



ENVIRONMENTAL CONSEQUENCES

4.1	General Methodology for Analyzing Impacts	4-1
4.2	Water Resources	4-4
4.3	Vegetation	4-30
4.4	Wildlife	4-55
4.5	Federally Listed Threatened or Endangered Species.....	4-82
4.6	Historic Structures.....	4-108
4.7	Cultural Landscapes.....	4-117
4.8	Seashore Operations	4-126
4.9	Access and Circulation.....	4-143
4.10	Visitor Use and Visitor Experience	4-159
4.11	Socio-Economic Environment.....	4-178
4.12	Relationship between Local Short-term Uses of the Environment and Maintenance of Long-term Productivity	4-196
4.13	Irreversible or Irretrievable Commitments of Resources	4-196
4.14	Adverse Impacts that could not be Avoided	4-197

(this page intentionally left blank)

4. ENVIRONMENTAL CONSEQUENCES

This chapter describes the probable consequences of the seashore management alternatives on natural and cultural resources, seashore operations, access and circulation, visitor use and visitor experience, and the socio-economic environment. Because the management alternatives are general in nature, the analysis of impacts is also general. The impact topics include the seashore resources or conditions which relate to planning issues and concerns at the seashore, as well as resources or conditions potentially affected by management actions proposed in the alternatives.

4.1 General Methodology for Analyzing Impacts

In accordance with CEQ regulations, the analysis of impacts describes the direct, indirect, and cumulative impacts of management actions (40 CFR 1502.16) and assesses the significance of the impacts (40 CFR 1508.27). Where appropriate, the evaluation of impacts also describes mitigating measures for adverse impacts. Because the specific methods appropriate to assess impacts for each resource varies, the introduction to each impact topic discussion includes a summary of the methodology used.

4.1.1 GEOGRAPHIC AREA EVALUATED FOR IMPACTS

The primary area of impact for the GMP/EIS is the Maryland portion of Assateague Island, although alternatives may also affect areas on the Maryland mainland, the Virginia mainland, the coastal bays to the west of Assateague Island, and the Toms Cove area and access to it.

4.1.2 ANALYSIS OF IMPACTS

The impact analysis addresses all of the following:

Direct Impacts	Impacts that would occur as a direct result of NPS management actions.
Indirect Impacts	Impacts that would occur because of NPS management actions, but would occur later in time or farther in distance from the action.
Beneficial Impact	A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
Adverse Impact	A change that degrades the resource, or moves the resource away from a desired condition, or detracts from its appearance or condition.

Cumulative Impacts Defined as “the impact on the environment which results from the incremental impact of the action when added to other past, current, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7).

To assess cumulative impacts, the GMP planning team identified actions taken by others in the surrounding area which, although unrelated to the GMP alternatives, could have impacts on the same resources or values, resulting in an additive (cumulative) effect when considered in combination with the impacts of the actions proposed in the alternatives. By generally assessing the impacts of those other actions and combining those impacts with the impacts of the GMP alternatives, the GMP planning team was able to estimate an overall cumulative impact as well as the relative contribution of the alternative to the cumulative effect.

4.1.3 ASSESSING IMPACTS USING COUNCIL ON ENVIRONMENTAL QUALITY (CEQ) CRITERIA

The impacts of the alternatives are assessed using the CEQ definition of “significantly” (1508.27), which requires consideration of both context and intensity:

Context: This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

Intensity: This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. The following should be considered in evaluating intensity:

- (1) Impacts that may be both adverse and beneficial.
- (2) A significant effect may exist even if the federal agency believes that on balance the effect would be beneficial.
- (3) The degree to which the proposed action affects public health or safety.
- (4) Unique characteristics of the geographic area such as proximity to historic or cultural resources, parklands, prime

- farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.
- (5) The degree to which the effects on the quality of the human environment are likely to be controversial.
 - (6) The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.
 - (7) The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.
 - (8) Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.
 - (9) The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the *National Register of Historic Places* or may cause loss or destruction of significant scientific, cultural, or historical resources.
 - (10) The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.
 - (11) Whether the action threatens a violation of federal, state, or local law or requirements imposed for the protection of the environment.

Context provides a comparison that helps to put the relative importance of the impacts into perspective and can include such things as geography, population size, uniqueness of the resource, affected individuals, agency mandates and more.

The NPS is an agency with a “conservation” mandate and identifies fundamental resources and values in its GMPs, defined as those resources or values that are critical to achieving a park’s purpose or maintaining its significance. Collectively, these resources and values capture the essence of the seashore and provide overall context for evaluating the relative severity of an impact, e.g. the degree to which an alternative would help or hinder these resources would be important in assessing whether impacts of that alternative are significant. Fundamental resources and values, other important resources, and related resources are identified for Assateague National Seashore in section 1.4.3 of this GMP/EIS.

For each impact topic analyzed, an assessment of the potential significance of the impacts according to context and intensity is provided in the conclusion section that follows the discussion of the impacts under each alternative. In addition to the overall context of the seashore's purpose and significance, resource-specific context is presented in the methodologies section under each impact topic and applies across all alternatives. Intensity of the impacts is discussed by considering the relevant factors from the above list. Intensity factors that do not apply to a given impact topic and/or alternative are not discussed.

4.2 Water Resources

4.2.1 METHODOLOGY FOR ANALYZING IMPACTS

Management actions are qualitatively analyzed with respect to their potential to benefit or adversely impact the quality and quantity of the seashore's water resources, including groundwater, freshwater ponds, wetlands, floodplains, estuarine waters, and ocean waters. Responses to natural coastal processes and the effects of climate change/sea level rise are analyzed to identify potential impacts to water resources. Actions are identified and analyzed that have the potential to release and convey pollutants to surface waters and groundwater because of soil disturbance, treatment and discharge of wastewater, inadvertent discharge of petroleum products, accidental chemical spills, and planned application of chemicals for management of insects and invasive plants. Actions are also identified and analyzed that would likely occur within floodplains, potentially affect wetlands, or increase demand for potable water drawn from the groundwater aquifer. For this analysis, it is assumed that during final design for specific projects, best management practices (BMPs) for water resource protection would be identified and during construction, these measures would be implemented to mitigate adverse impacts to water quality and maintain runoff at pre-development discharge rates.

The resource-specific context for the evaluation of impacts on water resources is as follows:

- High quality water resources within the seashore's boundary are fundamental to the seashore's purpose and significance.
- Barrier island habitats including freshwater wetlands and saltmarshes are fundamental to the seashore's purpose and significance.
- Aquatic habitats including the open ocean, estuarine waters, and saltmarshes are fundamental to the seashore's purpose and significance.
- The waters and mainland watershed of the coastal bays (Chincoteague and Sinepuxent Bays) and Atlantic Ocean are resources that are related to the seashore because the activities that occur outside the seashore but within the

watershed affect the integrity of many of the seashore's fundamental resources.

- Water quality within the coastal bays is declining, with phosphorus consistently the largest water quality concern.
- Development of 158,386 feet of marsh mosquito ditches at the seashore have severely altered marsh hydrology at the seashore, disrupting natural flow of tidal water into and out of the seashore's marshes and degrading estuarine water quality by increasing nutrient export from marshes (NPS 2011d).
- *Pragmites australis* has invaded many of the seashore's freshwater shrub wetlands (representing >40% cover on 5.6% of the total area of the seashore (NPS 2011d)), adversely impacting sediment levels and hydrologic flows.

4.2.2 ALTERNATIVE 1 – CONTINUATION OF CURRENT MANAGEMENT

- **Impact Analysis**

Coastal Response Management Actions. Facilities lost or damaged by natural coastal processes or the effects of climate change/sea level rise would be replaced or repaired, if funding is available. Facilities to be replaced would be moved back from the shoreline and made more sustainable in form and function, at sites that would continue to be protected by investment in dune maintenance. Wetlands would be avoided, although all new sites would be within the 100-year floodplain. Previous development sites would be rehabilitated to foster a return to natural conditions. These actions would benefit water resources by increasing the distance between the shoreline and the potential source of pollutants at parking areas, comfort stations, maintenance facilities, and sites where chemicals subject to accidental spills are handled. Adverse impacts to water resources would continue as facilities in the floodplain would be replaced in kind for as long as possible. NPS would use best management practices to address stormwater and water quality during and following demolition of damaged facilities and new construction. Permitting requirements would be addressed with the state of Maryland, as appropriate, in advance of any removal and replacement activity. In general, NPS would seek to use non-structural stormwater management and alternatives in the design and construction of new facilities, including the use of alternatives to asphalt paving, to improve groundwater recharge and reduce runoff and erosion. Such measures would benefit water resources by generally slowing sheetflow into adjoining areas and reducing the risk of sedimentation and erosion over the long-term. Solid waste generated by facility replacement would be properly disposed on the mainland, thus removing fill previously placed in the floodplain and offsetting placement of new fill required for new facilities.

Natural Resource Management Actions. NPS would continue scientific and scholarly research focused on developing a better understanding of natural coastal processes and the effects of climate change/sea level rise. Existing programs documenting water quality conditions in the coastal bays would continue. NPS would also implement a

baseline groundwater monitoring program, and continue to monitor the distribution and abundance of submerged aquatic vegetation (SAV). Collectively, these data would enhance understanding of water quality conditions, trends, and pollutant sources, help focus future research and monitoring to address water quality threats within the watershed, and provide the basis for defining and implementing measures to adapt to change and reduce the adverse effects of sea level rise.

Existing partnerships and cooperative relationships with Maryland and Virginia resource management agencies, Worcester County, Accomack County, the Maryland Coastal Bays Program, and various academic institutions and conservation organizations would continue to support ongoing water resource monitoring, research, and watershed conservation planning. These partnerships would continue to benefit the seashore's water resources by providing information needed to better understand water quality conditions, trends, and pollutant sources, and by facilitating coordinated efforts toward addressing water quality threats within the watershed. Cooperative research could also help identify new approaches to minimizing the effects of sea level rise at the seashore.

Management actions would continue to restore island habitats altered by historic land use, including removal of six hunting lodges, two private residences, access roads, and water impoundments in the seashore's backcountry. Structures and other impervious surfaces would be removed and sites rehabilitated to foster a return to natural conditions. There would be a beneficial impact on water resources by restoring natural runoff and infiltration characteristics and removing potential pollutants present at former development sites. During demolition and removal of structures, NPS would mitigate potential impacts to water resources by implementing best management practices for water quality protection. Solid waste generated by facility replacement would be properly disposed on the mainland.

Filling mosquito ditches in the Maryland portion of the seashore would continue. Currently, the seashore has filled about 10 percent of its 48,000 meters of mosquito ditches. Continued ditch restoration would have a beneficial impact on water resources by helping to restore natural surface and groundwater flows from the island to the bayside and tidal flows in and out of saltmarshes. This would enhance the health and function of saltmarshes and reduce nutrient export from marshes to bay waters. During the filling process, NPS would mitigate potential impacts to water resources by implementing best management practices for water quality protection.

Phragmites australis removal from inland wetlands would continue using a combination of standard, ground-based control methods in combination with aerial spraying and prescribed fire or mowing as needed in heavily infested areas. These actions would have a beneficial impact on water resources by helping to restore natural sediment levels and hydrologic flows. Systemic herbicides would be used that do not bioaccumulate in the aquatic food chain, that exhibit very low toxicity to bacteria, fungi,

and animals, and that are rapidly removed from the environment by chemical bonding with soil particles and microbial degradation.

NPS would continue other ongoing natural resource management actions that could affect water resources, such as other vegetation restoration and protection, and beach and bayside wetlands protection. Resulting human intervention in natural processes, when necessary, could affect water resources both beneficially and adversely when chemical or mechanical methods are used. Mechanical actions could result in localized disturbances causing erosion and subsequent sedimentation in nearby waters. NPS would mitigate potential impacts to water resources by implementing best management practices for water quality protection.

Cultural Resource Management Actions. NPS efforts to identify, manage, and protect cultural resources would continue. These would not noticeably affect water resources. When historic structures could no longer be protected from natural coastal processes and the impacts of climate change/sea level rise, they would be demolished and the sites restored to foster a return to natural conditions. There would be a beneficial impact on water resources by restoring natural runoff and infiltration characteristics and removing potential pollutants that could be present. During demolition, NPS would mitigate potential impacts to water resources by implementing best management practices for water quality protection.

At the Assateague Beach U.S. Coast Guard Station, boat dock repairs would expose soil to erosion, with the potential for sedimentation in Toms Cove. Restoration of electrical service would have minor short-term adverse impacts on water quality associated with trenching for conduit installation from the Tom's Cove recreational beach to the station. NPS would mitigate potential impacts during and following construction by implementing best management practices for water quality protection.

Visitor Use and Visitor Experience Management Actions. Environmental education programs would be enhanced and supported by rehabilitation of the seashore's previous visitor center as an environmental education center. This would benefit water resources by offering greater opportunities to educate the public regarding the seashore's water resources, water quality issues, and stewardship of water resources.

OSV use on the beach would continue to have the potential to result in petroleum pollutants entering ocean waters. By continuing to strictly enforce rules for driving on the beach, the potential for adverse impacts would be minimized. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to water resources because vehicles would be eliminated from part or all of the current OSV use area.

Operation of private boats would continue to emit petroleum products into the water column and/or cause sediment disturbances in shallow waters where propellers make contact with the bay bottom. NPS would continue to educate visitors regarding potential resource impacts associated with boating in shallow waters.

Seashore Operations Management Actions. Based on analysis of historic visitation counts, seashore visitation in Maryland is expected to increase by approximately 8,000 visitors per year as long as there is vehicular access to the seashore. The majority of this growth will be in day-use visitors, as campgrounds are already at capacity most days during the peak summer season. Daily water consumption by day-use visitors is very low, estimated at less than five gallons per day; as a result, visitation growth would result in a modest increase daily demand for potable water. In Maryland, increased demand could be met by the two existing groundwater wells in the Maryland Island Developed Area; these wells currently provide approximately 10,000 gallons/day on peak days, representing approximately 20 to 25 percent of their daily production capacity. In Virginia, potable water would be supplied by the town of Chincoteague, piped by FWS to the recreational use area, and water for cold showers would be available from four existing shallow wells. Additional wastewater volumes associated with increased visitation would be hauled to treatment plants on the mainland where there is excess capacity available to handle the additional flows.

Routine seashore operations and maintenance activities could adversely impact water resources if activities release pollutants into nearby wetlands and surface waters. Existing maintenance facilities, solid waste transfer locations, and comfort stations where wastewater is routinely pumped would be locations where accidental spills and soil disturbances could occur with the potential to impact nearby waters. NPS would mitigate potential impacts to water resources by implementing best management practices for water quality protection.

NPS would maintain its existing fleet of work and patrol boats. Normal storage and operation of these vessels would continue to reduce water quality via inadvertent petroleum discharges/spills from refueling and contribution to runoff from impervious surfaces at the fleet storage and maintenance areas. Operation of the NPS fleet would continue to emit petroleum products into the water column and/or cause sediment disturbances in shallow waters in the bay from accidental propeller contact with the bottom. NPS would mitigate potential impacts to water resources by implementing best management practices for water quality protection.

Miscellaneous enhancements to the seashore's wastewater treatment facility, campground wastewater treatment facilities, and wastewater dump stations would benefit groundwater and bay water quality by providing more effective wastewater treatment. Addition of tertiary treatment of wastewater at the NPS treatment plant on the mainland would reduce nutrient discharge to the bay by applying treated effluent to

wetlands; impacts of this project were analyzed in a separate document (NPS 2003) which concluded that the project would have a moderate, long-term beneficial impact on bay waters compared to continuing to discharge into Sinepuxent Bay.

Miscellaneous repairs would be made to the seashore's headquarters complex and routine maintenance to the seashore's roads would continue, such as repaving and minor drainage enhancements. Minor soil disturbances would be associated with these maintenance actions. NPS would mitigate potential impacts to water resources by implementing best management practices for water quality protection.

Development of additional housing for seasonal employees would increase the demand for potable water and wastewater treatment:

- At the existing NPS housing complex adjacent to seashore headquarters in Maryland, development of 20 additional bedrooms would require an additional 1,500 gallons of potable water per day. NPS's three existing deep wells have excess capacity to meet this demand. Wastewater would be treated at the seashore's treatment plant on the mainland and would likely require minor expansion to the existing facility and an amended permit for additional effluent discharge.
- At the FWS maintenance facility in Virginia, development of 17 additional bedrooms for seasonal employees would require 3,400 to 5,100 gallons of potable water per day. Potable water would be obtained from a new groundwater well or by tying into the Wallops Island potable water system, which has excess capacity. Wastewater treatment would require installation of a package plant or a community on-site wastewater disposal system; proper site design, installation, and maintenance of wastewater facilities would mitigate potential contamination of groundwater or ocean or bay waters.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions within the coastal bays watershed have the potential to impact water resources within the seashore. These actions generally include: development on private property, agricultural activities, public development projects, transportation system improvements, sand transport projects, dredging projects, and offshore development projects that have resulted in or could result in discharge of pollutants to waterways and ocean waters. Potential pollutants from these activities within the coastal bays watershed have historically included urban runoff, erosion and sedimentation, combined sewer overflows, improperly functioning on-site disposal systems (OSDS), and agricultural runoff. In the future pollutant loading from these sources will continue, although at reduced levels when compared to the past. OSDSs and sewer overflows will decrease somewhat as municipal sewers are installed and combined sewers are eliminated. This benefit will be somewhat offset by new development in the watershed that occurs outside of sewer service areas, requiring

use of OSDs that have historically provided inadequate treatment due to poor maintenance. Future stormwater runoff and erosion and sedimentation from construction sites greater than one acre would be reduced by mitigation measures required pursuant to water pollution control permits of the states, counties, cities, and towns.

Other actions with cumulative impacts to water resources include: sand transport projects; sediment dredging projects; actions by the US FWS implementing the comprehensive conservation plan for Chincoteague National Wildlife Refuge; actions by others to implement plans and programs focused on water resource management, such as the Maryland Coastal Bays Program, the Maryland Coastal Zone Enhancement Plan, the Virginia Coastal Resources Management Program and, natural resource management actions of Accomack County and Worcester County; and land uses within and outside the region that adversely impact air quality, contributing to high levels of ozone and atmospheric deposition of nitrogen at the seashore.

The overall cumulative impacts would be primarily beneficial because the overall condition of water resources would be improved because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce pollutant loads from point and non-point sources throughout the coastal bay watersheds. Alternative 1 would add a noticeable increment to the overall beneficial cumulative impact through reduction in stormwater runoff at existing seashore facilities. There would also be adverse cumulative impacts associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas. Alternative 1 would add an imperceptible increment to the overall adverse cumulative impact due to short term stormwater runoff from active construction sites.

- **Conclusions**

In alternative 1 management actions would have both adverse and beneficial impacts on water resources and would add an imperceptible adverse increment and a noticeable beneficial increment to the total cumulative adverse and beneficial impacts on water resources, respectively.

Adverse impacts would result from potential water contamination associated with continued private motorboat use, OSV use, routine seashore operations and maintenance, and use of chemical treatments to manage vegetation, insect, and wildlife populations, as well as from minor additional groundwater withdrawals for potable water supply. Development of visitor use facilities to replace those lost or damaged by coastal storms or the effects of climate change/sea level rise and removal of structures associated with historic land uses on the island could have temporary adverse impacts on water resources depending on the nature and location of the actions. These impacts would not be significant because of the simultaneous implementation of best

management practices and continued actions consistent with NPS management policies protecting water resources, within the context of the overall quality of water resources throughout the seashore.

Beneficial impacts would result from restoring natural surface and groundwater flows by filling remaining mosquito ditches, enhancing hydrologic flows and reducing sedimentation by reducing the aerial coverage of *Phragmites australis* from 5.6 percent to 2 percent, restoring natural surface water flows and removing potential pollutants by rehabilitating island habitats altered by historic land use, promoting public stewardship of water resources by increasing environmental education, reducing nutrient loads to bay waters by improving wastewater treatment, and supporting water quality restoration within the watershed through ongoing partnerships for water resource monitoring, research, and watershed conservation planning. In general, on the island and on the mainland floodplain functions would be slightly enhanced and flood potentials would be minimally reduced. No wetland resources would be lost and wetland functions and values would be enhanced throughout the seashore.

Collectively, the beneficial impacts would not be significant because while management actions would benefit water resources that are fundamental or related to the seashore and would address significant threats to those resources, the impacts would be short-term (continuing until access is lost and/or resources are no longer available to sustain natural resource management programs) and not readily apparent. Once vehicular access is lost, rehabilitation and restoration of island habitats would slow and possibly be curtailed with the result that the beneficial impact on water resources would be greatly reduced.

4.2.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

- **Impact Analysis**

Coastal Response Management Actions. As in alternative 1, under alternatives 2, 3, and 4, facilities lost or damaged by natural coastal processes or the effects of climate change/sea level rise would be replaced or repaired, if funding is available, consistent with the underlying principles of each alternative. While the timing and extent to which facilities would continue to be replaced would vary in alternatives 2, 3, and 4, the nature of the impacts on water resources associated with replacement would be similar to those described for alternative 1 (section 4.2.2).

Visitor Use and Visitor Experience Management Actions. Until facilities are lost, NPS would generally increase visitor services within the Maryland Island Developed Area. A few new small structures (with parking) would be added to support commercial services within existing previously disturbed visitor use areas. Minor soil disturbances would be associated with construction of these structures and rooftops would add impervious surfaces. NPS would mitigate potential impacts to water resources by implementing best management practices for water quality protection and stormwater management.

The former visitor center would be rehabilitated as a stand-alone environmental education center. Minor soil disturbances would occur; no additional impervious surface would be added. NPS would mitigate potential impacts to water resources by implementing best management practices for water quality protection.

Seashore Operations Management Actions. In collaboration with MD DNR, NPS would develop a new seashore entrance station on the mainland, requiring realignment and widening of MD 611, construction of entrance booths, and addition of employee parking spaces. The entrance station would be located within the 100-year floodplain because an alternative site located outside the floodplain would not be available within the MD 611 corridor in suitable proximity to the seashore entrance. During construction, road widening and addition of facilities would expose soil to erosion with the potential for sedimentation in nearby waterways; construction vehicle operations would increase potential for petroleum products to enter runoff from the construction site. Following construction, site specific risk to human health and property would be negligible; placement of fill within the floodplain would include impervious paving and fill needed to raise the new entrance station above the level of the 100-year storm to reduce flood risk to health and property, resulting in the potential for slight increases in runoff rates and volumes that could minimally affect local flooding; visitor vehicles queuing at the entrance station would increase the potential for petroleum products to enter runoff from the site. NPS and MD DNR would mitigate potential impacts during and following construction by implementing best management practices for stormwater management and water quality protection. Facility design would seek to ensure that there would be no increase in runoff rate and volume from the site following development. Collectively these actions would result in a potential adverse impact on water resources, which would continue as long as vehicular access to the island is possible.

Development of a mainland-based alternative transportation system (ATS) would require development of a shuttle staging area and associated unpaved parking area (for approximately 360 cars) on the mainland and shelters and paved pull-offs at three shuttle stops on the island. The staging area and shelters would be located within the 100-year floodplain because alternative sites located outside the floodplain would not be available on the island or within the MD 611 corridor in suitable proximity to the seashore entrance. During construction, soils would be exposed to erosion with the potential for sedimentation in nearby waterways; construction vehicle operations would increase potential for petroleum products to enter runoff from the construction site. Following construction, site-specific flood risk to human health and property would be negligible; placement of fill within the floodplain would be limited to pervious paving on the mainland and installation of shuttle stops on the island, resulting in the potential for minimal increases in runoff rates and volumes that could affect local flooding; visitor vehicles parked at the facility would increase the potential for petroleum products to enter runoff from the site. NPS would mitigate potential impacts during and following construction by implementing best management practices for stormwater management

and water quality protection. Facility design would seek to ensure that there would be no increase in runoff rate and volume from the site following development. Collectively these actions would result in a potential adverse impact on water resources, which would continue as long as vehicular access to the island is possible.

Non-structural stabilization of the mainland shoreline near the visitor center would benefit water quality by reducing shoreline erosion and sedimentation of bay waters.

4.2.4 ALTERNATIVE 2 – CONCENTRATED TRADITIONAL BEACH RECREATION

- **Impact Analysis**

Coastal Response Management Actions. Artificial dune fortification and beach nourishment would protect the Maryland Island Developed Area from the effects of natural coastal processes and climate change/sea level rise as long as suitable land base exists and funding is available. The seashore would expand partnerships with the USACE to provide additional sand to provide additional sand to mitigate the erosional forces associated with storms and/or sea level rise. This effort, as well as planting of dunes and fencing to trap sand and exclude grazing horses from the dune, could substantially slow the loss of the developed area to natural coastal processes. As land and facilities are lost, they would be rebuilt using more sustainable design within the remaining protected developed area, concentrating visitor use and facilities within a smaller area. To the maximum extent, facilities would be temporary, designed to be removed in advance of coastal storms. As in alternative 1, NPS would use best management practices to address stormwater and water quality during and following demolition of damaged facilities and new construction. Permitting requirements would be addressed with the state of Maryland, as appropriate, in advance of any removal and replacement activity. In general, NPS would seek to use non-structural stormwater management in design and construction of new facilities to slow sheetflow and reduce the risk of local flooding and erosion and sedimentation, although this would become increasingly difficult due to the concentration of visitor use and facilities within a shrinking area. Collectively these actions would result in a potential adverse impact on water resources, which would continue as long as vehicular access to the island is possible.

Natural Resource Management Actions. Studies would be completed as in alternative 1. However, the ability of NPS to encourage and support cooperative research would likely decline, adversely impacting efforts to address the challenges of climate change/sea level rise and diminishing detection of emerging threats to the seashore's water resources. Water quality monitoring could decrease in frequency reducing information needed to better understand water quality conditions, trends, and pollutant sources, and to help focus collaboration with other public agencies, academic institutions, and non-governmental organizations to address water quality threats within the watershed; emerging threats to water resources would be less likely to be detected and addressed.

Natural resource management programs and activities would continue as in alternative 1 although over time their scope would diminish as support for natural resource management would likely be re-directed toward activities protecting recreation opportunities. Filling mosquito ditches in the Maryland portion of the seashore would likely diminish, reducing benefits to the health and function of saltmarshes with less benefit to bay water quality due to reducing nutrient export from marshes.

Reduced scope of other natural resource management actions that could affect water resources, such as *Phragmites australis* removal, other vegetation restoration and protection, and beach and bayside wetlands protection would result in less human intervention. This could affect water resources both beneficially and adversely when chemical or mechanical methods are used. Fewer herbicides used to remove invasive species, such as *Phragmites australis*, could help to reduce migration into ground or surface waters, affecting water quality and aquatic habitat. Fewer mechanical actions could result in fewer localized disturbances causing erosion and subsequent sedimentation in nearby waters.

