continuing current management practices as proposed under alternative A will not result in any new or significant impacts to hydrology or water quality.

4.4.2 Impacts on Hydrology/Water Quality in Alternative B

Alternative B proposes changes to the hunting program (management actions 69b, 70b, 71b, 72b, and 73b). These visitor service actions have been analyzed and found to have no significant adverse impacts to hydrology or water quality. Current big game hunting programs on the refuge would see a slight change in services (increased hunting outreach events), but there would be no significant increase in visitation related to hunting. Since there would not be a significant increase in visitor use, then there would not be an increase in visitor pollution or vehicle run-off which could negatively impact water quality. Other new visitor services, such as light goose hunting, would be added to the refuge hunting opportunities and result in a slight potential increase in visitors related to hunting.

The management of the Beach Road causeway, which would be restricted from routine visitor use, and the eventual modification of that area, would have a positive impact on tidal flow and water

quality for Swan Cove Pool (F Pool) (management action 15b). The increased tidal rhythm through impoundment culverts would now be allowed to mimic the natural tidal rhythm of Toms Cove, which would lead to improved water quality, dissolved oxygen, pH, and salinity levels for the new flow area. Improvements to tidal flow will require additional consultation with partners (e.g. USACE, Town), an additional environmental analysis.

The disturbance of Mallard and Pintail Pools (C and D Pools) (management action 22b), as part of construction of new recreational beach parking, could have negative impact on water quality for all impoundments to the south (management action 52b). Since impoundment flow is connected from north to south by culverts, anything that occurs in upper watershed beginning at Pintail Pool (D Pool) would flow through the impoundments south of them. Pollutants from vehicle emissions, oils, and coolants that leak out and collect in the parking area could eventually be washed into the adjacent water systems, which would flow south to Toms Cove. This occurrence would be largely confined to the summer months when beach traffic would be at its highest, and would be mitigated through best engineering practices such as the creation of catch basins around the parking area, as well as new culvert containments that would trap pollutants.

General construction practices associated with parking lot building (management action 52b), road expansion, and the improvement of water control structures along the refuge (management action 15b) including site grading, top soiling, and fertilizing could cause erosion, nutrient runoff, and a potential decline in surface and shallow groundwater quality, until development is completed. These impacts would be temporary and best management practices would be followed to help mitigate.

4.4.3 Impacts on Hydrology/Water Quality in Alternative C

Impacts to hydrology and water quality under alternative C would be nearly the same as alternative B, but likely less due to the reduced parking lot size (management action 51b).

4.5 Vegetation

We evaluated the management actions for each alternative for their potential to benefit or adversely impact vegetation on the refuge, including one or more of the following:

- Water level and habitat management for impoundments;
- Construction impacts due to the building of new facilities;
- Management strategies that allow natural succession and dynamic coastal processes to proceed unimpeded along undeveloped barrier island areas of the refuge;
- Change in OSV and horseback riding management; and
- Invasive species management.

Table 4-1 assesses the impact of management actions on vegetation; management actions are referenced by number throughout the text.

Regardless of the alternative selected, impacts on vegetation would be influenced by climate change and sea level rise as increased weather extremes and more severe coastal storms would introduce greater frequency and duration of salt water intrusions in freshwater wetland and upland habitats. These impacts can be seen in detail in the SLAMM analysis (Nieves 2009).

4.5.1 Impacts on Vegetation in Alternative A

Current management practices, as proposed to continue under alternative A, will not result in any new or significant impacts to vegetation.

4.5.2 Impacts on Vegetation in Alternative B

Proposed management actions in alternative B that would affect vegetation include three primary changes from alternative A: change in management for the NWF (management actions 22b and 23b), relocation of the recreational beach and parking, and widening of the new beach access road to permit public access to the new recreational beach (management action 52b).

Alternative B also proposes changes to the hunting program (management actions 69b, 70b, 71b, 72b, and 73b). These visitor service actions have been analyzed and found to have no significant adverse impacts to vegetation. Current big game hunting programs on the refuge would see a slight change in services (increased hunting outreach events), but no anticipated increase in visitation related to hunting, and thus, no increase in visitor trampling potential or vegetation habitat disturbance. Other new visitor services, such as turkey and light goose hunting, would be added to the refuge hunting opportunities which would result in a potential increase in visitors related to hunting. However, the total number of hunters on the refuge at any time would be limited.

Impacts from new or expanded visitor uses would be minimal since visitors use pre-selected paths and hiking trails which the refuge created to traverse through habitat, and avoid future vegetation impacts. For hunters, impacts to wildlife habitat would be minimal as most species impacted would have already undergone senescence (aging or dying process) or become dormant during the hunting seasons. Further impacts are minimized by not permitting hunters to cut vegetation for shooting lanes or camouflage, and by not permitting the use of permanent hunting structures attached by nails, wire, and other materials that could adversely affect vegetation. No significant impacts would result on the refuge from these visitor services, but current monitoring efforts would continue (USFWS 2007b).

The relocation of the recreational beach boundaries and parking areas, along with the expansion of the beach access road, would result in negative impacts to approximately 27 acres of vegetation (management action 52b). The creation of new recreational beach parking would negatively impact approximately 8.5 acres of a mixture of scrub shrub, wetland, and forested habitats, with their associated vegetation (see chapter 3). Vegetation would be altered and/or removed from the vicinity of Mallard Pool (C Pool) and Pintail Pool (D Pool) resulting in a loss of that habitat, mostly myrtle/bayberry shrub (management action 22b). Mitigation for these adverse impacts would result from management of the NWF (management action 23b), as outlined in the section on Soils, that would cease vegetation removal and allow for the natural vegetation to grow back in an area of approximately 300 acres, improving the habitat for spring and fall migratory neotropical birds. In other words, while 8.5 acres of this habitat type would be negatively impacted by construction of the parking lot, 300 acres would be allowed to grow back naturally and improve the overall habitat on the refuge for the native species. The impacts to vegetation resulting from the expansion of the beach access road would result in removal of approximately 18 acres of scrub shrub and forest vegetation. The exact footprint and design of the expanded beach access road is unknown at this time, although the amount of impact is a conservative estimate; it accounts for the existing roadway at this location and acknowledges that road construction would be an expansion of a current footprint. Further environmental analysis would be required for the beach access

road expansion prior to construction. The removal of vegetation would be mitigated by expanding the road in currently impacted areas as much as possible (i.e., expansion into the current man-made borrow ditches that were created to build the road originally), and where not possible, only impacting minimal scrub shrub or forest vegetation where no threatened or endangered species are known to occur. Construction of a new bike path from the current Wildlife Loop to Mallard/C Dike would result in negative vegetation impacts to wetland or scrub shrub habitat, depending on specifically where the bike path is located (management action 56b). When construction occurs, best management practices would be used to limit impacts. Mitigation to this impact would come from the elimination of the current Swan Cove bike trail, and by allowing native species to grow back, resulting in net positive impacts to vegetation and hydrology of that area of about 0.5 linear miles.

OSV and horseback riding use would expand approximately 2.7 miles (management action 59b). Impacts would not be significant because access would continue to be limited throughout the season, and vehicles would still be required to stay within the intertidal zone.

The opening of the OSV zone from September 16 to March 14 creates negative impacts by exposing the area to potential vegetation trampling and habitat alteration. The closing of the zone to protect nesting shorebirds from March 15 to September 15 has beneficial impacts for vegetation; decreasing the amount of time that trampling would be possible (management action 57b). All of these impacts would not be significant due to the restricted area in which these activities are permitted, and the lack of vegetation that occurs on the beach.

Horseback riding would take place along the Atlantic Ocean beachfront below the high tide zone between September 16 and March 14 (management action 63b). This area is devoid of vegetation. It is anticipated however, that allowing this use would have minimal impact to vegetation near parking area assigned for horse trailer parking. Current plant communities that occur in these areas are not rare or highly sensitive to disturbance based on available information. Through the development of brochures, maps, and established travel corridors we would minimize the impacts to vegetation along the entire horseback riding/OSV zone.

New horseback riding parking would have a negative impact on approximately 1 acre of forested upland vegetation at the corner of Mallard/C Dike and the new beach access road (management action 64b). This adverse impact would be mitigated by using best management practices and construction where the least amount of vegetation would be removed. The parking lot would not be paved. This would allow for the minimal amount of disturbance, causing only the compaction of underbrush and small vegetation, with no large removal needed.

Closing all routine public access on the Service Road north of the relocated recreational beach would have a beneficial impact to vegetation by decreasing the potential for humans to trample or damage native vegetation adjacent to the road (management action 75b).

The improvement or replacement of all water control structures would have beneficial impact on all freshwater impoundments into Toms Cove and Chincoteague Bay (management action 15b). By updating flow capabilities, of Mallard Pool (C Pool), Shoveler Pool (B-North Pool), and Snow Goose Pool (B-South Pool), water could drain freely into Toms Cove through Swan Cove (F Pool) more efficiently. This would maintain low salinity levels and improve water quality for moist soil vegetation and associated wildlife.

Opening non-migratory (resident) Canada goose and light goose hunting on Assateague Island would have a slight beneficial impact to wetland vegetation in the impoundments (management action 69b). Any decreased amount of these species would result in less grazing effects that deteriorate native vegetation.

The construction of new lifeguard housing facilities and a boardwalk at or near Wallops Island NWR would result in an adverse impact for forested vegetation such as loblolly pine (management action 66b). This impact would be minimal due to the small size of the facilities and the boardwalk, but further investigations and environmental analysis to assess impacts would need to be conducted prior to construction. Efforts would be made to assure minimal vegetation would be impacted.

4.5.3 Impacts on Vegetation in Alternative C

The creation of new recreational beach parking would negatively impact approximately 4.25 acres of a mixture of scrub shrub, wetland, and forested habitats, with their associated vegetation (see Chapter 3) (management action 51b). Vegetation would be altered and/or removed from the vicinity of Mallard and Pintail (C and D Pools) impoundments resulting in a loss of that habitat, mostly myrtle/bayberry shrub (management action 22b). Impacts associated with the recreational beach relocation, and the expansion of the new beach access road would be consistent with alternative B (management action 52b).

The elimination of OSV use and horseback riding on the refuge would have a positive benefit to vegetation along approximately eight linear miles of the beach, by eliminating the risk of trampling, compaction, or other degrading possibilities to the native plants (management actions 62b and 65b) if visitors stray from the designated routes of travel.

Currently the population of the Chincoteague pony herd on Chincoteague Island is approximately 125 to 135, with slight fluctuations depending on the time of year and whether or not it is breeding season. The current management of allowing 150 potential ponies would be reduced to only allowing a population of 125 ponies, with no potential to increase the herd size. This change in management would reduce the pony population, which would likely decrease the effects of grazing and trampling that the ponies currently have on vegetation on the refuge (management action 17b).

Phasing out of the exotic sika population on the refuge over the next 15 years would have a beneficial impact for vegetation, especially for the endangered seabeach amaranth, of which sika is a documented herbivore (management action 37b). The grazing habitats of sika have led to an overgrazing of certain habitat types on the refuge, mainly in the impoundments and forested areas. These areas have been documented as overbrowsed areas of vegetation, which would see a positive increase in regeneration if sika were phased out.

There would be no new construction of a bicycle or pedestrian trail in alternative C. The impacts described for the building of a new bicycle trail in alternative B would therefore be avoided. All other impacts to vegetation would be the same as alternative B.

4.6 Federally Threatened and Endangered Species

Piping plover, loggerhead sea turtle, Delmarva Peninsula fox squirrel, and seabeach amaranth are the current federally threatened or endangered species managed on the refuge. We analyzed the

alternatives for impacts to these four endemic focal species, which would exemplify the impacts for all other listed species that may be found on the refuge. Red knot, a shorebird species proposed to be listed as threatened under the Endangered Species Act (ESA), also uses refuge beaches during spring and fall migration.

Table 4-1 assesses the impact of management actions on threatened and endangered species; management actions are referenced by number throughout the text.

4.6.1 Impacts on Federally Threatened and Endangered Species in Alternative A

Current management adheres to guidelines set forth in previous recovery plans and biological opinions. Under alternative A, continuing those current management practices will not result in any new or significant adverse impacts to threatened or endangered species.

4.6.2 Impacts on Federally Threatened and Endangered Species in Alternative B

Allowing natural vegetation to grow within the NWF to improve habitat for spring and fall migratory birds, waterfowl, and neotropical birds would result in an initial negative impact for piping plovers (management action 23b) at that location. Current management of the NWF area has vegetation adjacent to open mudflats being annually cut back to create a more suitable habitat for coastal nesting shorebird populations. Allowing natural scrub shrub vegetation to grow in adjacent to the open mudflats, would transform the area into habitat that is not commonly used by coastal nesting shorebirds, altering approximately 300 acres of habitat. However, this negative impact would be off-set and even surpassed as a beneficial effect from relocating the current recreational beach (management actions 2b and 3b).

The existing 1-mile beach area and 8.5 acres of beach parking on the southern end of the refuge is determined to be prime coastal shorebird and seabeach amaranth habitat. By moving the recreational beach and accompanying facilities north (management action 52b), this area would be allowed to revert back to coastal nesting shorebird and amaranth habitat by natural processes (management actions 2b and 3b). Piping plovers and amaranth favor areas with frequent overwash events, which occur currently where the recreational beach is located. Areas adjacent to the recreational beach exhibit high density of piping plovers nesting. This area has the potential to support a higher number of species than what is currently supported in the NWF. Sea turtles exist in the same types of habitats as piping plovers, and the increase in habitat quality coming from the allowance of natural processes to take over would see a beneficial impact for both (management action 8b), as well as the benefits from the general decrease in human disturbance.

Through the creation of the year-round OSV access area, all day and nighttime OSV use south of this area would be discontinued between March 15 and September 15 (management actions 9b, 10b, 60b, 61b). This would eliminate the potential for OSV users to run over nests, hatchlings or plants, or otherwise disturb the nesting process.

From September 16 to March 14, negative impacts could result from the expansion of the OSV zone from the new recreational beach location to the current zone (management action 59b). This expanded OSV area would increase the possibility of human disturbance in the coastal habitat. However, negative impacts would be minimized since OSV users would only be permitted to travel in the intertidal zone, and by management action conducted by refuge staff, usually in the form of enclosures and signs.

Mowing would occur on various roads within the refuge to benefit the Delmarva Peninsula fox squirrel. Alternative B's (and C's) actions for mowing would result from the change in the access to and relocation of the recreational beach. Although this management action (mowing) is similar to alternative A's, the location of the mowing would shift to the areas where refuge traffic would be the highest due to the new access routes for the new recreational beach.

4.6.3 Impacts on Federally Threatened and Endangered Species in Alternative C

The phasing out of OSV and horseback riding on the refuge would have a beneficial impact to threatened and endangered species on the refuge (management actions 62b and 65b). Currently, OSV and horseback riding is managed to minimize disturbance to threatened and endangered species, but a complete elimination of the activities would eliminate the threat of disturbance. Other impacts to federally threatened and endangered species under alternative C would be the same as under alternative B.

4.7 Birds

Habitat conservation and management is the highest priority of the refuge, consistent with the original establishment purposes for the protection of migratory birds. More than 320 species of birds are known to use the refuge regularly for nesting and brood rearing, feeding, resting and staging during migration, or wintering.

We evaluated the management actions for each alternative for their potential to benefit or adversely impact the various bird species on the refuge, including one or more of the following:

- management of the recreational beach and parking;
- change in impoundment management;
- OSV management;
- access to Assawoman Island; and
- hunting.

Visitor use activities (hunting, fishing, recreational beach use, walking, biking, horseback riding, OSV use) currently occurring on the refuge have been analyzed for impacts to birds. As analyzed for the 1992 EIS, such activities are expected to have a negative short term impact on birds. These activities are known to create disturbance to migratory and breeding birds and can cause alteration of habitats by trampling vegetation, compacting soils, and increasing the potential of erosion. For other visitor use activities, impacts would be minimal since visitors are required to use pre-selected paths and hiking trails which the refuge created to traverse through habitat, and avoid future vegetation impacts. No significant impacts would result on the refuge from these visitor services, but current monitoring efforts would continue.

Table 4-1 assesses the impact of management actions on birds; management actions are referenced by number throughout the text.

4.7.1 Impacts on Birds in Alternative A

Previous land and wetland acquisition to ensure protection of important habitats for various birds and aquatic species was a high priority in the previous master plan and EIS. Protection and management of these acquired lands have continued to be of the highest priority for the refuge, making as much suitable habitat as possible available for the varied refuge wildlife. Existing management activities do not adversely affect birds or bird populations. Under alternative A,

continuing current management practices will not result in any new or significant adverse impacts to birds.

4.7.2 Impacts on Birds in Alternative B

Alternative B proposes changes to the hunting program (management actions 69b, 70b, 71b, 72b, and 73b). These visitor service actions have been analyzed and found to have no significant, overall adverse impact to the bird population. Current big game hunting programs on the refuge would see a slight change in services (increased hunting outreach events), but there would be no significant increase in visitation related to big game hunting.

Light goose, resident Canada goose, and mourning dove hunting would be added to the refuge hunting opportunities which would result in a potential increase in visitors related to hunting (management action 69b). Additional impact analysis for any new hunts will be addressed in hunts plans that will include environmental compliance. These hunt programs would be regulated as the current hunt programs are, with a limited amount of permits awarded. Any increase in hunting will likely have adverse impacts on individual waterfowl, but at the population level no significant impact is expected.

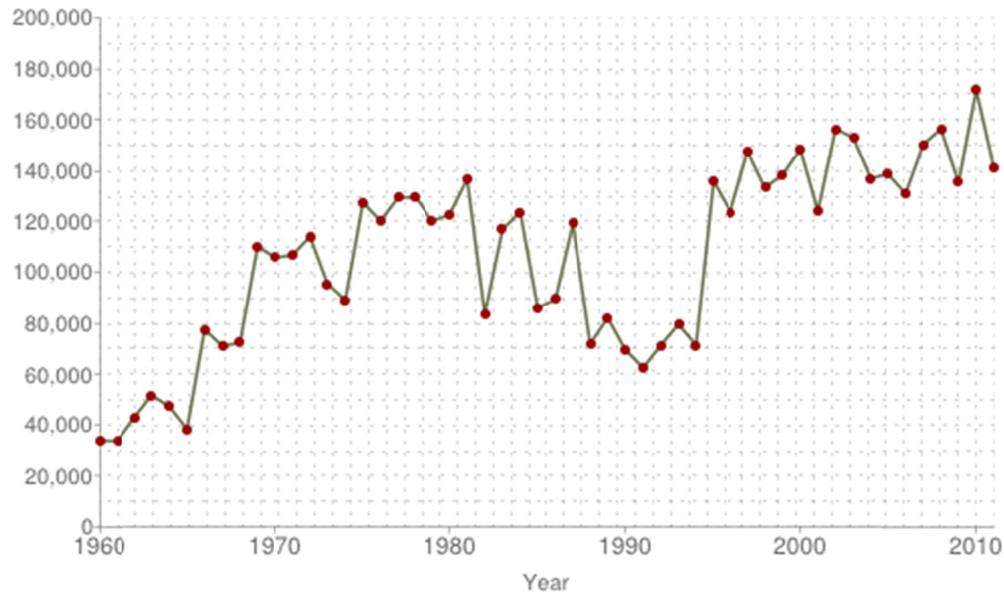
Net positive impacts from the refuge hunt program are expected. We expect that the harvest of local resident Canada geese would have the following beneficial effects on other resources:

- Increase natural seed regeneration within refuge impoundments thereby increasing fall/winter food availability for migrating ducks, geese and swans.
- Reduce fecal contamination in the refuge impoundments. Excessive fecal matter also changes the nitrogen and oxygen levels in the refuge waters resulting in algal blooms and death of aquatic organisms. (Source: USDA-APHIS. 1999. Environmental Assessment for the management of conflicts associated with non-migratory Canada geese, migratory Canada geese, and urban/suburban ducks in the Commonwealth of Virginia. 77 pp.)
- Reduce the possibility of transmitting disease to susceptible populations of migrating birds as they over-winter at the refuge or pass through.
- Reduce negative interactions (aggressive behavior) with refuge visitors on roads and trails during spring breeding season.

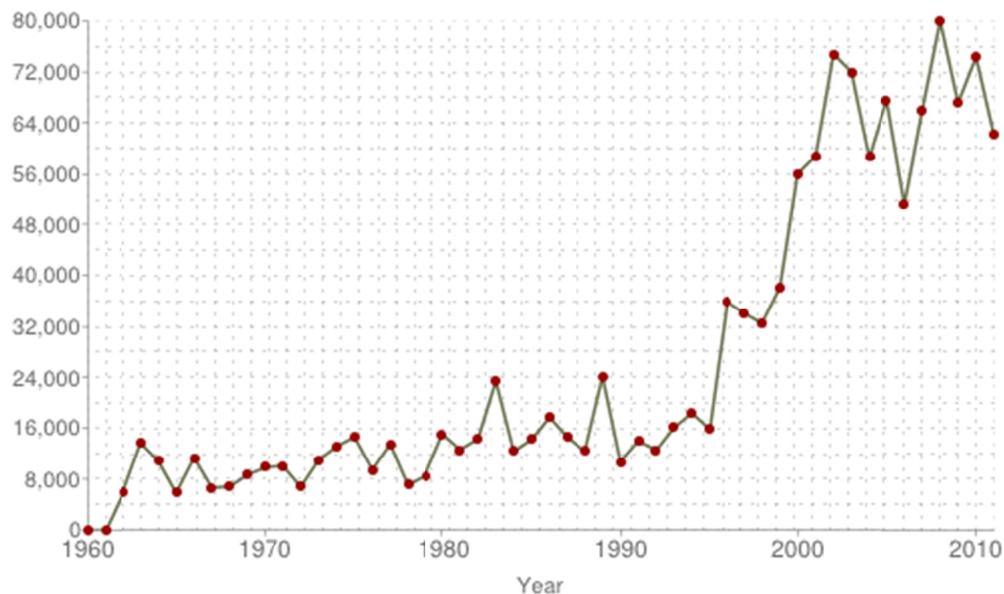
Harvest and disturbance of light geese under the authority of the light goose conservation order would have the following beneficial effects:

- Reduce damage caused by light geese to sensitive arctic breeding habitats. This would have the additional benefit of reducing negative impacts to other bird species nesting within that same arctic habitat.
- Reduce damage to wintering habitats within the Atlantic Flyway.

Total number of ducks harvested in Virginia



Total number of geese harvested in Virginia



<http://www.flyways.us/regulations-and-harvest/harvest-trends>

The resident Canada goose population increased significantly during the 1980s and early 1990s. The population peaked at over 260,000 geese in the mid-late 1990s in Virginia and has been steadily reduced by specific management programs since that time. The current population estimate is 158,267 (+/- 28%) in Virginia and over 1 million in the Atlantic Flyway. For migrant Canada geese, the breeding population estimate for 2012 (190,340) is similar to the past 3 year average (189,317).

http://www.dgif.virginia.gov/hunting/va_game_wildlife/waterfowlfactsheets.pdf

Liberal duck seasons (60 days, 6 bird bag limit) and resident goose seasons have resulted in higher waterfowl harvests in Virginia during the past 10 years. Harvest has averaged approximately 150,000 ducks and 60,000 geese from 2000-2011, compared to 114,770 ducks and 25,000 geese during the 1990s. The long season length and liberal bags offer greater opportunity and a greater cumulative harvest over the course of the season.

Waterfowl hunter numbers in Virginia have been generally stable since the late 1990s, and Federal Duck Stamp sales have averaged 23,390 in Virginia (for 5-year period, 2006-10). Since 1999, the Harvest Information Program (HIP) has been used to estimate hunter effort and harvest. The average number of duck and goose hunters over the past 3 years, as measured by HIP, was 13,618 and 12,360 respectively. In 2011, only 99 visits occurred on the refuge for migratory bird hunting, possibly because the hunt areas are only accessible by boat.

Chincoteague Waterfowl Harvest (self-reported, 2008-2013)

2008/2009 - 212

2009/2010 - 65

2010/2011 - 53

2011/2012 - 67

2012/2013 - 69

Given the exceptionally low numbers of waterfowl harvested from the refuge in respect to the total statewide harvest and waterfowl population, no cumulative impacts to local, regional, or statewide populations of ducks or geese are anticipated from hunting on the refuge.

Disturbance to wintering waterfowl can be significant particularly from human activity within feeding and loafing areas. Hunting occurs only on the Wildcat Marsh and on Morris, Assawoman, and the north end of Metompkin islands. Morton (1986) found that the increased presence of humans associated with the refuge big game hunting program can contribute to significant movements of ducks, particularly black ducks, off the refuge. These disturbances are at a time when these birds need the isolation of the refuge to feed and rest. Paulus (1984) and Belanger (1989) found that hunting activity (gun shots or hunter movements) caused waterfowl to move to less disturbed areas and avoided some areas until after the hunting season. Laskowski et al (1993) documented human disturbance to a representative species of waterfowl by the visiting public on Back Bay NWR, Virginia. Disturbance elicited behavioral changes ranging from increase alertness to flying to other parts of the refuge. McNeil et al. (1992) found that many waterfowl species avoid human disturbance by feeding at night instead of the day.

Waterfowl and other migratory bird hunting would continue to be limited to specific areas on the refuge in order to reduce potential disturbance. Migratory game birds are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703-712), the Secretary of the Interior is authorized to determine when "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any bird, or any part, nest, or egg" of migratory game birds can take place, and to adopt regulations for this purpose.

Changes in hunt management would have net positive impacts for bird species on the refuge, mostly by the elimination of predation and competition. Adding new hunting opportunities and developing a trapping program would add to the beneficial impacts of the current predator management program (management actions 69b, 70b, 71b, 72b, and 73b). These new hunting and trapping programs would further reduce mammalian predators of coastal nesting birds. Further, adding resident Canada goose and light goose hunting on Assateague Island would reduce their negative impact to habitat on the refuge.

Impacts to shorebirds from human activity have been well documented. Pfister et al. (1992) investigated human disturbance as a factor that might limit the capacity of appropriate staging areas to support migrating shorebirds. Results indicate that adverse impacts from human disturbance would be greater on shorebird species using the front side of beach habitats, and because of these impacts the local abundance of species may be reduced by 50 percent. Such disturbance is implicated as a potential factor in long-term declines in shorebird abundance during migration periods at disturbed sites.

Based on past observations of impacts on shorebirds by refuge staff, disturbance by refuge hunters to shorebirds is expected to be negligible since most shorebird species have completely passed through Virginia by peak hunting season in November through January. Some hunting occurs when these species may be migrating before and after this peak hunting time. In addition, hunters are restricted from prime shorebird use areas.

The new recreational beach area was chosen through a Structured Decision Making (SDM) analysis (USFWS 2011b).¹ Through this SDM process, a 1-mile segment of beach was identified as having the least impacts to refuge habitat and wildlife. This 1-mile segment would be the location for the new recreational beach in alternatives B and C (management action 52b). Human disturbance to coastal nesting birds would be greatly diminished since the recreational beach would be relocated north, and OSV use would be limited to September 16 to March 14 (management action 60b). Natural processes would allow for overwash to occur in the location of the existing recreational beach, resulting in fresh sand and shell which is prime habitat for coastal nesting birds, turtles, and seabeach amaranth (management actions 2b, 3b, 6b, 8b, and 13b).

The moving of the recreational beach and parking areas, along with the expansion of the beach access road, would result in removal to approximately 27 acres of migratory bird habitat, but the initial negative impacts would be alleviated (management action 52b) with restoration of other areas. The creation of new recreational beach parking would negatively impact approximately 8.5 acres of a mixture of scrub shrub, wetland, and forested habitats, with their associated vegetation (see chapter 3). Vegetation would be altered and/or removed from the vicinity of Mallard Pool (C Pool) and Pintail Pool (D Pool) resulting in a loss of that feeding and nest habitat, mostly myrtle/bayberry shrub (management action 22b). Pintail Pool (D Pool) has received very low waterfowl and shorebird use over the past 20 years, so minimal impact is expected.

¹ The Chincoteague refuge staff conducted a workshop with the following attendees to arrive on a consensus on the problem statement and findings of the document: the town of Chincoteague (town planner), FWS Regional Biologist, FWS Assistant Regional Biologist, FWS Inventory and Monitoring Coordinator, NPS Assateague Island National Seashore, Virginia Division of Game and Inland Fisheries, FWS Coastal Delaware NWR Complex Manager, Chincoteague refuge staff, Eastern Shore of Virginia Refuge Manager. (Accomack County was invited but not in attendance).

The proposed new management of the NWF under alternative B would help to mitigate initial adverse impacts as outlined in the Soils and Vegetation sections (management action 23b). Proposed management at the NWF would cease vegetation removal and allow for the natural succession of vegetation to occur in this 300-acre area, improving the habitat for spring and fall migratory neotropical birds.

The new management of the extended OSV zone would have negative impacts to shorebird species that feed and loaf outside the breeding season (management action 59b). Although the zone would be increasing in size from alternative A, impacts would not be significant because the OSV use is now only allowed in support of priority public uses like surf fishing, and the driving limitations to the intertidal zone. The year-round fishing zone south of the relocated recreational beach would have a negligible impact on coastal nesting birds, primarily because of its location (management action 61b). The specific area highlighted for year-round fishing was chosen because of its current lack of use by coastal nesting birds, and its close proximity to the new recreational beach.

Assawoman Island would see beneficial impacts to birds as the area would be closed to all visitor use during the nesting season (management action 41b). Additionally, beneficial impact for migratory waterfowl is expected as this management strategy would: increase thermal cover for waterfowl in the winter; increase the food sources for water birds of conservation concern such as snowy egret, glossy ibis, Forster's and gull-billed terns; and improve shorebird migratory stopover habitat for many species of conservation concern, including short-billed dowitcher, dunlin, and semipalmated sandpiper.

4.7.3 Impacts on Birds in Alternative C

The phasing out of OSV and horseback riding on the refuge would have a positive benefit for coastal, migratory, and wintering shorebird species (management actions 62b and 65b). As analyzed under alternative A, current OSV and horseback riding use does not pose a significant impact for birds in that area, but the complete phase out of these activities would further diminish the possibility for trampling or general human disturbance. All other impacts to birds in this alternative would be the same as under alternative B.

4.8 Fish and Other Aquatic Species

The refuge has a minimal assemblage of fish species in the freshwater impoundments. The refuge currently manages the impoundment habitats for birds, and not necessarily for fish, but impacts that occur in this habitat for birds would potentially affect fish as well. Since the impoundments are managed annually and on a strict regime through water control structures, the habitat remains a beneficial area for all aspects of the fish lifecycle.

The horseshoe crab is an endemic species found on the east coast of the United States, with the center of abundance between New Jersey and Virginia. This species spawns in the spring during new and full moon periods starting the end of April and lasting into June. This period of time coincides with the spring migration of shorebirds. Migration is an extremely energetic undertaking for these birds and their success or failure is dependent upon finding sufficient energy (food) to complete migration and then to breed. Studies have shown that horseshoe crab eggs that wash up on beaches after a spawning cycle are known to supply some or the entire energy requirement to complete migration.

Table 4-1 assesses the impact of management actions on aquatic species; management actions are referenced by number throughout the text.

4.8.1 Impacts on Fish and Other Aquatic Species in Alternative A

Existing management activities do not adversely affect fish or fish populations. Under alternative A, continuing current management practices will not result in any new or significant adverse impacts to fish.

4.8.2 Impacts on Fish and Other Aquatic Species in Alternative B

Improvements to the tidal flow of Swan Cove (F Pool) resulting from modification and replacement of water control structures within Beach Road causeway would have a positive impact on fish and other aquatic species (management action 15b). Increased water flow and tidal rhythm would allow fish and aquatic invertebrates such as crabs and mollusks passage into this restored salt marsh.

4.8.3 Impacts on Fish and Other Aquatic Species in Alternative C

Impacts to fish and other aquatic species under alternative C would be the same as under alternative B.

4.9 Mammals

The refuges support populations of mammalian species common to habitats of the Delmarva Peninsula (plus the Delmarva fox squirrel, which is endemic to the area and rare). As a taxonomic group, mammals would benefit from the refuge land protection and management of riparian habitats, forests, grasslands, shrub, and wetlands proposed for listed species, waterfowl, and migratory birds. Likewise, refuge habitats would benefit from careful attention to the impacts on mammals resulting from any of its activities. We evaluated management actions and visitor uses for alternatives for their potential to beneficially or adversely affect large and small aerial, terrestrial, or wetland mammals. Table 4-1 assesses the impact of management actions on mammals; management actions are referenced by number throughout the text.

4.9.1 Impacts on Mammals in Alternative A

Current management practices that occur on the refuge were analyzed for impacts in the 1992 EIS, and largely remain consistent for this alternative. In general, the presence of humans disturbs most mammals, typically resulting in indirect short-term adverse impacts considered negligible since they would not cause any long-term effects on individuals or populations. Continuing existing management activities will not result in any new or significant adverse impacts to mammals.

4.9.2 Impacts on Mammals in Alternative B

Refuge strategies for conserving and maintaining biological integrity, diversity, and environmental health, restoring native plant communities, improving habitat conditions for the endangered Delmarva Peninsula fox squirrel, and controlling invasive or nuisance species would be management actions that have net beneficial impacts to mammals. The actions would directly or indirectly benefit mammalian populations over the long term by ensuring the continuation of quality natural habitats for resident mammalian wildlife.

Controlling invasive plant species, particularly those that quickly colonize an area and form dense, monotypic stands such as phragmites, would benefit mammals by maintaining the balance of food resources and native vegetative communities with which they evolved or adapted to for cover, nesting, and diverse food resources. For smaller, insectivorous mammals, maintenance of native plant diversity and structural integrity by controlling invasive species would have a positive impact as those species rely on biodiversity and availability of invertebrate food resources that are only associated with native floral assemblages.

UFWFS recognizes USDA-Animal and Plant Health Inspection Service (APHIS) as the expert in reducing mammalian predation on natural resources. Chincoteague NWR and APHIS agree to work together and with other interested parties to benefit threatened and endangered wildlife, bird species of management concern, and wildlife nesting habitat. The objective of the project is to: (1) conduct avian and mammalian predator management throughout the refuge complex to support the refuge's effort to enhance migratory bird populations of selected bird species, and to carry out wildlife management objectives of the complex; (2) assist the complex with the management and eradication of invasive species such as nutria; and (3) assist the complex with the monitoring and management of wildlife disease surveillance and outbreaks.

APHIS will conduct predatory mammalian and avian species management efforts on the refuge complex upon request by refuge staff and approved by the Refuge Manager. The strategy used will include preventative control and corrective control. Preventative control will include the removal of red fox, coyote, raccoons and mink as requested on Assateague Island, Assawoman Island, Eastern Shore of Virginia, Fisherman Island and other designated units (Cedar, Metompkin, Morris Islands and Wildcat Marsh) within the refuge complex from February through August and continue until predator management goals for red fox, gray fox, raccoons, coyote, mink and opossum are met for individual complex units.

Hunting is an important visitor use activity that results in a net positive impact for mammals by helping control the current sika elk and white-tailed deer populations. Overall it serves both a wildlife-dependent recreational use and a method of population control that would benefit other non-hunted mammals, conserve migratory bird habitats, reduce vehicle/deer collisions, and reduce overbrowsing of vegetation.

VDGIF has primary responsibility for managing white-tailed deer in Virginia. The Virginia Deer Management Plan, first completed in 1999 and revised in 2006, guides management of deer habitat, deer populations, damage caused by deer, and deer-related recreation in the Commonwealth. In 2012, 213,597 deer were reported killed by hunters in Virginia. This total included 96,712 antlered bucks, 18,061 button bucks, 98,781 does (46.3 percent), and 43 "unknown" deer. It is also 8 percent below the last 10-year average of 232,573. In Accomack County, an average of 3,056 deer per year are killed (see Table, 2008-2012 data).

Accomack County Deer Kills, 2008-2012

Year	Antlered Males	Male Fawns	Females	% Female	Unknown	Total Kill
2008	1412	371	1924	51.9%	0	3707
2009	1225	249	1614	52.3%	0	3088
2010	1246	307	1740	52.8%	0	3293
2011	1007	263	1535	54.7%	2	2807
2012	923	212	1249	52.4%	0	2384

<http://www.dgif.virginia.gov/wildlife/deer/harvest/index.asp>

Population reconstruction computer models indicate that Virginia's statewide deer population has been relatively stable over the past decade, fluctuating between 850,000 and 1,050,000 animals (mean = 945,000). <http://www.dgif.virginia.gov/wildlife/deer/management-plan/virginia-deer-management-plan.pdf>

Hunting resident game species, such as deer, on Chincoteague NWR and Wallops Island NWR will result in negligible impacts on their populations because of their restricted home ranges. The refuges also contribute negligibly to the state's total harvest for resident game species.

Chincoteague NWR white-tailed deer harvest

2008/2009 - 23

2009/2010 - 20

2010/2011 - 15

2011/2012 - 27

2012/2013 - 26

Wallops Island NWR white-tailed deer harvest

2008 - 13

2009 - 15

2010 - 15

2011 - 8

2012 - 11

The refuges harvested a total of 173 white-tailed deer over the past 5 years, with 37 in 2012. Given the exceptionally low numbers of animals harvested from the refuges in respect to the total statewide harvest and deer population, no cumulative impacts to local, regional, or statewide populations of white-tailed deer are anticipated from hunting of the species on the refuges.

Aggressive management of the non-native sika population would have a beneficial impact on native white-tailed deer. As white-tailed deer compete with sika for habitat and food sources, the decreased sika population would reduce this competition. Deer impacts to ecosystems (e.g., forest regeneration, ground-dwelling birds) are a concern in certain areas with poor habitat and high deer populations. VDGIF has implemented innovative programs such as the Deer Population Reduction Program (DPOP). The refuge manages sika population with DPOP. Approximately 150 to 200 sika are taken each year, from an estimated population of 600 to 800.

At Wallops Island NWR, hunting would be used primarily as a management tool for reducing the impacts of white-tailed deer on forested habitats important to migratory birds and other wildlife. The public hunt would also reduce the threat of deer-aircraft strikes at the adjacent

NASA/Goddard Space Flight Center/Wallops Flight Facility, and deer-automobile strikes on the adjacent Virginia State Highway Route 175. Finally, the hunt would provide limited public hunting opportunities on Wallops Island NWR.