Reduced access to the north end – by eliminating high density use in the north end – would reduce visitor use and decrease the complexity of natural resource management due to fewer visitor/resource conflicts. There would be reduced potential for contamination from petroleum products due to fewer boats visiting the north end.

Working with Virginia to ensure appropriate wastewater treatment and disposal at privately owned structures (oyster watch houses and hunting blinds) located within the seashore's Virginia waters would reduce discharge of nutrients, pathogens, and other contaminants into bay waters.

Cultural Resource Management Actions. NPS efforts to identify, manage, and protect cultural resources would continue. These would not noticeably affect water resources. When historic structures could no longer be protected from natural coastal processes and the impacts of climate change/sea level rise, they would be demolished and the sites restored to foster a return to natural conditions. There would be a beneficial impact on water resources by restoring natural runoff and infiltration characteristics and removing potential pollutants that could be present. During demolition, NPS would mitigate potential impacts to water resources by implementing best management practices for water quality protection.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on access and circulation

Seashore Operations Management Actions. Seashore operations would be based in a rehabilitated headquarters complex in the Maryland Mainland Developed Area, which is located above the 100-year floodplain. During construction minor areas adjacent to the

existing buildings and parking areas would be disturbed and soils exposed to erosion with the potential for sedimentation in nearby waterways; vehicle operations would increase potential for petroleum products to enter runoff from the construction site. Following construction, runoff rates and volumes would generally remain the same or be reduced; NPS staff and maintenance vehicle parking would continue at current levels with the same or less potential for petroleum products to enter runoff from the site. NPS would mitigate potential impacts during and following construction by implementing best management practices for stormwater management and water quality protection that would likely better control runoff and contain pollutants on-site than the existing facility. Collectively these actions could have a beneficial impact on water resources.

Approximately 10 acres would be acquired near the existing seashore headquarters complex to develop a shuttle staging area and associated visitor unpaved parking area (for approximately 360 cars). Construction of this facility is common to alternatives 2, 3, and 4, although where the action would occur would vary slightly with near the seashore headquarters complex. Impacts on water resources are summarized above in section 4.2.3.

Electricity and potable water would be extended to approximately 90 existing campsites. During construction, trenching for underground installation of lines would expose soil to erosion with the potential for sedimentation in nearby waterways. NPS would mitigate potential impacts during and following construction by implementing best management practices for water quality protection. With full occupancy of the 90 sites served with potable water, total additional daily water consumption is estimated to be approximately 2,160 gallons/day (assuming six gallons of water/camper/day and an average four campers/RV). Increased demand could be met by the two existing groundwater wells in the Maryland Island Developed Area; these wells currently provide approximately 10,000 gallons/day on peak days, representing approximately 20 to 25 percent of their daily production capacity. Additional wastewater volumes associated with increased visitation would be hauled to treatment plants on the mainland where there is excess capacity available to handle the additional flows.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on water resources would be the same as those identified for alternative 1.

The overall cumulative impacts would be primarily beneficial because the overall condition of water resources would be improved because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce pollutant loads from point and non-point sources throughout the coastal bay watersheds. Alternative 2 would add a noticeable increment to the overall beneficial cumulative impact through reduction in stormwater runoff at existing and future seashore facilities. There would

also be adverse cumulative impacts associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas. Alternative 2 would add an imperceptible increment to the overall adverse cumulative impact due to short term stormwater runoff from active construction sites.

- **Conclusions**

In alternative 2 management actions would have both adverse and beneficial impacts on water resources and would add an imperceptible adverse increment and a noticeable beneficial increment to the total cumulative adverse and beneficial impacts on water resources, respectively.

Adverse impacts would result from potential water contamination associated with continued private motorboat use, OSV use, routine seashore operations and maintenance, and use of chemical treatments to manage vegetation, insect, and wildlife populations, as well as from minor additional groundwater withdrawals for potable water supply. Construction activities associated with replacement of lost or damaged visitor use facilities within the island developed area, removal of structures associated with historic land use on the island, rehabilitation of the seashore headquarters complex, and development of new facilities (a seashore entrance station and ATS parking facility) could have temporary adverse impacts on water resources depending on the nature and location of the actions. New development in the floodplain on the mainland (entrance station and ATS parking (short-term)) would have the potential to minimally affect floodplain functions. Collectively, the adverse impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting water resources, within the context of the overall quality of water resources throughout the seashore.

Beneficial impacts would result from restoring natural surface and groundwater flows by filling remaining mosquito ditches, enhancing hydrologic flows and reducing sedimentation by reducing the aerial coverage of *Phragmites australis* from 5.6 percent to 2 percent, restoring natural surface water flows and removing potential pollutants by rehabilitating island habitats altered by historic land use, limiting use of the north end beach, reducing shoreline erosion by stabilizing the mainland shoreline using non-structural measures, promoting public stewardship of water resources by increasing environmental education, reducing nutrient loads to bay waters by improving wastewater treatment, reducing discharges from private structures (oyster houses and hunting blinds) in Virginia waters, and supporting water quality restoration within the watershed through ongoing partnerships for water resource monitoring, research, and watershed conservation planning. Floodplain functions on the island would be slightly enhanced and flood potentials would be minimally reduced. No wetland resources would be lost and wetland functions and values would be enhanced throughout the

seashore. Collectively, the beneficial impacts would not be significant because, while management actions would benefit water resources that are fundamental or related to the seashore, the impacts would be short-term (continuing until access is lost and/or resources are no longer available to sustain natural resource management programs) and probably not readily apparent, depending on when NPS resources are redirected away from rehabilitation and restoration of island habitats to maintenance and fortification of the developed area. Once vehicular access is lost, rehabilitation and restoration of island habitats would slow and possibly be curtailed, with the result that the intensity of the beneficial impacts on water resources would be greatly diminished.

4.2.5 ALTERNATIVE 3 – SUSTAINABLE RECREATION AND CLIMATE CHANGE ADAPTATION (NPS PREFERRED ALTERNATIVE)

- **Impact Analysis**

Coastal Response Management Actions. Seashore management would allow the island to evolve naturally, relocating and designing new facilities to be more sustainable. Visitor use infrastructure would evolve to more sustainable designs and likely shift to new, more stable locations initially on the island; over time development on the island would become less intensive, with fewer facilities and less impervious surfaces as visitor use facilities are slowly moved to the mainland. Facilities lost or damaged by natural coastal processes or the effects of climate change/sea level rise would be replaced or repaired, if funding is available, at sites further from the shoreline at sites that do not require continued investment in dune maintenance where they can be made more sustainable in form and function. Previous development sites would be rehabilitated to foster a return to natural conditions. Wetlands would be avoided, although all new sites would be within the 100-year floodplain. Most proposed actions within the floodplain would be functionally dependent upon locations in proximity to water and for which non-floodplain sites would not be a practicable alternative. Collectively these actions would benefit water resources by removing fill from the floodplain and by increasing the distance between the shoreline and the potential source of pollutants at parking areas, comfort stations, maintenance facilities, and sites where chemicals subject to accidental spills are handled. As in alternative 1, NPS would use best management practices to address stormwater and water quality during and following demolition of damaged facilities and new construction. Permitting requirements would be addressed with the state of Maryland, as appropriate, in advance of any removal and replacement activity. In general, NPS would seek to use non-structural stormwater management and alternatives in the design and construction of new facilities, including the use of alternatives to asphalt paving, to improve groundwater recharge and reduce runoff and erosion. Such measures would benefit water resources by generally slowing sheetflow into adjoining areas and reducing the risk of sedimentation and erosion over the long-term. Solid waste generated by facility replacement would be properly disposed on the mainland, thus removing fill previously placed in the floodplain and offsetting placement of new fill required for new facilities.

If bridge access is lost, access would transition to all water access. Beneficial impacts to water resources would result from removal of 150 campsites, other visitor facilities, paved roads, and the NPS maintenance yard, as well as removal of most vehicles from the island; the potential for most spills and leakage of petroleum products and other contaminants would be eliminated and natural infiltration would be enhanced.

Natural Resource Management Actions. Studies would be completed as in alternative 1. Cooperative research would expand, accelerating growth in the understanding of seashore resources and ecological processes. Data from an expanded monitoring network, as well as new ecological research, would provide a significant increase in information needed to better understand water quality conditions, trends, and pollutant sources, and would help focus collaboration with other public agencies, academic institutions, and non-governmental organizations to address water quality threats within the watershed. Based on enhanced monitoring results and research findings, more effective and better targeted measures would be implemented to adapt to change and minimize the adverse effects of sea level rise.

Natural resource management programs and activities would continue as in alternative 1 although over time programs would expand to address issues created by global climate change. In alternative 3, actions would generally seek to enhance resiliency of saltmarsh habitats and inland wetlands resulting in a beneficial impact on water resources.

Visitor use impacts on water resources would continue at the north end but would be mitigated through implementation of new management actions. A new docking/entrance permit would control and reduce the number of motorized boats permitted in the area. In addition, a vessel-based restroom would be made available for visitor use. These actions would beneficially impact water resources by reducing emission of petroleum products into the water column and the potential for sediment disturbances in shallow waters of the north end caused by accidental propeller contact with the bay bottom and beaching/mooring of boats. By providing restroom facilities, less human waste would be discharged untreated into bay waters and onto the land in the north end, although there would be the potential for inadvertent spills of untreated wastewater from on-board restroom facilities.

NPS would encourage the state of Maryland to establish an oyster sanctuary within the seashore's waters. Oysters, once established would benefit water quality by filtering impurities from bay water.

Working with Virginia, NPS would assess the legal status of privately owned structures (oyster watch houses and hunting blinds) located within the seashore's Virginia waters and pursue removal of those found to be unauthorized. For authorized structures, NPS would work with Virginia to ensure appropriate wastewater treatment. Collectively,

these actions would reduce discharge of nutrients, pathogens, and other contaminants into bay waters.

Working with Worcester County, Accomack County, and conservation organizations, NPS would support efforts to protect land (through fee simple purchase or conveyance of conservation easements) within the watersheds of Chincoteague Bay and Newport Bay for conservation and climate change adaptation purposes. Conservation of these lands would benefit water resources by reducing or eliminating existing or future developed land uses that have the potential to discharge contaminants to surface waters or that have or could alter runoff characteristics.

NPS would collaborate with its conservation partners to acquire approximately 150 to 200 acres of buffer lands adjoining one to three new points of departure on the Chincoteague Bay mainland in Worcester County. Land conservation would permanently protect the land from development; long-term management would facilitate return to natural conditions, as appropriate, with beneficial impacts to water resources by likely protecting wetlands and floodplains, reducing non-point source discharge of pollutants, and potentially reducing runoff.

NPS would collaborate with partners to expand research to improve understanding of aquatic resources, estuarine ecology, and the effects of human activities on water quality. Research would enable NPS and its partners to better focus water quality management actions to reduce pollutant loads into the coastal bays.

Cultural Resource Management Actions. Implementation of non-structural storm protection measures (such as dune nourishment and planting) to protect the Assateague Beach U.S. Coast Guard Station would not affect water resources.

Visitor Use and Visitor Experience Management Actions. Once camping facilities are no longer sustainable in the Maryland Island Developed Area or when vehicular access to the island is lost, NPS would collaborate with MD DNR to develop a new campground on the mainland. Facilities would be replaced on an approximate 175-acre site in the MD 611 corridor near the existing seashore headquarters complex. NPS would seek a site that is outside of the 100-year floodplain and where wetland impacts could be avoided. Assuming the site is composed of a mix of upland field and forest, campground development would entail minimal clearing and grading of the site, paved road construction, utility installations, development of 150 campsites (including approximately 40 sites with paved pads/pull-throughs), and construction of comfort facilities, shower buildings, an amphitheater, sewage dump station, and an entrance station with parking). During construction, soils would be exposed to erosion with the potential for sedimentation in nearby waterways; construction vehicle operations would increase potential for petroleum products to enter runoff from the construction site. Following construction, additional paved roads and rooftops would result in the

potential for slight increases in runoff rates and volumes that could affect local flooding; and visitor vehicles parked at campsites would increase the potential for petroleum products to enter runoff from the site. NPS would mitigate potential impacts during and following construction by implementing best management practices for stormwater management and water quality protection. Facility design would seek to ensure that there would be no increase in runoff rates or discharge volume from the site following development due to addition of impervious surfaces. A new well (or wells) would provide water to meet an approximate demand for up to 10,000 to 15,000 gallons/day (assuming use of vault toilets and coldwater showers). Waste from vault toilets would be pumped to tankers and transferred to the seashore's wastewater plant where tertiary treatment would occur prior to upland site discharge of effluent. In general water withdrawals, wastewater volumes and treatment needs, and extent of impervious surfaces would be similar to those of the existing island campgrounds that the new campground would replace, likely resulting in no net increase in groundwater withdrawals, wastewater generation and treatment needs, nutrient and contaminant discharges to the bay, or runoff rates and volumes. Removing the existing campgrounds in the floodplain on the island and replacing it outside the floodplain on the mainland, while avoiding impacts to wetlands, would have a beneficial impact on water resources.

OSV use on the beach would continue to have the potential to result in petroleum pollutants entering ocean waters. By continuing to strictly enforce rules for driving on the beach, the potential for adverse impacts would be minimized. If vehicular access is lost, and the breach management plan recommends that the breach remain open, then OSV use might be modified or relocated so that the activity can continue. If it is relocated, then there would be no net benefit to water resources because beach areas would remain open to OSV use; if it is closed and not relocated there would be a net benefit.

Expanded use of Egging Island for environmental education would increase visitor use to the island. New facilities would include an expanded soft landing for canoes and kayaks, clearing for a primitive group campsite, and installation of relocatable vault toilets. During construction, minor areas would be disturbed at the campsite and soft landing, exposing soils to erosion with the potential for sedimentation in nearby waters. Motorized boats would be used to convey construction materials and site furnishings to the island and to provide long-term maintenance, increasing emission of petroleum products into the water column and the potential for sediment disturbances in shallow waters caused by accidental propeller contact with the bay bottom and beaching of boats. Long-term use of the site by large groups arriving in non-motorized boats would increase disturbances to the bay bottom at the soft landing and would increase trampling of island vegetation resulting in soil erosion and the potential for sedimentation in nearby waters. Periodic pumping of the vault toilets would have the potential for inadvertent spills of untreated wastewater.

Three new bayside access points would be developed to provide water access to existing backcountry campsites and trails, one of which would provide opportunities for access via motorized vessels. During construction, minor areas would be disturbed at the access points, exposing soils to erosion with the potential for sedimentation in nearby waters. Increased visitor use at the access points, particularly motorized boat access, would increase disturbances to the bay bottom and would increase trampling of island vegetation where boats are launched, resulting in soil erosion and the potential for sedimentation in nearby waters. Addition of motorized boats would increase emission of petroleum products into the water column and the potential for sediment disturbances in shallow waters caused by accidental propeller contact with the bay bottom and mooring/beaching of boats.

On the mainland in Worcester County NPS would seek to acquire from the county two existing points of departure from Chincoteague Bay; the sites would be rehabilitated, as needed, likely including development of a shade shelter and relocatable vault toilet. Rehabilitation could involve disturbance of minor areas at the access points, exposing soils to erosion with the potential for sedimentation in nearby waters. Increased visitor use at the access points, particularly motorized boat access, would increase disturbances to the bay bottom and would increase trampling of vegetation resulting in soil erosion and the potential for sedimentation in nearby waters. Addition of motorized boats would increase emission of petroleum products into the water column and the potential for sediment disturbances in shallow waters caused by accidental propeller contact with the bay bottom and mooring/beaching of boats.

NPS would encourage commercial service operators to provide water transportation to backcountry recreation areas. As more operators become established and new experiences become available, the number of motorized and non-motorized vessels in the backcountry would increase. Additional motorized vessels would have an adverse impact on water resources by increasing emission of petroleum products into the water column and increasing the potential for sediment disturbances in shallow waters caused by accidental propeller contact with the bay bottom and beaching/mooring of boats. Non-motorized vessel impacts would be limited to minor bottom disturbances at soft landings.

Seashore Operations Management Actions. Seashore operations would be relocated to a new headquarters complex in the MD 611 corridor near the seashore entrance. NPS would seek a site that is outside of the 100-year floodplain and where wetland impacts could be avoided. Development would entail clearing and grading of the site and construction of administrative offices, a maintenance complex, paved parking, and paved/unpaved outdoor maintenance storage areas. During construction, up to five acres of soil would be disturbed and soils exposed to erosion with the potential for sedimentation in nearby waterways; construction vehicle operations would increase potential for petroleum products to enter runoff from the construction site. Following

construction, paved parking, driveways, outdoor storage areas, and rooftops would result in the potential for slight increases in runoff rates and volumes that could affect local flooding near the new site; NPS staff and maintenance vehicles parked at the facility would increase the potential for petroleum products to enter runoff from the new site. NPS would mitigate potential impacts during and following construction by implementing best management practices for water quality protection and stormwater management. Facility design would ensure that there would be no increase in runoff rates or discharge volume from the site following development due to addition of impervious surfaces. These impacts would be offset by demolition of the existing headquarters complex (exclusive of the environmental education center). During demolition and removal of structures, NPS would mitigate potential impacts to water resources by implementing best management practices for water quality protection.

Approximately 10 acres at the existing seashore headquarters site would be rehabilitated as a shuttle staging area and associated visitor unpaved parking area (for approximately 360 cars). Construction of this facility is common to alternatives 2, 3, and 4 (although where the action would occur would vary slightly with near the seashore headquarters complex); impacts on water resources are summarized above in section 4.2.3. This facility would remain in use as long as vehicular access to the island is possible; when vehicular access to the island is lost, it would be removed and the site rehabilitated to foster a return to natural conditions, including natural runoff and infiltration characteristics.

When vehicular access to the island is no longer possible, access to the island would shift to a ferry based operation for visitor access and seashore operations at waterfront locations on the mainland and on the island. New mainland facilities near the existing seashore headquarters complex would include a passenger ferry terminal, docking facilities to support seashore operations, administrative offices, maintenance storage facility, paved access roads, unpaved parking area (for up to 700 cars), and unpaved NPS equipment storage yard; new island facilities would include an island terminal facility, docking facilities to support seashore operations, an island shuttle system with shelters and benches. During construction, impacts to water resources could include:

- Dredging, placement of piers, construction of bulkheads, and dredged material disposal would increase turbidity and potentially release contaminants into the water column near the construction site and the dredged material disposal site.
- New development would likely impact shoreline wetland areas.
- Soils on up to ten acres would be exposed to erosion with the potential for sedimentation in nearby waterways.
- Construction vehicle operations would increase potential for petroleum products to enter runoff from the construction site.

Following construction, impacts to water resources could include:

- New development would occur within the floodplain that is functionally dependent upon locations in proximity to water and for which non-floodplain sites would not be a practicable alternative. Placement of fill would be required to construct roads and parking areas and to raise offices and visitor service areas above the level of the 100-year storm.
- Handling solid waste and wastewater in transit from the island to treatment and disposal sites on the mainland would pose a risk of accidental spills that could introduce contaminants directly or indirectly into the water depending on where the spill occurs.
- Visitor vehicles and NPS maintenance and staff vehicles parked at the mainland facility would increase the potential for petroleum products to enter runoff from the site.
- Passenger ferries and NPS maintenance motorized boats would increase emission of petroleum products into the water column and the potential for sediment disturbances in shallow waters at docking facilities caused by accidental propeller contact with the bay bottom.
- Periodic maintenance dredging and dredged material disposal would increase turbidity and potentially release contaminants into the water column near the docking facilities and the dredged material disposal site.

NPS would mitigate potential impacts during and following construction by implementing best management practices for stormwater management and water quality protection. Floodplain impacts would be avoided to the extent practicable; facility design would use nonstructural measures such as unpaved parking areas to reduce flood hazards to human life and property, would ensure that structures and facilities are designed to be consistent with the standards and criteria of the National Flood Insurance Program, and would seek to ensure that there would be no increase in runoff discharge from the site following development. Wetland impacts would be avoided to the extent practicable; impacts that could not be avoided would be minimized; and actions would be taken to compensate for remaining unavoidable adverse wetland impacts by restoring wetlands that might be destroyed or degraded. Wastewater and solid waste handling, and spill prevention and response actions would be implemented to prevent or minimize the release of contaminants. Collectively these actions would result in a potential adverse impact on water resources.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on water resources would be the same as those identified for alternative 1.

The overall cumulative impacts would be primarily beneficial because the overall condition of water resources would be improved because of collaborative efforts by

public agencies, local governments, and non-profit partners to reduce pollutant loads from point and non-point sources throughout the coastal bay watersheds. Alternative 3 would add a noticeable increment to the overall beneficial cumulative impact through reduction in stormwater runoff at existing and future seashore facilities. There would also be adverse cumulative impacts associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas. Alternative 3 would add an imperceptible adverse increment to the overall adverse cumulative impact due to short term stormwater runoff from active construction sites.

- **Conclusions**

In alternative 3 management actions would have both adverse and beneficial impacts on water resources and would add an imperceptible adverse increment and a noticeable beneficial increment to the total cumulative adverse and beneficial impacts on water resources, respectively.

Adverse impacts would result from potential water contamination associated with continued private motorboat use, OSV use, routine seashore operations and maintenance, and use of chemical treatments to manage vegetation, insect, and wildlife populations, as well as from minor additional groundwater withdrawals for potable water supply. Construction activities associated with replacement of lost or damaged visitor use facilities at more sustainable locations on the island, removal of structures associated with historic land use on the island, and development of new facilities (a seashore entrance station, ATS parking facility, seashore headquarters complex, mainland ferry docking facilities, mainland campground, three bayside water access points, primitive group campsite on Egging Island, and enhancements to two points of departure on the mainland) could have temporary adverse impacts on water resources depending on the nature and location of the actions. New development in the floodplain on the mainland (entrance station, ATS parking (short-term), and ferry docking facilities (long-term)) would have the potential to minimally affect floodplain functions. On the mainland and the island, some wetland areas could be lost or adversely impacted by development of ferry docking facilities along the bay shoreline and a new campground in the MD 611 corridor. Collectively, the adverse impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting water resources, within the context of the overall quality of water resources throughout the seashore.

Beneficial impacts would result from restoring natural surface and groundwater flows by filling remaining mosquito ditches, enhancing hydrologic flows and reducing sedimentation by reducing the aerial coverage of *Phragmites australis* from 5.6 percent to 2 percent, restoring natural surface water flows and removing potential pollutants by rehabilitating island habitats altered by historic land use, reducing shoreline erosion by

stabilizing the mainland shoreline using non-structural measures, promoting public stewardship of water resources by increasing environmental education, reducing nutrient loads to bay waters by improving wastewater treatment, reducing pollutant discharges to bay waters in the north end by reducing boat access and providing restrooms, seeking to establish an oyster sanctuary in Maryland waters, reducing discharges from private structures (oyster houses and hunting blinds) in Virginia waters, supporting conservation partners to establish conservation easements on the mainland within the watersheds of Chincoteague Bay and Newport Bay, acquiring 150 to 200 acres of buffer lands along the bay shoreline, and supporting water quality restoration within the watershed through ongoing partnerships for water resource monitoring, research, and watershed conservation planning. Floodplain functions on the island would be slightly enhanced and flood potentials would be minimally reduced. No wetland resources would be lost and wetland functions and values would be enhanced. Collectively, the beneficial impacts would be significant because they would benefit water resources that are fundamental or related to the seashore, would be long term in duration, and would be readily apparent. Over time, as resources are increasingly focused on addressing issues created by global climate change and enhancing resiliency of saltmarsh habitats and freshwater wetlands, the beneficial impacts on water resources would increase and become more significant. Once vehicular access is lost, rehabilitation and restoration of island habitats would continue at a slower rate due to the complexities of water access operations, although impacts on water resources would continue to be readily apparent and significant.

4.2.6 ALTERNATIVE 4 – NATURAL ISLAND EVOLUTION AND A PRIMITIVE ISLAND EXPERIENCE

- **Impact Analysis**

Coastal Response Management Actions. Seashore management would allow the island to evolve naturally, maintaining facilities only until they are lost, severely damaged, or become obsolete. Development on the island would become less intensive, with fewer facilities and less impervious surfaces as visitor use facilities are removed. Previous development sites would be rehabilitated to foster a return to natural conditions. Solid waste generated by facility replacement would be properly disposed on the mainland. These actions would benefit water resources by removing fill from the floodplain and by eliminating point and non-point sources of pollutants at parking areas, comfort stations, maintenance facilities, and sites where chemicals subject to accidental spills are handled. Replacement of facilities lost or damaged would be limited to new primitive campsites. Wetlands would be avoided, although all new sites would be within the 100-year floodplain. As in alternative 1, NPS would use best management practices to address stormwater and water quality during and following demolition of damaged facilities and new construction. Permitting requirements would be addressed with the state of Maryland, as appropriate, in advance of any removal and replacement activity. In general, NPS would seek to use non-structural stormwater management and

alternatives in the design and construction of new primitive campsites, including the use of alternatives to asphalt paving to improve groundwater recharge and reduce runoff and erosion. Such measures would benefit water resources by generally slowing sheetflow into adjoining areas and reducing the risk of sedimentation and erosion over the long-term.

As in alternative 3, if bridge access is lost, access would transition to all water access. Beneficial impacts to water resources would result from removal of the remaining visitor use facilities at that time, such as developed campsites and paved roads, as well as removal of all non-NPS vehicles from the island; the potential for most spills and leakage of petroleum products and other contaminants would be eliminated and natural infiltration would be enhanced.

Natural Resource Management Actions. Studies would be completed as in alternative 1. Expanded cooperative research would include more basic science and barrier island ecology research into the effects of climate change/sea level rise. New ecological research would provide additional information needed to better understand water quality conditions, trends, and pollutant sources, and would help focus collaboration with other public agencies, academic institutions, and non-governmental organizations to address water quality threats within the watershed.

Natural resource management programs and activities would continue as in alternative 1 although over time programs would expand to address mitigation of human impacts and climate change adaptation. In alternative 4, monitoring key climate drivers and resource conditions would also increase. Collectively these expanded programs would support actions to enhance resiliency of vulnerable resources resulting in a beneficial impact on water resources.

Visitor use impacts on water resources in the north end would be largely eliminated by prohibiting visitor access via motorized vessels. This would largely eliminate emission of petroleum products into the water column in the nearshore area, stop sediment disturbances in shallow waters caused by accidental propeller contact with the bay bottom and by beaching/mooring of boats, and largely eliminate contamination by human waste caused by concentrations of visitors in an area without restroom facilities.

As in alternative 3, NPS would encourage the state of Maryland to establish an oyster sanctuary within the seashore's waters. Oysters, once established would benefit water quality by filtering impurities from bay water.