Negative impacts from hunting on non-hunted mammals, such as voles, moles, mice, shrews, and bats, are expected to be negligible. Except for some species of migratory bats, these species have very limited home ranges and hunting would not affect their populations regionally. Impacts of hunting to migratory bat species would be negligible. These species are in torpor or have completely passed through Virginia by peak hunting season in November through January. Vehicles are restricted to roads and harassment or taking of any wildlife other than legal game species is not permitted.

4.9.3 Impacts on Mammals in Alternative C

Impacts for alternative C would be similar to those of alternative B, except that, in addition, the refuge would work towards the eventual phasing out of the entire sika population (management action 37b). This phasing out of the exotic species would further diminish the competition with the white-tailed deer for food and habitat.

4.10 Reptiles and Amphibians

Other than the Federal listed species of turtles, 20 other amphibian and reptile species have been recorded on the refuge. Although no specific management policies are set in place for these species, the management of other species and habitats where these 20 species have been recorded would have direct impacts on these species. These species are commonly found in areas of the refuge with very limited visitor use, such as forest, vernal pools, refuge impoundments, and salt marsh areas. Impacts from visitor use actions such as hunting would not be significant due to the hibernation or torpor actions by cold-blooded reptiles and amphibians that limit their activity during the current hunting season when temperatures are low. Research is conducted on island dwarfisms in toads, a phenomenon common on Mid-Atlantic barrier islands, and what possible variables could cause this trait (Hranitz 2010).

Incidental mortality of reptiles and amphibians occurs on refuge roads between March and October. However, this mortality is negligible and the impact is not expected to affect the overall populations. Illegal harvest of reptiles and amphibians for the pet trade and/or consumptive use can and could have a negative impact on these populations.

The dewatering of the impoundments from May through August concentrates fish, amphibian and reptile species in deeper channels. Waterbirds such as snowy egrets, glossy ibis, terns, and herons take advantage of this abundant food supply. Table 4-1 assesses the impact of management actions on reptiles and amphibians; management actions are referenced by number throughout the text.

4.10.1 Impacts on Reptiles and Amphibians in Alternative A

Existing management activities do not adversely affect reptiles or amphibians. Continuing current management practices as proposed under alternative A will not result in any new or significant impacts to reptiles and amphibians.

4.10.2 Impacts on Reptiles and Amphibians in Alternative B

Increased incidental mortality of reptiles and amphibians may occur on newly created refuge roads between March and October (management action 52b). However, we expect negligible

impacts since best management practices would be implemented in the design and engineering of the roads and parking lots. For example, underground crossings, culverts, and timing of construction could be viable options to mitigate potential adverse impacts. Therefore, it would not affect their overall populations.

4.10.3 Impacts on Reptiles and Amphibians in Alternative C

Impacts to reptile and amphibian species under alternative C would be the same as under alternative B.

4.11 Invertebrates

Chapter 3, Affected Environment, discusses the valuable role that invertebrates play on the refuge. This section provides the results of the evaluation of the management actions each alternative proposes for impacts on invertebrates. Table 4-1 assesses the impact of management actions on invertebrates; management actions are referenced by number throughout the text.

4.11.1 Impacts on Invertebrates in Alternative A

Prescribed burning, disking, and mowing would continue on or around impoundments to manipulate vegetation for the benefit of wildlife. Consideration of invertebrate species would be included in these management practices under all alternatives. No significant impacts to invertebrates would be anticipated to occur on the refuge from visitor services, and current monitoring would be continued. Continuing existing refuge management activities will not result in any new or significant adverse impacts to invertebrates.

4.11.2 Impacts on Invertebrates in Alternative B

Invertebrate species (emergent grazers and algal-detrital feeders) commonly found in salt marshes within coastal Virginia include fiddler crabs, ghost crabs, mole crabs, saltmarsh snail, periwinkle, mud snail, mussels, and isopods (Mitsch and Gosselink 1986). Impacts to the above mentioned and other invertebrates such as butterflies, moths, other insects, and spiders would not be significant. While beach use, OSV use, surf fishing, and horseback riding can occur in areas where intertidal invertebrates (i.e. species such as coquina clams, ghost crabs and mole crabs) are located, impacts from these uses are thought to be minimal (Wolcott & Wolcott, 1984). Invertebrates are not active during the majority of the hunting season and would have few interactions with hunters (USFWS 2007b).

The alteration of Mallard and Pintail Pools (C and D Pools) from the refuge impoundment management in order to allow the building of approximately 8.5 acres of recreational beach parking would have a negative impact on invertebrates, mainly monarchs (management action 22b). This area is known habitat for Bidens, a type of vegetation that monarchs use for nectaring during their migration. Although this would be a permanent negative impact, it would not be a significant impact because of the small acreage that would be affected, and because there are several nearby habitats where monarchs could nectar, including Shoveler and Snow Goose Pools (B Pools). Monarch numbers are relatively low overall on the refuge, as compared to other regions (Gibbs 2008), and the removal of this vegetation would not be detrimental to their life cycle. The planting of seaside goldenrod seedlings along small dunes in the vicinity of the former recreational beach, as well as on the backsides of dunes along Wild Beach and Toms Cove Hook would have a beneficial impact towards monarchs, and could work to mitigate the negative effects of Bidens removal (management action 32b). Seaside goldenrod is the most important nectar source for monarchs on the refuge, and also acts a nesting location.

Improvements to the tidal flow of Swan Cove (F pool) resulting from modification and replacement of water control structures within Beach Road causeway would have a positive impact on aquatic invertebrates and fish species (management action 15b). Increased water flow and tidal rhythm would allow fish and aquatic invertebrates such as crabs and mollusks passage into this restored salt marsh.

Under alternative B, the new location of the recreational beach and parking lot would include management actions to control mosquitoes through water manipulation, insect traps, and best management practices. Control of mosquitoes would have the potential for an impact on other invertebrates in the area not being managed (management action 52b). The loss of mosquitoes may have adverse impacts on birds, fish, amphibians, bats, and other wildlife since they are known food source for these species. This impact would not be significant because it only occurs in a small area of the refuge focused around the recreational beach and parking, and would not expand out into habitats for the above mentioned wildlife.

4.11.3 Impacts on Invertebrates in Alternative C

Impacts under alternative C would be the same as under alternative B, except that the negative impacts from removal of Bidens at the new recreational beach parking would be reduced to only 4.25 acres (management action 51b).

Table 4-1 Beneficial and Adverse Impacts on Biological Resources by Management Action

● = benefits only; ○ = adverse impact only; ◐ = adverse impacts and benefits

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
1. Protect and enhance refugewide suitable coastal habitat for piping plovers which allows for the reduction of mortality factors; keep the fledge rate between 1.2 and 1.5 chicks per pair.	X	X	X				●	●	●			●	
2. Allow natural geologic processes to restore overwash to the former recreational beach and parking areas on Assateague Island in order to increase nesting habitat for plover, least terns, sea turtles, and other nesting shorebirds.		X	X				●	●	●			●	
3. Improve the beach nesting habitat at the former recreational beach parking area (8.5 acres); for example, removal of infrastructure and other man-made structures.		X	X				●	●	●			●	
4. Return footprint of current public beach parking area to wildlife habitat and reduce parking impact on habitat by reducing the size of public beach parking and relocating it to areas less sensitive for wildlife habitat and more stable to the forces of the tides and storms.			X	◐			◐	◐	◐			◐	◐
5. Protect and enhance 16.8 linear miles of Assateague Island and Toms Cove to benefit migrating and wintering shorebirds.	X	X	X				●	●	●			●	●
6. Improve the migratory and wintering habitat at the former recreational beach parking area (8.5 acres); for example, removal of infrastructure and other man-made structures.		X	X				●	●	●			●	●
7. Protect a minimum of 16.8 linear miles of sandy beach habitat on Assateague Island for nesting loggerhead sea turtles.	X	X	X				●	●	●			●	●

² The (b) represents management actions relating to biological resources.

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
8. Improve beach/dune habitat for turtle nesting areas at the former recreational beach parking area (8.5 acres); for example, removal of infrastructure and other man-made structures.		X	X				•	•	•			•	•
9. Restrict nighttime permitted beach driving in September and October, when the OSV zone is open but the sea turtle nesting season (June through October) is still ongoing.		X	X		•		•	•	•			•	•
10. Limit night use of the beach by official vehicles during the plover and sea turtle breeding season to the greatest extent possible.		X	X		•		•	•	•			•	•
11. Continue in situ nest protection for loggerhead sea turtles.	X	X	X					•					
12. Increase the number of Federal endangered seabeach amaranth plants by maintaining and enhancing coastal habitat along Assateague Island shoreline by allowing natural processes to occur.	X	X	X				•	•	•			•	•
13. Improve beach/dune habitat for seabeach amaranth at the former recreational beach parking area (8.5 acres); for example, removal of infrastructure and other man-made structures.		X	X				•	•	•			•	•
14. Refugewide, maintain 3,070 acres of salt marsh habitat for nesting, migrating and wintering birds.	X	X	X						•	•			
15. In cooperation with USACE and other partners develop strategies that will improve tidal flow to Swan Cove (F Pool).		X	X			•				•			•
16. Work with USDA to reduce non-migrant Canada goose population through addling, firearms, and round-ups.		X	X				•		•				
17. Within 15 years, phase in requirement for Chincoteague pony population to consist of no more than 125.			X	•			•						
18. Remove ponies from the proposed wilderness area.			X	•			•						
19. Protect the integrity of Lucky Boy Fen.	X	X	X			•	•					•	

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
20. Protect the ecological integrity of tidal creeks, estuaries, mudflats, and nearshore marine waters.	X	X	X			•			•	•			
21. Provide approximately 2,650 acres of quality wetland habitat to support wintering waterfowl, spring migrating shorebirds, breeding shorebirds and waterbirds, and fall migrating shorebirds and waterfowl.	X	X	X	•		•	•	•	•				•
22. Remove Pintail (D Pool) from impoundment management capabilities.		X	X			◦	◦		◦				◦
23. Since the NWF would no longer be needed as a piping plover mitigation area due to the relocation of the recreational beach, pumping operation would no longer be required to create additional piping plover nesting habitat. Management of the NWF would be improved for spring and fall migratory shorebirds and waterfowl.		X	X	•	•		•	◦	•				•
24. Enhance or restore at least 100 acres to meet the habitat needs of black ducks.	X	X	X						•				
25. Manage at least 40 acres in the refuge impoundments each fall with the goal of providing 50 percent cover of Bidens to benefit monarch butterflies.	X	X	X	•			•		•				•
26. Annually maintain 35 nest boxes located in or adjacent to impoundments for tree swallows (as a citizen science project).	X	X	X						•				
27. Discontinue maintaining wood duck nest boxes.	X	X	X						◦				
28. Maintain 2,500 acres of coastal shrubland to provide forage and cover habitat for fall landbird migrants, and breeding, and wintering landbirds.	X	X	X	•			•		◦				
29. Manage a minimum 500-foot wide continuous strip of 10 to 12-foot tall myrtle/bayberry shrub, free of trees, parallel to (and behind the) dunes on eastern side of the NWF impoundment.		X	X	•			•		◦				
30. Maintain, through rotational mowing, a minimum of 80 percent of the reliable monarch roosting locations and 50 percent of the preferred nectar source locations during mid-September through mid-October.	X	X	X	◦	◦		◦						•

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
31. Restore and enhance preferred nectaring plants (seaside goldenrod, <i>Bidens laevis</i>) in areas where they already grow or other suitable areas.	X	X	X				•						•
32. Use volunteers to plant seaside goldenrod seedlings in spring or fall on Toms Cove Hook, small dunes that dot the Overwash area, the north end of Toms Cove (including the causeway west of the NPS Toms Cove Visitor Center), and the backsides of dunes along Wild Beach.		X	X				•						•
33. Manage mowing on refuge roadsides, cross-dikes and fence lines in order to minimize Delmarva Peninsula fox squirrel vehicle mortality.	X	X	X	○	○		○	•					
34. Manage mowing on refuge roadsides, cross-dikes, and fence lines in order to minimize Delmarva Peninsula fox squirrel vehicle mortality, making necessary changes to incorporate the relocation of the recreational beach and access.		X	X	○	○		○	•					
35. Manage mowing on refuge roadsides, cross-dikes, and fence lines in order to maximize nesting opportunities for northern bobwhite and brown thrasher.	X	X	X	○	○		○		•				
36. Manage 1,600 acres of predominantly mature loblolly pine habitat to support a population of 200 Delmarva Peninsula fox squirrel, brown-headed nuthatch, and eastern towhee.	X	X	X				•	•	•				
37. Reduce, and eventually phase out, sika and resident, non-migratory Canada goose population through continued recreational hunt and professional means of elimination.			X	•			•	•	•		•		
38. Delineate the boundaries of the maritime upland forest and maritime dune forest community types, and develop appropriate conservation measures.	X	X	X				•						
39. Maintain and restore 178 acres of pine/mixed hardwood forest for the benefit of migrating/nesting landbirds, bobwhite, and woodcock.	X	X	X				•		•				
40. Continue to work with partners that manage other Virginia barrier islands to prevent human disturbance to nesting focal species.	X	X	X				•	•	•			•	

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
41. Implement a complete closure on Assawoman Island, including fishing, from March 15 through September 15 or thereafter, until the last shorebird fledges.		X	X		•	•	•	•	•			•	
42. Conserve sandy beach and overwash habitat along Assawoman Island, and northern end of Metompkin Island, Cedar Island, and the tidal marshes on the backside of the islands to benefit migrating and wintering focal species and other shorebirds of conservation concern.	X	X	X				•	•	•			•	
43. Allow and advocate for natural coastal processes as the primary force that shapes the southern barrier islands habitats and species composition.	X	X	X				•	•	•			•	
44. Complete a habitat management plan and continue to manage habitats and management structures.	X	X	X	◦	◦	◦	•	•	•	•	•	•	•
45. Provide protective conservation measures for federally listed species and their habitats.	X	X	X	◦	◦	◦	•	•	•	•	•	•	•
46. Work with partners toward regional conservation to protect estuarine, coastal, and marine habitats and substantial populations of migratory and breeding shorebirds, colonial waterbirds, landbirds, and raptors.	X	X	X	•			•	•	•	•	•	•	•
47. Work with the town of Chincoteague and other local, state, and Federal agencies to address hazard mitigation and sustain the resiliency of this unique barrier island system in the face of dynamic coastal processes and climate change.	X	X	X			•	•	•	•	•	•	•	•
48. Maintain personal motor vehicle access to Assateague Island and work with the town of Chincoteague to allow golf carts and allow a variety of modes of transportation to and in the refuge.	X	X	X	◦	◦	◦	◦	◦	◦			◦	◦
49. Continue to allow NPS to manage a 1-mile recreational beach.	X	X	X	◦	◦	◦	◦	◦	◦			◦	◦

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
50. Continue to allow NPS to maintain 8.5 acres of land (and preserve the capacity of 961 spaces) for parking at the existing recreational beach as long as suitable land base directly behind the recreational beach remains.	X			●	●	●	●	●	●			●	●
51. Reduce beach parking to 480 spaces (approximately 4.25 acres).			X		●		●	●	●			●	●
52. Relocate recreational beach, beach parking, access, and associated facilities approximately 1.5 miles north of current area.		X	X	●	●	●	●	●	●			●	●
53. Pursue shuttle from off-site parking to supplement reduced beach parking.	X		X		●								
54. Remove Swan Cove Trail.	X	X	X			●	●						
55. Continue pursuit of bicycle trail development via Beach Road to recreational beach to replace Swan Cove Trail.	X					●	●						
56. Replace Swan Cove Trail with an alternative bicycle trail from Wildlife Loop north to the south end of the relocated recreational beach, near the OSV zone entrance.		X				●	●						
57. Maintain current access and closures for OSV and horseback riding.	X			●	●	●	●	●					●
58. <i>ACTION ELIMINATED.</i>													
59. Expand the OSV zone from the new recreational beach to Toms Cove.		X		○	○	○	○	○	○				○
60. Keep the OSV zone open from approximately September 16 to March 14 and close the OSV zone to public access March 15 through September 15 or thereafter, until the last shorebird fledges.		X		●	●	●	●	●					●
61. Develop a designated, year-round area for fishing from south of the recreational beach to the point of closure that would include OSV parking.		X		●	●	●	●	●					●

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
62. Discontinue OSV use.			X	●	●	●	●	●	●				●
63. Allow horseback riding in OSV zone.	X	X		○			○	○	○				○
64. Designate separate parking for horse trailer parking.		X		○			○						
65. Discontinue horseback riding.			X	●			●	●	●				●
66. Work with NASA to develop a boardwalk, observation tower, and kiosk from the NASA Visitor Center to an area at or near Wallops Island NWR.		X		○			○						
67. Re-establish an interagency non-exclusive use agreement/MOU with NASA to support wildlife and habitat management for marshlands and uplands not impacted by facilities (3,000 acres).		X		●			●	●	●		●		
68. Maintain current hunting policy on Chincoteague NWR and Wallops Island NWR.	X	X	X	●			●	●	●		●	●	●
69. Introduce non-migratory Canada goose and light goose hunting within Assateague Island impoundments.		X	X	○		○	●		●				
70. Add mourning dove hunting to areas outside of Assateague Island.		X		○		○	○		○				
71. Add turkey to big game for youth hunting.		X		○			○						
72. Open refuge for migratory bird hunting on Federal holidays in designated areas of the refuge within Wildcat Marsh, Morris Island, Assawoman Island and Metompkin Island divisions, that occur outside of the current hunting days of Thursday, Friday, and Saturday.		X		○		○	○		●				
73. Pursue opening for fox and raccoon hunting as well as fur-bearer trapping on Assateague Island.		X	X	○			○	●	●			●	
74. Maintain current public access by foot to the Service Road.	X						○						

Management Action (b) ²	Element Included in Alternative			Soils	Air Quality	Hydrology/Water Quality	Vegetation	Federal T&E Species	Birds	Fish and other Aquatic Species	Mammals	Reptiles and Amphibians	Invertebrates
	A	B	C										
75. Close Service Road to all public access north of relocated parking except by special use permit or special day use privileges/openings.		X	X				•						
76. Maintain 23 full-time positions and 10 to 20 part-time, student, or contractor positions.	X	X	X	•	•	•	•	•	•	•	•	•	•
77. Add 8 full-time staff positions.		X	X	•	•	•	•	•	•	•	•	•	•

4.12 Socioeconomics

Similar to Chapter 3, Affected Environment, this section provides a summary of information from the report, *Chincoteague National Wildlife Refuge Economic Analysis in support of Comprehensive Conservation Plan* (USFWS 2012e), a full version of which is in Appendix M. Table 4-5 assesses the impact of three management actions for which information is available on socioeconomics; these management actions are referenced by number throughout the text.

All alternatives would maintain access to a 1-mile recreational beach, incorporate Americans with Disabilities Act standards and universal access into new buildings, and develop bilingual/multilingual materials. These commonalities serve to either maintain or increase the beneficial economic impacts of tourism for the region by improving the accessibility of the refuge.