As in alternative 3, working with Virginia, NPS would assess the legal status of privately owned structures (oyster watch houses and hunting blinds) located within the seashore's Virginia waters and pursue removal of those found to be unauthorized. For authorized structures, NPS would work with Virginia to ensure appropriate wastewater

treatment. Collectively, these actions would reduce discharge of nutrients, pathogens, and other contaminants into bay waters.

As in alternative 3, working with Worcester County, Accomack County, and conservation organizations, NPS would support efforts to protect land (through fee simple purchase or conveyance of conservation easements) within the watersheds of Chincoteague Bay and Newport Bay for conservation and climate change adaptation purposes. Conservation of these lands would benefit water resources by reducing or eliminating existing or future developed land uses that have the potential to discharge contaminants to surface waters or that have or could alter runoff characteristics.

As in alternative 3, NPS would collaborate with partners to expand research to improve understanding of aquatic resources, estuarine ecology, and the effects of human activities on water quality. Research would enable NPS and its partners to better focus water quality management actions to reduce pollutant loads into the coastal bays.

Cultural Resource Management Actions. As in alternative 3, implementation of non-structural storm protection measures (such as dune nourishment and planting) to protect the Assateague Beach U.S. Coast Guard Station would not affect water resources.

Visitor Use and Visitor Experience Management Actions. New facility development would include development of up to 150 primitive campsites, replacing developed campsites lost to natural coastal processes and the impacts of climate change/sea level rise. Related actions and measures to mitigate impacts on water resources are summarized above under coastal resource management actions for alternative 4.

OSV use on the beach would continue to have the potential to result in petroleum pollutants entering ocean waters. By continuing to strictly enforce rules for driving on the beach, the potential for adverse impacts would be further reduced. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to water resources because vehicles would be eliminated from part or all of the OSV use area.

Seashore Operations Management Actions. As in alternative 3, seashore operations would be based in a new headquarters complex to be developed on the mainland in the MD 611 corridor near the seashore entrance on a non-forested upland site. Proposed actions and related impacts on water resources would be the same as those described for alternative 3 (section 4.3.4).

As in alternative 3, the existing headquarters complex, exclusive of the environmental education center, would be removed. Potential pollutants present at former development sites would be properly disposed. Proposed actions and related impacts

on water resources would be the same as those described for alternative 3 (section 4.3.4).

As in alternative 3, when vehicular access to the island is no longer possible, access to the island would shift to a ferry based operation for visitor access and seashore operations at waterfront locations on the mainland and on the island. Proposed actions and related impacts on water resources would be the same as those described for alternative 3 (section 4.3.4).

The existing maintenance yard in the Maryland Island Developed Area would be removed and the site rehabilitated to foster a return to natural conditions. This would benefit water resources by eliminating impervious surfaces, vehicle storage and use, and storage and handling of petroleum products and other chemicals that could result in inadvertent spills of contaminants that could enter groundwater or nearby wetlands and surface waters.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on water resources would be the same as those identified for alternative 1.

The overall cumulative impacts would be primarily beneficial because the overall condition of water resources would be improved because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce pollutant loads from point and non-point sources throughout the coastal bay watersheds. Alternative 4 would add a noticeable increment to the overall beneficial cumulative impact through reduction in stormwater runoff at existing and future seashore facilities. There would also be adverse cumulative impacts associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas. Alternative 4 would add an imperceptible adverse increment to the overall adverse cumulative impact due to short term stormwater runoff from active construction sites.

- **Conclusions**

In alternative 4 management actions would have both adverse and beneficial impacts on water resources and would add an imperceptible adverse increment and a noticeable beneficial increment to the total cumulative adverse and beneficial impacts on water resources, respectively.

Adverse impacts would result from potential water contamination associated with continued private motorboat use, OSV use, routine seashore operations and maintenance, and use of chemical treatments to manage vegetation, insect, and wildlife populations, as well as from minor additional groundwater withdrawals for potable

water supply. Construction activities associated with removal of structures associated with historic land use on the island and development of new facilities (a seashore entrance station, ATS parking facility, seashore headquarters complex, mainland ferry docking facilities, and primitive campsites on the island) could have temporary adverse impacts on water resources depending on the nature and location of the actions. New development in the floodplain on the mainland (entrance station, ATS parking (short-term), and ferry docking facilities (long-term)) would have the potential to minimally affect floodplain functions. On the mainland and the island, some wetland areas could be lost or adversely impacted by development of ferry docking facilities along the bay shoreline. Collectively, the adverse impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting water resources, within the context of the overall quality of water resources throughout the seashore.

Beneficial impacts would result from restoring natural surface and groundwater flows by filling remaining mosquito ditches, enhancing hydrologic flows and reducing sedimentation by reducing the aerial coverage of *Phragmites australis* from 5.6 percent to 2 percent, restoring natural surface water flows and removing potential pollutants by rehabilitating island habitats altered by historic land use, reducing shoreline erosion by stabilizing the mainland shoreline using non-structural measures, promoting public stewardship of water resources by increasing environmental education, reducing nutrient loads to bay waters by improving wastewater treatment, reducing pollutant discharges to bay waters in the north end by prohibiting visitor access via motorized vessels, seeking to establish an oyster sanctuary in Maryland waters, reducing discharges from private structures (oyster houses and hunting blinds) in Virginia waters, supporting conservation partners to establish conservation easements on the mainland within the watersheds of Chincoteague Bay and Newport Bay, and supporting water quality restoration within the watershed through ongoing partnerships for water resource monitoring, research, and watershed conservation planning. Floodplain functions on the island would be slightly enhanced and flood potentials would be minimally reduced. No wetland resources would be lost and wetland functions and values would be enhanced. Collectively, the beneficial impacts would be significant because they would benefit water resources that are fundamental or related to the seashore, would be long term in duration, and would be readily apparent. Over time, as resources are increasingly focused on mitigating human impacts and climate change adaptation, the beneficial impacts on water resources would increase and become more significant. Once vehicular access is lost, rehabilitation and restoration of island habitats would continue at a slower rate due to the complexities of water access operations, although impacts on water resources would continue to be readily apparent and significant.

4.3 Vegetation

4.3.1 METHODOLOGY FOR ANALYZING IMPACTS

Management actions are qualitatively analyzed with respect to their potential to benefit or adversely impact vegetation within the seashore's key habitats, including bayside subtidal and mudflats, saltmarsh, inland wetlands, forest and shrubland, beach and intertidal, and Atlantic subtidal. Analysis also addresses potential impacts to vegetation on the mainland within and adjoining the seashore. Responses to natural coastal processes and the effects of climate change/sea level rise are analyzed to identify potential impacts to vegetation. Actions are identified and analyzed that have the potential to disturb vegetation because of new development, changes in seashore operations, or increased visitor use. Actions are also identified that have the potential to benefit vegetation through research and special studies or through resource management actions aimed at rehabilitating seashore habitats that have been affected by historic land uses and invasive species. For this analysis, it is assumed that during final design for specific projects best management practices (BMPs) would be used to avoid or minimize vegetation disturbances and that all areas experiencing short-term disturbance would be revegetated with native species.

The resource specific context for assessing impacts of the alternatives on vegetation within the seashore's habitats includes:

- Barrier island habitats including dunes, grass and shrublands, freshwater wetlands, maritime forests, and saltmarshes are fundamental to the seashore's purpose and significance.
- Aquatic habitats, including sea grass beds, saltmarshes, sandy shallows, and intertidal flats are fundamental to the seashore's purpose and significance.
- A recent assessment of the seashore's habitats concluded that saltmarsh and forest and shrubland habitats are in degraded condition; inland wetlands, and dunes and grassland habitats are in fair condition; bay subtidal and mudflats, and beach and intertidal habitats are in good condition; and Atlantic subtidal habitat is in very good condition (NPS 2011d).
- Development of 158,386 feet of marsh mosquito ditches at the seashore have severely altered marsh hydrology, disrupting natural flow of tidal water into and out of the seashore's marshes and degrading estuarine water quality by increasing nutrient export from marshes (NPS 2011d).
- *Pragmites australis* has invaded many of the seashore's freshwater shrub wetlands (representing >40% cover on 5.6% of the total area of the seashore (NPS 2011d)), adversely impacting sediment levels and hydrologic flows.
- Introduced horses and sika deer are non-native species that are stressors to seashore vegetation when populations are extreme (NPS 2011d); despite this, sustainable populations of horses and sika deer are desired conditions because visitors highly value the animals as part of the seashore experience.

Furthermore, horses are considered resources that are important to the seashore.

4.3.2 ALTERNATIVE 1 – CONTINUATION OF CURRENT MANAGEMENT

- **Impact Analysis**

Coastal Response Management Actions. Facilities lost or damaged by natural coastal processes or the effects of climate change/sea level rise would be replaced or repaired, if funding is available. Facilities to be replaced would be moved back from the shoreline and made more sustainable in form and function, at sites that would continue to be protected by investment in dune maintenance. During construction, areas of dunes and grassland, and forest and shrubland would be disturbed. Following construction some areas would be converted to developed facilities, including impervious surfaces (rooftops and paved roads) and pervious paving (parking areas); disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees. Vegetation losses would be offset to some extent by rehabilitation of previous development sites to foster a return to natural conditions.

Altered sand transport processes at Ocean City Inlet would continue to be mitigated in collaboration with the USACE. This would benefit beach and intertidal vegetation by alleviating sand starvation of the island (from the stabilized inlet) and indirectly helping to create overwash fans and replenish back-barrier marshes. Overwash areas are a dynamic habitat that supports rare island flora, including suitable habitat conditions for the threatened seabeach amaranth (*Amaranthus pumilus*).

Dune maintenance to protect visitor facilities and seashore infrastructure in the Maryland Island Developed Area would continue to prevent the natural processes of sand overwash. This would continue to impact adversely vegetation in saltmarshes, dunes and grasslands, and beach and intertidal areas by inhibiting sand replenishment.

Natural Resource Management Actions. Existing and new planned monitoring programs and research would benefit all seashore vegetation. Water quality monitoring programs and research would benefit vegetation in bay and subtidal and mudflat areas by enhancing understanding of water quality conditions, trends, and pollutant sources, helping to focus future research and monitoring to address water quality threats within the watershed, and providing the basis for defining and implementing measures to adapt to change and reduce the adverse effects of sea level rise. Continued annual monitoring of seagrass and submerged aquatic vegetation (SAV) would assist with understanding the processes to maintain seagrass within bay subtidal areas. Continued saltmarsh monitoring would provide information on relative saltmarsh elevation needed to interpret changes in saltmarsh vegetation and would contribute to worldwide efforts to monitor sea level rise with by measuring the amount of erosion and accretion on saltmarsh surfaces; together with continued monitoring of marsh birds and saltmarsh

nekton, this would benefit saltmarshes by providing metrics for future condition assessments and could enhance early identification of degradation from climate change. A new baseline groundwater monitoring program would benefit inland wetlands by enhancing understanding of the interrelationships of groundwater and storm overwash/flooding events. Continued monitoring, tracking, and eradication of invasive plant species would benefit vegetation in the seashore's bay subtidal areas and mudflats, saltmarshes, forests and shrubland, inland wetlands, and dunes and grasslands by eliminating species that outcompete native flora and that lower plant diversity in native coastal communities.

NPS would continue scientific and scholarly research focused on developing a better understanding of natural coastal processes and the effects of climate change/sea level rise. Existing partnerships and cooperative relationships with Maryland and Virginia resource management agencies, Worcester County, Accomack County, the Maryland Coastal Bays Program, and various academic institutions and conservation organizations would continue to support ongoing water resource monitoring, research, and watershed conservation planning. These partnerships would continue to benefit vegetation in the seashore's saltmarsh and bay subtidal and mudflat areas by providing information needed to understand better water quality conditions, trends, and pollutant sources, and by facilitating coordinated efforts toward addressing water quality threats within the watershed.

Management actions would continue to restore island habitats altered by historic land use, including removal of six hunting lodges, two private residences, access roads, and water impoundments in the seashore's backcountry. Structures and other impervious surfaces would be removed and sites rehabilitated to foster a return to natural conditions, resulting in a beneficial impact on vegetation in forest and shrubland habitat and dunes and grassland habitat and saltmarsh habitat.

Filling mosquito ditches in the Maryland portion of the seashore would continue. Currently, the seashore has filled about 10 percent of its 48,000 meters of mosquito ditches. Continued ditch restoration would have a beneficial impact on saltmarsh vegetation by helping to restore natural surface and groundwater flows from the island to the bayside and tidal flows in and out of saltmarshes. This would enhance the health and function of saltmarsh vegetation and reduce nutrient export from marshes to bay waters.

Phragmites australis removal from saltmarsh, forest and shrubland, inland wetlands, and dunes and grassland would continue using a combination of standard, ground-based control methods in combination with aerial spraying and prescribed fire or mowing as needed in heavily infested areas. These actions would have a beneficial impact on vegetation in these habitats by helping to restore natural sediment levels and hydrologic flows and by eliminating species that outcompete native flora and that lower

plant diversity in native coastal communities. Systemic herbicides would be used that do not bioaccumulate in the aquatic food chain, that exhibit very low toxicity to bacteria, fungi, and animals, and that are rapidly removed from the environment by chemical bonding with soil particles and microbial degradation.

Horse management would continue with the goal of reducing the feral horse population to a sustainable population of 80 to 100 individuals. This would benefit vegetation in saltmarsh habitat, forest and shrubland habitat, inland wetlands habitat, and dunes and grassland habitat by reducing overgrazing, trampled vegetation, addition of nutrients, and loss of sensitive plant species.

Hunting management would continue to reduce the size of the sika deer and white-tailed deer population to levels which would contain impacts on plant species native to the seashore's forest and shrubland habitat. A new hunting monitoring program would enhance management of both sika deer and native white-tailed deer by providing information needed to develop deer density and deer herbivory indices that would inform management decisions aimed at protecting native plant species. If access to the OSV area is lost, access for public hunting could be significantly reduced or lost and deer populations could increase with potential adverse impacts on vegetation. NPS would explore alternative public hunting strategies to manage deer populations.

Cultural Resource Management Actions. NPS efforts to identify, manage, and protect cultural resources would continue. When historic structures could no longer be protected from natural coastal processes and the impacts of climate change/sea level rise, they would be demolished and the sites restored to foster a return to natural conditions, resulting in a beneficial impact on vegetation in forest and shrubland habitat and dunes and grassland habitat.

At the Assateague Beach U.S. Coast Guard Station, boat dock repairs would have minor short-term adverse impacts on vegetation in dunes and grassland habitat. Similarly, restoration of electrical service would have minor short-term adverse impacts on vegetation in dunes and grassland habitat associated with trenching for conduit installation from the Tom's Cove recreational beach to the station.

Visitor Use and Visitor Experience Management Actions. Confinement of oversand vehicle (OSV) use within the existing designated OSV use area would continue to limit the adverse impact of OSVs on vegetation in dunes and grassland habitat and beach and intertidal habitat by controlling the area subject to compaction, sand displacement, reduced growth of protective foredunes, and erosion typically associated with OSV use. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to vegetation because vehicles would be eliminated from part or all of the OSV use area.

Seashore Operations Management Actions. Based on analysis of historic visitation counts, seashore visitation in Maryland is expected to increase by approximately 8,000 visitors per year as long as there is vehicular access to the seashore. The majority of this growth will be in day-use visitors, as campgrounds are already at capacity most days during the peak summer season. Additional visitors would increase the potential for impacts on vegetation in dune and grassland habitat and beach and intertidal habitat in day-use areas where visitor use is concentrated. Impacts would continue to include trampling, soil compaction, and vegetation loss. NPS would continue to restrict visitor access to habitat areas with designated trails and boardwalks. Some increase in impervious surfaces is likely, with the potential to cause minimal adverse impacts on water quality that could also affect the seashore's habitats. These potential impacts would be mitigated by implementing best management practices for water quality protection.

Development of 20 bedrooms of seasonal housing in Maryland and 17 bedrooms of seasonal housing in Virginia would disturb approximately one to two acres of vegetation during construction and convert approximately one acre to impervious surfaces associated with new buildings, parking, access drives, and walkways. Affected vegetation would likely be composed of a mix of shrubland and landscaped areas adjoining existing seashore facilities.

Withdrawals from wells to meet the daily visitor and NPS employee demands for water would not affect the seashore's vegetation. Water would continue to be drawn from deep groundwater aquifers that do not supply freshwater to the seashore's inland wetlands.

Miscellaneous repairs would be made to the seashore's headquarters complex, visitor use facilities, seashore operations facilities, roads, and trails. Minor soil disturbances would generally affect landscaped areas and mowed grass adjoining existing structures. Following construction, disturbed areas would be revegetated with native grasses, shrubs, and trees.

Routine seashore operations and maintenance activities could result in temporary and localized adverse impacts on vegetation due to trimming of overhanging branches and removal of vines for pedestrian safety. Adverse impacts would be short-term and minimal.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have the potential to impact vegetation within the seashore include sand transport projects, sediment dredging projects, and actions by the US FWS implementing the comprehensive conservation plan for Chincoteague National Wildlife Refuge. Some seashore vegetation is also affected by actions within the coastal bays watershed that

have the potential to impact water quality (see section 4.2.2) and by land uses within and outside the region that adversely impact air quality, contributing to high levels of ozone and atmospheric deposition of nitrogen at the seashore. Alternative 1 in conjunction with the impacts of these actions would result in a cumulative adverse impact and a cumulative beneficial impact on vegetation. Alternative 1 would contribute an imperceptible adverse increment and an imperceptible beneficial increment to the total cumulative adverse and beneficial impacts.

The overall cumulative impacts on vegetation would be primarily beneficial because of improvements to the overall condition of water resources because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce pollutant loads from point and non-point sources throughout the coastal bay watersheds, and because of national programs to enhance air quality which help to reduce ozone and atmospheric deposition of nitrogen. Alternative 1 would add a noticeable increment to the overall beneficial cumulative impact through continuation of natural resource management actions that restore island habitats altered by historic land use and mosquito ditching, remove invasive *Phragmites australis*, manage horses to reduce impacts to vegetation, and continue to reduce deer populations through managed hunting. There would also be adverse cumulative impacts on vegetation associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas, as well as with continued air quality impacts. Alternative 1 would add an imperceptible increment to the overall adverse cumulative impact due to minor vegetation disturbance and clearing for new seashore facilities.

- **Conclusions**

In alternative 1 management actions would have both adverse and beneficial impacts on vegetation and would add an imperceptible adverse increment and a noticeable beneficial increment to the total cumulative adverse and beneficial impacts on vegetation, respectively.

Adverse impacts on seashore vegetation would result from construction of visitor use facilities, including long-term loss of vegetation where new facilities are located and short-term vegetation disturbances during construction in areas adjoining new facilities. Major construction projects would include: new visitor use facilities to replace those lost or damaged by coastal storms or the effects of climate change/sea level rise, new housing (37 bedrooms) for seasonal staff, miscellaneous repairs to the seashore headquarters complex, repairs to the boat dock at the Assateague Beach U.S. Coast Guard Station, and restoration of electrical service to the coast guard station. Adversely affected areas would generally include vegetation in forest and shrubland habitat and dunes and grassland habitat on the island. Other adverse impacts to vegetation would result from: reduced or lost access for public hunting via the OSV route (if access is lost), resulting in potential for increased deer populations and associated overgrazing;

increased visitor use in day-use areas dispersed throughout the Maryland Island Developed Area where adequate land area remains (as long as there is vehicular access) primarily affecting vegetation in beach and intertidal habitat, dunes and grassland habitat, and forest and shrubland habitat; continued use of oversand vehicles within the existing designated OSV use area, affecting vegetation in beach and intertidal habitat and dunes and grassland habitat; continued dune maintenance to protect visitor facilities and seashore infrastructure in the Maryland Island Developed Area that prevents natural overwash processes and inhibits sand replenishment in the seashore's saltmarsh habitat, dunes and grassland habitat, and beach and intertidal habitat; and routine vegetation trimming or removal to protect visitors and seashore facilities. These impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting vegetation, within the context of the overall quality of vegetation throughout the seashore.

Beneficial impacts would result over the long-term from continuation of existing natural resource management actions, including: restoring natural surface and groundwater flows in saltmarsh habitat by filling remaining mosquito ditches; enhancing hydrologic flows and reducing sedimentation in saltmarsh habitat, forest and shrubland habitat, inland wetland habitat, and dunes and grassland habitat by reducing the aerial coverage of *Phragmites australis* from 5.6 percent to 2 percent; fostering a return to natural conditions in areas where historic land uses and construction of new facilities have damaged or resulted in loss of natural habitats by revegetating with native grasses, shrubs, and trees; and monitoring, tracking, and eradication of invasive plants from all seashore habitats and enhancing understanding of conditions, issues, and trends in the seashore's habitats through monitoring, planned special studies, and cooperative relationships with state and local agencies, academic institutions, and conservation organizations. Long-term benefits would also result from: reducing overgrazing, vegetation trampling, addition of nutrients, and loss of sensitive plant species by reducing the feral horse population to a sustainable population of 80 to 100 individuals; protecting native plants from overgrazing by sika deer and native white-tailed deer by continuing to allow hunting and implementing a hunting monitoring program to support more effective deer management; alleviating sand starvation of beach and intertidal habitat caused by the stabilized Ocean City Inlet; and replenishing sand in back-barrier marshes and overwash fan areas in the north end by restoring natural overwash processes. Collectively, the beneficial impacts would not be significant because, while the management actions would benefit vegetation in habitats that are fundamental to the seashore and would address significant threats to fundamental resources, the impacts would be short-term continuing until access is lost and/or resources are no longer available to sustain natural resource management programs and not readily apparent. Once vehicular access is lost, rehabilitation and restoration of island habitats would slow and possibly be curtailed, with the result that the intensity of the beneficial impacts on vegetation would be greatly diminished.

4.3.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

- **Impact Analysis**

Coastal Response Management Actions. As in alternative 1, under alternatives 2, 3, and 4, facilities lost or damaged by natural coastal processes or the effects of climate change/sea level rise would be replaced or repaired, if funding is available, consistent with the underlying principles of each alternative. While the timing and extent to which facilities would continue to be replaced would vary in alternatives 2, 3, and 4, the nature of the impacts on seashore vegetation associated with replacement would be similar to those described for alternative 1 (section 4.2.2).

Visitor Use and Visitor Experience Management Actions. Until facilities are lost, NPS would generally increase visitor services within the Maryland Island Developed Area. A few new small structures (with parking) would be added to support commercial services within existing previously disturbed visitor use areas. Construction would disturb approximately one to two acres and convert less than one acre to impervious surfaces associated with new buildings, parking, access drives, and walkways. Affected vegetation would likely be composed of a mix of shrubland and landscaped areas adjoining existing seashore facilities. Following construction, disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees.

The former visitor center would be rehabilitated as a stand-alone environmental education center. Minor short-term disturbances to landscaped areas adjoining the existing building would occur. No new impervious surface would be added. Following construction, disturbed areas adjoining the finished structure would be revegetated with native grasses, shrubs, and trees.

Seashore Operations Management Actions. In collaboration with MD DNR, NPS would develop a new seashore entrance station on the mainland, requiring realignment and widening of MD 611, construction of entrance booths, and addition of employee parking spaces. During construction, road widening and addition of facilities would disturb old field vegetation, weedy vegetation, and mowed grass along MD 611. Construction would disturb several acres and convert approximately one to two acres to impervious surfaces. Affected vegetation would likely be composed of a mix of old field, roadside weedy vegetation, and mowed grass. Following construction, disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees.

Development of a mainland-based alternative transportation system (ATS) would require development of a shuttle staging area and associated unpaved parking area (for approximately 360 cars) on the mainland and shelters and paved pull-offs at three shuttle stops on the island. During construction, road widening and addition of facilities would disturb old field vegetation, weedy vegetation, and mowed grass in the MD 611 corridor and shrubland or grassland adjoining seashore roads on the island.

Construction would disturb up to ten acres on the mainland and less than one acre on the island, and convert approximately one acre to impervious surfaces and up to nine acres to pervious paving on the mainland and less than 0.25 acre to impervious surfaces on the island. Following construction, disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees.

Non-structural stabilization of the mainland shoreline near the visitor center would benefit water quality by reducing shoreline erosion and sedimentation of bay waters. Minimal impacts on wetlands would occur where they are present along the shoreline.

4.3.4 ALTERNATIVE 2 – CONCENTRATED TRADITIONAL BEACH RECREATION

- **Impact Analysis**

Coastal Response Management Actions. Artificial dune fortification and beach nourishment would protect the Maryland Island Developed Area from the effects of natural coastal processes and climate change/sea level rise as long as suitable land base exists and funding is available. The seashore would expand partnerships with the USACE to provide additional sand to provide additional sand to mitigate the erosional forces associated with storms and/or sea level rise. This effort, as well as planting of dunes and fencing to trap sand and exclude grazing horses from the dune, could substantially slow the loss of the developed area to natural coastal processes; however, it would also have an adverse impact on vegetation in saltmarsh habitat, dunes and grassland habitat, and beach and intertidal habitat by interfering with sand transport from the beach to island interiors and depriving back-barrier marshes and overwash fans of sand replenishment.

As land and facilities are lost, they would be rebuilt using more sustainable design within the remaining protected developed area, concentrating visitor use and facilities within a smaller area. To the maximum extent, facilities would be temporary, designed to be removed in advance of coastal storms. Facilities to be replaced would be moved back from the shoreline and made more sustainable in form and function, at sites that would continue to be protected by investment in dune maintenance. During construction, vegetation in areas of dune and grassland habitat and forest and shrubland habitat would be disturbed. Following construction much of the disturbed areas would be converted to developed facilities, including impervious surfaces (rooftops and paved roads) and pervious paving (parking areas); disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees. Vegetation losses would be offset to some extent by rehabilitation of previous development sites to foster a return to natural conditions. The location, extent, and type of vegetation losses would depend on when and where seashore facilities and infrastructure would be lost and replaced within the developed area.

Natural Resource Management Actions. Studies would be completed as in alternative 1. However, the ability of NPS to encourage and support cooperative research would likely decline over time as support for natural resource management would likely be re-directed toward activities protecting recreation opportunities. This would adversely impact efforts to address the challenges of climate change/sea level rise and diminishing detection of emerging threats to the seashore's vegetation. Water quality monitoring, saltmarsh monitoring, groundwater monitoring, and invasive species monitoring would be reduced, resulting in an adverse impact on the seashore's vegetation due to less understanding of issues and trends needed to shape effective resource management and to focus collaboration with other public agencies, academic institutions, and non-governmental organizations to address threats.