4.12.1 Impacts on Socioeconomics in Alternative A

Alternative A, the no action alternative, assumes that the refuge would lose a significant number of beach parking spaces due to the projected intensity and frequency of coastal storms and sea level rise. The NPS surveyed the current recreational beach and determined that there will likely be sufficient area to provide for 400 parking spaces over the next 15 years, but the remaining 561 spaces currently available may lose their land base over time (management action 1s).

Due to an inability to predict when that land base may be lost and whether all 561 spaces would be taken away, a conservative estimate can be made comparing a situation in which all 561 are lost to the base year of 2009. The estimate does not include any mitigating effects of alternative parking solutions or shuttle service. It assumes, given survey data, that 10 percent of visitors come in the very early morning hours and 10 percent come in the evening hours, while the remaining visitors come during the prime beach hours of 10:00 a.m. to 5:00 p.m. The estimate shows that a maximum of 1,904 vehicles could be denied entrance to the recreational beach daily in the busiest month under the 400-car parking lot scenario of the no-action alternative. Table 4-2, taken from the economic alternatives analysis performed by the USFWS Economics Division, shows the number of vehicles denied access during the busy visit times.

Table 4-2 Vehicular Visits and Number of Vehicles Denied Access

Month	Average Daily Visits	Average Daily Visits During Peak Hours	Parking Available	Assumed Length of Stay (hours)	Vehicles Denied Access	Percent(%) of Day-long Beach Use Visits Affected
Memorial Day weekend	2,186	1,749	400	8	1,349	77
June	1,505	1,204	400	8	804	67
July	2,881	2,304	400	8	1,904	83
August	2,542	2,033	400	8	1,633	80
Labor Day weekend	2,843	2,275	400	8	1,875	82

Assuming that vehicles denied access to the beach choose not to visit the region at all and that each vehicle represents approximately \$268 dollars in lost regional expenditures per day, the loss of 561 parking spaces would result in a total economic impact per year of \$38.4 million, roughly 34 percent of annual total direct regional expenditures.

Table 4-3 breaks the impact down by the popular visit times.

Table 4-3 Economic Impact of Loss of Parking under Alternative A

Month	Daily Vehicles Denied Access	Associated Number of Daily Visitors Affected	Economic Impact Per Day	Economic Impact per Month/Holiday Weekend
Memorial Day weekend	1,349	4,317	\$ 361,073	\$ 1,083,219
June	804	2,573	\$ 215,185	\$ 6,455,560
July	1,904	6,094	\$ 509,720	\$ 15,801,328
August	1,633	5,227	\$ 437,155	\$ 13,551,794
Labor Day weekend	1,875	5,999	\$ 501,748	\$ 1,505,243
Total				\$ 38,397,143

4.12.2 Impacts on Socioeconomics in Alternative B

Alternative B would maintain the 8.5 acres of land for beach parking and relocates the beach approximately 1.5 miles north of the current area (management action 2s). USFWS assumes that visitation would not change as a result of the relocation, as the same number of spaces would be available, and the short-term transition between the locations would be carefully managed outside the peak visitation period. The alternative includes several expanded visitor services, such as hunting, but no significant increase in visitation would be expected, as hunting is limited by permits and other changes are aimed at benefiting current visitors. Therefore, USFWS assumes that there would not be any negative economic impact per year resulting from alternative B compared to the base year of 2009.

Enforcement of Federal laws that would effectively eliminate illegal horseshoe crab harvesting in the Toms Cove area would likely result in a negative impacts to some commercial watermen. According to VMRC, over 330,000 pounds of horseshoe crabs were harvested within the entire State of Virginia in 2012, at a value of \$276,305. In 2011, these numbers were almost 254,000 pounds and \$166,094 statewide. VMRC estimates that approximately 20 percent of the annual harvest is done by hand; thus, assuming that all hand harvesting is done in the Toms Cove area, the annual value of horseshoe crab harvesting on the refuge is, at most, approximately \$55,261. For the waters of Accomack County, 361,072 pounds of horseshoe crabs at a value of \$208,407 were reported from 1993 through 2010 (appendix M, section 3.3).

4.12.3 Impacts on Socioeconomics in Alternative C

Alternative C would reduce beach parking to 480 spaces, close the Beach Road causeway and the Service Road, and discontinue OSV use and horseback riding, all of which could have negative impacts on the number of visitors coming to the refuge. The negative impact could be mitigated somewhat by the implementation of a shuttle system to compensate for lost parking, and the implementation of hunting and trapping for certain species. Of these potential impacts, the only one for which an economic impact estimate is available is the loss of 481 parking spaces (management action 3s). Following the same methodology as alternative A, Table 4-4 estimates the economic impact of the lost visits. This analysis does not account for the institution of a shuttle from off-site parking.

The impact is less than that of alternative A. While the no action alternative would result in a loss of \$38.4 million in a year, alternative C would result in a loss of \$36.3 million, or 32 percent of the current annual baseline expenditures in Accomack and Worcester Counties. Impacts from elimination of horseshoe crab harvesting would be the same as described under alternative B.

Table 4-4 Economic Impact of Loss of Parking under Alternative C

Month	Daily Vehicles Denied Access	Associated Number of Daily Visitors Affected	Economic Impact Per Day	Economic Impact per Month/Holiday Weekend
Memorial Day weekend	1,269	4,061	\$ 339,661	\$ 1,018,983
June	724	2,317	\$ 193,774	\$ 5,813,208
July	1,824	5,838	\$ 488,309	\$ 15,137,565
August	1,553	4,971	\$ 415,743	\$ 12,888,031
Labor Day weekend	1,795	5,743	\$ 480,336	\$ 1,441,008
Total				\$ 36,298,795

Table 4-5 Beneficial and Adverse Impacts on Socioeconomics by Management Action

● = benefits only; ○ = adverse impact only; ◐ = adverse impacts and benefits

Management Action (s) ³	Element Included in Alternative			Socioeconomic
	A	B	C	
1. Continue to allow NPS to maintain 8.5 acres of land (and preserve the capacity of 961 spaces) for parking at the existing recreational beach as long as suitable land base directly behind the recreational beach remains, but maintain 400 spaces at a minimum over the 15 years.	X			○
2. Maintain 8.5 acres of land for parking (approximately 961 spaces).		X		●
3. Reduce beach parking to 480 spaces (approximately 4.25 acres).			X	○

³ The (s) represents management actions relating to socioeconomic resources.

4.13 Visitor Use and Access

The refuge is a major attraction for outdoor enthusiasts and a popular destination for visitors who participate in a range of activities, including the six wildlife-dependent priority activities (hunting, fishing, environmental education, interpretation, wildlife observation, photography), other recreational uses (e.g., bicycling, horseback riding, and OSV use in support of surf fishing and hunting) and use of the recreational beach. Each alternative evaluated in this document is comprised of a series of management actions. This section addresses the impacts on visitor use and access of the proposed management actions included in each alternative. These management actions broadly include:

- changes in visitor facilities or infrastructure;
- changes in approved public access, wildlife-dependent activities and other visitor uses;
- collaborations and partnerships with local, regional, and state recreation interests; and
- improvements in outreach and USFWS visibility.

This section considers the potential short- and long-term direct and indirect, and cumulative impacts on visitor use and access that could result from the actions above. The impacts include:

- conflicts among users—both actual (e.g., conflicts about safety and access) and perceived (e.g., outreach for one activity may deter the interest of other users);
- changes in visual landscape;
- a more informed public (e.g., about species, their habitats, and their conservation);
- a more supportive public (e.g., of the refuge, the refuge system, and the USFWS).

The discussion of impacts on visitor use and users is organized similar to other sections in this chapter, with some adjustment to reflect the fact that there are multiple uses and the impact of the same management action may be different on the various uses. First is a discussion of the impacts that do not vary by alternative and that generally affect all or most of the visitor uses. These impacts are the result of management actions that are included in all of the alternatives, and most of them are current management practices that that would remain the same for the next 15 years. Next, instead of dealing with all visitor uses by alternative, to make the comparison between alternatives more transparent, the impacts of each alternative are discussed by use and impacts to that use and subsequently to users (e.g. to hunting and hunters). Table 4-6 assesses the impact of management actions on visitor use and access; management actions are referenced by number throughout the text.

In general, there are both beneficial and adverse impacts to all visitor uses that would result from elements that are common to all of the alternatives. In all alternatives, the refuge would promote wildlife-oriented recreational opportunities that are compatible with the purpose for which the refuge was established, and would also maintain a recreational beach and many of the other recreation uses that are currently available at the refuge. The benefits of providing these activities would include helping to meet existing and future demands for outdoor recreation, interpretation, and education in the region. Visitors that are interested in these uses would benefit from high quality opportunities to engage in them. Another action that would likely benefit all users is the proposed implementation of a visitor survey every 5 years, which would allow visitors to share feedback on visitor use activities and to indirectly benefit from that information shaping refuge management over time. In addition, identifying and removing old abandoned structures on the refuge would enhance public safety and views.

Under all alternatives, visitor use and access, in terms of timing and location, would continue to be regulated to protect federally listed species and their habitats, such as the piping plover, tern, and shorebird habitat on Toms Cove Hook. As a result, potential users of this area would be adversely affected by the closures. The main visitor use constraints would occur from the continued closure of Toms Cove Hook and the Overwash area from March 15 through August 31 or thereafter, until the last shorebird fledges for alternative A, and through September 15 for alternative B.

Conversely, management actions to sustain and increase wildlife populations, in coordination with partners, could provide additional opportunities (benefits) for all six of the wildlife-dependent uses.

Coordination with the town of Chincoteague and other local, state, and Federal agencies to address hazard mitigation and resiliency in the face of dynamic coastal processes and climate change under all alternatives would benefit all uses on the refuge. In addition, as a result of these efforts, visitors would have the opportunity to learn about climate change at both local and global levels.

Under all alternatives, visitors would experience continued access to the refuge by bicycle, foot, and private vehicle. Access to several areas of the refuge, including the Woodland Trail, Lighthouse Trail, Herbert H. Bateman Educational and Administrative Center, and Wildlife Loop and associated trails, would be maintained under all alternatives. Access to other areas is addressed elsewhere in this section. Private motor vehicle access to Assateague Island would be maintained and the refuge would work with the town of Chincoteague to allow golf carts on the refuge and public roads, in order to provide a variety of modes of transportation to and in the refuge, thereby enhancing overall access to the refuge. Visitors would benefit directly from having multiple access options (walking, biking, shuttle system, and automobiles) from the pursuit of a well-planned transportation system by the refuge, in partnership with the town of Chincoteague. All visitors would benefit, because even those that still use automobiles would benefit from reduced roadway congestion and more available automobile parking.

Visitors would experience continued communication and outreach, which would have educational benefits and let them be aware of different visitor service restrictions or opportunities; continued access to the Assateague Lighthouse; and continued staffing of visitor programs as well as wildlife and maintenance programs that provide visual, safety, and other benefits to visitors.

4.13.1 Impacts on Hunting and Trapping Opportunities

All of the alternatives would maintain current hunting policies (management actions 41v and 42v) and as a consequence, would allow people to continue to enjoy hunting as a wildlife-related visitor use.

Under alternative A, opportunities for hunting are limited to big-game (white-tailed deer and sika elk) and migratory game bird hunting (waterfowl and rail).

Under alternative B, the expansion of hunting opportunities for new species (see management actions 43v, 44v, and 45v) and opening of additional hunting days (management action 46v) would benefit hunters. The relocation of the recreational beach, closure of the Beach Road causeway, and associated change in the OSV zone (management action 12v, 26v and 34v respectively) would change access to hunting zones. Those hunting zones currently closest to the OSV access point and recreational beach, such as Toms Cove Hook, would be 1.7 miles further away from the new OSV

access point, thus having the adverse impact of requiring hunters to travel longer distances. Conversely, those hunting zones currently further away would have the benefit of being more convenient for hunters to access from the improved Service Road and other facilities.

Under both alternatives B and C, the expansion of hunting areas and hunting for new species (management actions 44v and 45v) and introduction of fur-bearer trapping (management action 48v) would benefit hunters and trappers by providing new and expanded opportunities for these activities.

Under alternative C, the increase in sika hunting to achieve the species' removal (management action 49v) would be a short-term benefit to hunters as it could increase the number of hunters able to experience the hunt, but the eventual elimination of the sika population would mean over the long term, hunters would not be able to hunt sika and there would be fewer hunting permits available, an adverse impact. While OSV use would be discontinued (management action 37v), use of 4x4 vehicles would be permitted to access the Toms Cove Hook area for sika hunting.

If alternative B or C is selected for implementation, a new hunt management plan and other documentation would be developed to reflect changes. The plan would provide additional details, such as exact locations, time periods, and number of permits, and would be assessed through a separate NEPA process.

4.13.2 Impacts on Fishing Opportunities

Under all alternatives, users would continue to enjoy fishing, with the same areas available for surf fishing, crabbing, clamming and oyster harvest on Assateague Island, but with changes in access to those areas. Users would also continue to have restricted access to fishing near Assawoman Island from March 15 through August 31 or thereafter, until the last shorebird fledges for alternative A (management action 32v), and through September 15 for alternative B. For all alternatives, continued pedestrian access north and south of the recreational beach (management actions 21v and 23v) would allow for continued access to surf fishing areas and thus, reduced crowding along the beach.

Under alternative A, visitors would continue to have access to crabbing, clamming and oyster harvest areas; however, some of these areas could suddenly become inaccessible, an adverse impact, if parking/access to the recreational beach is lost due to natural causes (management action 10v).

Under alternative B, OSV use would be limited to those visitors who are engaged in wildlife-dependent recreational activities. This may result in an adverse impact to some users, but visitors that are fishing may benefit from reduced crowding within the OSV zone. With the expansion of the OSV zone (management action 34v), visitors would have access to approximately 2.65 more miles of beach for surf fishing by OSV, a benefit resulting in less crowding. A benefit of the designated year-round OSV parking area for fishing (management action 36v), is that visitors would have more convenient access to surf fishing when other portions of the OSV zone are closed and an extended time period for fishing using OSV access. Visitors would benefit from improved communication and coordination of the permit process throughout the region under this alternative (management action 31v) by saved time, reduced confusion, and raised awareness of rules and opportunities.

Under alternatives B and C, the relocated beach and change in Beach Road causeway access (management actions 12v and 26v, respectively) would result in improved experience for visitors interested in crabbing, clamming and oyster harvest in Swan Cove (F Pool) and Toms Cove. However, under alternative B, a new crabbing dock at the terminus of Beach Road (management action 28v) would create a new facility that would substitute for current inconvenient sites and be more accessible to visitors with disabilities and family groups, resulting in a net benefit from alternative B for this recreational activity. Under alternative C, visitors would not experience this improved amenity.

Under alternative C, OSV use would be discontinued (management action 37v) and there would be an adverse impact to visitors who come to the refuge to surf fish. Visitors who want to surf fish would experience greater inconvenience in taking their gear to surf fishing locations and surf fishing activities would be concentrated at points along the beach closer to the recreational beach so visitors would experience increased crowding. As a result, some visitors would continue to fish and carry gear by foot, some visitors would not choose to walk with gear down the beach, and others would choose not to visit the refuge.

4.13.3 Impacts on Environmental Education and Interpretation Opportunities

Under all alternatives, students able to travel to the refuge would continue to receive programming and experience the refuge. Visitors who stop by the exhibits and kiosks at the USFWS and NPS visitor centers and throughout the refuge would continue to learn about the agencies and the natural environment. The development of bilingual/multi-lingual information would enhance interpretation and environmental education opportunities for non-English speaking public and would also enhance compliance with hunting, fishing and other refuge laws and regulations. This is a benefit to non-English speakers and also to other uses because it would result in reduced violations and enhanced public safety. The replacement of existing exhibits with ones dedicated to climate change would benefit the public in raising awareness of the issue but could also lessen their awareness of other issues that could otherwise be covered in the same area.

Under alternative B, as communication in the “interconnected age” requires new approaches and changes in our communication culture, visitors would have new visual and interpretive experiences both online and on the refuge (management action 56v). Visitors would also benefit from improved organization and increased programming with the addition of an Education Program Specialist on staff (management action 61v). All of these would result in a more informed public and increased stewardship, and for Wallops Island NWR in particular, development of on-site interpretative opportunities with NASA would lead to increased visitation and awareness (management action 54v).

Under alternatives B and C, there are a number of common benefits to visitors involved in environmental education and interpretation. Students and others not able to travel to the refuge would be able to experience and learn about the refuge through the virtual exhibits. Enhanced opportunities would provide for a more informed public and increased stewardship. With the relocation of the recreational beach and change in access (management action 12v), beachgoing visitors would no longer pass by the Herbert H. Bateman Educational and Administrative Center en route to the beach and therefore, may be less inclined to visit, resulting in an adverse impact. However, the new visitor contact station at the recreational beach (management action 22v) would have information on both NPS and USFWS and would result in USFWS information being more directly accessible by beachgoing visitors, which would result in a net benefit to beachgoers.

Despite the relocation of the recreational beach and the closure of Beach Road causeway (management action 26v), visitors would continue to benefit from NPS and Marine Science Consortium canoe/kayak programs, which would have access to Toms Cove at the terminus of Beach Road.

Under alternative C, some beachgoing visitors who previously had not learned about the refuge would benefit from interpretation provided on the beach shuttle.

4.13.4 Impacts on Wildlife Observation and Photography Opportunities

For all alternatives, there are common adverse and beneficial impacts to visitors pursuing wildlife observation and photography due to resource management and continuation of other uses. Measures that are proposed to manage habitats could have short-term adverse impacts and long-term benefits to wildlife observation and photography. For example, visitors may be exposed to visual impacts of the removal of invasive species. These activities may be perceived as disturbing the natural character of the landscape and could temporarily decrease wildlife observation and photography opportunities. However, these vegetation management activities would be limited and temporary, and would result in long-term aesthetic and habitat benefits as native species replace the invasive species. The long-term result would be enhanced diversity and abundance of species that would be available for wildlife observation and photography, and could also result in enhanced opportunities for interpretation and education.

Under all alternatives, the continued allowance of hunting (management actions 41v) on the refuge would have adverse impacts on other users, including those pursuing wildlife observation and photography, by causing some noise and resulting in temporary access restrictions to certain areas, such as the Woodland Trail, on specific days while hunting is taking place. However, hunting also helps keep wildlife populations at healthy levels, which results in better opportunities for viewing of a variety of wildlife, a benefit to wildlife observers and photographers. For all alternatives, the continued parking access to the beach (management actions 8v, 9v, 11v) and continued pedestrian access north and south of the recreational beach (management action 21v and 23v) would be a benefit to wildlife observers and photographers by allowing continued access for wildlife observation and photography along the full length of the beach. The removal of Swan Cove Trail (management action 18v) would be an adverse impact, as it would reduce access to wildlife observation and photography opportunities along the trail and at the beach area that the trail accesses which currently provides a more remote, isolated experience.

Under alternative A, the limited level of hunting (management action 41v) would allow visitors to continue to enjoy wildlife observation and photography with minor noise and visual disturbance. Continued vehicular parking and access to the beach (management action 10v), while available, would facilitate visitors having convenient access to observe shorebirds and other coastal wildlife and for beach-related photography opportunities, including a vista with water on both sides. When the parking is reduced by natural processes, there would be a short-term disruption and then increased inconvenience in access to these opportunities (management action 10v and 13v). Under alternative A, visitors would continue to be able to access the Service Road by foot (management action 25v), thus providing for wildlife observation and photography opportunities to the north, including viewing of the northern pony herd.

Under alternative B, the replacement of Swan Cove Trail with an alternative trail to the relocated recreational beach (management action 20v) would provide visitors with a benefit in the form of

access to a new area for wildlife observation and photography and continue to facilitate such access to the beach. The expansion of hunting opportunities for new species (management action 43v, 44v, and 45v) and opening of additional hunting days (management action 46v) would mean that other visitors would be more likely to see or hear signs of hunting from adjacent areas, which could adversely affect their wildlife observation and photography. However, this impact would be minimized because hunting would occur during off-peak visitation times. Hunting of new species (management action 43v and 44v) would reduce the number of those species that visitors could see; however, these species are being identified because of their overabundance and impacts on other species. Thus, in the long term, increased hunting could enhance the opportunity for wildlife observation and photography. Under alternative B, a benefit of the new observation tower at or in the vicinity of Wallops Island NWR (management action 55v) is that it would provide new photography/wildlife observation opportunities in a new location, which would reduce crowding elsewhere and increase awareness of the refuge. Other improvements, such as the pursuit of photography blinds, could attract more visitors, which would increase crowding and disturbance, but would also provide new experiences for existing visitors and bring new visitors to the refuge.

Under alternative B and C, the relocation of the beach (management action 12v) and closure of beach causeway (management action 26v) would be an adverse impact because it would reduce opportunities for wildlife observation and photography in Swan Cove (F Pool), Toms Cove, and the southern end of the island, as parking and foot access to these sites would be more difficult and inconvenient. The relocated recreational beach would change the beach viewshed such that water would not be visible on both sides; however, the viewshed at the relocated recreational beach would also have reduced views of parking. A benefit is that the new wildlife viewing tower at the terminus of Beach Road (management action 27v) would provide a new opportunity for wildlife observation and photography and alternative access to viewing Toms Cove.

The relocated recreational beach would make it inconvenient to drive by the viewing area for the Chincoteague ponies; however, the planned relocation of some of the ponies would ensure continued convenient visual access, mitigating this impact. Relocation of the beach would change the use of part of the Wildlife Loop such that there may be increased disturbance to wildlife that would reduce wildlife observation and photography opportunities along the Loop; however, the stretch of road to be used is already well shielded and separate from most of the Loop habitat; lessening this impact. Closure of the Service Road north of the recreational beach to public access (management action 25v) would reduce opportunities to view the northern pony herd and access to that landscape for photography; however, alternative pony viewing opportunities would be pursued and some of the previous area would still be accessible as the recreational beach would be further north, thus minimizing this impact.

Under alternative C, there would be an increase in noise and visual disturbance from increased sika hunting (management action 49v), and as this species is removed, sika would no longer be available to observe and photograph. Expanded hunting and trapping opportunities (management actions 43v, 47v, 48v) under alternative C would result in increased noise and visible signs of hunting, disturbing users engaged in wildlife observation and photography and disturbing wildlife. In general, while the increase in hunting could adversely affect wildlife observers and photographers, because the hunts would take place mostly outside of the primary visitor use areas, the impact would be minimized. The limit on Chincoteague pony population to 125 (management action 52v) could reduce viewing opportunities; however, the current population is between 125 and 135 so no significant impact would be anticipated. Views of parking from the

recreational beach would be reduced due to the reduction in parking (management action 11v), which would be a benefit.

4.13.5 Impacts on Recreational Beach Use Experience

Under all of the alternatives, beachgoing visitors would continue to benefit from access to a 1-mile recreational beach with at least 480 adjacent parking spaces (there are currently 961 parking spaces).

Under alternative A, the recreational beach would remain in its current location and as a result, visitors would continue to enjoy beach activities, view of water on both sides of the beach, access to both ocean-side and bayside beaches, nearby clamming, crabbing and oyster harvest areas, and beach access within approximately 100 feet of parked vehicles. However, beach parking would only be maintained at the existing 961 spaces as long as the land base allows (management action 10v). Under alternative A, beachgoers would benefit from the new Beach Road bicycle connection to the recreational beach (management action 19v), which would provide a safer option than riding on the shoulder and could result in lower demand on beach parking.

As described elsewhere, NPS and USFWS expect that natural forces (wind, tidal flooding, strong coastal storms and sea level rise) will result in the partial or full loss of the existing beach parking lots over the next 15 years. These factors will combine to reduce the capacity of the land base to support 961 spaces of parking. This probability is supported by USGS in its vulnerability modeling. Additionally, the likelihood of the NPS continuing to obtain funding to rebuild the lots in the same location is uncertain.

The reduction in parking would have a significant adverse impact on beachgoers. It is possible that the land base would be able to continue to sustain the current parking areas; if not, the NPS has determined that they may be able to maintain a core parking area of 400 parking spaces between two significant overwash areas, over the next 15 years. NPS and USFWS realize that 400 parking spaces would not meet the current level of visitation to the recreational beach during peak season. Under this alternative, the parking reduction would mimic the loss of the land base, which is dependent on natural forces and other uncertainties as described above.

In addition to losing the parking areas under this approach there would not be infrastructure in place to start a shuttle system immediately, the shuttle implemented may not meet all visitor requirements, and the request for funds may be less competitive because other facilities are experiencing similar impacts. All of this could result in a significant adverse impact until such time that the shuttle system could meet all visitor requirements.

Based on visitation data, USFWS made a number of assumptions to calculate that if the number of parking spaces is reduced to 400, an estimated 67 to 83 percent of summer visitors (Memorial Day weekend through Labor Day weekend; 57 percent of total visitation) could eventually not have access to parking under alternative A (see Appendix M). In the short term, these visitors could be adversely affected in a significant manner by the insufficient transit services until adequate services are provided.

Under alternatives A and C, the introduction of a shuttle (management actions 14v and 16v) would have both adverse and beneficial impacts. NPS and USFWS realize that some visitors may be reluctant to use transit. Visitors dependent on transit would experience some adverse effects.

They would lose some beach time in using the shuttle and would be inconvenienced if bringing a lot of recreational beach gear. Visitors would not have the same level of flexibility in coming and going from the recreational beach. Visitors accessing the beach by shuttle would experience delays and risk exposure if everyone left at the same time due to a storm; however, the refuge and NPS would provide shelters and develop an evacuation plan. A benefit of the shuttle is that some visitors would gain time at the beach from not having to wait in traffic or wait for a parking space at the beach. The shuttle would also increase the number of visitors who could access the recreational beach, which would mean new beachgoing experiences but also potential overcrowding of the recreational beach.

Under alternative B, beachgoers would benefit from the ongoing provision of the same number of parking spots as there are currently at the existing beach without disruption. However, they would also experience the adverse impacts of traffic and waiting for parking as they currently do.

Beachgoers would benefit from the new bicycle connection to the recreational beach (management action 20v), which would provide a safer transportation option and could result in lower demand on beach parking.

Under alternatives B and C, the relocation of the beach (management action 12v) would have significant adverse impacts, as well as some beneficial impacts, on beachgoing visitors. Beachgoers would be able to continue the same type and level of beach activities on the ocean-side. Visitors would not have access to the bayside and thus would not be able to pursue bayside activities, such as clamming, crabbing, and swimming with young children. Due to the reduced points of access to the beach, visitors would experience the adverse impact of more crowding at access points, as some people would not want to carry recreational beach gear further up or down the beach. Visitors would experience increased exposure to mosquitoes in the relocated parking areas; however, the refuge would take measures to reduce the mosquito population, avoiding or minimizing this impact to the extent possible. Under both alternatives, the facilities would be constructed such that visitors would have continuous access to the refuge and recreational beach throughout the transition from the current to the new location of the recreational beach, and would receive communication on the timeline for relocation, reducing any significant disruption in visitor use.

Under alternatives B and C, the closure of Beach Road causeway (management action 26v) would eliminate access to the current recreation beach and its particular characteristics, such as water on both sides and easy access to clamming, crabbing, oyster harvest and other bayside activities.

Under alternative C, the reduction in beach parking (management action 11v) and introduction of a shuttle (management action 16v) would have significant adverse impacts on beach going visitors. Some beachgoers would choose not to visit and instead go elsewhere. Based on visitation data, USFWS made a number of assumptions to calculate that if the number of parking spaces is reduced to 480, an estimated 60 to 79 percent of summer visitors (Memorial Day weekend through Labor Day weekend; 57 percent of total visitation) would eventually not have access to parking under alternative C (see Appendix M). However, visitors would be able to access the beach by shuttle, which would accommodate some visitors but may discourage others.

4.13.6 Impacts on Other Uses

Under all alternatives, similar to impacts on wildlife observation and photography, the continued allowance of hunting (management actions 41v and 42v) on the refuge would have adverse impacts on other bicyclists, walkers and other users by causing some noise and resulting in temporary restrictions to access to certain areas during the hunting season, such as the Woodland Trail, on specific days while hunting is taking place. The removal of Swan Cove Trail (management action 18v) would be an adverse impact that reduces access to an area that provides a more remote, isolated experience away from the recreational beach.

Under alternative A, the replacement of Swan Cove Trail with a bicycle trail along Beach Road to the recreational beach (management action 19v) would provide a beneficial impact. It would provide safer access that would reduce safety incidents, and increase the likelihood that visitors, in particular those with families, would access the recreational beach by bicycle. This could result in fewer demands on beach parking, thus increasing the capacity for visitors. However, this trail would be dependent on the extent of erosion that Beach Road may experience. Additionally, visitors would continue to have non-motorized boat access at the current beach, horseback riding in the existing OSV zone, and bicycle access on the Wildlife Loop and existing trails.

Under alternative B, the expansion in the OSV zone (management action 34v) and consequently the horseback riding zone (management action 38v) would result in an expanded riding area for horseback riders but may also attract more use. The relocation of the recreational beach (management action 12v) and closure of the Beach Road causeway (management action 26v) would result in reduced access to Toms Cove for non-motorized boats; however, this would be offset because refuge would develop a launch point at terminus of Beach Road (management action 28v). In addition, relocation of the recreational beach would benefit bicyclists' access and beach access via bicycle, with introduction of new on-road bicycle lanes and trail that would provide improved, safer, and more direct access and could result in an increase in overall beach visitation, and reduced beach parking demand. However, this may be offset by more visitors choosing to bike to the beach, resulting in more crowded bicycle trails.

Under alternatives B (management actions 43-48v) and C (management actions 43v, 47v, 48v), the increase in hunters due to new hunting opportunities could result in increased violations and safety concerns for other visitors. However, the use by hunters occurs during the off-season for the majority of visitation and, the increase in hunter education and the introduction of bilingual hunting regulations would help mitigate such violations and concerns. Relocation of the beach (management action 12v) would change the use of part of the Wildlife Loop such that Loop non-motorized traffic would need an alternative or to share the right of way with beach traffic. This could result in adverse impacts in the form of increased crowding, discomfort, and safety incidents.

Under alternative C, there would be adverse impacts to users who horseback ride, which would be discontinued (management action 40v), or who smoke, which would be banned on the beach. The relocation of the beach and lack of access at the terminus at Beach Road would result in reduced access to Toms Cove.

Table 4-6 Beneficial and Adverse Impacts on Visitor Uses by Management Action

● = benefits only; ○ = adverse impact only; ◐ = adverse impacts and benefits

Management Action (v) ⁴	Element Included in Alternative			Hunting	Fishing	Environmental Education and Interpretation	Wildlife Observation / Photography	Recreational Beach	Other Recreation
	A	B	C						
1. Complete a habitat management plan and continue to manage habitats and management structures.	X	X	X	◐	◐	◐	◐	◐	◐
2. Provide protective conservation measures for federally listed species and their habitats.	X	X	X	◐	◐	◐	◐	◐	◐
3. Work with partners toward regional conservation to protect estuarine, coastal, and marine habitats and substantial populations of migratory and breeding shorebirds, colonial waterbirds, landbirds, and raptors.	X	X	X	●	●	●	●		
4. Work with the town of Chincoteague and other local, state, and Federal agencies to address hazard mitigation and sustain the resiliency of this unique barrier island system in the face of dynamic coastal processes and climate change.	X	X	X	●	●	●	●	●	●
5. Maintain personal motor vehicle access to Assateague Island and work with the town of Chincoteague to allow golf carts and allow a variety of modes of transportation to and in the refuge.	X	X	X				●	●	●
6. Include the development of bilingual/ multilingual information for regulations and environmental education.	X	X	X	●	●	●	●		●
7. Incorporate universal access and Americans with Disabilities Act standards into all new facilities.	X	X	X	●	●	●	●	●	
8. Continue to allow NPS to manage a 1-mile recreational beach.	X	X	X				●	●	
9. Maintain 8.5 acres of land for parking.		X					●	●	
10. Continue to allow NPS to maintain 8.5 acres of land (and preserve the capacity of 961 spaces) for parking at the existing recreational beach as long as suitable land base directly behind the recreational beach remains.	X						●	◐	

⁴ The (v) represents management actions relating to visitor use resources.

Management Action (v) ⁴	Element Included in Alternative			Hunting	Fishing	Environmental Education and Interpretation	Wildlife Observation / Photography	Recreational Beach	Other Recreation
	A	B	C						
11. Reduce beach parking to 480 spaces (approximately 4.25 acres).			X				○	○	
12. Relocate recreational beach, beach parking, and associated facilities approximately 1.5 miles north of current area.		X	X	●	●	●	●	●	●
13. Continue to coordinate with NPS and the town of Chincoteague to identify a suitable off-site beach parking area for future use once existing beach parking is lost due to lack of suitable land base behind the recreational beach.	X							●	
14. In being consistent with the 1993 Master Plan, as storms and other natural forces eliminate parking spaces adjacent to the beach, implement an alternate means of transportation such as a shuttle system.	X							●	
15. Work with the town of Chincoteague to develop a response plan for beach access during periods when existing beach parking is unavailable due to storm events, and during peak periods when existing beach parking is inadequate to meet demand. The response plan would include designated parking areas which may be on or off-refuge, and would include alternative means of transportation from the parking areas to the beach.	X	X	X					●	
16. Coordinate with NPS and the town of Chincoteague to identify a suitable off-site beach parking area, as close to the beach as possible, and facilitate a shuttle service from off-site parking to recreational beach for use during specific times of the year when parking capacity exceeded (anticipated to be every weekend in May and September and every day from Memorial Day weekend through Labor Day weekend).			X					●	
17. Work with NPS to install shelters for transit users, bicyclists, and walkers.	X	X	X					●	
18. Remove Swan Cove Trail.	X	X	X	●				○	○
19. Continue pursuit of bicycle trail development via Beach Road to recreational beach to replace Swan Cove Trail.	X							●	●
20. Replace Swan Cove Trail with an alternative bicycle trail from Wildlife Loop north to the south end of the relocated recreational beach, near the OSV zone entrance.		X		○			○	●	●
21. Allow pedestrian access in intertidal zone access north of recreational beach.	X	X	X		●		●		

Management Action (v) ⁴	Element Included in Alternative			Hunting	Fishing	Environmental Education and Interpretation	Wildlife Observation / Photography	Recreational Beach	Other Recreation
	A	B	C						
22. Develop joint NPS and USFWS Visitor Contact Station near the new recreational beach.		X	X			•	•		
23. Allow pedestrian access south of recreational beach outside of breeding season, between approximately September 16 and March 14.	X	X	X		•		•		
24. Maintain current public access by foot to the Service Road.	X						•		
25. Close Service Road to all public access north of relocated parking except by special use permit or refuge event.		X	X				○		
26. Close Beach Road causeway to all public access.		X	X		○		○	○	○
27. At new road terminus, build a vehicle turn around.		X	X				•		
28. At new road terminus, build a wildlife viewing tower, crabbing dock, and new launching area for small non-motorized vessels.		X			•				•
29. Allow canoe/kayak access from road terminus for environmental education and interpretation programs by NPS and the Marine Science Consortium.		X	X			•			
30. Maintain current access and closures for OSV.	X				•				
31. Improve signage, promotion, and coordination concerned barrier islands access and permitted activities throughout the refuge and Virginia’s Eastern Shore.		X			•		•		
32. Close Assawoman Island to fishing during breeding season from March 15 until September 15 or thereafter until the last shorebird fledges.	X	X	X		○				
33. Allow OSV for priority uses, like wildlife observation, fishing and to access hunting zones, and restrict nighttime OSV use during September and October, when OSV zone is open but sea turtle nesting season (June through October) is still ongoing.		X		•	•				
34. Expand the OSV zone from the new recreational beach to Toms Cove.		X		•	•		•		•
35. Keep the OSV zone open from approximately September 16 to March 14 and close the OSV zone to public access March 15 through September 15 or thereafter, until the last shorebird fledges.		X			•		•		
36. Develop a designated, year-round area for fishing from south of the recreational beach to the point of closure that would include OSV parking.		X			•				
37. Discontinue OSV use.			X		○		•		

Management Action (v) ⁴	Element Included in Alternative			Hunting	Fishing	Environmental Education and Interpretation	Wildlife Observation / Photography	Recreational Beach	Other Recreation
	A	B	C						
38. Allow horseback riding in OSV zone.	X	X		○			○		●
39. Designate separate parking for horse-trailer parking.		X						●	●
40. Discontinue horseback riding.			X	●			○		○
41. Maintain current hunting policy of big game and migratory bird on Chincoteague NWR.	X	X	X	●			○		○
42. Maintain current hunting policy of big game on Wallops Island NWR.	X	X	X	●					
43. Introduce non-migratory Canada goose and light goose hunting within Assateague Island impoundments.		X	X	●			○		
44. Add mourning dove hunting in areas outside of Assateague Island.		X		●			○		
45. Add turkey to big game for youth hunting.		X		●			○		
46. Open refuge for migratory bird hunting on Federal holidays in designated areas of the refuge within Wildcat Marsh, Morris Island, Assawoman Island and Metompkin Island divisions, that occur outside of the current hunting days of Thursday, Friday, and Saturday.		X		●			○		
47. Pursue opening for fox and raccoon hunting on Assateague Island.		X	X	●			○		
48. Pursue opportunity for fur-bearer trapping on Assateague Island.		X	X	●			○		
49. Work to eliminate sika and non-migratory Canada goose populations.			X	○			○		
50. Continue to allow current Chincoteague pony population of up to 150.	X	X					●		
51. Implement revised Chincoteague pony management plan.	X	X	X				●		
52. Within 15 years, phase in requirement for Chincoteague pony population to consist of no more than 125.			X				○		
53. Continue to protect the wilderness character of the proposed wilderness area.	X	X	X						
54. Work with NASA to develop a boardwalk, observation tower, and kiosk from the NASA Visitor Center to an area at or near Wallops Island NWR.		X				●	●		

Management Action (v) ⁴	Element Included in Alternative			Hunting	Fishing	Environmental Education and Interpretation	Wildlife Observation / Photography	Recreational Beach	Other Recreation
	A	B	C						
55. Maintain the restored Assateague Lighthouse and continue to allow the Chincoteague Natural History Association (CNHA) and refuge volunteers to conduct tours of the Assateague Lighthouse.	X	X	X			•	•		
56. Restore the light keeper’s house and historic landscaping at Assateague Lighthouse. Develop new cultural resource and interpretation amenities, including a virtual tour of the lighthouse and museum property. The refuge would allow access to the cemetery near Beach Road and develop tours and controlled access opportunities for Assateague Village.		X				•			
57. Continue public outreach activities (Web site, press releases, radio outreach, Community Leaders meetings, etc.), including implementation of fiber optics capacity and Intelligent Traffic System and the pursuit of mobile trailer for outreach/education and acquire by 2015.	X	X	X	•	•	•	•	•	•
58. Develop new outreach strategies, including technology-based outreach, and develop a communication plan and emergency infrastructure for the relocated recreational beach.		X	X	•	•	•	•	•	•
59. Maintain 23 full-time positions and 10 to 20 part-time, student, or contractor positions.	X	X	X	•	•	•	•	•	•
60. Add 8 full-time staff positions.		X	X	•	•	•	•	•	•
61. Add Education Program Specialist.		X				•			

4.14 Cultural and Historic Resources

Chapter 3, Affected Environment, discusses the status and location of cultural and historic resources on the refuge. This section provides the results of the evaluation of the management actions each alternative proposes for impacts on these resources, although nearly all known impacts would not vary by alternative.