Natural resource management programs and activities would continue as in alternative 1 although over time their scope would diminish. Filling mosquito ditches in the Maryland portion of the seashore would likely diminish, reducing benefits to the health and function of saltmarsh habitat and with less benefit to vegetation in bay subtidal and mudflat habitats accruing from bay water quality enhancements due to reducing nutrient export from marshes.

Reduced scope of other natural resource management actions – such as *Phragmites australis* removal, other vegetation restoration and protection, and beach and bayside wetlands protection – would reduce current benefits from those actions to vegetation in all seashore habitats.

Reduced access to the north end by implementing a permit system requiring a docking/mooring pass would benefit vegetation in dunes and grassland habitat and beach and intertidal habitat by reducing visitor use impacts to areas where NPS management actions are underway to restore natural overwash processes.

As in alternative 1, hunting management would continue to reduce the size of the sika deer and white-tailed deer population to levels which would contain impacts on plant species native to the seashore's forest and shrubland habitat, and a new hunting monitoring program would better inform management decisions aimed at protecting native plant species. In alternative 2, the benefits of public hunting to vegetation would be reduced because the OSV area would be smaller, making access to the backcountry more difficult for hunters with the result that fewer deer would be taken annually. If access to the OSV area is lost, no action would be taken to restore it; access for public hunting could be significantly reduced or lost and deer populations could increase with potential adverse impacts on vegetation. NPS would explore alternative public hunting strategies to manage deer populations.

Working with Virginia to ensure appropriate wastewater treatment and disposal at privately owned structures (oyster watch houses and hunting blinds) located within the

seashore's Virginia waters would reduce discharge of nutrients, pathogens, and other contaminants into bay waters, resulting in a beneficial impact to aquatic vegetation in bay subtidal and mudflat habitats.

Cultural Resource Management Actions. NPS efforts to identify, manage, and protect cultural resources would continue. When historic structures could no longer be protected from natural coastal processes and the impacts of climate change/sea level rise, they would be demolished and the sites restored to foster a return to natural conditions, resulting in a beneficial impact on vegetation in forest and shrubland habitat and dunes and grassland habitat.

Visitor Use and Visitor Experience Management Actions. Oversand vehicle use would be confined within a smaller designated OSV use area (extending south of the Maryland Island Developed Area to approximately KM 23.4). Confinement within this smaller area would further limit the adverse impact of OSVs on vegetation in dunes and grassland habitat and beach and intertidal habitat by reducing the area subject to compaction, sand displacement, reduced growth of protective foredunes, and erosion typically associated with OSV use. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to vegetation because vehicles would be eliminated from part or all of the OSV use area.

Seashore Operations Management Actions. Seashore operations would be based in a rehabilitated headquarters complex in the Maryland Mainland Developed Area. During construction, the area of disturbance would be largely confined to the footprint of existing buildings and parking areas. Some disturbance of adjoining landscaped areas and mowed grass could occur. Following construction, disturbed areas adjoining rehabilitated structures would be revegetated with native grasses, shrubs, and trees.

Approximately 10 acres would be acquired near the existing seashore headquarters complex to develop a shuttle staging area and associated visitor unpaved parking area (for approximately 360 cars). Construction of this facility is common to alternatives 2, 3, and 4, although where the action would occur would vary slightly. Impacts on vegetation are summarized above in section 4.3.3.

Electricity and potable water would be extended to approximately 90 existing campsites. During construction, trenching for underground installation of lines would disturb existing vegetation composed of a mix of grasses and shrubby vegetation in previously disturbed areas along the edges of existing seashore roads. Following construction, disturbed areas would be revegetated with native grasses.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on vegetation would be the same as those identified for alternative 1.

Alternative 2 in conjunction with these actions would result in a cumulative adverse impact and a cumulative beneficial impact on vegetation.

The overall cumulative impacts on vegetation would be primarily beneficial because of improvements to the overall condition of water resources because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce pollutant loads from point and non-point sources throughout the coastal bay watersheds, and because of national programs to enhance air quality which help to reduce ozone and atmospheric deposition of nitrogen. Alternative 2 would add a noticeable increment to the overall beneficial cumulative impact through continuation of natural resource management actions that restore island habitats altered by historic land use and mosquito ditching, remove invasive *Phragmites australis*, manage horses to reduce impacts to vegetation, and continue to reduce deer populations through managed hunting. There would also be adverse cumulative impacts on vegetation associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas, as well as with continued air quality impacts. Alternative 2 would add a noticeable adverse increment to the overall adverse cumulative impact due to vegetation disturbance and clearing for new seashore facilities.

- **Conclusions**

In alternative 2 management actions would have both adverse and beneficial impacts on vegetation and would add a noticeable adverse increment and a noticeable beneficial increment to the total cumulative adverse and beneficial impacts on vegetation, respectively.

Adverse impacts on seashore vegetation would result from construction of visitor use facilities, including long-term loss of vegetation where new facilities are located and short-term vegetation disturbances during construction in areas adjoining new facilities. Major construction projects would include: new visitor use facilities to replace those lost or damaged by coastal storms or the effects of climate change/sea level rise, new housing for seasonal staff, a new seashore entrance station on the mainland, facilities to support a mainland-based alternative transportation system, a few small structures to support increased visitor services in the island developed area, rehabilitation of the seashore headquarters complex, and extension of electricity and potable water to approximately 90 existing campsites. Adversely affected areas would generally include vegetation in forest and shrubland habitat and dunes and grassland habitat on the island and old field, mowed grass, and landscaped areas around existing seashore buildings on the mainland. Other adverse impacts to vegetation would result from: reduced or lost access for public hunting via the OSV route, resulting in potential increased deer populations and associated overgrazing; increased visitor use in day-use areas within a shrinking protected Maryland Island Developed Area (as long as there is vehicular access), affecting beach and intertidal habitat, dunes and grassland habitat,

and forest and shrubland habitat; continued use of oversand vehicles within a smaller designated OSV use area, affecting vegetation in beach and intertidal habitat and dunes and grassland habitat; enhanced dune maintenance to protect visitor facilities and seashore infrastructure in the Maryland Island Developed Area that would further prevent natural overwash processes and inhibit sand replenishment in the seashore's saltmarsh habitat, dunes and grassland habitat, and beach and intertidal habitat; and routine vegetation trimming or removal to protect visitors and seashore facilities; and continued dune maintenance at the Assateague Beach U.S. Coast Guard Station that prevents natural overwash processes that benefit vegetation in seashore habitats. Over time, the scope of natural resource management programs and activities would diminish. Some of these impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting vegetation, within the context of the overall quality of vegetation throughout the seashore. However, the adverse impacts on vegetation associated with intensification of development within the Maryland Island Development Area and its fortification to withstand the impacts of coastal storms and the effects of climate change/sea level rise would be significant; extensive areas of dunes and grassland habitat and forest and shrubland habitat that are fundamental to the seashore would be lost, and extensive areas of beach and intertidal habitat, dunes and grassland habitat, and saltmarsh habitat that are also fundamental to the seashore would be seriously threatened by sand starvation caused by enhanced fortification that would curtail natural overwash processes.

Beneficial impacts would result over the short-term from continuation of existing natural resource management actions, including: restoring natural surface and groundwater flows in saltmarsh habitat by filling remaining mosquito ditches; enhancing hydrologic flows and reducing sedimentation in saltmarsh habitat, forest and shrubland habitat, inland wetland habitat, and dunes and grassland habitat by reducing the aerial coverage of *Phragmites australis*; fostering a return to natural conditions in areas where historic land uses and construction of new facilities have damaged or resulted in loss of natural habitats by revegetating with native grasses, shrubs, and trees; monitoring, tracking, and eradication of invasive plants from all seashore habitats; enhancing understanding of conditions, issues, and trends in the seashore's habitats through monitoring, planned special studies, and cooperative relationships with state and local agencies, academic institutions, and conservation organizations. Long-term benefits would also result from reducing overgrazing, vegetation trampling, addition of nutrients, and loss of sensitive plant species by reducing the feral horse population to a sustainable population of 80 to 100 individuals; protecting native plants from overgrazing by sika deer and native white-tailed deer by continuing to allow hunting and implementing a hunting monitoring program to support more effective deer management; limiting use of the north end beach; alleviating sand starvation of beach and intertidal habitat caused by the stabilized Ocean City Inlet; and replenishing sand in back-barrier marshes and overwash fan areas in the north end by restoring natural

overwash processes. Collectively, the beneficial impacts would not be significant because, while the management actions would benefit vegetation in habitats that are fundamental to the seashore and would address significant threats to fundamental resources, the impacts would be short-term (continuing until access is lost and/or resources are no longer available to sustain natural resource management programs) and probably not readily apparent, depending upon when existing natural resource management programs are diminished or curtailed. Once vehicular access is lost, rehabilitation and restoration of island habitats would slow and possibly be curtailed, with the result that the intensity of the beneficial impacts on vegetation would be greatly diminished.

4.3.5 ALTERNATIVE 3 – SUSTAINABLE RECREATION AND CLIMATE CHANGE ADAPTATION (NPS PREFERRED ALTERNATIVE)

- **Impact Analysis**

Coastal Response Management Actions. Seashore management would allow the island to evolve naturally, relocating and designing new facilities to be more sustainable. The seashore would no longer work with the USACE to provide additional sand to provide additional sand to mitigate the erosional forces associated with storms and/or sea level rise. No new investments would be made in dune fortification through planting and fencing installation. Over time, natural overwash would resume throughout the developed area. This would benefit vegetation in beach and intertidal habitat, dunes and grassland habitat, and saltmarsh habitat by restoring sand transport from the beach to the island interiors, creating overwash fans and replenishing sand in back-barrier marshes.

Visitor use infrastructure would evolve to more sustainable designs and likely shift to new, more stable locations initially on the island; over time development on the island would become less intensive, with fewer facilities and less impervious surfaces as visitor use facilities are slowly moved to the mainland. To the maximum extent, facilities would be temporary, designed to be removed in advance of coastal storms. Facilities lost or damaged by natural coastal processes or the effects of climate change/sea level rise would be replaced or repaired, if funding is available, at sites further from the shoreline at sites that do not require continued investment in dune maintenance where they can be made more sustainable in form and function. Previous development sites would be rehabilitated to foster a return to natural conditions. During construction, vegetation in dunes grassland habitat and forest and shrubland habitat would be disturbed. Following construction much of the disturbed areas would be converted to more primitive less extensive developed facilities with less impervious surfaces (rooftops and paved roads) and pervious paving (parking areas) when compared to the facilities being replaced. Disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees. Vegetation losses would be largely offset by rehabilitation of previous development sites to foster a return to natural

conditions. The location, extent, and type of vegetation losses would depend on when and where seashore facilities and infrastructure would be lost and replaced.

If bridge access is lost, access would transition to all water access. Beneficial impacts to vegetation in dunes and grassland habitat and forest and shrubland habitat would result from removal of 150 campsites, other visitor facilities, paved roads, and the NPS maintenance yard and subsequent management to foster a return to natural condition.

Natural Resource Management Actions. Studies would be completed as in alternative 1. Existing and new planned monitoring programs and research would benefit vegetation in all seashore habitats. Cooperative research would expand, accelerating growth in the understanding of seashore resources and ecological processes. Data from an expanded monitoring network, as well as new ecological research, would provide a significant increase in information needed to understand better vegetation conditions, trends, and threats.

Natural resource management programs and activities would continue as in alternative 1 although over time programs would expand to address issues created by global climate change. In alternative 3, actions would generally seek to enhance resiliency of saltmarshes and inland wetlands resulting in a beneficial impact on vegetation.

Reduced access to the north end by implementing a permit system requiring a docking/mooring pass would benefit vegetation in dunes and grassland habitat and beach and intertidal habitat by reducing visitor use impacts to areas where NPS management actions are underway to restore natural overwash processes.

As in alternative 1, hunting management would continue to reduce the size of the sika deer and white-tailed deer population to levels which would contain impacts on plant species native to the seashore's forest and shrubland habitat, and a new hunting monitoring program would better inform management decisions aimed at protecting native plant species. In alternative 3, if access to the OSV area is lost, consideration would be given to modifying the OSV route or relocating it to another more suitable location, thereby maintaining public access for hunting and its beneficial impacts to vegetation by reducing deer populations. Over time, however, it is possible that access for public hunting could be significantly reduced or lost and deer populations could increase with potential adverse impacts on vegetation.

NPS would explore alternative public hunting strategies to manage deer populations.

Working with Virginia, NPS would assess the legal status of privately owned structures (oyster watch houses and hunting blinds) located within the seashore's Virginia waters and pursue removal of those found to be unauthorized. For authorized structures, NPS would work with Virginia to ensure appropriate wastewater treatment. Collectively,

these actions would reduce discharge of nutrients, pathogens, and other contaminants into bay waters resulting in a beneficial impact on aquatic vegetation in bay subtidal and mudflat habitats.

Working with Worcester County, Accomack County, and conservation organizations, NPS would support efforts to protect land (through fee simple purchase or conveyance of conservation easements) within the watersheds of Chincoteague Bay and Newport Bay for conservation and climate change adaptation purposes. Conservation of these lands would benefit vegetation in a variety of mainland habitats by protecting them from future loss to developed land uses.

NPS would collaborate with its conservation partners to acquire approximately 150 to 200 acres of buffer lands adjoining the one to three new points of departure on the Chincoteague Bay mainland in Worcester County. Land conservation would permanently protect these lands from loss to developed land uses; long-term management would facilitate return to natural conditions, as appropriate, with beneficial impacts to vegetation in a variety of mainland habitats, particularly saltmarsh habitat along the bayshore.

Cultural Resource Management Actions. Implementation of non-structural storm protection measures (such as dune nourishment and planting) to protect the Assateague Beach U.S. Coast Guard Station would continue to prevent natural processes of sand overwash in the station vicinity. This would continue to impact adversely vegetation in dunes and grassland habitat and beach and intertidal habitat by inhibiting sand replenishment.

Visitor Use and Visitor Experience Management Actions. Once camping facilities are no longer sustainable in the Maryland Island Developed Area or when vehicular access to the island is lost, NPS would collaborate with MD DNR to develop a new campground on the mainland. Facilities would be replaced on an approximate 175-acre site in the MD 611 corridor near the existing seashore headquarters complex. Campground development would entail minimal clearing and grading of the site, paved road construction, utility installations, development of 150 campsites (including approximately 40 sites with paved pads/pull-throughs), and construction of comfort facilities and shower buildings, an amphitheater, sewage dump station, and an entrance station with parking). Construction would disturb a portion of the campground site, depending upon the final program and site design, likely adversely impacting vegetation in a mix of old field habitat and forest habitat. Site selection and design would seek to avoid impacts to wetlands. Some of the disturbed area would be converted to developed campground uses. Disturbed areas not needed for facilities would be revegetated with native grasses, shrubs, and trees to foster a return to natural conditions.

As in alternative 1, confinement of oversand vehicle use within the existing designated OSV use area would continue to limit the adverse impact of OSVs on vegetation in dunes and grassland habitat and beach and intertidal habitat by controlling the area subject to compaction, sand displacement, reduced growth of protective foredunes, and erosion typically associated with OSV use. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to vegetation because vehicles would be eliminated from part or all of the OSV use area.

Expanded use of Egging Island for environmental education would increase visitor use to the island. New facilities would include an expanded soft landing for canoes and kayaks, clearing for a primitive group campsite, and installation of relocatable vault toilets. Minor areas would be cleared at the campsite and soft landing site, adversely impacting vegetation in bay subtidal and mudflat habitat and/or saltmarsh habitat at the island shore and forest and shrubland habitat and/or dune and grassland habitat at the campsite. Long-term use of the site by large groups arriving in non-motorized boats would increase disturbances to the bay bottom at the soft landing and would increase trampling of island vegetation in the campsite vicinity resulting in potential loss of vegetation.

Three new bayside access points would be developed to provide water access to existing backcountry campsites and trails, one of which would provide opportunities for access via motorized vessels. Minor areas would be cleared at each access site, adversely impacting aquatic vegetation in bay subtidal and mudflat habitat and/or saltmarsh habitat on the bayshore. Long-term use of the site by large groups arriving in non-motorized boats would increase disturbances to the bay bottom at the soft landing and would increase trampling of island vegetation in the campsite vicinity resulting in potential loss of vegetation.

On the mainland in Worcester County NPS would seek to acquire from the county two existing points of departure from Chincoteague Bay; the sites would be rehabilitated, as needed, likely including development of a shade shelter and relocatable vault toilet. Rehabilitation could involve disturbance of minor areas at the access points that were previously disturbed when the facility was originally developed. Increased visitor use at the access points, particularly motorized boat access, would increase disturbances to the bay bottom and would increase trampling of vegetation along the mainland shore where boats are launched.

Seashore Operations Management Actions. Seashore operations would be relocated to a new headquarters complex in the MD 611 corridor near the seashore entrance. Development would entail clearing and grading of the site and construction of administrative offices, a maintenance complex, paved parking, and paved/unpaved outdoor maintenance storage areas. Construction would disturb up to five acres of old

field and/or upland forest, and convert approximately four acres to impervious surfaces. Following construction, disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees.

Approximately 10 acres at the existing seashore headquarters site would be rehabilitated as a shuttle staging area and associated visitor unpaved parking area (for approximately 360 cars). Construction of this facility is common to alternatives 2, 3, and 4, although where the action would occur would vary slightly. Impacts on seashore vegetation are summarized above in section 4.3.3. This facility would remain in use as long as vehicular access to the island is possible; when vehicular access to the island is lost, it would be removed and the site rehabilitated to foster a return to natural conditions.

When vehicular access to the island is no longer possible, access to the island would shift to a ferry based operation for visitor access and seashore operations at waterfront locations on the mainland and on the island. New mainland facilities near the existing seashore headquarters complex would include a passenger ferry terminal, docking facilities to support seashore operations, administrative offices, maintenance storage facility, paved access roads, unpaved parking area (for up to 700 cars), and unpaved NPS equipment storage yard; new island facilities would include an island terminal facility, docking facilities to support seashore operations, an island shuttle system with shelters and benches. Development would entail clearing and grading of sites on the mainland and the island. On the mainland, construction would disturb vegetation on up to ten acres in old field and/or upland forest habitats. On the island, construction would disturb up to two acres, likely composed of a mix of vegetation in previously developed land, dunes and grassland habitat, and forest and shrubland habitat. Along the shore on the mainland and the island, construction of docking facilities would disturb vegetation in saltmarsh habitat and/or bay subtidal and mudflat habitat. Following construction, disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees, as appropriate.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on vegetation would be the same as those identified for alternative 1.

The overall cumulative impacts on vegetation would be primarily beneficial because of improvements to the overall condition of water resources because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce pollutant loads from point and non-point sources throughout the coastal bay watersheds, and because of national programs to enhance air quality which help to reduce ozone and atmospheric deposition of nitrogen. Alternative 3 would add an appreciable increment to the overall beneficial cumulative impact through expansion of natural resource management actions that restore island habitats altered by historic

land use and mosquito ditching, remove invasive *Phragmites australis*, manage horses to reduce impacts to vegetation, continue to reduce deer populations through managed hunting, and – once access is lost – removal of visitor facilities and reduced visitation. There would also be adverse cumulative impacts on vegetation associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas, as well as with continued air quality impacts. Alternative 3 would add a noticeable adverse increment to the overall adverse cumulative impact due to vegetation disturbance and clearing for new seashore facilities.

- **Conclusions**

In alternative 3 management actions would have both adverse and beneficial impacts on vegetation and would add a noticeable adverse increment and an appreciable beneficial increment to the total cumulative adverse and beneficial impacts on vegetation, respectively.

Adverse impacts on seashore vegetation would result from construction of visitor use facilities, including long-term loss of vegetation where new facilities are located and short-term vegetation disturbances during construction in areas adjoining new facilities. Major construction projects would include: new visitor use facilities to replace those lost or damaged by coastal storms or the effects of climate change/sea level rise, new housing for seasonal staff, a new seashore entrance station on the mainland, facilities to support a mainland-based alternative transportation system, a few small structures to support increased visitor services in the island developed area, construction of a new seashore headquarters complex, repairs to the boat dock at the Assateague Beach U.S. Coast Guard Station, restoration of electrical service to the coast guard station, development of docking facilities on the mainland and the island to support water-based visitor access and seashore operations, and construction of a new campground on the mainland with approximately 150 campsites. Adversely affected areas would generally include vegetation in forest and shrubland habitat and dunes and grassland habitat on the island and old field, mowed grass, landscaped areas around existing seashore buildings, and upland forest on the mainland. Other adverse impacts to vegetation would result from: increased visitor use in day-use areas dispersed throughout the Maryland Island Developed Area (as long as there is vehicular access) at existing sites where adequate land area remains or at more sustainable sites, primarily affecting vegetation in beach and intertidal habitat, dunes and grassland habitat, and forest and shrubland habitat; continued use of oversand vehicles within the existing designated OSV use area, affecting vegetation in beach and intertidal habitat and dunes and grassland habitat; continued dune maintenance at the Assateague Beach U.S. Coast Guard Station that prevents natural overwash processes that benefit vegetation in seashore habitats; and routine vegetation trimming or removal to protect visitors and seashore facilities. These impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with

NPS management policies protecting vegetation, within the context of the overall quality of vegetation throughout the seashore.

Beneficial impacts would result over the long-term from continuation and expansion of existing natural resource management actions, including: restoring natural surface and groundwater flows in saltmarsh habitat by filling remaining mosquito ditches; enhancing hydrologic flows and reducing sedimentation in saltmarsh habitat, forest and shrubland habitat, inland wetland habitat, and dunes and grassland habitat by reducing the aerial coverage of *Phragmites australis* from 5.6 percent to 2 percent; fostering a return to natural conditions in areas where historic land uses and construction of new facilities have damaged or resulted in loss of natural habitats by revegetating with native grasses, shrubs, and trees; monitoring, tracking, and eradication of invasive plants from all seashore habitats; enhancing understanding of conditions, issues, and trends in the seashore's habitats through expanded monitoring, additional special studies, and expanded cooperative relationships with state and local agencies, academic institutions, and conservation organizations. Long-term benefits would also result from reducing overgrazing, vegetation trampling, addition of nutrients, and loss of sensitive plant species by reducing the feral horse population to a sustainable population of 80 to 100 individuals; protecting native plants from overgrazing by sika deer and native white-tailed deer by continuing to allow hunting and implementing a hunting monitoring program to support more effective deer management; reducing visitor use impacts on vegetation in the north end by reducing visitor access by water; alleviating sand starvation of beach and intertidal habitat caused by the stabilized Ocean City Inlet; replenishing sand in back-barrier marshes and overwash fan areas in the north end by restoring natural overwash processes; collaboration with the states to ensure adequate wastewater treatment at oyster watch houses and hunting blinds; supporting conservation partners to establish conservation easements on the mainland within the watersheds of Chincoteague Bay and Newport Bay; collaboration to acquire and protect 150 to 200 acres of buffer lands adjoining one to three new points of departure on the mainland in Worcester County; and, once vehicular access is lost, removal of visitor use facilities from the island and rehabilitation of sites to foster a return to natural conditions. Collectively, the beneficial impacts would be significant because they would benefit vegetation in habitats that are fundamental to the seashore, would address significant threats to fundamental resources, would be long term in duration, and would be readily apparent. Once vehicular access is lost, rehabilitation and restoration of island habitats would continue at a slower rate due to the complexities of water access operations, although impacts on vegetation would continue to be readily apparent and significant.

4.3.6 ALTERNATIVE 4 – NATURAL ISLAND EVOLUTION AND A PRIMITIVE ISLAND EXPERIENCE

- **Impact Analysis**

Coastal Response Management Actions. Seashore management would allow the island to evolve naturally, maintaining facilities only until they are lost, severely damaged, or become obsolete. As in alternative 3, the seashore would no longer work with the USACE to provide additional sand to mitigate the erosional forces associated with storms and/or sea level rise. No new investments would be made in dune fortification through planting and fencing installation. Over time, natural overwash would resume throughout the developed area. This would benefit vegetation in beach and intertidal habitat, dunes and grassland habitat, and saltmarsh habitat by restoring sand transport from the beach to the island interiors, creating overwash fans and replenishing sand in back-barrier marshes.

Development on the island would become less intensive, with fewer facilities and less impervious surfaces as visitor use facilities are removed. Previous development sites would be rehabilitated to foster a return to natural conditions. Replacement of facilities lost or damaged would be limited to new primitive campsites. During construction, vegetation in areas of dune and grassland habitat and forest and shrubland habitat would be disturbed. Following construction, much of the disturbed areas would be converted to more primitive less extensive developed facilities with very little impervious surfaces; disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees. Vegetation losses would be largely offset by rehabilitation of previous development sites to foster a return to natural conditions. The location, extent, and type of vegetation losses would depend on when and where seashore facilities and infrastructure would be lost and replaced.

As in alternative 3, if bridge access is lost, access would transition to all water access. Beneficial impacts to vegetation in dunes and grassland habitat and forest and shrubland habitat would result from removal of 150 campsites, other visitor facilities, paved roads, and the NPS maintenance yard and subsequent management to foster a return to natural condition.

Natural Resource Management Actions. Natural resource management programs and activities would continue as in alternative 1 although over time programs would expand to address mitigation of human impacts and climate change adaptation. In alternative 4, monitoring key climate drivers and resource conditions would increase. Collectively these expanded programs would support actions to enhance resiliency of vulnerable resources resulting in a beneficial impact on the seashore's vegetation.

Visitor use impacts on vegetation resources in the north end would be largely eliminated by prohibiting boat-in visitor use. This would have a beneficial impact on

vegetation because few visitors would make the trip to the north end via non-motorized boats or hiking, thereby reducing the potential for vegetation disturbance.

Expanded cooperative research would include more basic science and barrier island ecology research. New ecological research, would provide additional information needed to better understand habitat conditions, trends, and pollutant sources, and would help focus collaboration with other public agencies, academic institutions, and non-governmental organizations.

As in alternative 1, hunting management would continue to reduce the size of the sika deer and white-tailed deer population to levels which would contain impacts on plant species native to the seashore's forest and shrubland habitat, and a new hunting monitoring program would better inform management decisions aimed at protecting native plant species. In alternative 4, if access to the OSV area is lost, no action would be taken to restore it; access for public hunting could be significantly reduced or lost and deer populations could increase with potential adverse impacts on vegetation. NPS would explore alternative public hunting strategies to manage deer populations.

As in alternative 3, working with Virginia, NPS would assess the legal status of privately owned structures (oyster watch houses and hunting blinds) located within the seashore's Virginia waters and pursue removal of those found to be unauthorized. For authorized structures, NPS would work with Virginia to ensure appropriate wastewater treatment. Collectively, these actions would reduce discharge of nutrients, pathogens, and other contaminants into bay waters resulting in a beneficial impact on aquatic vegetation in bay subtidal and mudflat habitats.