An impact to cultural resources would be considered significant if it adversely affects a resource listed in or eligible for listing in the National Register of Historic Places. In general, an adverse effect may occur if a cultural resource would be physically damaged or altered, isolated from the context considered significant, or affected by project elements that would be out of character with the significant property or its setting. Title 36 CFR Part 800.5(2) provides the following examples of adverse effects on historic properties:

- Physical destruction, damage, or alteration of all or part of the property;
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines;
- Removal of the property from its historic location;
- Change of the character of the property's use or of physical features within the property's setting that contributes to its historic significance;
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
- Neglect of a property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
- Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

Refuge lands are protected from development or destructive land uses that may result in substantial impacts on cultural and historic resources. Regardless of which alternative we select, we would protect known cultural and historic resources. USFWS has a regular process for ensuring protection of archaeological sites and historic structures from activities. The process includes review of projects by professional archaeologists in the USFWS Regional Office and consultation with the Virginia Department of Historic Resources (the Virginia State Historic Preservation Office, SHPO). Project leaders submit descriptions of their proposed projects, maps, and plans to the Regional Historic Preservation Officer (RHPO), who determines what is needed to identify archaeological sites in the project area and helps the refuge avoid sites when called for. Rarely, the USFWS will mitigate an unavoidable impact to a site, in consultation with the SHPO and interested parties. Any future ground disturbing activities would go through this process. Activities such as shoreline modification, development of infrastructure for roads or parking, and wetland restoration will require RHPO review and SHPO consultation under this process.

4.14.1 Impacts on Cultural and Historic Resources in Alternatives A, B, and C

We expect that our routine process for compliance with the NHPA (review of projects by the RHPO, identification of as yet unknown sites, consultation with SHPOs, Tribes, and other interested parties, archaeological site avoidance at the planning stage, and mitigation of any impacts that are unavoidable) will address any unanticipated potential impacts of implementation

of the CCP on cultural resources. We foresee no particular cumulative impacts to archaeological sites from the implementation of the plan. We will continue to protect the refuge's archaeological sites from our activities through our routine compliance process including RHPO review, site location surveys or evaluations, redesign of projects to avoid sites, consultation with SHPO, and mitigation of impacts when necessary. Current management adheres to guidelines set forth in previous coordination with SHPO. Under alternative A, continuing those current management practices will not result in any new or significant adverse impacts to cultural and historic resources.

In regard to the potential development in alternatives B and C, a refuge volunteer, under the guidance of refuge staff, compared findings in the report, "Archaeological Reconnaissance of the Chincoteague National Wildlife Refuge, Accomack County, Virginia and Worcester County, Maryland" (Goodwin & Associates, Inc. 1989) with the potential development in alternatives B and C. Intended as a "fatal flaw" test, the volunteer prepared a brief summary memo concluding that nothing in the Goodwin report indicated we would be impacting cultural resources based on the previous findings. Since the proposed actions associated with the relocated beach parking and road expansion are conceptual and not finalized, specific details for these actions are currently unknown. Further environmental assessments and analysis for impacts on cultural resources would need to be completed prior to construction.

4.15 Refuge Administration

Refuge administration consists of staffing, fee administration, communications, and facility management, among other functions. This section evaluates the following management actions for their potential beneficial or adverse impacts on refuge administration:

- changes in staffing;
- increased coordination or other administration requirements; and
- changes in visitor use activities that would require increased or decreased administration and law enforcement.

This section considered the following potential short- and long-term direct, indirect, and cumulative impacts on refuge administration that could result from the actions above:

- conflicts among resources (staff, time, funding);
- ability to meet requirements and administer the elements under each alternative; and
- ability to meet short-term and long-term agency goals and objectives, such as environmental education and fiscally responsible and environmental sustainability.

Having well-maintained visitor facilities is important for encouraging and welcoming visitors to Federal lands. It reflects on USFWS's responsibility to spend taxpayer dollars effectively and efficiently. It is also important to protect public safety and refuge resources, both of which can be directly impacted or compromised when facilities deteriorate. In addition, the refuge is committed to incorporating universal access and Americans with Disabilities Act standards into all new facilities.

Regional conservation, economic, and resiliency/hazard mitigation efforts would require refuge staff to coordinate with other Federal, State, regional, and local agencies but may also provide access to additional funding or in-kind support.

4.15.1 Impacts on Refuge Administration in Alternative A

Under alternative A, the existing level of staffing and volunteer support would likely be sufficient for the refuge to meet most of its major commitments. However, lack of designated staffing for Wallops Island NWR could result in competing demands on Chincoteague NWR staff time, in particular for biology, which may limit the ability of staff to fulfill future strategies.

4.15.2 Impacts on Refuge Administration in Alternative B

Under alternative B, new activities and programs would result in staffing needs and infrastructure investment. The focus on use of social media/technology would require new technical knowledge and some infrastructure investments (i.e., fiber optics). The expansion of hunting and trapping opportunities would require a follow-up hunt management plan, with a short-term impact on staff time. Subsequent increase in hunting permits and need for new materials and maps would require additional staff and funding to administer permits, patrol hunting zones, and provide orientation for new hunters. This would be a long-term impact, as such administration is year-round. The relocation of the recreational beach and related facilities would require staff to develop a transition and communication plan, as well as participate in design, further environmental assessment, and other planning efforts. New staffing would better address Wallops Island NWR needs and the needs created by strategies for resource management (biology), visitor services, maintenance, law enforcement, and coordination with NASA.

4.15.3 Impacts on Refuge Administration in Alternative C

Under alternative C, new activities would require staff time while the removal of some activities would lessen the administrative burden. Similar to alternative B, the expansion of hunting and trapping opportunities and the relocation of the recreational beach would have long and short term administrative impacts. The removal of the OSV and horseback riding zone would reduce the administrative and enforcement burden on NPS and refuge staff. Such staff would then be able to devote more time to other resource management needs. New staffing would better address Wallops Island NWR needs and the needs created by strategies for resource management (biology), visitor services, maintenance, law enforcement, and coordination with NASA.

4.16 Cumulative Impacts

CEQ defines cumulative effect as the “impact on the environment which results from the incremental impact of the action(s) when added to other past, present and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR 1508.7). The purpose of cumulative effects analysis (CEA) is to determine if, when they are added together, the adverse impacts would be significant. Therefore, cumulative effects can result from individually minor but cumulatively significant adverse effects.

As noted elsewhere in this CCP/EIS, there are management actions proposed by the alternatives for which the details are not available at this time, and will therefore be addressed in a separate NEPA analysis, including relocation of the recreational beach (alternatives B and C) and relocation of parking at an offsite location (alternatives A and C). The potential cumulative impacts of these actions are addressed conceptually in this section.

4.16.1 Resources Evaluated

CEQ’s guidance on CEA says that “Determining thresholds beyond which cumulative effects significantly degrade a resource, ecosystem and human community is often problematic. Without a definitive threshold, the NEPA practitioner should compare the cumulative effect with

appropriate national, state or community goals to determine if the total effect is significant” (CEQ 1997). Following the guidance, the scope of the CEA should be related to the magnitude of the environmental effects of the proposed actions only for those resource areas upon which the proposed actions, when combined with other actions, may be significant. For this CEA, the following resources areas are evaluated:

- air quality;
- hydrology/water quality;
- vegetation, wildlife, and habitat;
- birds;
- threatened and endangered species;
- socioeconomics; and
- soils.

4.16.2 Actions Included

CEA is framed by geographic and temporal (time) boundaries based on the magnitude and the nature of the proposed action, with boundaries for actions that constitute major changes in management of the refuge or that result in many significant impacts compared to other actions.

The geographic boundary for CEA in this CCP/EIS includes the Southern Delmarva Peninsula (in particular Accomack County) and all coastal NWRs in the area of the Chesapeake Bay and Delmarva Peninsula. Although our analysis is done resource by resource, we have chosen a large geographic boundary to include all possible cumulative effects, including possible additive effects of strategies within this CCP on others’ actions. The other NWRs are included because past and future management actions and resources at these refuges could be similar to the actions proposed in this CCP. These include the Eastern Shore of Virginia/Fisherman Island NWRs, Eastern Neck NWR, Back Bay NWR, Prime Hook NWR, Bombay Hook NWR, and the Chesapeake Marshlands NWR Complex (NWRC), which includes Blackwater, Martin, and Susquehanna NWRs. The total land area of these refuges, including Chincoteague and Wallops Island NWRs, is approximately 87,500 acres. For these other refuges, this CEA includes only the adverse effects of each refuge CCP’s selected alternative. Bombay Hook is in the process of developing its CCP/EA and therefore, no information impact information is available to include in this analysis.

Temporal boundaries are often more challenging to define than geographic boundaries. The period from the last refuge master plan through the 15-year CCP planning period (1993 to 2028) is a logical study period for this CEA. However, the availability of data often determines how far back past effects are examined. Because data on past conditions are usually scarce, the analysis of past effects is usually qualitative. Identifying the effects of fairly recent past actions and actions presently underway is easier than identifying past or future actions, but is by no means simple (CEQ 1997). Identifying future actions requires determining what is reasonably foreseeable, rather than what is speculative and requires using the best available information, which generally results in an analysis that is both quantitative and qualitative.

The 1997 CEQ guidance states that identifying future actions requires investigating the planning documents of other agencies. Accordingly, the following sources were consulted in this CEA: the 1992 Chincoteague NWR Master Plan EIS; CCPs/EAs covering the NWRs in the CEA study area; the Town of Chincoteague (2010) and Accomack County (2008) comprehensive plans; the 2005 Wildlife Action Plan (2005), the Virginia Outdoors Plan (2007); Federal and state data on

economic activity and labor force data; other relevant documents on the Delmarva Peninsula; and 15 NEPA documents completed between 1997 and 2013 for actions on the Wallops Flight Facility (WFF) site and one on the Assateague Island National Seashore (Seashore), which are major Federal land facilities that abut the refuge.

4.16.3 Results of Cumulative Effects Analysis

Because information on past actions is limited, this section provides background on the CEA study area to frame the analysis. It contains a summary of data available from the sources listed above as an overview of the CEA study area to supplement information provided in chapter 3.

At some point in the past, much of the CEA study area was undeveloped. Due to its isolated location, the Delmarva Peninsula developed more slowly than the rest of the eastern seaboard, but human habitation changed the natural state of the CEA study area as it was subsequently settled. While Accomack County is the largest in total area in the Commonwealth of Virginia, nearly 65 percent of the area is water and the population is 0.4 percent of the Commonwealth's population (U.S. Census 2010). The WFF facility was initially developed by the U.S. Navy in the 1930s, followed by the establishment of the refuge in 1943 and the Seashore in 1965. Over 47,000 acres (about 5 percent) of Accomack County remain in conservation and some of the remaining land is undevelopable as wetlands or marsh (Accomack County 2008).

While the particular impacts of the area's early development and the early management actions at the refuge are not documented, the existing conditions documented in the various state and local plans consulted provide an overview of the cumulative effects of past actions, just as chapter 3 of the CCP/EIS represents the cumulative effects of past actions on the refuge. Population in the county grew at an average rate of approximately 10 percent each decade between 1930 and 1990, and then grew just one percent between 1990 and 2000 (Accomack County 2008). Consistent with the national economy and its position as a tourist economy, Accomack County lost 13 percent of its population between 2000 and 2010 (Virginia Employment Commission 2013), reflecting the tendency of tourist economies to experience greater swings when the national economy changes. There are few large employers in the County; only 5 percent of them employ more than 50 people and 58 percent of all employers have less than five employees (Virginia Employment Commission 2013). As a result, we were unable to identify proposed actions for inclusion the CEA other than those in the other refuge CCPs and Federal agency NEPA documents. The Town of Chincoteague's Comprehensive Plan (2010) identifies some economic development opportunities; however, these opportunities are not sufficiently developed or detailed to determine the adverse environmental impacts for this CEA.

Past and future actions by relevant Federal agencies are less speculative because they are described in detail in long-term planning documents. With regard to past actions on the refuge, according to the EIS on the 1993 Master Plan, construction of the Herbert H. Bateman Educational and Administrative Center, and the associated access road and parking lot, resulted in loss of habitat, especially pine forest. The Center and its related uses also introduced more signs of human presence in the refuge landscape, and along with the new bicycle trail, reduced pervious surface thereby increasing storm water runoff. However, stormwater runoff percolates through the sandy soil and is captured in the freshwater lens. Other impacts of the facilities were largely mitigated by the removal of the existing visitor contact station site and old administrative area, which were allowed to succeed to native habitat.

Each of the nearby NWRs developed a CCP in the past several years and the impacts of each of the management actions in those CCPs have been evaluated in detail in an EA, as shown in the sources notes to Table 4-7. Some of the actions have been implemented and others are programmed to occur in the next several years. In accordance with the mission of the Refuge System, most of the management actions undertaken and proposed at NWRs result in benefits, rather than adverse impacts, to natural resources and wildlife-dependent uses. However, some of the actions result in minor unintended adverse effects that can be mitigated. These are listed in Table 4-7 and considered in this CEA. Table 4-7 also includes the effects of past and proposed actions at the WFF and the Assateague Island National Seashore. Information on future actions is limited, however, because both NPS and NASA are in the process of updating their long-term plans: NPS is in the process of preparing a new General Management Plan (GMP) and EIS for the Seashore. A site-wide Programmatic EIS for expanding operations at Wallops Flight Facility is currently being developed.

Air Quality

Air quality is addressed here as it is an issue typically evaluated on a regional basis. All of the refuges would undertake prescribed burning on a periodic basis, and most of them expect to experience at least a minor increase in visitation as a result of improved facilities. Several planned construction projects at WFF would generate dust and emissions. In a 2003 Final EA for rocket operations at WFF (NASA 2003), air quality impacts were assessed cumulatively with other projects and operations in the surrounding area. Although increased rocket operations would increase the amount of hazardous constituents and emissions, the overall impact to air quality would be negligible and the cumulative impact would not be significant to the surrounding environment when combined with other projects and operations. More recently, a 2012 Draft EIS for WFF (NASA 2012) analyzed rocket operations and its cumulative impacts towards air quality and climate change. The impacts to the global atmosphere from emissions of greenhouse gases related to the project would be global, negligible, and long-term; and when combined with the existing air quality impacts in the surrounding area, little air pollution concentration change was expected, with levels expected to continue below ambient standards. However, all of these impacts are considered negligible and therefore, the cumulative impact is expected to be negligible.

Hydrology/Water Quality

At Chincoteague NWR, potentially significant effects to uplands and wetlands would result from the construction of a new recreational beach parking lot and expansion of the service road under alternatives B (approximately 27 acres) and C (approximately 22 acres), including clearing, site preparations, and earth moving. This action would also potentially disturb Mallard and Pintail Pools (C and D Pools). These activities could cause erosion, runoff, and a potential temporary decline in surface and shallow groundwater quality until development is completed. However, the proposed action (relocated beach parking and road expansion) is conceptual and further environmental evaluations would be completed prior to construction. All other activities are relatively minor with negligible impacts and therefore, the cumulative impact that we can evaluate at this time would not be significant.

Vegetation, Wildlife, and Habitat

The other refuges considered seem to experience different and fewer impacts to vegetation, habitat, and wildlife than Chincoteague NWR does, probably because Chincoteague NWR is one of the most intensely visited refuges in the nation. The other refuge EAs are concerned primarily with the impacts to wildlife from hunting and human interaction and with specific actions that

require vegetation clearing. Minor adverse effects to vegetation and wildlife as a result of human contact and trampling from various public activities are reported at the refuge under all alternatives, as well as at Eastern Shore of Virginia/Fisherman Island NWRs and the Chesapeake Marshlands NWRC. Although this is a cumulative effect, in all cases it is temporary and partially mitigated for by education and management activities. Both Chincoteague NWR and Prime Hook NWR experience impacts from overgrazing of certain overpopulated wildlife species (e.g. light geese); this will be mitigated through hunting. As shown in Table 4-7, actions on all of the refuges, at the Seashore, and on the WFF have identified vegetation clearing projects. At WFF most of the effect of a very large vegetation clearing project will be mitigated by replanting with lower-growing vegetation. The estimated total effect of these actions (excluding the mitigated areas at WFF), and the clearing associated with the beach parking and access for alternatives B and C at Chincoteague NWR, is approximately 27 acres. This is less than 0.01 percent of the total area of these sites and most of the impacts would be mitigated. Selective cutting of forest vegetation through silviculture practices at both Chincoteague NWR and Prime Hook NWR would have temporary adverse impacts, but beneficial long term impacts to vegetation and wildlife habitat. The spraying of herbicides and pest control chemicals could result in cumulative effects to invertebrates at Chincoteague NWR and Prime Hook NWR.

Birds

Minor adverse effects to shorebirds as a result of human contact from hunting, fishing, hiking, and walking are reported at the refuge under all alternatives, as well as at Eastern Shore of Virginia/Fisherman Island NWRs and the Chesapeake Marshlands NWRC. At Eastern Shore of Virginia NWR, additional human contact would increase over the existing condition by adding canoeing and kayaking opportunities and from the loss of beneficial foods when an impoundment complex is allowed to revert to scrub-shrub and natural emergent marshes. At Chesapeake Marshlands NWRC, an adverse effect would result from permitting hunting on an additional 200 acres. The greatest impact at Chincoteague Island NWR is reported from continued use of the recreation beach under alternative A. The beach would be relocated under alternatives B and C, eliminating these effects. While alternatives B and C would have minor impacts of their own, these would be greatly offset by the relocation of the beach and beach parking area and allowing natural processes to occur, which is beneficial to shorebirds, and also by allowing for natural succession of vegetation to occur in the 300-acre NWF. While a cumulative adverse effect would result from actions at these three refuges, the net effect, when considering the beneficial impact of management actions at the three refuges, is negligible.

Threatened and Endangered Species

None of the protected wildlife or plant species that would be adversely affected at the refuge would be adversely affected by actions that have been taken or are proposed at other NWRs in the CEA study area. Some past actions at the WFF have had an adverse effect on piping plover habitat; however, all of these actions have been subject to Section 7 consultation and the impacts have been mitigated. Therefore, there are no adverse cumulative impacts to threatened and endangered species.

Socioeconomic Effects

As reported in Section 4.12, alternatives A and C would result in adverse socioeconomic effects in the form of reduced expenditures in Accomack and Worcester counties by visitors. The economic impact to the region would be a loss of direct expenditures from tourists of \$38.4 million for alternative A and \$36.3 million for alternative C. Acquisition of several thousand acres

(cumulatively) is proposed at Back Bay NWR, Chesapeake Marshlands NWRC, and the Eastern Shore of Virginia/Fisherman Island NWRs. Some of this land is farmland and this property acquisition would result in reduced local tax revenue. Adverse economic effect to farmers is not expected, as all acquisitions would be voluntary, however there may be some adverse effects to agricultural support businesses. However, the tax revenue impact would be partially offset by payment in lieu of taxes and the acquisitions would be made only from willing sellers and would occur over a 15-year period. Although it would partially be mitigated by the fact that each of these effects would be located in different counties, there would be a cumulative adverse effect to socioeconomics as a result of these actions.

Soils

Increased public use at all refuges would result in temporary minor impacts due to soil compaction. This effect would not be considered cumulative because it only occurs locally at all refuges, and does not contribute to an additive effect of other actions.

4.16.4 Climate Change

The lower Delmarva Peninsula is an area of recognized global ecological significance for its remarkable estuarine, coastal, and marine habitats and substantial populations of migratory and breeding shorebirds, colonial waterbirds, landbirds, and raptors. The coastal lagoons and barrier islands represent what is arguably the most significant remaining wilderness on the Atlantic coast. Located across the peninsula from Chincoteague NWR, Pocomoke Sound, Beasley Bay, and smaller tidal creeks to the south along the western margin of the peninsula provide some of the most significant wetlands and largest beds of submerged aquatic vegetation in the Chesapeake Bay. Bisecting the peninsula, the Pocomoke River and its watershed are a recognized biodiversity hotspot and contain critical habitats for a number of rare, threatened, and endangered plants and animals. The Smithsonian Institution named the Pocomoke River and its bottomland forests as one of the most important sites for natural diversity on the east coast. Collectively, the focus area for the CCP provides globally significant habitat for a wide diversity of species, especially shorebirds, waterfowl, and migratory and breeding songbirds.

Fortunately, the conservation importance of area within the Atlantic Flyway has been long recognized by the USFWS and its Federal, state, local, and non-profit partners. All have worked together to protect over 27.6 percent of the land within the 987,000-acre focus area.

Unfortunately, several real and growing challenges threaten the area's rich and diverse natural heritage and the many benefits humans derive from the region's intact habitats and natural systems. The greatest of these is global climate change and its associated effects including sea level rise, changing frequency and intensity of storms, warming air and water temperatures, increasing variability in seasonal and annual precipitation, and increases in ocean acidity. Vulnerability of natural systems to global climate change, especially sea level rise, will be exacerbated by incompatible land uses and land management activities such as plasticulture, industrial pine plantations, conversion of natural habitats to residential development, shoreline armoring, increased pumping of ground water for agricultural irrigation, commercial, and residential uses, and the continued ditching of wetlands. Fifty-one (51) percent of protected lands within the proposed project area currently lie one meter or less above sea level, compared to only 30 percent of the project's overall area. While complex sediment dynamics and marsh migration processes mean that not all of these acres will actually be submerged by rising waters, it is clear that, unless steps are taken, sea level rise will have profound effects, often negative, on the

region's coastal habitats and that impact will be disproportionately severe on existing protected lands. While decades of investment and conservation work by the USFWS and its many partners in Maryland and Virginia have yielded real, tangible, and significant results, there is a conspicuous lack of connectivity among existing protected lands along the gradient from estuary to uplands. This lack of connectivity magnifies impact of existing threats and represents a real impediment to building resilience into the ecological systems so that they can adapt and migrate in response to sea level rise, increased frequency of droughts, and other climate change effects.

Table 4-7. Summary of Adverse Effects of Actions at Other Major Facilities in the CEA Study Area							
Resource	Back Bay NWR	Chesapeake Marshlands NWRC ⁵	Eastern Neck NWR	Eastern Shore of Virginia & Fisherman Island NWRs	Prime Hook NWR	Assateague Island National Seashore	Wallops Flight Facility
Air Quality	Minor impacts from prescribed burning (every 1 to 3 years).						Negligible air quality impacts from increased rocket operations. Negligible impacts to climate change from WFF operations.
	Minor increase in vehicle emissions from increase in visitation.						
Hydrology/ Water Quality	Potential negligible impacts from select use of low-toxicity herbicides.				Increased erosion, bottom sediments stirred up, and/or pollutants introduced to waterways from recreational use.	Increase in runoff from minor increase in impervious surface surfaces (2.2 acres).	4.6 acres wetlands fill from several projects (mitigated). Increase in runoff from minor increase in impervious surfaces. Minor changes to drainage patterns and potential to alter drainage patterns to Little Mosquito Creek.
	Potential negligible increased leaking oils and antifreeze from vehicles associated with increased visitation.						
		Potential minor sedimentation associated with from shrub and tree clearing.					
		Increase in runoff from minor increase in impervious surfaces.					

⁵ Includes Blackwater, Martin, and Susquehanna NWRs.

Vegetation /Habitat /Wildlife	Effects to wildlife and vegetation from human activity				2.5 acres of vegetation disturbance.	8 to 100 acres of vegetation clearing (60 to 92 acres mitigated by planting lower-growing vegetation). 2.3 acres rare maritime dunes altered.
	Slight risk of increase in distribution on non-native plant species from increased visitation and hunting.		Effect from routine maintenance (prescribed burn, moving, and forest management). Vegetation and habitat impacts from overgrazing by light geese, Canada geese, and white tailed deer.			
Elimination of most impoundment populations of rare Carolina grasswort. Effect on habitat from clearing vegetation for trail, canoe/kayak parking areas boat launch, and eight acres for HQ/VC/ maintenance compound. Vegetation clearing for	Increased visitation results in additional disturbance to wildlife and vegetation. Prescribed burning could increase amount of sunlight and/destroy food sources in forest for fox squirrel.	Tree cutting of 17 acres.	Vegetation disturbance from for 3 to 6 new bike /walk trails on existing old roads and rail right of way on 6,000-acre additional parcel to be acquired(725-acre tidal marsh and 120 acres open water).	Minor impacts to piping plovers and horseshoe crabs could result from improper sand sources (i.e., incorrect sediment grain size). Disturbance of vegetation and wildlife from selective cutting on forest vegetation. Active salt marsh restoration		

	<p>footpath, bridges, and boardwalk that could create some barriers for wildlife.</p>				<p>strategies could disturb habitat and temporarily disturb wildlife (mostly birds).</p> <p>Hypersaline soil conditions that persist during the summer will have moderate and potentially long-term impacts to wildlife and habitat.</p> <p>Spraying of pest control chemicals could affect wildlife, specifically invertebrate species.</p>		
Birds	<p>Effect on shorebirds from human contact, adding canoeing/kayaking opportunities.</p> <p>Loss of beneficial foods when impoundments revert to scrub-shrub and emergent marsh.</p>			<p>Effects on water fowl hunting on 200 additional acres.</p>	<p>Same as above.</p>		

Socio-economics	<p>Reduced local tax revenue as a result of proposed land acquisition partially offset by payment in lieu of taxes.</p> <p>Minor adverse economic effect on agricultural support businesses from taking farmland out of production.</p>	<p>Reduced local tax revenue as a result of proposed land acquisition, partially offset by payment in lieu of taxes.</p> <p>Minor adverse economic effect on agricultural support businesses from taking farmland out of production.</p>					
Soil	Compaction from increased public use.						
					Siltation and erosion effects from salt marsh and upland forest restoration.		

Sources:

- USFWS, Back Bay NWR Draft CCP and EA (March 2010)
- USFWS, Chesapeake Marshlands NWR Complex CCP and EA (September 2006)
- USFWS, Eastern Neck NWR CCP and EA (September 2010)
- USFWS, Eastern Shore of Virginia and Fisherman Island NWRs CCP and EA (September 2004)
- USFWS, Prime Hook NWR CCP and EIS (December 2012)
- NPS, Assateague Island National Seashore. Improvements to Island Facilities Environmental Assessment (February 2006)
- NASA and U.S. Navy, Wallops Flight Facility, various NEPA documents (1997-2013), <http://sites.wff.nasa.gov/code250/documents.html>

4.17 Relationship Between Short-term Uses of the Human Environment and the Enhancement of Long-term Productivity

This section considers the relationship between local, short-term uses of the human environment and maintaining the long-term productivity of the environment. Long-term is considered for impacts that would extend beyond the 15-year period of this draft CCP/EIS. Under all alternatives, the primary aim is to maintain or enhance the long-term productivity, resiliency, and sustainability of natural resources on the refuge, the southern Delmarva Peninsula, and the Commonwealth of Virginia, along with migratory birds and inter-jurisdictional fish and other far-ranging wildlife species, across their whole range.

Habitat protection and restoration actions across all alternatives may entail short-term negative impacts to ensure the long-term productivity of the refuge. Many of the cyclic management actions in the alternatives, namely, prescribed burning, controlling invasive plants and animals, proactively managing habitats, and restoring native plant communities can have dramatic short-term impacts. These include direct mortality of some plants and animals, displacement of species, and temporary displacement or cessation of certain types of visitor use. However, the long-term benefits of those actions generally offset their short-term impacts. Habitat management practices that mimic ecological and sustainable processes optimize the maintenance and enhancement of the biological diversity, integrity, resiliency, and environmental health of those habitats for the long term. Long-term productivity is especially enhanced when the ecological and sustainable management actions that are proposed in the alternatives would best support and improve links between nutrient cycling, ecological processes, and ecosystem function.

The nutrient cycling of the refuge's habitats is closely linked to other ecological processes discussed in this document. Vegetative structural diversity in the forms of dead wood, leaf litter, senesced wetland vegetation, and detritus contributes to terrestrial and aquatic invertebrate resources that maximize sustainable nutrient recycling which in turn enhances the long-term productivity of the refuge's natural resources to people and wildlife.

Diverse and wide-ranging wildlife recreational opportunities for visitor use should provide the best long-term positive economic impacts to local communities. That mirrors the widely accepted premise that maintaining biological diversity in natural ecosystems helps ensure their long-term resiliency. The visitor use programs under each alternative heavily rely on outreach and environmental education to explain management actions to visitors and the public that would encourage everyone to be better stewards of our natural environment.

Climate change is a growing concern for the refuge and the nation. Within the 15-year horizon envisioned by this document, we can expect repeated weather events that will cause coastal flooding and overwash of Assateague Island and the other barrier islands on Virginia's Eastern Shore. However, over the longer term (20 to 80 years) rising air and water temperatures, intense precipitation events, drought, sea level rise, strong coastal storms, and intense wind events will significantly alter the shape and character of these islands and the coastal marshes behind them. We fully recognize the conservation importance of the southern Delmarva Peninsula and the challenges it faces due to a changing climate. Adapting to a changing coastal environment will require a landscape-level approach to conservation, management, protection and where appropriate restoration of lands and waters, for the good of wildlife and people.

In summary, the alternatives would contribute positively to maintaining and enhancing the long-term productivity of the refuge's natural resources, with sustainable beneficial cumulative and long-term benefits to the environment surrounding the refuge with minimal inconvenience or loss of opportunity for the American public.

4.18 Unavoidable Adverse Effects

Unavoidable adverse effects are the effects of those actions that could cause harm to the human environment and cannot be completely avoided, even with mitigation measures. All alternatives would result in some minor, localized, unavoidable adverse effects. For example, any new construction, burning of prescribed fires, or control of invasive species would produce minor, short-term, localized adverse effects. However, none of those effects would rise to a significant level. Furthermore, all of those impacts would be mitigated with best management practices, so none of the alternatives would cause significant, unavoidable cumulative impacts.

As previously noted, many of the habitat and facility construction projects in the alternatives have a certain level of unavoidable adverse effects, especially during the actual construction. Those effects are mitigated to some degree by the use of practices and precautions that safeguard water quality, avoid sensitive or irreplaceable habitats, and by timing activities or including actions to avoid or minimize impacts on fish and wildlife. The adverse effects generally are short-term and more than offset by the long-term gains in habitat quality and fish, wildlife, and plant productivity.

All these unavoidable adverse effects on the physical and biological environment would be relatively local and more than offset by the long-term benefits of cleaner air, cleaner water, and making rare wildlife species more common across the landscape, while providing quality wildlife-dependent recreation.

All the alternatives, in varying degrees, would have adverse impacts to a certain segment of the public that does not desire any change to current habitat management or visitor use programs, or that may have differing views on the course of action to be taken. Some may be concerned about decreased visitation to the refuge or restraints for certain uses, such as horseback riding or OSV use. These impacts to individuals or groups are unavoidable given the need to follow current law and policy, the diversity and number of publics, conflicts between and within user groups due to preferences, continued increase in use numbers, and relatively finite nature of land available on the refuge for public recreation. It is the refuge's responsibility to provide equal opportunities to the American public and seek a fair balance in minimizing and mitigating adverse impacts while optimizing wildlife conservation and providing excellent recreational opportunities to the public.

4.19 Potential Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be reversed, except perhaps in the extreme long term or under unpredictable circumstances. One example is an action that contributes to a species' extinction. Once extinct, it can never be replaced.

By comparison, irretrievable commitments of resources are those that can be reversed, given sufficient time and resources, but represent a loss in production or use for a time. An example of an irretrievable commitment is relocating the recreational beach parking and related facilities in alternative B and C. Small visitor facilities, such as information kiosks, are not considered irretrievable commitments of resources. Those facilities could be dismantled and restored at a more suitable site if resource damage is occurring.

4.20 Environmental Justice

Executive Order 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations” was signed by President Bill Clinton on February 11, 1994, to focus Federal attention on the environmental and human health conditions of minority and low-income populations. The Order directed Federal agencies to develop environmental justice strategies to aid in identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. The Order is also intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority and low-income communities’ access to public information and participation in matters relating to human health or the environment.

We evaluated alternatives in this CCP to determine if low-income and minority communities would bear a disproportionate burden from negative impacts resulting from any of the alternatives in this CCP. Burdens that have a disproportionate effect on low-income and minority communities either target the geographic areas where the communities are based, or burdens are due from imposed fees to access resources. Agencies should also make every effort to include low-income and minority communities in the planning process. To address the latter, outreach for the CCP/EIS process hosted meetings in multiple locations, including in the lower income portions of Accomack County, and held meetings at various times throughout the day to accommodate different work schedules. For more information on public outreach, see chapter 5.

As described in chapter 3, within the study area, low-income and minority communities reside outside of the town of Chincoteague in the more rural areas of Accomack County. Given the distance between the refuge and environmental justice communities, they would not be affected as residents, for the most part, but these communities were evaluated for environmental justice impacts as visitors to the refuge and as employees of town businesses. According to the Springsted Report referred to in the Economic Analysis section, 85 percent of travel related expenditures in Accomack County occur in Chincoteague, and it has nearly 600 jobs supported by refuge-related visits. Given the importance of the town of Chincoteague to the county economy, the economic impacts to the town described in the economic impacts section can be considered to be felt more broadly within the county as a whole. Economic impacts resulting from any of the alternatives would not disproportionately affect low-income communities.

The refuge maintains a commitment to develop bilingual/multilingual materials for use in the refuge. Such materials increase the enjoyment and educational benefit of the refuge for non-English speaking populations and as such provide positive environmental justice benefits.

Each of the alternatives also maintains access to a 1-mile recreational beach. The variation among the alternatives in parking location and availability and the provision of shuttle service do not have differential environmental justice impacts as long as the vehicle entrance fee for the beach remains the same regardless of whether it is accessed via shuttle or private vehicle. As the bicycle entrance to the refuge is currently free, bicycle trail construction under all alternatives would have positive impacts for low-income communities.

Impacts to horseback riding, OSV use, and hunting and trapping among the various alternatives could benefit or burden those user groups irrespective of income or minority status, and there is no evidence that such groups are disproportionately low-income or minority.

4.20.1 Impacts on Environmental Justice in Alternative A

There are no specific impacts on environmental justice in alternative A.

4.20.2 Impacts on Environmental Justice in Alternative B

Alternative B would restrict Service Road access north of the new recreational beach to those with a special permit. The time and effort required to obtain a permit would have a small negative impact on all users, and any fee involved would have a small but disproportionate effect on low-income users.

4.20.3 Impacts on Environmental Justice in Alternative C

Alternative C would restrict Service Road access north of the new recreational beach to those with a special permit. The time and effort required to obtain a permit would have a small negative impact on all users, and any fee involved would have a small but disproportionate effect on low-income users.