As in alternative 3, working with Worcester County, Accomack County, and conservation organizations, NPS would support efforts to protect land (through fee simple purchase or conveyance of conservation easements) within the watersheds of Chincoteague Bay and Newport Bay for conservation and climate change adaptation purposes. Conservation of these lands would benefit vegetation in a variety of mainland habitats by protecting them from future loss to developed land uses.

Cultural Resource Management Actions. As in alternative 3, implementation of non-structural storm protection measures (such as dune nourishment and planting) to protect the Assateague Beach U.S. Coast Guard Station would continue to prevent natural processes of sand overwash in the station vicinity. This would continue to impact adversely vegetation in dunes and grassland habitat and beach and intertidal habitat by inhibiting sand replenishment.

Visitor Use and Visitor Experience Management Actions. New facility development would include development of up to 150 primitive campsites, replacing developed campsites lost to natural coastal processes and the impacts of climate change/sea level

rise. Related actions and measures to mitigate impacts on vegetation are summarized above under coastal resource management actions for alternative 4.

As in alternative 1, confinement of oversand vehicle use within the existing designated OSV use area would continue to limit the adverse impact of OSVs on vegetation in dunes and grassland habitat and beach and intertidal habitat by controlling the area subject to compaction, sand displacement, reduced growth of protective foredunes, and erosion typically associated with OSV use. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to vegetation because vehicles would be eliminated from part or all of the OSV use area.

Seashore Operations Management Actions. As in alternative 3, seashore operations would be based in a new headquarters complex to be developed on the mainland in the MD 611 corridor near the seashore entrance on a non-forested upland site. Proposed actions and related impacts on vegetation in old field habitat and upland forest habitat on the mainland would be the same as those described for alternative 3 (section 4.3.5).

Approximately 10 acres at the existing seashore headquarters site would be rehabilitated as a shuttle staging area and associated visitor unpaved parking area (for approximately 360 cars). Construction of this facility is common to alternatives 2, 3, and 4, although where the action would occur would vary slightly. Impacts on seashore vegetation are summarized above in section 4.3.3. As in alternative 3, this facility would remain in use as long as vehicular access to the island is possible; when vehicular access to the island is lost, it would be removed and the site rehabilitated to foster a return to natural conditions.

As in alternative 3, when vehicular access to the island is no longer possible, access to the island would shift to a ferry based operation for visitor access and seashore operations at waterfront locations on the mainland and on the island. Proposed actions and related impacts on the seashore's vegetation would be the same as those described for alternative 3 (section 4.3.5).

The existing maintenance yard in the Maryland Island Developed Area would be removed and the site rehabilitated to foster a return to natural conditions.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on vegetation would be the same as those identified for alternative 1.

The overall cumulative impacts on vegetation would be primarily beneficial because of improvements to the overall condition of water resources because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce

pollutant loads from point and non-point sources throughout the coastal bay watersheds, and because of national programs to enhance air quality which help to reduce ozone and atmospheric deposition of nitrogen. Alternative 4 would add an appreciable increment to the overall beneficial cumulative impact through expansion of natural resource management actions that restore island habitats altered by historic land use and mosquito ditching, remove invasive *Phragmites australis*, manage horses to reduce impacts to vegetation, continue to reduce deer populations through managed hunting and – once access is lost – removal of visitor facilities and reduced visitation. There would also be adverse cumulative impacts on vegetation associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas, as well as with continued air quality impacts. Alternative 4 would add a noticeable adverse increment to the overall adverse cumulative impact due to vegetation disturbance and clearing for new seashore facilities.

- **Conclusions**

In alternative 4 management actions would have both adverse and beneficial impacts on vegetation and would add a noticeable adverse increment and an appreciable beneficial increment to the total cumulative adverse and beneficial impacts on vegetation, respectively.

Adverse impacts on seashore vegetation would result from construction of visitor use facilities, including long-term loss of vegetation where new facilities are located and short-term vegetation disturbances during construction in areas adjoining new facilities. Major construction projects would include: 150 primitive campsites on the island (to replace existing developed campgrounds once they are lost or severely damaged), a new seashore entrance station on the mainland, facilities to support a mainland-based alternative transportation system, a few small structures to support increased visitor services in the island developed area (until developed facilities are lost), construction of a new seashore headquarters complex, repairs to the boat dock at the Assateague Beach U.S. Coast Guard Station, restoration of electrical service to the coast guard station, and development of docking facilities on the mainland and the island to support water-based visitor access and seashore operations. Adversely affected areas would generally include vegetation in forest and shrubland habitat and dunes and grassland habitat on the island and old field, mowed grass, landscaped areas around existing seashore buildings, and upland forest on the mainland. Other adverse impacts to vegetation would result from: reduced or lost access for public hunting via the OSV route (if access is lost), resulting in potential for increased deer populations and associated overgrazing; increased visitor use in day-use areas dispersed throughout the Maryland Island Developed Area (as long as there is vehicular access) at existing sites where adequate land area remains or at more sustainable sites, primarily affecting vegetation in beach and intertidal habitat, dunes and grassland habitat, and forest and shrubland habitat; continued use of oversand vehicles within the existing designated

OSV use area, affecting vegetation in beach and intertidal habitat and dunes and grassland habitat; continued dune maintenance at the Assateague Beach U.S. Coast Guard Station that prevents natural overwash processes that benefit vegetation in seashore habitats; and routine vegetation trimming or removal to protect visitors and seashore facilities. These impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting vegetation, within the context of the overall quality of vegetation throughout the seashore.

Beneficial impacts would result over the long-term from continuation and expansion of existing natural resource management actions, including: restoring natural surface and groundwater flows in saltmarsh habitat by filling remaining mosquito ditches; enhancing hydrologic flows and reducing sedimentation in saltmarsh habitat, forest and shrubland habitat, inland wetland habitat, and dunes and grassland habitat by reducing the aerial coverage of *Phragmites australis* from 5.6 percent to 2 percent; fostering a return to natural conditions in areas where historic land uses and construction of new facilities have damaged or resulted in loss of native vegetation with native grasses, shrubs, and trees; monitoring, tracking, and eradication of invasive plants from all seashore habitats; and enhancing understanding of conditions, issues, and trends in the seashore's habitats through expanded monitoring, additional special studies, and expanded cooperative relationships with state and local agencies, academic institutions, and conservation organizations. Long-term benefits would also result from reducing overgrazing, vegetation trampling, addition of nutrients, and loss of sensitive plant species by reducing the feral horse population to a sustainable population of 80 to 100 individuals; protecting native plants from overgrazing by sika deer and native white-tailed deer by continuing to allow hunting and implementing a hunting monitoring program to support more effective deer management; reducing visitor use impacts on vegetation in the north end by reducing visitor access by water; alleviating sand starvation of beach and intertidal habitat caused by the stabilized Ocean City Inlet; replenishing sand in back-barrier marshes and overwash fan areas in the north end by restoring natural overwash processes; collaboration with the states to ensure adequate wastewater treatment at oyster watch houses and hunting blinds; supporting conservation partners to establish conservation easements on the mainland within the watersheds of Chincoteague Bay and Newport Bay; and, as facilities are lost or severely damaged, removal of visitor use facilities from the island and rehabilitation of sites to foster a return to natural conditions. Collectively, the beneficial impacts would be significant because they would benefit vegetation in habitats that are fundamental to the seashore, would address significant threats to fundamental resources, would be long term in duration, and would be readily apparent. Once vehicular access is lost, rehabilitation and restoration of island habitats would continue at a slower rate due to the complexities of water access operations, although impacts on vegetation would continue to be readily apparent and significant.

4.4 Wildlife

4.4.1 METHODOLOGY FOR ANALYZING IMPACTS

Management actions are qualitatively analyzed with respect to their potential to benefit or adversely impact wildlife within the seashore's key habitats, including bayside subtidal and mudflats, saltmarsh, inland wetlands, forest and shrubland, beach and intertidal, and Atlantic subtidal. Analysis also addresses potential impacts to wildlife on the mainland within and adjoining the seashore. Responses to natural coastal processes and the effects of climate change/sea level rise are analyzed to identify potential impacts to wildlife. Actions are identified and analyzed that have the potential to disturb wildlife because of new development, changes in seashore operations, or increased visitor use. Actions are also identified that have the potential to benefit wildlife through research and special studies or through resource management actions aimed at rehabilitating seashore habitats that have been affected by historic land uses and invasive species. For this analysis, it is assumed that during final design for specific projects, best management practices (BMPs) would be used to avoid or minimize wildlife disturbances and that all areas experiencing short-term disturbance would be revegetated with native species.

The resource specific context for assessing impacts of the alternatives on wildlife within the seashore's habitats includes:

- Barrier island habitats including beaches, intertidal areas, dunes, grass and shrublands, freshwater wetlands, maritime forests, and saltmarshes provide habitat for a multitude of specialized plant and animal species – such as abundant and diverse populations of migratory birds – that are fundamental to the seashore's purpose and significance.
- Aquatic habitats including sea grass beds, saltmarshes, sandy shallows, and intertidal flats provide habitat for a multitude of marine life, ranging from small sedentary plants and invertebrates to large ocean-going marine mammals that are fundamental to the seashore's purpose and significance.
- A recent assessment of the seashore's habitats concluded that saltmarsh, and forest and shrubland habitats are in degraded condition; inland wetlands, and dunes and grassland habitats are in fair condition; bay subtidal and mudflats, and beach and intertidal habitats are in good condition; and Atlantic subtidal habitat is in very good condition (NPS 2011d).
- Management actions at the seashore over the past eighty years have changed the naturally dynamic geomorphological processes of Assateague Island, resulting in long-term impediments to natural island overwash processes with ensuing impacts to the seashore's habitats (NPS 2011d).
- Development of 158,386 feet of marsh mosquito ditches at the seashore have severely altered marsh hydrology, disrupting natural flow of tidal water into

and out of the seashore's marshes and degrading estuarine water quality by increasing nutrient export from marshes (NPS 2011d).

- *Pragmites australis* has invaded many of the seashore's freshwater shrub wetlands (representing >40% cover on 5.6% of the total area of the seashore (NPS 2011d)), adversely impacting sediment levels and hydrologic flows.
- Significant impacts to the seashore's geomorphology and wildlife habitats include the hard stabilization of the Ocean City Inlet, the construction of an artificial protective dune along much of the island in 1962 following a major coastal storm, and the creation of an emergency storm berm at the north end of the island in 1998 after two storms threatened to breach the island (NPS 2011d). To mitigate the impacts, NPS and the USACE have been engaged in a long-term mechanical sand bypass project to alleviate sand starvation of the island from the stabilized inlet, thereby preventing unnatural, accelerated erosion and roll over.
- Introduced horses and sika deer are non-native species that are stressors to seashore vegetation and wildlife when populations are extreme (NPS 2011d); despite this, sustainable populations of horses and sika deer are desired conditions because visitors highly value the animals as part of the seashore experience. Furthermore, horses are considered resources that are important to the seashore.

4.4.2 ALTERNATIVE 1 – CONTINUATION OF CURRENT MANAGEMENT

- **Impact Analysis**

Coastal Response Management Actions. Dune maintenance to protect visitor facilities and seashore infrastructure in the Maryland Island Developed Area would continue to prevent the natural processes of sand overwash. This would continue to impact adversely wildlife inhabiting the beach, intertidal area, dunes, grasslands, and saltmarshes in the developed area by interfering with sand transport from the beach to island interiors and depriving back-barrier marshes and overwash fans of sand replenishment needed to sustain habitats.

Facilities lost or damaged by natural coastal processes or the effects of climate change/sea level rise would be replaced or repaired, if funding is available. Facilities to be replaced would be moved back from the shoreline and made more sustainable in form and function, at sites that would continue to be protected by investment in dune maintenance. Overall wildlife would be adversely impacted. Over time much of the developed area on the island would become much more intensely developed with more impervious surfaces (rooftops and paved roads) and pervious paving (parking areas) when compared to the current condition. Previous development sites, where land area continues to exist, would be rehabilitated to foster a return to natural conditions and disturbed areas adjoining finished structures would be revegetated with native grasses,

shrubs, and trees; these actions would minimally offset habitat losses associated with development of new facilities by creating habitat of value to some species.

Altered sand transport processes at Ocean City Inlet would continue to be mitigated in collaboration with the USACE. This would benefit species inhabiting beach and intertidal habitats by alleviating sand starvation of the island (from the stabilized inlet) and indirectly helping to create overwash fans and replenish back-barrier marshes. Overwash areas are a dynamic habitat that supports shorebirds and rare island fauna, including suitable habitat conditions for the threatened piping plover (*Charadrius melodus*).

Natural Resource Management Actions. Existing and new planned monitoring programs and research would generally benefit seashore wildlife. Water quality monitoring programs and research would benefit aquatic invertebrates, finfish, marine mammals, and diverse migratory birds that inhabit the seashore's bay subtidal and mudflat habitats by enhancing understanding of water quality conditions, trends, and pollutant sources, helping to focus future research and monitoring to address water quality threats within the watershed, and providing the basis for defining and implementing measures to adapt to change and reduce the adverse effects of sea level rise. Wildlife inhabiting bay subtidal areas would also benefit from continued annual monitoring of seagrass and submerged aquatic vegetation (SAV); these actions would assist with understanding the processes to maintain the seashore's seagrass beds. Continued saltmarsh monitoring would provide information on relative saltmarsh elevation needed to interpret changes in saltmarsh vegetation and would contribute to worldwide efforts to monitor sea level rise with by measuring the amount of erosion and accretion on saltmarsh surfaces; together with continued monitoring of marsh birds and saltmarsh nekton, this would benefit saltmarshes and the wildlife that inhabit them by providing metrics for future condition assessments and could enhance early identification of degradation from climate change. A new baseline groundwater monitoring program would benefit inland wetlands – the only source of freshwater to support wildlife populations, including the seashore's horses – by enhancing understanding of the interrelationships of groundwater and storm overwash/flooding events. Continued monitoring, tracking, and eradicating invasive plant species would benefit most species inhabiting the seashore's bay subtidal areas and mudflats, saltmarshes, forests and shrubland, inland wetlands, and dunes and grasslands by eliminating species that outcompete native flora and that lower plant diversity in native coastal communities.

NPS would continue scientific and scholarly research focused on developing a better understanding of natural coastal processes and the effects of climate change/sea level rise. Existing partnerships and cooperative relationships with Maryland and Virginia resource management agencies, Worcester County, Accomack County, the Maryland Coastal Bays Program, and various academic institutions and conservation organizations

would continue to support ongoing water resource monitoring, research, and watershed conservation planning. These partnerships would continue to benefit wildlife inhabiting the seashore's saltmarsh and bay subtidal and mudflat habitats by providing information needed to better understand water quality conditions, trends, and pollutant sources, and by facilitating coordinated efforts toward addressing water quality threats within the watershed that threaten these habitats.

Management actions would continue to restore island habitats altered by historic land use, including removal of six hunting lodges, two private residences, access roads, and water impoundments in the seashore's backcountry. Structures and other impervious surfaces would be removed and sites rehabilitated to foster a return to natural conditions, resulting in a beneficial impact on wildlife that inhabit the seashore's forests, shrublands, dunes, grasslands, and saltmarshes.

Filling mosquito ditches in the Maryland portion of the seashore would continue. Currently, the seashore has filled about 10 percent of its 48,000 meters of mosquito ditches. Continued ditch restoration would have a beneficial impact on saltmarsh vegetation by helping to restore natural surface and groundwater flows from the island to the bayside and tidal flows in and out of saltmarshes. This would benefit wildlife inhabiting saltmarshes, bay subtidal areas, and mudflats by enhancing the health and function of saltmarsh vegetation and reducing nutrient export from marshes to bay waters

Phragmites australis removal from saltmarsh, forest and shrubland, inland wetlands, and dunes and grassland would continue using a combination of standard, ground-based control methods in combination with aerial spraying and prescribed fire or mowing as needed in heavily infested areas. These actions would have a beneficial impact on wildlife relying on these habitats by helping to restore natural sediment levels and hydrologic flows and by eliminating species that outcompete native flora and that lower plant diversity in native coastal communities. Systemic herbicides would be used that do not bioaccumulate in the aquatic food chain, that exhibit very low toxicity to bacteria, fungi, and animals, and that are rapidly removed from the environment by chemical bonding with soil particles and microbial degradation.

Horse management would continue with the goal of reducing the feral horse population to a sustainable population of 80 to 100 individuals. This would benefit wildlife that inhabit saltmarshes, forests, and shrublands, inland wetlands, dunes, and grasslands by reducing overgrazing, trampled vegetation, and addition of nutrients that adversely impact wildlife habitat.

Hunting management would continue to benefit the seashore's wildlife by reducing the size of the non-native sika deer and white-tailed deer population to levels, which would contain impacts on plant species native to the seashore's forest and shrubland habitat.

A new hunting monitoring program would enhance management of both sika deer and native white-tailed deer by providing information needed to develop deer density and deer herbivory indices that would inform management decisions aimed at protecting native plant species. If access to the OSV area is lost, access for public hunting could be significantly reduced or lost and deer populations could increase with potential adverse impacts on wildlife due to adverse impacts on their habitat. NPS would explore alternative public hunting strategies to manage deer populations.

NPS would continue to not enforce existing federal laws prohibiting horseshoe crab harvest. Horseshoe crab harvest would continue to directly contribute to a decline of spawning horseshoe crabs in the Toms Cove area (US FWS 2015). A decline in horseshoe crabs could negatively impact shorebirds for which horseshoe crab eggs are an important food source during critical migration periods (US FWS 2015).

Cultural Resource Management Actions. NPS efforts to identify, manage, and protect cultural resources would continue. When historic structures could no longer be protected from natural coastal processes and the impacts of climate change/sea level rise, they would be demolished and the sites restored to foster a return to natural conditions, resulting in a beneficial impact on wildlife that inhabit the seashore's forests, shrublands, dunes, and grasslands.

At the Assateague Beach U.S. Coast Guard Station, boat dock repairs would have minor short-term adverse impacts on wildlife inhabiting dunes and grasslands in the dock area. Restoration of electrical service would require trenching for conduit installation from the Tom's Cove recreational beach to the station, also resulting in minor short-term adverse impacts on wildlife inhabiting dunes and grasslands.

Visitor Use and Visitor Experience Management Actions. Confinement of oversand vehicle use within the existing designated OSV use area would continue to limit the area within which adverse impacts occur to wildlife inhabiting the beach and adjoining dunes and grasslands where vehicle use occurs. Impacts would include loss of wildlife killed by OSV passes, disturbances due to noise and human activity, and changed habitat conditions such as sand compaction, sand displacement, reduced growth of protective foredunes, loss of food sources damaged or killed by human activity, and erosion typically associated with OSV use. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to wildlife because vehicles would be eliminated from part or all of the OSV use area.

Seashore Operations Management Actions. Based on analysis of historic visitation counts, seashore visitation in Maryland is expected to increase by approximately 8,000 visitors per year as long as there is vehicular access to the seashore. The majority of this growth will be in day-use visitors, as campgrounds are already at capacity most days during the peak summer season. Additional visitors would increase the potential for

impacts on wildlife inhabiting the seashore's dunes, grasslands, beaches, and intertidal areas in day-use areas where visitor use is concentrated. Impacts would continue to include loss of wildlife killed because of human interactions or vehicles, disturbances due to noise and human activity, and changed habitat conditions such as trampling, soil compaction, loss of food sources damaged or killed by human activity, and vegetation loss. NPS would continue to restrict visitor access to habitat areas through the use of designated trails and boardwalks. Some increase in impervious surfaces is likely, with the potential to cause minimal loss of habitat that could also affect the seashore's habitats. These potential impacts would be mitigated by implementing best management practices for wildlife protection.

Development of 20 bedrooms of seasonal housing in Maryland and 17 bedrooms of seasonal housing in Virginia would disturb approximately one to two acres of vegetation near existing buildings during construction, and convert approximately one acre to impervious surfaces associated with new buildings, parking, access drives, and walkways. Short-term adverse impacts to wildlife would occur in the construction site vicinity due to noise and human activity; long-term impacts would include minor loss of habitat where shrubland and landscaped areas adjoining existing seashore facilities are converted to developed uses.

Withdrawals from wells to meet the daily visitor and NPS employee demands for water would not affect the availability of freshwater for wildlife in the seashore's inland wetlands. Water would continue to be drawn from deep groundwater aquifers that do not supply freshwater to the seashore's inland wetlands.

Miscellaneous repairs would be made to the seashore's headquarters complex, visitor use facilities, seashore operations facilities, roads, and trails. Minor soil disturbances would generally affect landscaped areas and mowed grass adjoining existing structures. Short-term adverse impacts to wildlife would occur in the construction site vicinity due to noise and human activity. Following construction disturbed areas would be revegetated with native grasses, shrubs, and trees, replacing disturbed habitat that would support species typical of the pre-construction condition.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have the potential to impact wildlife include sand transport projects, sediment dredging projects, and actions by the US FWS implementing the comprehensive conservation plan for Chincoteague National Wildlife Refuge. Some wildlife habitats are also affected by actions within the coastal bays watershed that have the potential to impact water quality (see section 4.2.2) and by land uses within and outside the region that adversely impact air quality, contributing to high levels of ozone and atmospheric deposition of nitrogen at the seashore.

The overall cumulative impacts on wildlife would be primarily beneficial because of improvements to the overall condition of seashore habitats because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce water pollutant loads from point and non-point sources throughout the coastal bay watersheds, and because of national programs to enhance air quality which help to reduce ozone and atmospheric deposition of nitrogen. Alternative 1 would add a noticeable increment to the overall beneficial cumulative impact through continuation of natural resource management actions that restore island habitats altered by historic land use and mosquito ditching, remove invasive *Phragmites australis*, manage horses to reduce impacts to habitats, and continue to reduce deer populations through managed hunting. There would also be adverse cumulative impacts on wildlife associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas, as well as with continued air quality impacts. Alternative 1 would add an imperceptible adverse increment to the overall adverse cumulative impact due to minor habitat disturbance and clearing for new seashore facilities, and due to annual growth in visitation (as long as there is vehicular access to the island) with the potential to impact adversely habitat and to increase loss of wildlife because of human interactions.

- **Conclusions**

In alternative 1 management actions would have both adverse and beneficial impacts on wildlife and would add an imperceptible adverse increment and a noticeable beneficial increment to the total cumulative adverse and beneficial impacts on wildlife, respectively.

Adverse impacts on wildlife would result from construction of visitor use facilities, including short-term habitat disturbances during construction and long-term loss of habitat where new facilities are located. Major construction projects affecting wildlife and their habitat would include: concentration of new visitor use facilities within the developed area to replace those lost or damaged by coastal storms or the effects of climate change/sea level rise, new housing (37 bedrooms) for seasonal staff, miscellaneous repairs to the seashore headquarters complex, repairs to the boat dock at the Assateague Beach U.S. Coast Guard Station, and restoration of electrical service to the coast guard station. Adversely affected wildlife would generally include species inhabiting the island's forest, shrublands, dunes, and grasslands. Other adverse impacts to wildlife would result from: reduced or lost access for public hunting via the OSV route (if access is lost), resulting in potential for increased deer populations and associated overgrazing of wildlife habitats; increased visitor use in day-use areas dispersed throughout the Maryland Island Developed Area where adequate land area remains (as long as there is vehicular access) primarily affecting wildlife inhabiting the beach, intertidal areas, dunes, grasslands, forest, and shrublands; continued use of oversand vehicles within the existing designated OSV use area, affecting wildlife

inhabiting the beach, intertidal areas, dunes, and grasslands; continued dune maintenance to protect visitor facilities and seashore infrastructure in the Maryland Island Developed Area that adversely impacts wildlife inhabiting saltmarshes, dunes, grasslands, beaches, and intertidal areas by preventing natural overwash processes and inhibiting sand replenishment; and continued horseshoe crab harvesting. These impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting wildlife and wildlife habitats, within the context of wildlife and wildlife habitat throughout the seashore.

Beneficial impacts would result over the long-term from continuation of existing natural resource management actions that would generally enhance wildlife habitats throughout the seashore, including: restoring natural surface and groundwater flows in saltmarsh habitat by filling remaining mosquito ditches; enhancing hydrologic flows and reducing sedimentation in saltmarsh habitat, forest and shrubland habitat, inland wetland habitat, and dunes and grassland habitat by reducing the aerial coverage of *Phragmites australis* from 5.6 percent to 2 percent; fostering a return to natural conditions in areas where historic land uses and construction of new facilities have damaged or resulted in loss of natural habitats by revegetating with native grasses, shrubs, and trees; monitoring, tracking, and eradicating invasive plants from all seashore habitats; and enhancing understanding of conditions, issues, and trends in the seashore's wildlife populations and their habitats through monitoring, planned special studies, and cooperative relationships with state and local agencies, academic institutions, and conservation organizations. Long-term benefits would also result from: reducing overgrazing, vegetation trampling, addition of nutrients, and loss of sensitive plant species by reducing the feral horse population to a sustainable population of 80 to 100 individuals; protecting wildlife habitats from overgrazing by sika deer and native white-tailed deer by continuing to allow hunting and implementing a hunting monitoring program to support more effective deer management; alleviating sand starvation of beach and intertidal habitat caused by the stabilized Ocean City Inlet and replenishing sand in back-barrier marshes and overwash fan areas in the north end by restoring natural overwash processes. Collectively, the beneficial impacts would not be significant because, while the management actions would benefit wildlife in habitats that are fundamental to the seashore and would address significant threats to fundamental resources, the impacts would be short-term (continuing until access is lost and/or resources are no longer available to sustain natural resource management programs) and probably not readily apparent. Once vehicular access is lost, rehabilitation and restoration of island habitats would slow and possibly be curtailed, with the result that the intensity of the beneficial impacts on wildlife would be greatly diminished.

4.4.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

- **Impact Analysis**

Coastal Response Management Actions. As in alternative 1, under alternatives 2, 3, and 4, facilities lost or damaged by natural coastal processes or the effects of climate change/sea level rise would be replaced or repaired, if funding is available, consistent with the underlying principles of each alternative. While the timing and extent to which facilities would continue to be replaced would vary in alternatives 2, 3, and 4, the nature of the impacts on seashore wildlife associated with replacement would be similar to those described for alternative 1 (section 4.4.2).

Natural Resource Management Actions. In alternatives 2, 3, and 4, actions to protect the seashore's unique working marine landscape and way of life would have a beneficial impact on the seashore's marine wildlife. New research undertaken in collaboration with the states of Maryland and Virginia would enhance understanding of the conditions of the seashore's marine environment, better informing future decisions regarding management of marine wildlife.

Enforcement of existing federal laws prohibiting harvest of horseshoe crabs (as proposed by FWS in the Final CCP/EIS) would effectively eliminate illegal horseshoe crab harvesting in the Toms Cove area (US FWS 2015). This would result in a beneficially impact on the horseshoe crab population by directly reducing the decline of spawning horseshoe crabs in the Toms Cove area. Reduced decline of spawning crabs could benefit shorebirds for which horseshoe crab eggs are an important food source during critical migration periods (US FWS 2015).

Visitor Use and Visitor Experience Management Actions. Until facilities are lost, NPS would generally increase visitor services within the Maryland Island Developed Area. A few new small structures (with parking) would be added to support commercial services within existing previously disturbed visitor use areas. Construction would disturb approximately one to two acres and convert less than one acre to impervious surfaces associated with new buildings, parking, access drives, and walkways. Affected wildlife would include those inhabiting a mix of shrubland and landscaped areas adjoining existing seashore facilities. Following construction disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees, generally restoring habitat for species found at the sites of new structures prior to disturbance; increased vehicular traffic and human activity at commercial service sites would adversely impact wildlife in the vicinity.

The former visitor center would be rehabilitated as a stand-alone environmental education center. Minor short-term disturbances to landscaped areas adjoining the existing building would occur. No additional impervious surface would be added. Following construction disturbed areas adjoining the finished structure would be

revegetated with native grasses, shrubs, and trees, generally restoring habitat for species found at the visitor center site prior to disturbance.

Seashore Operations Management Actions. In collaboration with MD DNR, NPS would develop a new seashore entrance station on the mainland, requiring realignment and widening of MD 611, construction of entrance booths, and addition of employee parking spaces. During construction, road widening and addition of facilities would displace wildlife inhabiting several acres of old field vegetation, weedy vegetation, and mowed grass along MD 611; noise and human activity would disturb wildlife in areas adjoining the construction site. Approximately one to two acres of habitat would be lost to impervious surfaces. Following construction disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees, providing habitat for less diverse wildlife than found at the site prior to disturbance; slightly increased vehicular traffic and human activity at the site would adversely impact wildlife in the vicinity.

Development of a mainland-based alternative transportation system (ATS) would require development of a shuttle staging area and associated unpaved parking area (for approximately 360 cars) on the mainland and shelters and paved pull-offs at three shuttle stops on the island. During construction, road widening and addition of facilities would displace wildlife inhabiting up to ten acres of old field vegetation, weedy vegetation, and mowed grass in the MD 611 corridor and less than one acre of shrubland or grassland adjoining seashore roads on the island; noise and human activity would disturb wildlife in areas adjoining the construction sites. Approximately ten acres of habitat would be lost on the mainland and less than 0.25 acre of habitat would be lost on the island; increased vehicular traffic and human activity at the staging area and shuttle stops would adversely impact wildlife near each site. Following construction disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees, providing habitat for less diverse wildlife than found at the parking area and shuttle sites prior to disturbance.

Non-structural stabilization of the mainland shoreline near the visitor center would benefit vegetation in nearby bay subtidal and mudflat habitat by reducing shoreline erosion and sedimentation of bay waters.

4.4.4 ALTERNATIVE 2 – CONCENTRATED TRADITIONAL BEACH RECREATION

- **Impact Analysis**

Coastal Response Management Actions. Artificial dune fortification and beach nourishment would protect the Maryland Island Developed Area from the effects of natural coastal processes and climate change/sea level rise as long as suitable land base exists and funding is available. The seashore would expand partnerships with the USACE to provide additional sand to provide additional sand to mitigate the erosional forces

associated with storms and/or sea level rise. This effort, as well as planting of dunes and fencing to trap sand and exclude grazing horses from the dune, could substantially slow the loss of the developed area to natural coastal processes; however, it would also have an adverse impact on wildlife inhabiting saltmarshes, dunes and grasslands, beaches, and intertidal areas by interfering with sand transport from the beach to island interiors and depriving back-barrier marshes and overwash fans of sand replenishment needed to sustain habitats.

As land and facilities are lost, they would be rebuilt using more sustainable design within the remaining protected developed area, concentrating visitor use and facilities within a smaller area. To the maximum extent, facilities would be temporary, designed to be removed in advance of coastal storms. Facilities to be replaced would be moved back from the shoreline and made more sustainable in form and function, at sites that would continue to be protected by investment in dune maintenance. Overall wildlife would be adversely impacted. Over time most areas the developed area on the island would become much more intensely developed with more impervious surfaces (rooftops and paved roads) and pervious paving (parking areas) when compared to the current condition. Previous development sites, where land area continues to exist, would be rehabilitated to foster a return to natural conditions and disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees; these actions would minimally offset habitat losses associated with development of new facilities by creating habitat of value to some species.

Natural Resource Management Actions. Studies would be completed as in alternative 1. However, the ability of NPS to encourage and support cooperative research would likely decline over time as support for natural resource management would likely be re-directed toward activities protecting recreation opportunities. This would adversely impact efforts to address the challenges of climate change/sea level rise and diminishing detection of emerging threats to the seashore's wildlife populations. Water quality monitoring, saltmarsh monitoring, groundwater monitoring, and invasive species monitoring would be reduced, resulting in an adverse impact on the seashore's wildlife due to less understanding of issues and trends needed to shape effective resource management and to focus collaboration with other public agencies, academic institutions, and non-governmental organizations to address threats.

Natural resource management programs and activities would continue as in alternative 1 although over time their scope would diminish. Filling mosquito ditches in the Maryland portion of the seashore would likely diminish, reducing benefits to the health and function of saltmarsh habitat and with less benefit to wildlife inhabiting bay subtidal and mudflat habitats accruing from bay water quality enhancements due to reducing nutrient export from marshes.

Reduced scope of other natural resource management actions – such as *Phragmites australis* removal, other vegetation restoration and protection, and beach and bayside wetlands protection – would reduce current benefits from those actions to wildlife inhabiting all seashore habitats.

Reduced access to the north end by implementing a permit system requiring a docking/mooring pass would benefit wildlife inhabiting dunes, grasslands, beach and intertidal areas by reducing visitor use impacts to areas where NPS management actions are underway to restore natural overwash processes to benefit these habitats.

As in alternative 1, hunting management would continue to benefit the seashore's wildlife by reducing the size of the non-native sika deer and white-tailed deer population to levels which would contain impacts on plant species native to the seashore's forest and shrubland habitat, and a new hunting monitoring program would better inform management decisions aimed at protecting native plant species. In alternative 2, the benefits of public hunting to vegetation would be reduced because the OSV area would be smaller, making access to the backcountry more difficult for hunters with that result fewer deer would be taken annually. If access to the OSV area is lost, no action would be taken to restore it; access for public hunting could be significantly reduced or lost and deer populations could increase with potential adverse impacts on on wildlife due to adverse impacts on their habitat. NPS would explore alternative public hunting strategies to manage deer populations.

Working with Virginia to ensure appropriate wastewater treatment and disposal at privately owned structures (oyster watch houses and hunting blinds) located within the seashore's Virginia waters would reduce discharge of nutrients, pathogens, and other contaminants into bay waters, resulting in a beneficial impact to wildlife inhabiting bay subtidal and mudflat habitats.

Cultural Resource Management Actions. NPS efforts to identify, manage, and protect cultural resources would continue. When historic structures could no longer be protected from natural coastal processes and the impacts of climate change/sea level rise, they would be demolished and the sites restored to foster a return to natural conditions, resulting in a beneficial impact on wildlife that inhabit the seashore's forests, shrublands, dunes, and grasslands.

Visitor Use and Visitor Experience Management Actions. Oversand vehicle use would be confined within a smaller designated OSV use area (extending south of the Maryland Island Developed Area to approximately KM 23.4). Confinement within this smaller area would further limit the area within which adverse impacts occur to wildlife inhabiting the beach and adjoining dunes and grasslands where vehicle use occurs. Impacts would include loss of wildlife killed by OSV passes, disturbances due to noise and human activity, and changed habitat conditions such as sand compaction, sand displacement,

reduced growth of protective foredunes, loss of food sources damaged or killed by human activity, and erosion typically associated with OSV use. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to wildlife because vehicles would be eliminated from part or all of the OSV use area.

Seashore Operations Management Actions. Seashore operations would be based in a rehabilitated headquarters complex in the Maryland Mainland Developed Area. Minor soil disturbances would generally affect landscaped areas and mowed grass adjoining existing structures. Short-term adverse impacts to wildlife would occur in the construction site vicinity due to noise and human activity. Following construction disturbed areas would be revegetated with native grasses, shrubs, and trees, replacing disturbed habitat that would support species typical of the pre-construction condition.

Approximately 10 acres would be acquired near the existing seashore headquarters complex to develop a shuttle staging area and associated visitor unpaved parking area (for approximately 360 cars). Construction of this facility is common to alternatives 2, 3, and 4, although where the action would occur would vary slightly. Impacts on wildlife are summarized above in section 4.4.3.

Electricity and potable water would be extended to approximately 90 existing campsites. During construction trenching for underground installation of lines, noise and human activity would disturb wildlife. The impact area would generally be in previously disturbed areas along the edges of existing seashore roads, where noise and human activity levels are already high. Following construction disturbed areas would be revegetated with native grasses resulting in no loss of habitat.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on wildlife would be the same as those identified for alternative 1.

The overall cumulative impacts on wildlife would be primarily beneficial because of improvements to the overall condition of seashore habitats because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce water pollutant loads from point and non-point sources throughout the coastal bay watersheds, and because of national programs to enhance air quality which help to reduce ozone and atmospheric deposition of nitrogen. Alternative 2 would add a noticeable increment to the overall beneficial cumulative impact through continuation of natural resource management actions that restore island habitats altered by historic land use and mosquito ditching, remove invasive *Phragmites australis*, manage horses to reduce impacts to habitats, and continue to reduce deer populations through managed hunting. There would also be adverse cumulative impacts on wildlife associated with pollutant discharges from previously permitted and new construction

activities and land uses within the watershed, particularly where they occur outside sewer service areas, as well as with continued air quality impacts. Alternative 2 would add a noticeable adverse increment to the overall adverse cumulative impact due to habitat disturbance and clearing for new seashore facilities, and due to annual growth in visitation (as long as there is vehicular access to the island) with the potential to impact adversely habitat and to increase loss of wildlife because of human interactions.

- **Conclusions**

In alternative 2 management actions would have both adverse and beneficial impacts on wildlife and would add a noticeable adverse increment and a noticeable beneficial increment to the total cumulative adverse and beneficial impacts on wildlife, respectively.

Adverse impacts on wildlife would result from construction of visitor use facilities, including short-term habitat disturbances during construction and long-term loss of habitat where new facilities are located. Major construction projects would include: concentration of new visitor use facilities within a smaller developed area to replace those lost or damaged by coastal storms or the effects of climate change/sea level rise, new housing for seasonal staff, a new seashore entrance station on the mainland, facilities to support a mainland-based alternative transportation system, a few small structures to support increased visitor services in the island developed area, rehabilitation of the seashore headquarters complex, and extension of electricity and potable water to approximately 90 existing campsites. Adversely affected wildlife would generally include species inhabiting the island's forest, shrublands, dunes, and grassland on the island and old field, mowed grass, and landscaped areas around existing seashore buildings on the mainland. Other adverse impacts to wildlife would result from: reduced or lost access for public hunting via the OSV route, resulting in potential increased deer populations and associated overgrazing of wildlife habitats; increased visitor use in day-use areas within a shrinking protected Maryland Island Developed Area (as long as there is vehicular access), affecting wildlife inhabiting the beach, intertidal areas, dunes, grasslands, forest, and shrublands; continued use of oversand vehicles within a smaller designated OSV use area, reducing adverse impacts to wildlife inhabiting the beach, intertidal areas, dunes, and grasslands within the OSV use area; and enhanced dune maintenance to protect visitor facilities and seashore infrastructure in the Maryland Island Developed Area that would adversely impact wildlife by further preventing natural overwash processes and inhibiting sand replenishment in the developed area's saltmarshes, dunes, grasslands, beach, and intertidal habitat. Over time the scope of natural resource management programs and activities would diminish. Some of these impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting wildlife and wildlife habitats, within the context of the overall quality of wildlife and wildlife habitats throughout the seashore. However, the adverse impacts on wildlife associated with intensification of development within

the Maryland Island Development Area and its fortification to withstand the impacts of coastal storms and the effects of climate change/sea level rise would be significant; extensive areas of dunes, grasslands, forest, and shrubland upon which the seashore's wildlife depend that are fundamental to the seashore would be lost, and extensive areas of beach, intertidal flats, dunes, grasslands, and saltmarsh that are also fundamental to the seashore would be seriously threatened by sand starvation caused by enhanced fortification that would curtail natural overwash processes.

Beneficial impacts would result over the long-term from continuation of existing natural resource management actions that would generally enhance wildlife habitats throughout the seashore, including: restoring natural surface and groundwater flows in saltmarsh habitat by filling remaining mosquito ditches; enhancing hydrologic flows and reducing sedimentation in saltmarsh habitat, forest and shrubland habitat, inland wetland habitat, and dunes and grassland habitat by reducing the aerial coverage of *Phragmites australis*; fostering a return to natural conditions in areas where historic land uses and construction of new facilities have damaged or resulted in loss of natural habitats by revegetating with native grasses, shrubs, and trees; monitoring, tracking, and eradicating invasive plants from all seashore habitats; enhancing understanding of conditions, issues, and trends in the seashore's wildlife populations and their habitats through monitoring, planned special studies, and cooperative relationships with state and local agencies, academic institutions, and conservation organizations. Long-term benefits would also result from reducing overgrazing, vegetation trampling, addition of nutrients, and loss of sensitive plant species by reducing the feral horse population to a sustainable population of 80 to 100 individuals; protecting wildlife habitats from overgrazing by sika deer and native white-tailed deer by continuing to allow hunting and implementing a hunting monitoring program to support more effective deer management; limiting use of the north end beach; alleviating sand starvation of beach and intertidal habitat caused by the stabilized Ocean City Inlet; replenishing sand in back-barrier marshes and overwash fan areas in the north end by restoring natural overwash processes; and enforcing federal laws prohibiting horseshoe crab harvest. Collectively, the beneficial impacts would not be significant because, while the management actions would benefit wildlife and wildlife habitats that are fundamental to the seashore and would address significant threats to fundamental resources, the impacts would be short-term (continuing until access is lost and/or resources are no longer available to sustain natural resource management programs) and probably not readily apparent, depending upon when existing natural resource management programs are diminished or curtailed. Once vehicular access is lost, rehabilitation and restoration of island habitats would slow and possibly be curtailed, with the result that the intensity of the beneficial impacts on wildlife would be greatly diminished.

4.4.5 ALTERNATIVE 3 – SUSTAINABLE RECREATION AND CLIMATE CHANGE ADAPTATION (NPS PREFERRED ALTERNATIVE)

- **Impact Analysis**

Coastal Response Management Actions. Seashore management would allow the island to evolve naturally, relocating and designing new facilities to be more sustainable. The seashore would no longer work with the USACE to provide additional sand to provide additional sand to mitigate the erosional forces associated with storms and/or sea level rise. No new investments would be made in dune fortification through planting and fencing installation. Over time natural overwash would resume throughout the developed area. This would benefit wildlife inhabiting the beach, intertidal area, dunes, grasslands, and saltmarshes in the developed area by restoring sand transport from the beach to the island interiors, creating overwash fans and replenishing sand in back-barrier marshes.

Visitor use infrastructure would evolve to more sustainable designs and likely shift to new, more stable locations initially on the island; over time development on the island would become less intensive, with fewer facilities and less impervious surfaces as visitor use facilities are slowly moved to the mainland. To the maximum extent, facilities would be temporary, designed to be removed in advance of coastal storms. Facilities lost or damaged by natural coastal processes or the effects of climate change/sea level rise would be replaced or repaired, if funding is available, at sites further from the shoreline at sites that do not require continued investment in dune maintenance where they can be made more sustainable in form and function. The location, extent, and type of habitat lost and wildlife species affected would depend on when and where seashore facilities and infrastructure would be lost and replaced. Over time wildlife habitat would be generally enhanced. The developed area on the island would become more primitive with less extensive developed facilities with fewer impervious surfaces (rooftops and paved roads) and less pervious paving (parking areas) when compared to the current condition. Previous development sites would be rehabilitated to foster a return to natural conditions and disturbed areas adjoining new finished structures would be revegetated with native grasses, shrubs, and trees; these actions would generally offset habitat losses associated with development of new replacement facilities.

If bridge access is lost, access would transition to all water access. Beneficial impacts to wildlife inhabiting dunes, grasslands, and forests in the developed area would result from removal of most vehicles from the island (with the exception of NPS operations vehicles and beach shuttles) and from removal of 150 campsites, other visitor facilities, paved roads, and the NPS maintenance yard. This would benefit wildlife by reducing impacts from vehicles (noise and drive-by deaths), reducing human activity and associated disturbances to wildlife, and enhancing habitats by fostering a return to natural conditions in areas where developed uses are removed.

Natural Resource Management Actions. Studies would be completed as in alternative 1. Existing and new planned monitoring programs and research would benefit wildlife in all seashore habitats. Cooperative research would expand, accelerating growth in the understanding of seashore resources and ecological processes. Data from an expanded monitoring network, as well as new ecological research, would provide a significant increase in information needed to understand better conditions, trends, and threats in the seashore's wildlife populations and their habitats.

Natural resource management programs and activities would continue as in alternative 1 although over time programs would expand to address issues created by global climate change. In alternative 3, actions would generally seek to enhance resiliency of saltmarshes and inland wetlands resulting in a beneficial impact on wildlife.

Reduced access to the north end by implementing a permit system requiring a docking/mooring pass would benefit wildlife inhabiting dunes, grasslands, beach and intertidal areas by reducing visitor use impacts to areas where NPS management actions are underway to restore natural overwash processes to benefit these habitats.

As in alternative 1, hunting management would continue to benefit the seashore's wildlife by reducing the size of the non-native sika deer and white-tailed deer population to levels which would contain impacts on plant species native to the seashore's forest and shrubland habitat, and a new hunting monitoring program would better inform management decisions aimed at protecting native plant species. In alternative 3, if access to the OSV area is lost, consideration would be given to modifying the OSV route or relocating it to another more suitable location, thereby maintaining public access for hunting and its beneficial impacts to vegetation by reducing deer populations. Over time, however, it is possible that access for public hunting could be significantly reduced or lost and deer populations could increase with potential adverse impacts on wildlife due to adverse impacts on their habitat.

Working with Virginia, NPS would assess the legal status of privately owned structures (oyster watch houses and hunting blinds) located within the seashore's Virginia waters and pursue removal of those found to be unauthorized. For authorized structures, NPS would work with Virginia to ensure appropriate wastewater treatment. Collectively, these actions would reduce discharge of nutrients, pathogens, and other contaminants into bay waters resulting in a beneficial impact on aquatic wildlife inhabiting bay subtidal areas and mudflats.

Working with Worcester County, Accomack County, and conservation organizations, NPS would support efforts to protect land (through fee simple purchase or conveyance of conservation easements) within the watersheds of Chincoteague Bay and Newport Bay for conservation and climate change adaptation purposes. Conservation of these

lands would benefit wildlife inhabiting a variety of mainland habitats by protecting habitats from future loss to developed land uses.

NPS would collaborate with its conservation partners to acquire approximately 150 to 200 acres of buffer lands adjoining the one to three new points of departure on the Chincoteague Bay mainland in Worcester County. Land conservation would permanently protect these lands from loss to developed land uses; long-term management would facilitate return to natural conditions, as appropriate, with beneficial impacts to wildlife inhabiting a variety of mainland habitats, particularly saltmarsh along the bayshore.

Cultural Resource Management Actions. Implementation of non-structural storm protection measures (such as dune nourishment and planting) to protect the Assateague Beach U.S. Coast Guard Station would continue to prevent natural processes of sand overwash in the station vicinity. This would continue to impact adversely vegetation in dunes and grassland habitat and beach and intertidal habitat by interfering with sand transport from the beach to island interiors and depriving back-barrier marshes and overwash fans of sand replenishment needed to sustain habitats.

Visitor Use and Visitor Experience Management Actions. Once camping facilities are no longer sustainable in the Maryland Island Developed Area or when vehicular access to the island is lost, NPS would collaborate with MD DNR to develop a new campground on the mainland. Facilities would be replaced on an approximate 175-acre site in the MD 611 corridor near the existing seashore headquarters complex. Campground development would entail minimal clearing and grading of the site, paved road construction, utility installations, development of 150 campsites (including approximately 40 sites with paved pads/pull-throughs), and construction of comfort facilities and shower buildings, an amphitheater, sewage dump station, and an entrance station with parking). During construction, wildlife inhabiting the site would be displaced; noise and human activity would disturb wildlife in areas adjoining the construction site. Following construction several acres of field and forest habitat would be converted to developed uses resulting in an adverse impact on wildlife; disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees, providing habitat for less diverse wildlife than found at the site prior to disturbance. Increased vehicular traffic and human activity at the campground would adversely impact wildlife in the vicinity.

As in alternative 1, confinement of oversand vehicle use within the existing designated OSV use area would continue to limit the area within which adverse impacts occur to wildlife inhabiting the beach and adjoining dunes and grasslands where vehicle use occurs. Impacts would include loss of wildlife killed by OSV passes, disturbances due to noise and human activity, and changed habitat conditions such as sand compaction, sand displacement, reduced growth of protective foredunes, loss of food sources damaged or killed by human activity, and erosion typically associated with OSV use. If

vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to wildlife because vehicles would be eliminated from part or all of the OSV use area.

Expanded use of Egging Island for environmental education would increase visitor use to the island. New facilities would include an expanded soft landing for canoes and kayaks, clearing for a primitive group campsite, and installation of relocatable vault toilets. Minor areas would be cleared at the campsite and soft landing site, adversely impacting wildlife inhabiting affected bay subtidal areas, mudflats, and/or saltmarsh at the island shore and forest, shrubland, dunes, or grasslands at the campsite, depending upon the site selected. Long-term use of the site by large groups arriving in non-motorized boats would also disturb island habitats on the bayshore; noise and human activity would also adversely impact island wildlife.

Three new bayside access points would be developed to provide water access to existing backcountry campsites and trails, one of which would provide opportunities for access via motorized vessels. Minor areas would be cleared at each access site, adversely impacting wildlife inhabiting bay subtidal areas, mudflats, and/or saltmarsh on the bayshore. Long-term use of the sites by large groups arriving in non-motorized boats would also disturb island habitats on the bayshore; noise and human activity would also adversely impact island wildlife.

On the mainland in Worcester County NPS would seek to acquire from the county two existing points of departure from Chincoteague Bay; the sites would be rehabilitated, as needed, likely including development of a shade shelter and relocatable vault toilet. Rehabilitation could involve disturbance of minor areas at the access points which were previously disturbed when the facility was originally developed. Increased visitor use at the access points, particularly motorized boat access, would disturb island mainland habitats on the bayshore; noise and human activity would also adversely impact island wildlife.

Seashore Operations Management Actions. Seashore operations would be relocated to a new headquarters complex in the MD 611 corridor near the seashore entrance. Development would entail clearing and grading of the site and construction of administrative offices, a maintenance complex, paved parking, and paved/unpaved outdoor maintenance storage areas. During construction, wildlife inhabiting up to five acres of old field and/or upland forest would be displaced; noise and human activity would also disturb wildlife in areas adjoining the construction site. Following construction approximately four acres of habitat would be converted to impervious surfaces; disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees, providing habitat for less diverse wildlife than found at the site prior to disturbance. Increased vehicular traffic and human activity at the new headquarters complex site would adversely impact wildlife in the vicinity.

Approximately 10 acres at the existing seashore headquarters site would be rehabilitated as a shuttle staging area and associated visitor unpaved parking area (for approximately 360 cars). Construction of this facility is common to alternatives 2, 3, and 4, although where the action would occur would vary slightly. Impacts on seashore wildlife are summarized above in section 4.4.3. This facility would remain in use as long as vehicular access to the island is possible; when vehicular access to the island is lost, it would be removed and the site rehabilitated to foster a return to natural conditions restoring habitat for wildlife previously displaced from the site.

When vehicular access to the island is no longer possible, access to the island would shift to a ferry based operation for visitor access and seashore operations at waterfront locations on the mainland and on the island. New mainland facilities near the existing seashore headquarters complex would include a passenger ferry terminal, docking facilities to support seashore operations, administrative offices, maintenance storage facility, paved access roads, unpaved parking area (for up to 700 cars), and unpaved NPS equipment storage yard; new island facilities would include an island terminal facility, docking facilities to support seashore operations, an island shuttle system with shelters and benches. Development would entail clearing and grading of sites on the mainland and the island. On the mainland, construction would adversely impact wildlife inhabiting up to ten acres of old field and/or upland forest habitats. On the island, construction would adversely impact wildlife inhabiting up to two acres, likely composed of a mix of habitat in previously developed land, dunes, grasslands, forest, and shrublands. Along the shore on the mainland and the island, construction of docking facilities would disturb wildlife in saltmarsh, bay subtidal areas, and mudflats. Following construction, disturbed areas adjoining finished structures would be revegetated with native grasses, shrubs, and trees, as appropriate, providing habitat for less diverse wildlife than found at the site prior to disturbance. Increased vehicular traffic and human activity at the docking facility sites would adversely impact wildlife in the vicinity.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on wildlife would be the same as those identified for alternative 1.

The overall cumulative impacts on wildlife would be primarily beneficial because of improvements to the overall condition of seashore habitats because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce water pollutant loads from point and non-point sources throughout the coastal bay watersheds, and because of national programs to enhance air quality which help to reduce ozone and atmospheric deposition of nitrogen. Alternative 3 would add an appreciable increment to the overall beneficial cumulative impact through expansion of natural resource management actions that restore island habitats altered by historic land use and mosquito ditching, remove invasive *Phragmites australis*, manage horses

to reduce impacts to habitats, continue to reduce deer populations through managed hunting, and – once access is lost – removal of visitor facilities and reduced visitation. There would also be adverse cumulative impacts on wildlife associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas, as well as with continued air quality impacts. Alternative 3 would add a noticeable adverse increment to the overall adverse cumulative impact due to habitat disturbance and clearing for new seashore facilities, and due to annual growth in visitation (as long as there is vehicular access to the island) with the potential to impact adversely habitat and to increase loss of wildlife because of human interactions.

- **Conclusions**

In alternative 3 management actions would have both adverse and beneficial impacts on wildlife and would add a noticeable adverse increment and an appreciable beneficial increment to the total cumulative adverse and beneficial impacts on wildlife, respectively.