4.21 Environmental Consequences Comparison Matrix by Alternative (Table 4-8)

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
Soils	<p>Beneficial impacts would result from the shift in management of the NWF.</p> <p>Negative impacts to approximately 27 acres of soil would result from the creation of new recreational beach parking, including new horse-trailer parking, and from the expansion of the new recreational beach access road.</p> <p>Negative impacts, compaction and increased erosion, would result from the expansion of the OSV zone.</p>	<p>Beneficial impacts would result from the elimination of OSV use and horseback riding, greatly reducing soil compaction and increasing beach and dune sand stability.</p> <p>All other impacts to soil would be the same as alternative B; however, the area negatively impacted would be approximately 22.5 acres.</p>
Air Quality	<p>Alternative B would relocate beach parking north approximately 1.5 miles from its current location. Final location of the relocated beach parking lots is expected to be closer than the current recreational beach, which may result in a decreased VMT of passenger vehicles, a positive outcome. However, new uses such as space tourism and separation of existing uses (recreational beach from crabbing and clamming areas) would cause additional vehicle use by visitors which would create seasonal or temporal decreases in air quality.</p>	<p>Positive impacts would result from the reduction of passenger vehicles on the refuge through the decreased amount of parking, as well as the discontinuation of OSV use.</p>
Hydrology/Water Quality	<p>Management of the Beach Road causeway, which would restrict it from routine visitor use, and eventual modification of that area would have a positive impact on tidal flow and water quality for Swan Cove Pool (F Pool). The increased tidal rhythm through impoundment culverts would now be allowed to mimic the natural tidal rhythm of Toms Cove, which would lead to improved water quality, dissolved oxygen, pH, and salinity levels for the new flow area.</p> <p>The disturbance of Mallard and Pintail (C and D Pools) to allow for the construction of new public beach parking could have negative impacts on water quality for all impoundments to the south. Since impoundment flow is connected from north to south by culverts, anything that occurs in upper watershed beginning at Pintail Pool (D Pool) would flow through the impoundments south of them.</p>	<p>Impacts to hydrology and water quality under alternative C would be the same as alternative B but perhaps less due to reduced parking lot size.</p>

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
Vegetation	<p>Negative impacts to approximately 27 acres of vegetation would result from the moving of the recreational beach, associated parking, and the expansion of the new Beach Road.</p> <p>Closing all routine public access on the service road north of the relocated recreational beach would have a beneficial impact to vegetation by decreasing the potential for humans to trample or damage native vegetation adjacent to the road.</p> <p>Beneficial impacts through better water flow and salinity levels would result from the improvement of water control structures throughout refuge impoundments.</p> <p>The reduction of non-migratory (resident) Canada geese and light geese on the refuge through hunting would create benefits by decreasing the amount of grazing by these species that currently impact native plant species.</p> <p>Construction of a new bike path from the current Wildlife Loop to Mallard/C Dike would result in negative vegetation impacts, most likely from wetland or scrub shrub habitat, depending on where the bike path is located.</p> <p>The construction of new lifeguard housing facilities and a boardwalk at or near Wallops Island NWR would have a negative impact on forested vegetation such as loblolly pine.</p>	<p>Adverse impacts resulting from the movement of the recreational beach, associated parking, and the expansion of the new beach access road would be the same as alternative B, except impacts would be limited to approximately 22.5 acres.</p> <p>The discontinuation of OSV and horseback riding would have a beneficial impact by eliminating potential trampling and compaction of native plants. It would also reduce the possibility that vehicles or horses could bring invasive species to the refuge.</p> <p>The phasing out of the exotic sika population, resulting in the elimination of associated grazing, would have a beneficial impact on native vegetation including the endangered seabeach amaranth.</p> <p>All other vegetation impacts would be the same as alternative B, except there would be no new construction of a bicycle trail in alternative C. Impacts described for the building of a new bicycle trail in alternative B would therefore be avoided. All other impacts to vegetation would be the same as B.</p>

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
<p>Federal Threatened and Endangered Species</p>	<p>Negative impacts would occur for piping plovers on the refuge resulting from the shift of habitat management by allowing natural vegetation to grow back in the NWF impoundments area. However, this impact would be off-set and even surpassed as a result from relocating the current recreational beach.</p> <p>The expansion of the OSV zone from the new recreational beach would create negative impacts for sea turtles and coastal birds by increased potential for disturbance.</p> <p>Through the creation of the year-round OSV access area, all day and nighttime OSV use south of this area would be discontinued between March 15 and September 15. This would eliminate the potential for OSV users to run over nests, hatchlings or plants, or otherwise disturb the nesting process - a beneficial outcome.</p> <p>From September 16 to March 14, negative impacts would result from the expansion of the OSV zone from the new recreational beach location to the current zone. This expanded OSV area would increase the possibility of human disturbance in the coastal habitat. Negative impacts would be minimized since OSV users would only be permitted to travel in the intertidal zone and by management actions usually in the form of exclosures and signs.</p>	<p>The elimination of OSV and horseback riding would have beneficial impacts on threatened or endangered species (piping plover, seabeach amaranth, and loggerhead sea turtle).</p> <p>All other impacts would be the same as alternative B.</p>
<p>Birds</p>	<p>Human disturbance to coastal nesting birds would be greatly diminished since the recreational beach would be relocated north, and OSV use would be limited to September 16 to March 14.</p> <p>New management of the extended OSV zone would have negative impacts to shorebird species that feed and loaf outside the breeding season.</p> <p>The moving of the recreational beach and parking areas, along with the expansion of the beach access road, would result in negative impacts to approximately 27 acres of migratory bird habitat, but the impacts would be mitigated.</p> <p>This management strategy would cease vegetation removal from the</p>	<p>The elimination of OSV and horseback riding on the refuge would have a positive benefit for coastal, migratory, and wintering shorebird species. As analyzed under alternative A, current OSV and horseback riding use does not pose a significant impact for birds in that area, but the complete phase out of these activities would further diminish the possibility for trampling or general human disturbance.</p> <p>All other impacts to birds in this alternative would be the same as under alternative B.</p>

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
	<p>NWF and allow for natural succession improving habitat for spring and fall migratory neotropical birds. Beneficial impacts for migratory waterfowl are also expected as this management strategy would increase thermal cover for waterfowl in the winter, increase the food sources for water birds and improve shorebird migratory stopover habitat.</p> <p>The change in hunt management would have positive impacts for bird species on the refuge, mostly by the elimination of predation and competition. Further, adding resident Canada goose and light goose hunting on Assateague Island would reduce their populations on the refuge and their negative impact to habitat.</p>	
Fish and Other Aquatic Wildlife	<p>Improvements to the tidal flow of Swan Cove Pool (F Pool) resulting from modification and replacement of water control structures within Beach Road causeway would have a positive impact on fish and other aquatic species. Increased water flow and tidal rhythm would allow fish and aquatic invertebrates such as crabs and mollusks passage into this restored salt marsh.</p>	<p>Impacts would be the same as alternative B.</p>
Mammals	<p>The refuge would implement new hunting and trapping programs for raccoon and red fox populations. These new programs would minimize predation on nesting piping plovers and other coastal birds – a beneficial outcome for birds, yet adverse for mammals.</p>	<p>Impacts for alternative C would be the same as alternative B, except that, in addition, the refuge would work towards the elimination of the entire sika population on the refuge. This elimination of the exotic species would further diminish the competition with the white-tailed deer for food and habitat.</p>
Reptiles and Amphibians	<p>Increased incidental mortality of reptiles and amphibians could occur on newly created refuge roads between March and October. However, we expect negligible impacts since best management practices would be implemented in the design and engineering of the roads and parking lots. Therefore, it would not affect their overall populations.</p>	<p>Impacts to reptile and amphibian species under alternative C would be the same as under alternative B.</p>

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
Invertebrates	<p>The alteration of Mallard and Pintail (C and D Pools) in order to allow the building of approximately 8.5 acres of recreational beach parking would have a negative impact on invertebrates, mainly monarchs, due to the removal of Bidens. Although this would be a permanent negative impact, it would not be a significant impact because of the small acreage that would be affected, and because there are several nearby habitats where monarchs could nectar, including Shoveler and Snow Goose (B Pools).</p> <p>Improvements to the tidal flow of Swan Cove Pool (F Pool) resulting from modification and replacement of water control structures within Beach Road causeway would have a positive impact on aquatic invertebrates and fish species. Increased water flow and tidal rhythm would allow fish and aquatic invertebrates such as crabs and mollusks passage into this restored salt marsh.</p> <p>Control of mosquitoes may have adverse impacts on birds, fish, amphibians, bats, and other wildlife since they are a known food source for these species. This impact would not be significant because it only occurs in a small area.</p>	<p>Impacts under alternative C would be the same as under alternative B, except that the negative impacts from removal of Bidens at the new recreational beach parking would be reduced to only 4.5 acres.</p>
Socioeconomics	<p>Assuming that visitation would not change as a result of the beach relocation, as the same number of spaces would be preserved, and the short-term transition between the locations would be carefully managed outside the peak visitation period, there would not be any negative economic impact per year resulting from alternative B compared to the base year of 2009. The expansion of several visitor services, such as hunting, may result in increased visitation but is not expected to be significant.</p>	<p>The reduction in beach parking to 480 spaces, would result in a loss of \$36.3 million, or 32 percent of current annual baseline expenditures in Accomack and Worcester Counties.</p> <p>Parking loss is the only action for which an economic impact estimate is available, but other actions (e.g., closing the Beach Road causeway and the Service Road and discontinuing OSV use and horseback riding) could have negative impacts on the number of visitors coming to the refuge, although institution of a shuttle and expansion of hunting opportunities could mitigate these decreases.</p>

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
Hunting	<p>The expansion of hunting opportunities due to increase in permits, additional hunting days and hunting of new species would benefit hunters.</p> <p>The relocation of the recreational beach, closure of the Beach Road causeway, and associated change in the OSV zone would change access to the Toms Cove Hook hunting zone which would be 1 to 2 miles further away, thus having the adverse impact of requiring hunters to travel longer distances.</p> <p>The expansion of hunting for new species and introduction of fur-bearer trapping would benefit hunters and trappers by providing new and expanded opportunities for these activities.</p>	<p>In addition to those listed below, impacts and benefits would be the same as for alternative B.</p> <p>The increase in sika hunting to achieve the removal of species would be a short-term benefit to hunters as it could increase the number of hunters able to experience the hunt, but the eventual elimination of the sika population would mean over the long term, hunters would not be able to hunt sika and there would be fewer hunting permits available, an adverse impact.</p> <p>While OSV use would be discontinued, use of 4x4 vehicles would be permitted to access the Toms Cove Hook area for sika hunting.</p>
Fishing	<p>OSV use would be allowed to access surf fishing areas but would be limited in the Overwash area from March 15 to September 15 or whenever the last shorebird chick fledges. This would be a slight decrease over present opportunities, creating an adverse impact to anglers. Anglers may benefit from reduced crowding within the OSV zone.</p> <p>With the expansion of the OSV zone, visitors would have access to approximately 2.7 more miles of beach for surf fishing by OSV, a benefit resulting in less crowding.</p> <p>A benefit of the designated year-round OSV parking area for fishing is that visitors would have more convenient access to surf fishing when other portions of the OSV zone are closed and an extended time period for fishing using OSV access.</p> <p>Visitors would benefit from improved communication and coordination of the permit process throughout the region under this alternative by saved time, reduced confusion, and raised awareness of rules and opportunities.</p>	<p>OSV use would be discontinued and there would an adverse impact to visitors who come to the refuge to surf fish.</p> <p>Visitors who want to surf fish would experience greater inconvenience in taking their gear to surf fishing locations and surf fishing activities would be concentrated at points along the beach closer to the recreational beach so visitors would experience increased crowding. As a result, some visitors would continue to fish and carry gear by foot, some visitors would not choose to walk with gear down the beach and others would choose not to visit the refuge.</p>

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
	<p>The relocated beach and change in Beach Road causeway access would result in improved experience for visitors interested in crabbing, clamming, and oyster harvest in Swan Cove (F Pool) and Toms Cove.</p> <p>A new crabbing dock at the terminus of Beach Road would create a new facility that would substitute for current inconvenient sites and be more accessible to visitors with disabilities and family groups, resulting in a net benefit.</p>	
Environmental Education and Interpretation	<p>Students and others not able to travel to the refuge would be able to experience and learn about the refuge through the virtual exhibits. Enhanced opportunities would provide for a more informed public and increase stewardship.</p> <p>With the relocation of the recreational beach and change in access, beachgoing visitors would no longer pass by the Herbert H. Bateman Educational and Administrative Center en route to the beach and therefore, may be less inclined to visit, resulting in an adverse impact. However, the new visitor contact station at the recreational beach would have information on both NPS and USFWS and would result in USFWS information being more directly accessible by beachgoing visitors, which would result in a net benefit to beachgoers.</p> <p>Despite the relocation of the recreational beach and the closure of Beach Road causeway, visitors would continue to benefit from NPS and Marine Science Consortium canoe/kayak programs, which would have access to Toms Cove at the terminus of Beach Road.</p>	<p>Some beachgoing visitors who previously had not learned about the refuge would benefit from interpretation provided on the beach shuttle.</p>
Wildlife Observation and Photography	<p>Relocation of the beach and closure of beach causeway would be an adverse impact because it would reduce opportunities for wildlife observation and photography in Swan Cove (F Pool), Toms Cove, and the southern end of the island, as parking and foot access to these sites would be more difficult and inconvenient. A relocated recreational beach would change the beach viewshed such that water would not be visible on both sides; however, the viewshed at the relocated beach would also have reduced views of parking.</p>	<p>Same adverse and beneficial impacts of removing invasive plant species and of increased hunting as alternative B, except that the elimination of sika would likely increase the abundance of other plant and animal species.</p> <p>Same adverse impacts as alternative B as a result of the relocation of the beach and</p>

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
	<p>Closure of the Service Road north of the new recreational beach to public access would reduce opportunities to view the northern Pony Herd and access to that landscape for photography.</p> <p>The replacement of Swan Cove Trail with an alternative trail to the relocated recreational beach would provide visitors with a benefit in the form of access to a new area for wildlife observation and photography and continue to facilitate such access to the beach.</p> <p>The expansion of hunting opportunities for new species and opening of additional hunting days would mean that other visitors would be more likely to see or hear signs of hunting from adjacent areas, which could adversely affect their wildlife observation and photography. However, this impact would be minimized because hunting would occur during off-peak visitation times.</p> <p>Hunting of new species would reduce the number of those species that visitors could see; however, these species are being identified because of their overabundance and impacts on other species. Thus, in the long term, increased hunting could enhance the opportunity for wildlife observation and photography.</p> <p>The relocated recreational beach would make it inconvenient to drive by the viewing area for the Chincoteague ponies; however, the planned relocation of some of the ponies would ensure continued convenient visual access, mitigating this impact.</p> <p>A benefit of the new observation tower at or in the vicinity of Wallops Island NWR is that it would provide new photography/wildlife observation opportunities in a new location, which would reduce crowding elsewhere and increase awareness of the refuge. Other improvements, such as the pursuit of photography blinds, could attract more visitors, which would increase crowding and disturbance, but would also provide new experiences for existing visitors and bring new visitors to the refuge.</p>	<p>closure of beach causeway.</p> <p>Same adverse impact and minimization of impact as alternative B from the closure of the Service Road north of the new recreational beach to public access with regard to viewing the northern Pony Herd and access to that landscape for photography.</p> <p>Sika would no longer be available to observe and photograph as a result of the planned elimination through hunting, an adverse impact.</p> <p>Views of parking from the recreational beach would be reduced due to the reduction in parking, which would be a benefit.</p> <p>The loss of Swan Cove Trail and no replacement from Wildlife Loop to the new beach would result in an overall loss of wildlife observation and photography opportunities along a trail.</p> <p>The limit on the Chincoteague pony population to 125 could reduce viewing opportunities; however, the current population is between 125 and 135 so no significant impact would be anticipated.</p>

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
Recreational Beach Use	<p>Beachgoers would benefit from the ongoing provision of the same number of parking spots as there are currently at the existing beach without disruption. However, they would also experience the adverse impacts of traffic and waiting for parking as they currently do.</p> <p>Beachgoers would benefit from the new bicycle connection to the recreational beach which would provide a safer transportation option and could result in lower demand on beach parking.</p> <p>The relocation of the beach would have significant adverse impacts, as well as some beneficial impacts, on beachgoing visitors. Beachgoers would be able to continue the same type and level of beach activities on the ocean-side. Visitors would not have access to the bayside and thus would not be able to pursue bayside activities, such as clamming, crabbing, and swimming with young children.</p> <p>Due to the reduced points of access to the beach, visitors would experience the adverse impact of more crowding at access points, as some people would not want to carry recreational beach gear further up or down the beach.</p> <p>Visitors could experience increased exposure to mosquitoes in the relocated parking areas; however, the refuge would take measures to reduce the mosquito population, avoiding or minimizing this impact.</p> <p>Facilities would be constructed such that visitors would have continuous access to the refuge and recreational beach throughout the transition from the current to the new location of the recreational beach, and would receive communication on the timeline for relocation, reducing any significant disruption in visitor use.</p> <p>The closure of Beach Road causeway would eliminate access to the current recreation beach and its particular characteristics, such as water on both sides and easy access to clamming, crabbing, oyster harvest, and other bayside activities.</p>	<p>The reduction in beach parking and introduction of a shuttle would have significant adverse impacts on beach going visitors. Some beachgoers would choose not to visit and instead go elsewhere.</p> <p>The relocation of the beach would have significant adverse impacts, as well as some beneficial impacts, on beachgoing visitors. Beachgoers would be able to continue the same type and level of beach activities on the ocean-side. Visitors would not have access to the bayside and thus would not be able to pursue bayside activities, such as clamming, crabbing, and swimming with young children.</p> <p>Due to the reduced points of access to the beach, visitors would experience the adverse impact of more crowding at access points, as some people would not want to carry recreational beach gear further up or down the beach.</p> <p>Visitors could experience increased exposure to mosquitoes in the relocated parking areas; however, the refuge would take measures to reduce the mosquito population, avoiding or minimizing this impact.</p> <p>Facilities would be constructed such that visitors would have continuous access to the refuge and recreational beach throughout the transition from the current to the new location of the recreational beach, and would receive communication on the timeline for relocation, reducing any significant disruption in visitor use.</p>

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
		<p>The closure of Beach Road causeway would eliminate access to the current recreation beach and its particular characteristics, such as water on both sides and easy access to clamming, crabbing, oyster harvest, and other bayside activities.</p>
<p>Other Uses</p>	<p>Relocation of the beach would change the use of part of the Wildlife Loop such that non-motorized traffic would need to share the right of way with beach traffic, resulting in adverse impacts in the form of increased crowding, discomfort, and safety incidents.</p> <p>In addition, relocation of the recreational beach would benefit bicyclists' access and beach access via bicycle, with introduction of new on-road bicycle lanes and trail that would provide improved, safer, and more direct access and could result in an increase in overall beach visitation, and reduced beach parking demand. However, this may be offset by more visitors choosing to bike to the beach, resulting in more crowded bicycle trails.</p>	<p>Same impacts and benefits as alternative B with regard to impacts of rocket launches and impact to Wildlife Loop.</p> <p>There would be adverse impacts to users who horseback ride, which would be discontinued and to those who smoke, which would be banned on the beach. The relocation of the beach and lack of access at the terminus at Beach Road would result in reduced access to Toms Cove.</p> <p>Bicyclists would benefit from on-road bicycle lanes but bicyclists and visitors generally would be adversely impacted by the loss of Swan Cove Trail and no replacement from Wildlife Loop to the new beach.</p>
<p>Cultural and Historic Properties</p>	<p>A comparison of findings in the report, "Archaeological Reconnaissance of the Chincoteague National Wildlife Refuge, Accomack County, Virginia and Worcester County, Maryland" (Goodwin & Associates, Inc. 1989) with the potential development in alternatives B and C concluded that nothing in the Goodwin report indicated we would be impacting cultural resources based on the previous findings. Since the proposed actions associated with the relocated beach parking and road expansion are conceptual and not finalized, specific details for these actions are currently unknown. Further environmental assessments and analysis for impacts on cultural resources would need to be completed prior to construction.</p>	
<p>Refuge Administration</p>	<p>New activities and programs would require expanded staffing and infrastructure investment.</p> <p>A focus on use of social media/technology would require some infrastructure investments (i.e., fiber optics).</p>	<p>Impacts related to hunting, the relocation of the recreational beach and Wallops Island would be the same as for alternative B.</p> <p>The removal of the OSV and horseback riding</p>

Resources	Alternative B Balanced Approach	Alternative C Reduced Disturbance
	<p>The expansion of hunting and trapping opportunities would require a follow-up hunt management plan, with a short-term impact on staff time.</p> <p>Subsequent increase in hunting permits and need for new materials and maps would require additional staff and funding to administer permits, patrol hunting zones, and provide orientation for new hunters. This would be a long-term impact, as such administration is year-round.</p> <p>The relocation of the recreational beach and related facilities would require staff to develop a transition and communication plan, as well as participate in design, further environmental assessment, and other planning efforts.</p> <p>New staffing would better address Wallops Island NWR needs and the needs created by strategies for resource management (biology), visitor services, maintenance, law enforcement, and coordination with NASA.</p>	<p>zone would reduce the administrative and enforcement burden on NPS and Refuge staff which is a benefit because the time could be dedicated to other management needs.</p>