Adverse impacts on wildlife would result from construction of visitor use facilities, including short-term habitat disturbances during construction and long-term loss of habitat where new facilities are located. Major construction projects would include: a few new visitor use facilities in sustainable locations on the island to replace those lost or damaged by coastal storms or the effects of climate change/sea level rise, new housing for seasonal staff, a new seashore entrance station on the mainland, facilities to support a mainland-based alternative transportation system, a few small structures to support increased visitor services in the island developed area, construction of a new seashore headquarters complex, repairs to the boat dock at the Assateague Beach U.S. Coast Guard Station, restoration of electrical service to the coast guard station, development of docking facilities on the mainland and the island to support water-based visitor access and seashore operations, and construction of a new campground on the mainland with approximately 150 campsites. Adversely affected wildlife would generally include species inhabiting forest, shrubland, and dunes and grassland on the island and old field, mowed grass, landscaped areas around existing seashore buildings, and upland forest on the mainland. Other adverse impacts to wildlife would result from: increased visitor use in day-use areas dispersed throughout the Maryland Island Developed Area (as long as there is vehicular access) at existing sites where adequate land area remains or at more sustainable sites, primarily affecting wildlife that inhabit the beach, intertidal areas, dunes, grassland, forest, and shrublands; continued use of oversand vehicles within the existing designated OSV use area, affecting wildlife inhabiting the beach, intertidal areas, dunes, and grasslands; and continued dune maintenance at the Assateague Beach U.S. Coast Guard Station that would continue to impact adversely wildlife by preventing natural overwash processes and inhibiting sand replenishment in adjoining saltmarshes, dunes, grasslands, beach and intertidal habitat. These impacts would not be significant because of the simultaneous implementation of

best management practices and continued actions consistent with NPS management policies protecting wildlife and wildlife habitats, within the context of the overall quality of wildlife and wildlife habitats throughout the seashore.

Beneficial impacts would result over the long-term from continuation of existing natural resource management actions that would generally enhance wildlife habitats throughout the seashore, including: restoring natural surface and groundwater flows in saltmarsh habitat by filling remaining mosquito ditches; enhancing hydrologic flows and reducing sedimentation in saltmarsh habitat, forest and shrubland habitat, inland wetland habitat, and dunes and grassland habitat by reducing the aerial coverage of *Phragmites australis* from 5.6 percent to 2 percent; fostering a return to natural conditions in areas where historic land uses and construction of new facilities have damaged or resulted in loss of natural habitats by revegetating with native grasses, shrubs, and trees; monitoring, tracking, and eradicating invasive plants from all seashore habitats; enhancing understanding of conditions, issues, and trends in the seashore's wildlife populations and their habitats through expanded monitoring, additional special studies, and expanded cooperative relationships with state and local agencies, academic institutions, and conservation organizations. Long-term benefits would also result from reducing overgrazing, vegetation trampling, addition of nutrients, and loss of sensitive plant species by reducing the feral horse population to a sustainable population of 80 to 100 individuals; protecting wildlife habitats from overgrazing by sika deer and native white-tailed deer by continuing to allow hunting and implementing a hunting monitoring program to support more effective deer management; reducing visitor use impacts on wildlife in the north end by reducing visitor access by water; alleviating sand starvation of beach and intertidal habitat caused by the stabilized Ocean City Inlet; replenishing sand in back-barrier marshes and overwash fan areas in the north end by restoring natural overwash processes; collaboration with the states to ensure adequate wastewater treatment at oyster watch houses and hunting blinds; supporting conservation partners to establish conservation easements on the mainland within the watersheds of Chincoteague Bay and Newport Bay; collaboration to acquire and protect 150 to 200 acres of natural habitat adjoining one to three new points of departure on the mainland in Worcester County; once vehicular access is lost, removal of visitor use facilities from the island and rehabilitation of sites to foster a return to natural conditions; and enforcing federal laws prohibiting horseshoe crab harvest. Collectively, the beneficial impacts would be significant because they would benefit wildlife and wildlife habitats that are fundamental to the seashore, would address significant threats to fundamental resources, would be long term in duration, and would be readily apparent. Once vehicular access is lost, rehabilitation and restoration of island habitats would continue at a slower rate due to the complexities of water access operations, although impacts on wildlife would continue to be readily apparent and significant.

4.4.6 ALTERNATIVE 4 – NATURAL ISLAND EVOLUTION AND A PRIMITIVE ISLAND EXPERIENCE

- **Impact Analysis**

Coastal Response Management Actions. Seashore management would allow the island to evolve naturally, maintaining facilities only until they are lost, severely damaged, or become obsolete. As in alternative 3, the seashore would no longer work with the USACE to provide additional sand to mitigate the erosional forces associated with storms and/or sea level rise. No new investments would be made in dune fortification through planting and fencing installation. Over time natural overwash would resume throughout the developed area. This would benefit wildlife inhabiting the beach, intertidal area, dunes, grasslands, and saltmarshes in the developed area by restoring sand transport from the beach to the island interiors, creating overwash fans and replenishing sand in back-barrier marshes.

Development on the island would become less intensive, with fewer facilities and less impervious surfaces as visitor use facilities are removed, resulting in a beneficial impact on wildlife. Replacement of facilities lost or damaged would be limited to new primitive campsites. The location, extent, and type of habitat lost and wildlife species affected would depend on when and where seashore facilities and infrastructure would be lost and replaced. Over time wildlife habitat would be generally enhanced. The developed area on the island would become much more primitive with very few impervious surfaces and much less pervious paving (parking areas) when compared to the current condition. Previous development sites would be rehabilitated to foster a return to natural conditions and disturbed areas adjoining new finished structures would be revegetated with native grasses, shrubs, and trees; these actions would generally offset habitat losses associated with development of new replacement facilities.

As in alternative 3, if bridge access is lost, access would transition to all water access. Beneficial impacts to wildlife inhabiting dunes, grasslands, and forests in the developed area would result from removal of most vehicles from the island (with the exception of NPS operations vehicles and beach shuttles) and from removal of 150 campsites, other visitor facilities, paved roads, and the NPS maintenance yard. This would benefit wildlife by reducing impacts from vehicles (noise and drive-by deaths), reducing human activity and associated disturbances to wildlife, and enhancing habitats by fostering a return to natural conditions in areas where developed uses are removed.

Natural Resource Management Actions. Natural resource management programs and activities would continue as in alternative 1 although over time programs would expand to address mitigation of human impacts and climate change adaptation. In alternative 4, monitoring key climate drivers and resource conditions would increase. Collectively these expanded programs would support actions to enhance resiliency of vulnerable

resources resulting in a beneficial impact on the seashore's wildlife populations and their habitats.

Visitor use impacts on wildlife in the north end would be largely eliminated by prohibiting boat-in visitor use to the area. This would have a beneficial impact because most visitors who now access the area by boat would no longer be able or willing to do so. In the future, only visitors willing to hike or paddle the distance to the north end will visit the area. This will significantly reducing the potential for adverse impacts to wildlife and their habitat.

Expanded cooperative research would include more basic science and barrier island ecology research. New ecological research, would provide additional information needed to better understand wildlife populations, habitat conditions, trends, and pollutant sources, and would help focus collaboration with other public agencies, academic institutions, and non-governmental organizations.

As in alternative 1, hunting management would continue to benefit the seashore's wildlife by reducing the size of the non-native sika deer and white-tailed deer population to levels which would contain impacts on plant species native to the seashore's forest and shrubland habitat, and a new hunting monitoring program would better inform management decisions aimed at protecting native plant species. In alternative 4, if access to the OSV area is lost, no action would be taken to restore it; access for public hunting could be significantly reduced or lost and deer populations could increase with potential adverse impacts on wildlife due to adverse impacts on their habitat. NPS would explore alternative public hunting strategies to manage deer populations.

As in alternative 3, working with Virginia, NPS would assess the legal status of privately owned structures (oyster watch houses and hunting blinds) located within the seashore's Virginia waters and pursue removal of those found to be unauthorized. For authorized structures, NPS would work with Virginia to ensure appropriate wastewater treatment. Collectively, these actions would reduce discharge of nutrients, pathogens, and other contaminants into bay waters resulting in a beneficial impact on aquatic wildlife inhabiting bay subtidal areas and mudflats.

As in alternative 3, working with Worcester County, Accomack County, and conservation organizations, NPS would support efforts to protect land (through fee simple purchase or conveyance of conservation easements) within the watersheds of Chincoteague Bay and Newport Bay for conservation and climate change adaptation purposes. Conservation of these lands would benefit wildlife inhabiting a variety of mainland habitats by protecting habitats from future loss to developed land uses.

Cultural Resource Management Actions. As in alternative 3, implementation of non-structural storm protection measures (such as dune nourishment and planting) to protect the Assateague Beach U.S. Coast Guard Station would continue to prevent natural processes of sand overwash in the station vicinity. This would continue to impact adversely vegetation in dunes and grassland habitat and beach and intertidal habitat by interfering with sand transport from the beach to island interiors and depriving back-barrier marshes and overwash fans of sand replenishment needed to sustain habitats.

Visitor Use and Visitor Experience Management Actions. New facility development would include development of up to 150 primitive campsites, replacing developed campsites lost to natural coastal processes and the impacts of climate change/sea level rise. Related actions and measures to mitigate impacts on wildlife are summarized above under coastal resource management actions for alternative 4.

As in alternative 1, confinement of oversand vehicle use within the existing designated OSV use area would continue to limit the area within which adverse impacts occur to wildlife inhabiting the beach and adjoining dunes and grasslands where vehicle use occurs. Impacts would include loss of wildlife killed by OSV passes, disturbances due to noise and human activity, and changed habitat conditions such as sand compaction, sand displacement, reduced growth of protective foredunes, loss of food sources damaged or killed by human activity, and erosion typically associated with OSV use. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to wildlife because vehicles would be eliminated from part or all of the OSV use area.

Visitor use impacts on wildlife inhabiting dunes, grasslands, beaches, and intertidal areas in the north end would be largely eliminated by prohibiting boat-in visitor use.

Seashore Operations Management Actions. As in alternative 3, seashore operations would be based in a new headquarters complex to be developed on the mainland in the MD 611 corridor near the seashore entrance on a non-forested upland site. Proposed actions and related impacts on wildlife would be the same as those described for alternative 3 (section 4.4.5).

Approximately 10 acres at the existing seashore headquarters site would be rehabilitated as a shuttle staging area and associated visitor unpaved parking area (for approximately 360 cars). Construction of this facility is common to alternatives 2, 3, and 4, although where the action would occur would vary slightly. Impacts on seashore wildlife are summarized above in section 4.4.3. As in alternative 3, this facility would remain in use as long as vehicular access to the island is possible; when vehicular access to the island is lost, it would be removed and the site rehabilitated to foster a return to natural conditions. Following construction, disturbed areas adjoining finished structures

would be revegetated with native grasses, shrubs, and trees, as appropriate, providing habitat for less diverse wildlife than found at the site prior to disturbance.

As in alternative 3, when vehicular access to the island is no longer possible, access to the island would shift to a ferry based operation for visitor access and seashore operations at waterfront locations on the mainland and on the island. Proposed actions and related impacts on the seashore's wildlife would be the same as those described for alternative 3 (section 4.4.5).

The existing maintenance yard in the Maryland Island Developed Area would be removed and the site rehabilitated to foster a return to natural conditions providing new habitat for wildlife.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on wildlife would be the same as those identified for alternative 1.

The overall cumulative impacts on wildlife would be primarily beneficial because of improvements to the overall condition of seashore habitats because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce water pollutant loads from point and non-point sources throughout the coastal bay watersheds, and because of national programs to enhance air quality which help to reduce ozone and atmospheric deposition of nitrogen. Alternative 4 would add an appreciable increment to the overall beneficial cumulative impact through expansion of natural resource management actions that restore island habitats altered by historic land use and mosquito ditching, remove invasive *Phragmites australis*, manage horses to reduce impacts to habitats, continue to reduce deer populations through managed hunting, and – once access is lost – removal of visitor facilities and reduced visitation. There would also be adverse cumulative impacts on wildlife associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas, as well as with continued air quality impacts. Alternative 4 would add a noticeable adverse increment due to habitat disturbance and clearing for new seashore facilities, and due to annual growth in visitation (as long as there is vehicular access to the island) with the potential to impact adversely habitat and to increase loss of wildlife because of human interactions.

- **Conclusions**

In alternative 4 management actions would have both adverse and beneficial impacts on wildlife and would add a noticeable adverse increment and an appreciable beneficial increment to the total cumulative adverse and beneficial impacts on wildlife, respectively.

Adverse impacts on wildlife would result from construction of visitor use facilities, including short-term habitat disturbances during construction and long-term loss of habitat where new facilities are located. Major construction projects would include: a few new visitor use facilities in sustainable locations on the island, 150 new primitive campsites on the island (to replace existing developed campgrounds once they are lost or severely damaged), a new seashore entrance station on the mainland, facilities to support a mainland-based alternative transportation system, a few small structures to support increased visitor services in the island developed area (until developed facilities are lost), construction of a new seashore headquarters complex, repairs to the boat dock at the Assateague Beach U.S. Coast Guard Station, restoration of electrical service to the coast guard station, and development of docking facilities on the mainland and the island to support water-based visitor access and seashore operations. Adversely affected wildlife would generally include species inhabiting forest, shrublands, dunes, and grassland on the island and old field, mowed grass, landscaped areas around existing seashore buildings, and upland forest on the mainland. Other adverse impacts to wildlife would result from: increased visitor use in day-use areas dispersed throughout the Maryland Island Developed Area (as long as there is vehicular access) at existing sites where adequate land area remains or at more sustainable sites, primarily affecting wildlife inhabiting the beach, intertidal areas, dunes, grasslands, forest, and shrublands; continued use of oversand vehicles within the existing designated OSV use area, affecting wildlife inhabiting the beach, intertidal areas, dunes, and grassland; and continued dune maintenance at the Assateague Beach U.S. Coast Guard Station that would continue to impact adversely wildlife by preventing natural overwash processes and inhibiting sand replenishment in adjoining saltmarshes, dunes, grasslands, beach and intertidal habitat.. These impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting wildlife and wildlife habitat, within the context of the overall quality of wildlife and wildlife habitats throughout the seashore.

Beneficial impacts would result over the long-term from continuation of existing natural resource management actions that would generally enhance wildlife habitats throughout the seashore, including: restoring natural surface and groundwater flows in saltmarsh habitat by filling remaining mosquito ditches; enhancing hydrologic flows and reducing sedimentation in saltmarsh habitat, forest and shrubland habitat, inland wetland habitat, and dunes and grassland habitat by reducing the aerial coverage of *Phragmites australis* from 5.6 percent to 2 percent; fostering a return to natural conditions in areas where historic land uses and construction of new facilities have damaged or resulted in loss of native vegetation with native grasses, shrubs, and trees; monitoring, tracking, and eradicating invasive plants from all seashore habitats; and enhancing understanding of conditions, issues, and trends in the seashore's wildlife populations and trends through expanded monitoring, additional special studies, and expanded cooperative relationships with state and local agencies, academic institutions,

and conservation organizations. Long-term benefits would also result from reducing overgrazing, vegetation trampling, addition of nutrients, and loss of sensitive plant species by reducing the feral horse population to a sustainable population of 80 to 100 individuals; protecting wildlife habitats from overgrazing by sika deer and native white-tailed deer by continuing to allow hunting and implementing a hunting monitoring program to support more effective deer management; reducing visitor use impacts on wildlife in the north end by reducing visitor access by water; alleviating sand starvation of beach and intertidal habitat caused by the stabilized Ocean City Inlet; replenishing sand in back-barrier marshes and overwash fan areas in the north end by restoring natural overwash processes; collaboration with the states to ensure adequate wastewater treatment at oyster watch houses and hunting blinds; supporting conservation partners to establish conservation easements on the mainland within the watersheds of Chincoteague Bay and Newport Bay; supporting conservation partners to establish conservation easements on the mainland within the watersheds of Chincoteague Bay and Newport Bay; as facilities are lost or severely damaged, removal of visitor use facilities from the island and rehabilitation of sites to foster a return to natural conditions; and enforcing federal laws prohibiting horseshoe crab harvest. Collectively, the beneficial impacts would be significant because they would benefit wildlife and wildlife habitats that are fundamental to the seashore, would address significant threats to fundamental resources, would be long term in duration, and would be readily apparent. Once vehicular access is lost, rehabilitation and restoration of island habitats would continue at a slower rate due to the complexities of water access operations, although impacts on wildlife would continue to be readily apparent and significant.

4.5 Federally Listed Threatened or Endangered Species

4.5.1 METHODOLOGY FOR ANALYZING IMPACTS

Management actions are qualitatively analyzed with respect to their potential to benefit or adversely impact the nine federally-listed species that inhabit land and waters managed by the NPS within the limits of Assateague National Seashore. Responses to natural coastal processes and the effects of climate change/sea level rise are analyzed to identify potential impacts to these species. Actions are identified and analyzed that have the potential to disturb these species because of new development, changes in seashore operations, or increased visitor use. Actions are also identified that have the potential to benefit listed species through research and special studies or through resource management actions aimed at rehabilitating seashore habitats that have been affected by historic land uses and invasive species. For this analysis, it is assumed that the NPS – in cooperation with the U.S. Fish and Wildlife Service and the NOAA Fisheries – will continue to undertake active management programs to inventory, monitor, restore, and maintain listed species' habitats; control detrimental nonnative species;

manage detrimental visitor access; and manage habitat to maintain and enhance its value for the recovery of listed species.

The resource specific context for assessing impacts of the alternatives on threatened or endangered within the seashore's habitats includes:

- Beaches and overwash areas on the seashore provide habitat needed to maintain and enhance the recovery of piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) – two federally listed threatened species that are fundamental to the seashore's purpose and significance.
- Nearshore ocean waters within the seashore boundary are known to be used on occasion by three endangered whale species, three endangered sea turtle species, and one threatened sea turtle species. The threatened Atlantic loggerhead sea turtle (*Caretta caretta*) occasionally nests on the seashore's beaches; single event nesting by the endangered leatherback turtle (*Dermachelys coriacea*) and the endangered green sea turtle (*Chelonia mydas*) have also been documented.
- Significant impacts to the seashore's geomorphology and wildlife habitats – including beaches and overwash areas used by piping plovers (*Charadrius melodus*), seabeach amaranth (*Amaranthus pumilus*), and occasional nesting turtles – include the hard stabilization of the Ocean City Inlet, the construction of an artificial protective dune along much of the island in 1962 following a major coastal storm, and the creation of an emergency storm berm at the north end of the island in 1998 after two storms threatened to breach the island (NPS 2011d). To mitigate the impacts, NPS and the USACE have been engaged in a long-term mechanical sand bypass project to alleviate sand starvation of the island from the stabilized inlet, thereby preventing unnatural, accelerated erosion and roll over.
- Introduced horses and sika deer are non-native species that are stressors to seashore vegetation and wildlife – including piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) – when populations are extreme (NPS 2011d); despite this, sustainable populations of horses and sika deer are desired conditions because visitors highly value the animals as part of the seashore experience. Furthermore, horses are considered resources that are important to the seashore.

4.5.2 ALTERNATIVE 1 – CONTINUATION OF CURRENT MANAGEMENT

- **Impact Analysis**

Coastal Response Management Actions. Dune maintenance to protect visitor facilities and seashore infrastructure in the Maryland Island Developed Area would continue to prevent the natural processes of sand overwash. This would continue to prevent evolution of sparsely vegetated overwash areas that could provide habitat for piping

plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) within the developed area.

Facilities lost or damaged by natural coastal processes or the effects of climate change/sea level rise would be replaced or repaired, if funding is available. Facilities to be replaced would be moved back from the shoreline and made more sustainable in form and function, at sites that would continue to be protected by investment in dune maintenance. Replacement facilities would be located in areas where dune maintenance would continue (as noted above) where sparsely vegetated overwash areas that could provide habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) do not occur, resulting in no additional adverse impact on threatened and endangered species.

Altered sand transport processes at Ocean City Inlet would continue to be mitigated in collaboration with the USACE. This would benefit threatened and endangered species by alleviating sand starvation of the island (from the stabilized inlet) and indirectly helping to maintain existing sparsely vegetated overwash areas and to create new overwash areas needed by piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*).

Natural Resource Management Actions. Ongoing research by the NPS and others would continue to benefit threatened and endangered species. These efforts would continue to monitor plover nesting success and occurrences of seabeach amaranth (*Amaranthus pumilus*) and to conduct studies needed to protect better both species from impacts of visitor use and the effects of climate change/sea level rise.

Management actions would continue to restore island habitats altered by historic land use, including removal of six hunting lodges, two private residences, access roads, and water impoundments in the seashore's backcountry. Structures and other impervious surfaces would be removed and sites rehabilitated to foster a return to natural conditions. These actions would not affect habitat used by threatened and endangered species.

Filling mosquito ditches in the Maryland portion of the seashore would continue. Currently, the seashore has filled about 10 percent of its 48,000 meters of mosquito ditches. Continued ditch restoration would have a beneficial impact on saltmarsh vegetation by helping to restore natural surface and groundwater flows from the island to the bayside and tidal flows in and out of saltmarshes. These actions would not affect habitat used by threatened and endangered species.

Phragmites australis removal from saltmarsh, forest and shrubland, inland wetlands, and dunes and grassland would continue using a combination of standard, ground-based control methods in combination with aerial spraying and prescribed fire or

mowing as needed in heavily infested areas. These actions would not affect habitat used by threatened and endangered species.

Horse management would continue with the goal of reducing the feral horse population to a sustainable population of 80 to 100 individuals. This would benefit threatened and endangered species by reducing overgrazing in sparsely vegetated overwash areas where seabeach amaranth (*Amaranthus pumilus*) and piping plovers (*Charadrius melodus*) are present and by reducing trampling of nests and chicks by grazing horses. NPS would also continue to use cages to protect seabeach amaranth (*Amaranthus pumilus*) from horse grazing and trampling.

Hunting management would continue to benefit the seashore's threatened and endangered species by reducing the size of the non-native sika deer and white-tailed deer population to levels which would contain impacts on seabeach amaranth (*Amaranthus pumilus*) and habitat of piping plovers (*Charadrius melodus*). A new hunting monitoring program would enhance management of both sika deer and native white-tailed deer by providing information needed to develop deer density and deer herbivory indices that would inform management decisions aimed at protecting native plant and wildlife species, such as seabeach amaranth (*Amaranthus pumilus*) and piping plovers (*Charadrius melodus*). If access to the OSV area is lost, access for public hunting could be significantly reduced or lost and deer populations could increase potential adverse impacts to seabeach amaranth (*Amaranthus pumilus*) and habitat of piping plovers (*Charadrius melodus*). NPS would explore alternative public hunting strategies to manage deer populations.

Cultural Resource Management Actions. NPS efforts to identify, manage, and protect cultural resources would continue. When historic structures could no longer be protected from natural coastal processes and the impacts of climate change/sea level rise, they would be demolished and the sites restored to foster a return to natural conditions. Should the Assateague Beach U.S. Coast Guard Station be subject to these actions, measures would be taken to protect seabeach amaranth (*Amaranthus pumilus*) and piping plovers (*Charadrius melodus*) from disturbance, if present in overwash areas adjoining the site at that time.

At the Assateague Beach U.S. Coast Guard Station, boat dock repairs would not impact threatened and endangered species. Restoration of electrical service would require trenching for conduit installation from the Tom's Cove recreational beach to the station in overwash areas where piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) could be present. Actions would be taken during project design and planning to avoid impacts to threatened and endangered species. Construction would not occur when plovers are present in the area, generally from April through October. Areas disturbed by construction would be revegetated to foster a return to natural conditions.

Visitor Use and Visitor Experience Management Actions. Confinement of oversand vehicle use within the existing designated OSV use area would continue to limit the area within which potential adverse impacts could occur to piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) on the intertidal beach and in overwash gaps in the dunes. NPS would continue to close portions of the OSV use area, as appropriate, when plover nesting occurs within the OSV use area. NPS would continue to use cages, signs, and marking to protect seabeach amaranth (*Amaranthus pumilus*) from disturbance by visitors. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to threatened or endangered species because vehicles would be eliminated from part or all of the OSV use area.

Seashore Operations Management Actions. Based on analysis of historic visitation counts, seashore visitation in Maryland is expected to increase by approximately 8,000 visitors per year as long as there is vehicular access to the seashore. The majority of this growth will be in day-use visitors, as campgrounds are already at capacity most days during the peak summer season. Additional visitors would require increased monitoring of seabeach amaranth (*Amaranthus pumilus*) and piping plover (*Charadrius melodus*) occurrences year-round in order to prevent loss because of human interactions or vehicles, disturbances due to noise and human activity, and changed habitat conditions such as trampling, soil compaction, vegetation loss, and loss of food sources damaged or killed by human activity. More visitors would likely use the OSV use area during the off season, when capacity for additional visitation remains, with the potential for additional adverse impacts to seabeach amaranth (*Amaranthus pumilus*) and piping plover (*Charadrius melodus*) habitat during that period.

Development of 20 bedrooms of seasonal housing in Maryland and 17 bedrooms of seasonal housing in Virginia would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*).

Withdrawals from wells to meet the daily visitor and NPS employee demands for water would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*).

Miscellaneous repairs would be made to the seashore's headquarters complex, visitor use facilities, seashore operations facilities, roads, and trails. These actions would generally not occur in habitats where piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*) are present. When maintenance is planned in areas where these species could be present, actions would be taken to avoid impacts through site design and/or timing of construction.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have the potential to impact threatened and endangered species include sand transport projects, sediment dredging projects, and actions by the US FWS implementing the comprehensive conservation plan for Chincoteague National Wildlife Refuge. Some habitats of threatened and endangered species are also affected by actions within the coastal bays watershed that have the potential to impact water quality (see section 4.2.2) and by land uses within and outside the region that adversely impact air quality, contributing to high levels of ozone and atmospheric deposition of nitrogen at the seashore.

The overall cumulative impacts on federally listed threatened or endangered species would be primarily beneficial because of improvements to the overall condition of seashore habitats because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce water pollutant loads from point and non-point sources throughout the coastal bay watersheds, and because of national programs to enhance air quality which help to reduce ozone and atmospheric deposition of nitrogen. Alternative 1 would add a noticeable increment to the overall beneficial cumulative impact through continuation of natural resource management actions that restore island habitats altered by historic land use and mosquito ditching, remove invasive *Phragmites australis*, manage horses to reduce impacts to habitats, and continue to reduce deer populations through managed hunting. There would also be adverse cumulative impacts on federally listed threatened or endangered species associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas, as well as with continued air quality impacts. Alternative 1 would add an imperceptible adverse increment to the overall adverse cumulative impact due to minor habitat disturbance and clearing for new seashore facilities, and due to annual growth in visitation (as long as there is vehicular access to the island) with the potential to impact adversely habitat and to increase loss of federally listed threatened or endangered species because of human interactions.

- **Conclusions**

In alternative 1 management actions would have both adverse and beneficial impacts on threatened and endangered species and would add an imperceptible adverse increment and a noticeable beneficial increment to the total cumulative adverse and beneficial impacts on federally listed threatened and endangered species, respectively.

Numerous actions associated with alternative 1 would not affect threatened and endangered species because they would occur in areas that do not provide suitable habitat for piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*). Continuation of natural resource management actions to restore island

habitats altered by historic land use would occur in forest, shrubland, and saltmarsh. *Phragmites australis* removal would occur primarily in saltmarsh, forest, shrubland, inland wetlands, and grassland. Similarly, filling of mosquito ditches would occur in saltmarsh habitat not used by piping plovers (*Charadrius melodus*).

Potential adverse impacts on threatened and endangered species could result from several management actions in alternative 1. Dune maintenance to protect visitor facilities and seashore infrastructure in the Maryland Island Developed Area and at the Assateague Beach U.S. Coast Guard Station would continue to prevent evolution of sparse vegetation in overwash areas that could provide habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Growth in visitation, as long as vehicular access to the island exists, would increase the potential for human disturbance in areas where piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) could occur; although in alternative 1 visitor use would generally be concentrated in or near the developed area where piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) do not occur and are not expected to occur as long as fortification continues. OSV use would continue within the existing OSV use area, with potential adverse impacts to plovers and seabeach amaranth (*Amaranthus pumilus*). In the north end, boat access to the beach would continue to enable visitors to use areas for recreation where plovers and seabeach amaranth (*Amaranthus pumilus*) are known to occur. At the Assateague Beach U.S. Coast Guard Station, restoration of electrical service would require trenching through overwash areas where piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) could be present. Impacts to plovers would be mitigated by closures during the nesting period (if plovers are present) and avoidance of construction during the nesting period; impacts to seabeach amaranth (*Amaranthus pumilus*) would be mitigated by use of cages and signage to protect plants from trampling. Reduced or lost access for public hunting via the OSV route (if access is lost), would lead to increased deer populations and associated overgrazing of areas where seabeach amaranth (*Amaranthus pumilus*) could occur or that provide habitat for piping plovers (*Charadrius melodus*). These impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting threatened and endangered species habitats, within the context of threatened and endangered species habitat throughout the seashore.

Beneficial impacts on threatened and endangered species would result from several management actions in alternative 1. The north end Restoration Project and NPS management actions in the north end, aimed at restoring natural overwash processes interrupted by the 1999 emergency storm berm, would continue to facilitate evolution of sparsely vegetated overwash areas providing habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Reducing the feral horse population to a sustainable population of 80 to 100 individuals would better protect

piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) by reducing overgrazing, vegetation trampling, and addition of nutrients. Ongoing research by the NPS and others would continue to monitor plover nesting success and occurrences of seabeach amaranth (*Amaranthus pumilus*) and to conduct studies needed to protect better both species from impacts of visitor use and the effects of climate change/sea level rise. Collectively, the beneficial impacts would be significant and long-term because they would benefit threatened and endangered species that are fundamental to the seashore and would address significant threats to those species within the context of the threatened and endangered species throughout the seashore.

4.5.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

- **Impact Analysis**

Coastal Response Management Actions. As in alternative 1, under alternatives 2, 3, and 4, facilities lost or damaged by natural coastal processes or the effects of climate change/sea level rise would be replaced or repaired, if funding is available, consistent with the underlying principles of each alternative. While the timing and extent to which facilities would continue to be replaced would vary in alternatives 2, 3, and 4, the nature of the impacts on threatened and endangered species associated with replacement would be similar to those described for alternative 1 (section 4.5.2).

Visitor Use and Visitor Experience Management Actions. Until facilities are lost, NPS would generally increase visitor services within the Maryland Island Developed Area. A few new small structures (with parking) would be added to support commercial services within existing previously disturbed visitor use areas. These facilities would be located in areas where dune maintenance would continue, where sparsely vegetated overwash areas that could provide habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) do not occur, and where existing visitor activity creates unsuitable conditions for these species.

The former visitor center on the mainland would be rehabilitated as a stand-alone environmental education center. Rehabilitation of this facility would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); human activity associated its operation would not disturb either species.

Seashore Operations Management Actions. In collaboration with MD DNR, NPS would develop a new seashore entrance station on the mainland, requiring realignment and widening of MD 611, construction of entrance booths, and addition of employee parking spaces. Construction of this facility would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); human activity associated its operation would not disturb either species.

Development of a mainland-based alternative transportation system (ATS) would require development of a shuttle staging area and associated unpaved parking area (for approximately 360 cars) on the mainland and shelters and paved pull-offs at three shuttle stops along existing roads on the island. These facilities would be located in areas where dune maintenance would continue, where sparsely vegetated overwash areas that could provide habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) do not occur, and where existing visitor activity creates unsuitable conditions for these species.

Non-structural stabilization of the mainland shoreline near the visitor center would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*).

4.5.4 ALTERNATIVE 2 – CONCENTRATED TRADITIONAL BEACH RECREATION

- **Impact Analysis**

Coastal Response Management Actions. Artificial dune fortification and beach nourishment would protect the Maryland Island Developed Area from the effects of natural coastal processes and climate change/sea level rise as long as suitable land base exists and funding is available. The seashore would expand partnerships with the USACE to provide additional sand to provide additional sand to mitigate the erosional forces associated with storms and/or sea level rise. Seabeach amaranth (*Amaranthus pumilus*) and piping plovers (*Charadrius melodus*) currently do not occur near where these actions are proposed due to lack of suitable habitat and human activity. Piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*) would not be affected, except to the extent that fortification would continue to prevent evolution of overwash areas where these species might otherwise potentially find suitable habitat.

As land and facilities are lost, they would be rebuilt using more sustainable design within the remaining protected developed area, concentrating visitor use and facilities within a smaller area. Seabeach amaranth (*Amaranthus pumilus*) and piping plovers (*Charadrius melodus*) would not likely occur near where these actions are proposed due to lack of suitable habitat and the existing concentration of human activity.

Natural Resource Management Actions. As in alternative 1, ongoing research by the NPS and others would continue to benefit threatened and endangered species. These efforts would continue to monitor plover nesting success and occurrences of seabeach amaranth (*Amaranthus pumilus*) and to conduct studies needed to protect better both species from impacts of visitor use and the effects of climate change/sea level rise.

Natural resource management programs and activities would continue as in alternative 1 although over time their scope would diminish. Filling mosquito ditches in the Maryland portion of the seashore would likely diminish, reducing benefits to the health

and function of saltmarsh habitat and with less benefit to wildlife inhabiting bay subtidal and mudflat habitats accruing from bay water quality enhancements due to reducing nutrient export from marshes. These actions would not affect habitat used by threatened and endangered species.

Reduced scope of other natural resource management actions – such as *Phragmites australis* removal, other vegetation restoration and protection, and beach and bayside wetlands protection – would reduce current benefits from those actions to wildlife inhabiting most seashore habitats. These actions would not affect habitat used by threatened and endangered species.

Reduced access to the north end by eliminating high density use in the north end would benefit piping plovers and seabeach amaranth by reducing the number of visitors in an area of the seashore where the species are known to occur.

As in alternative 1, hunting management would continue to benefit the seashore's threatened and endangered species by reducing the size of the non-native sika deer and white-tailed deer population to levels which would contain impacts on plant species native to the seashore's forest and shrubland habitat, and a new hunting monitoring program would better inform management decisions aimed at protecting native plant and wildlife species, such as seabeach amaranth (*Amaranthus pumilus*) and piping plovers (*Charadrius melodus*). In alternative 2, the benefits of public hunting to native plant and wildlife species, such as seabeach amaranth (*Amaranthus pumilus*) and piping plovers (*Charadrius melodus*) would be reduced because the OSV area would be smaller, making access to the backcountry more difficult for hunters with that result fewer deer would be taken annually. If access to the OSV area is lost, no action would be taken to restore it; access for public hunting could be significantly reduced or lost and deer populations could increase with potential adverse impacts on on wildlife due to adverse impacts on their habitat. NPS would explore alternative public hunting strategies to manage deer populations.

Working with Virginia to ensure appropriate wastewater treatment and disposal at privately owned structures (oyster watch houses and hunting blinds) located within the seashore's Virginia waters would reduce discharge of nutrients, pathogens, and other contaminants into bay waters, resulting in a beneficial impact to wildlife inhabiting bay subtidal and mudflat habitats. These actions would not affect habitat used by threatened and endangered species.

Cultural Resource Management Actions. NPS efforts to identify, manage, and protect cultural resources would continue. When historic structures could no longer be protected from natural coastal processes and the impacts of climate change/sea level rise, they would be demolished and the sites restored to foster a return to natural conditions. Should the Assateague Beach U.S. Coast Guard Station be subject to these

actions, measures would be taken to protect seabeach amaranth (*Amaranthus pumilus*) and piping plovers (*Charadrius melodus*) from disturbance, if present in overwash areas adjoining the site at that time.

Visitor Use and Visitor Experience Management Actions. OSV use would be confined within a smaller designated OSV use area (extending south of the Maryland Island Developed Area to approximately KM 23.4). Confinement within this smaller area would further limit the area within which adverse impacts occur to piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) on the intertidal beach and in overwash gaps in the dunes. As in alternative 1, NPS would continue to use cages, signs, and marking to protect seabeach amaranth (*Amaranthus pumilus*) from disturbance by visitors. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to threatened or endangered species because vehicles would be eliminated from part or all of the OSV use area.

Seashore Operations Management Actions. Seashore operations would be based in a rehabilitated headquarters complex in the Maryland Mainland Developed Area. Rehabilitation of this facility would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); continued human activity associated its operation would not disturb either species.

Approximately 10 acres would be acquired near the existing seashore headquarters complex to develop a shuttle staging area and associated visitor unpaved parking area (for approximately 360 cars). Construction of this facility would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); human activity associated its operation would not disturb either species.

Electricity and potable water would be extended to approximately 90 existing campsites. During construction trenching for underground installation of lines, noise and human activity would disturb wildlife. The impact area would generally be in previously disturbed areas along the edges of existing seashore roads, where noise and human activity levels are already high. Utility installations would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*).

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on threatened and endangered species would be the same as those identified for alternative 1.

The overall cumulative impacts on federally listed threatened or endangered species would be primarily beneficial because of improvements to the overall condition of seashore habitats because of collaborative efforts by public agencies, local

governments, and non-profit partners to reduce water pollutant loads from point and non-point sources throughout the coastal bay watersheds, and because of national programs to enhance air quality which help to reduce ozone and atmospheric deposition of nitrogen. Alternative 2 would add a noticeable increment to the overall beneficial cumulative impact through continuation of natural resource management actions that restore island habitats altered by historic land use and mosquito ditching, remove invasive *Phragmites australis*, manage horses to reduce impacts to habitats, and continue to reduce deer populations through managed hunting. There would also be adverse cumulative impacts on federally listed threatened or endangered species associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas, as well as with continued air quality impacts. Alternative 2 would add an imperceptible adverse increment to the overall adverse cumulative impact due to habitat disturbance and clearing for new seashore facilities, and due to annual growth in visitation (as long as there is vehicular access to the island) with the potential to impact adversely habitat and to increase loss of federally listed threatened or endangered species because of human interactions.

- **Conclusions**

In alternative 2 management actions would have both adverse and beneficial impacts on threatened and endangered species and would add an imperceptible adverse increment and a noticeable beneficial increment to the total cumulative adverse and beneficial impacts on federally listed threatened and endangered species, respectively.

Numerous actions associated with alternative 2 would not affect threatened and endangered species because they would occur in areas that do not provide suitable habitat for piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*). Development of new seashore facilities, most repairs to existing facilities, and replacement of existing facilities damaged or lost by natural coastal processes and/or the effects of climate change/sea level rise would occur on the mainland or on sites within the Maryland Island Developed Area in forest, shrubland, and grassland habitat. Continuation of natural resource management actions to restore island habitats altered by historic land use would occur in forest, shrubland, and saltmarsh. *Phragmites australis* removal would occur primarily in saltmarsh, forest, shrubland, inland wetlands, and grassland. Similarly, filling of mosquito ditches would occur in saltmarsh habitat, and stabilization of the shoreline near the new visitor center would occur in bay subtidal and mudflat habitat, all habitats that are not used by piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*).

Potential adverse impacts on threatened and endangered species could result from several management actions in alternative 2. Fortification of the Maryland Island Developed Area and dune maintenance to protect visitor facilities and seashore infrastructure in the Maryland Island Developed Area would continue to prevent

evolution of sparse vegetation in overwash areas that could provide habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Growth in visitation, as long as vehicular access to the island exists, would increase the potential for human disturbance in areas where piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) could occur; although in alternative 2 visitor use would become increasingly concentrated within the developed area where piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) do not occur and are not expected to occur as long as fortification continues and actually intensifies. OSV use would continue within a reduced OSV use area, with continued potential adverse impacts to plovers and seabeach amaranth (*Amaranthus pumilus*) although within a smaller area. In the north end, boat access to the beach would continue to enable visitors to use areas for recreation where plovers and seabeach amaranth (*Amaranthus pumilus*) are known to occur. As in alternative 1, at the Assateague Beach U.S. Coast Guard Station, restoration of electrical service would require trenching through overwash areas where piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) could be present. Impacts to piping plovers (*Charadrius melodus*) would be mitigated by closures during the nesting period (if plovers are present) and avoidance of construction during the nesting period; impacts to seabeach amaranth (*Amaranthus pumilus*) would be mitigated by use of cages and signage to protect plants from trampling. Reduced or lost access for public hunting via the OSV route (if access is lost), would lead to increased deer populations and associated overgrazing of areas where seabeach amaranth (*Amaranthus pumilus*) could occur or that provide habitat for piping plovers (*Charadrius melodus*). These impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting threatened and endangered species habitats, within the context of threatened and endangered species habitat throughout the seashore.

Beneficial impacts on threatened and endangered species would result from several management actions in alternative 2. OSV use would continue within a smaller OSV use area, benefitting piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) by reducing the area of potential adverse impacts associated with OSV use on the intertidal beach and in overwash gaps in the dunes where these species occur. Limiting use of the north end beach would reduce the number of visitors in the habitat areas of these species. The north end Restoration Project and NPS management actions in the north end, aimed at restoring natural overwash processes interrupted by the 1999 emergency storm berm, would continue to facilitate evolution of sparsely vegetated overwash areas providing habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Reducing the feral horse population to a sustainable population of 80 to 100 individuals would better protect piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) by reducing overgrazing, vegetation trampling, and addition of nutrients. Ongoing research by the NPS and others would continue to monitor plover nesting success and occurrences of

seabeach amaranth (*Amaranthus pumilus*) and to conduct studies needed to protect better both species from impacts of visitor use and the effects of climate change/sea level rise. Collectively, the beneficial impacts would be significant and long-term because they would benefit threatened and endangered species that are fundamental to the seashore and would address significant threats to those species within the context of the threatened and endangered species throughout the seashore.

4.5.5 ALTERNATIVE 3 – SUSTAINABLE RECREATION AND CLIMATE CHANGE ADAPTATION (NPS PREFERRED ALTERNATIVE)

- **Impact Analysis**

Coastal Response Management Actions. Seashore management would allow the island to evolve naturally, relocating and designing new facilities to be more sustainable. The seashore would no longer work with the USACE to provide additional sand to provide additional sand to mitigate the erosional forces associated with storms and/or sea level rise. No new investments would be made in dune fortification through planting and fencing installation. Over time natural overwash would resume throughout the developed area. This would benefit threatened and endangered species by encouraging evolution of sparsely vegetated overwash areas that could provide habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) within the developed area.

Visitor use infrastructure would evolve to more sustainable designs and likely shift to new, more stable locations initially on the island; over time development on the island would become less intensive, with fewer facilities and less impervious surfaces as visitor use facilities are slowly moved to the mainland. To the maximum extent, facilities would be temporary, designed to be removed in advance of coastal storms. Facilities lost or damaged by natural coastal processes or the effects of climate change/sea level rise would be replaced or repaired, if funding is available, at sites further from the shoreline at sites that do not require continued investment in dune maintenance where they can be made more sustainable in form and function. The location, extent, and type of habitat lost and wildlife species affected would depend on when and where seashore facilities and infrastructure would be lost and replaced. Replacement facilities would generally be located in habitat that is not used by piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); should there be potential for disturbance, actions would be taken during project design and planning to avoid impacts; construction with the potential to disturb plovers would not occur when plovers are present in the area, generally from April through October. As facilities are relocated, in combination with stopping beach fortification (see above) there would be greater potential for evolution of suitable habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) within what is now the developed area, due to restoration of overwash processes, removal of visitor use facilities, and less human disturbance.

If bridge access is lost, access would transition to all water access. Beneficial impacts to threatened and endangered species would generally result from removal of most vehicles from the island (with the exception of NPS operations vehicles and beach shuttles) and from removal of 150 campsites, other visitor facilities, paved roads, and the NPS maintenance yard. This would benefit piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) by reducing human activity and associated disturbances, and by fostering a return to natural conditions that promote evolution of habitat that could become suitable for their use in the future.

Natural Resource Management Actions. As in alternative 1, ongoing research by the NPS and others would continue to benefit threatened and endangered species. These efforts would continue to monitor plover nesting success and occurrences of seabeach amaranth (*Amaranthus pumilus*) and to conduct studies needed to protect better both species from impacts of visitor use and the effects of climate change/sea level rise. In alternative 3, data from an expanded monitoring network, as well as new ecological research, would provide a significant increase in information needed to better understand conditions, trends, and threats in the seashore's wildlife populations and their habitats, including piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*).

Natural resource management programs and activities would continue as in alternative 1 although over time programs would expand to address issues created by global climate change. In alternative 3, actions would generally seek to enhance resiliency of saltmarshes and inland wetlands resulting in a beneficial impact on the seashore's wildlife populations and their habitats, including piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*).

Reduced access to the north end by implementing a permit system requiring a docking/mooring pass would benefit piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) by reducing the number of visitors in an area of the seashore where the species are known to occur.

As in alternative 1, hunting management would continue to benefit the seashore's threatened and endangered species by reducing the size of the non-native sika deer and white-tailed deer population to levels which would contain impacts on plant species native to the seashore's forest and shrubland habitat, and a new hunting monitoring program would better inform management decisions aimed at protecting native plant and wildlife species, such as seabeach amaranth (*Amaranthus pumilus*) and piping plovers (*Charadrius melodus*). In alternative 3, if access to the OSV area is lost, consideration would be given to modifying the OSV route or relocating it to another more suitable location, thereby maintaining public access for hunting and its beneficial impacts to native plant and wildlife species, such as seabeach amaranth (*Amaranthus pumilus*) and piping plovers (*Charadrius melodus*), by reducing deer populations. Over

time, however, it is possible that access for public hunting could be significantly reduced or lost and deer populations could increase with potential adverse impacts on wildlife due to adverse impacts on their habitat.

Working with Virginia to ensure appropriate wastewater treatment and disposal at privately owned structures (oyster watch houses and hunting blinds) located within the seashore's Virginia waters would reduce discharge of nutrients, pathogens, and other contaminants into bay waters, resulting in a beneficial impact to wildlife inhabiting bay subtidal and mudflat habitats. These actions would not affect habitat used by threatened and endangered species.

Working with Worcester County, Accomack County, and conservation organizations, NPS would support efforts to protect land (through fee simple purchase or conveyance of conservation easements) within the watersheds of Chincoteague Bay and Newport Bay for conservation and climate change adaptation purposes. Conservation of these lands would not affect habitat used by threatened and endangered species.

NPS would collaborate with its conservation partners to acquire approximately 150 to 200 acres of buffer lands adjoining the one to three new points of departure on the Chincoteague Bay mainland in Worcester County. Land conservation would permanently protect these lands from loss to developed land uses; long-term management would facilitate return to natural conditions, as appropriate, with beneficial impacts to wildlife inhabiting a variety of mainland habitats, particularly saltmarsh along the bayshore. Conservation of these lands would not affect habitat used by threatened and endangered species.

Cultural Resource Management Actions. Implementation of non-structural storm protection measures (such as dune nourishment and planting) to protect the Assateague Beach U.S. Coast Guard Station would continue to prevent natural processes of sand overwash in the station vicinity. This would continue to prevent evolution of sparsely vegetated overwash areas that could provide habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) in the coast guard station vicinity.

Visitor Use and Visitor Experience Management Actions. Once camping facilities are no longer sustainable in the Maryland Island Developed Area or when vehicular access to the island is lost, NPS would collaborate with MD DNR to develop a new campground on the mainland. Construction of this facility on the mainland would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); human activity associated its operation would not disturb either species. On the island, existing campground sites would be rehabilitated to foster a return to natural conditions. Once this occurs, in combination with stopping beach fortification (see above) there would be greater potential for successful use of land within the developed

area by piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) due to restored overwash and less intense development of visitor facilities within areas that could become suitable for habitat in the future.

As in alternative 1, confinement of oversand vehicle use within the existing designated OSV use area would continue to limit the area within which adverse impacts occur to piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) on the intertidal beach and in overwash gaps in the dunes. NPS would continue to close portions of the OSV use area, as appropriate, when plover nesting occurs within the OSV use area. NPS would continue to use cages, signs, and marking to protect seabeach amaranth (*Amaranthus pumilus*) from disturbance by visitors. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to threatened or endangered species because vehicles would be eliminated from part or all of the OSV use area.

Expanded use of Egging Island for environmental education would increase visitor use to the island. New facilities would include an expanded soft landing for canoes and kayaks, clearing for a primitive group campsite, and installation of relocatable vault toilets. Construction of this facility on an island in Chincoteague Bay would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); human activity associated its operation would not disturb either species.

Three new bayside access points would be developed to provide water access to existing backcountry campsites and trails, one of which would provide opportunities for access via motorized vessels. Construction of these facilities on the mainland would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); human activity associated its operation would not disturb either species.

On the mainland in Worcester County NPS would seek to acquire from the county two existing points of departure from Chincoteague Bay; the sites would be rehabilitated, as needed, likely including development of a shade shelter and relocatable vault toilet. Rehabilitation of these facilities on the mainland would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); human activity associated its operation would not disturb either species.

Seashore Operations Management Actions. Seashore operations would be relocated to a new headquarters complex in the MD 611 corridor near the seashore entrance. Construction of this facility on the mainland would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); human activity associated its operation would not disturb either species.

Approximately 10 acres at the existing seashore headquarters site would be rehabilitated as a shuttle staging area and associated visitor unpaved parking area (for approximately 360 cars). Construction of this facility on the mainland would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); human activity associated its operation would not disturb either species.

When vehicular access to the island is no longer possible, access to the island would shift to a ferry based operation for visitor access and seashore operations at waterfront locations on the mainland and on the island. Construction of the docking facilities would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); human activity associated its operation would not disturb either species. On the island, a new shuttle route from the bayshore to the beach and other island attractions would generally be located in habitat that is not used by piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); should there be potential for disturbance, actions would be taken during project design and planning to avoid impacts; construction with the potential to disturb plovers would not occur when plovers are present in the area, generally from April through October.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on threatened and endangered species would be the same as those identified for alternative 1.

The overall cumulative impacts on federally listed threatened or endangered species would be primarily beneficial because of improvements to the overall condition of seashore habitats because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce water pollutant loads from point and non-point sources throughout the coastal bay watersheds, and because of national programs to enhance air quality which help to reduce ozone and atmospheric deposition of nitrogen. Alternative 3 would add an appreciable increment to the overall beneficial cumulative impact through expansion of natural resource management actions that restore island habitats altered by historic land use and mosquito ditching, remove invasive *Phragmites australis*, manage horses to reduce impacts to habitats, continue to reduce deer populations through managed hunting, and – once access is lost – removal of visitor facilities and reduced visitation. There would also be adverse cumulative impacts on federally listed threatened or endangered species associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas, as well as with continued air quality impacts. Alternative 3 would add an imperceptible adverse increment to the overall adverse cumulative impact due to habitat disturbance and clearing for new seashore facilities, and due to annual growth in visitation (as long as there is vehicular access to the island) with the potential to impact

adversely habitat and to increase loss of federally listed threatened or endangered species because of human interactions.

- **Conclusions**

In alternative 3 management actions would have both adverse and beneficial impacts on threatened and endangered species and would add an imperceptible adverse increment and an imperceptible beneficial increment to the total cumulative adverse and beneficial impacts on federally listed threatened and endangered species, respectively.

Numerous actions associated with alternative 3 would not affect threatened and endangered species because they would occur in areas that do not provide suitable habitat for piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*). Development of new seashore facilities, most repairs to existing facilities, and replacement of existing facilities damaged or lost by natural coastal processes and/or the effects of climate change/sea level rise would occur on the mainland or on sites within the Maryland Island Developed Area in forest, shrubland, and grassland habitat. Continuation of natural resource management actions to restore island habitats altered by historic land use would occur in forest, shrubland, and saltmarsh. *Phragmites australis* removal would occur primarily in saltmarsh, forest, shrubland, inland wetlands, and grassland. Similarly, filling of mosquito ditches would occur in saltmarsh habitat, and stabilization of the shoreline near the new visitor center would occur in bay subtidal and mudflat habitat, all habitats that are not used by plovers or amaranth.

Potential adverse impacts on threatened and endangered species could result from several management actions in alternative 3. Dune maintenance to protect the Assateague Beach U.S. Coast Guard Station would continue to prevent evolution of sparse vegetation in overwash areas that could provide habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Growth in visitation, as long as vehicular access to the island exists, would increase the potential for human disturbance in areas where piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) could occur, particularly as fortification ceases and areas within the Maryland Island Developed Area are permitted to evolve naturally, including evolution of habitat suitable for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Once access is lost, island roads and parking would be largely removed, retaining only those needed for seashore operations and for an island visitor shuttle (from the new bayshore ferry dock to the beach); over time, the island could evolve such that these roads could traverse or be near habitat that has become suitable habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*), resulting in the potential for adverse impacts due to human disturbance. As in alternative 1, OSV use would continue within the existing OSV use area, with potential adverse impacts to plovers and seabeach amaranth (*Amaranthus pumilus*) due to trampling, human activity, noise, and sand compaction. In

the north end, visitors would continue to use areas for recreation where plovers and seabeach amaranth (*Amaranthus pumilus*) are known to occur, although the number of visitors and potential for adverse impacts on the species would be reduced because of implementing a permit system requiring a docking/mooring pass for boats accessing the north end. As in alternative 1, at the Assateague Beach U.S. Coast Guard Station, restoration of electrical service would require trenching through overwash areas where piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) could be present. Impacts to plovers would be mitigated by closures during the nesting period (if plovers are present) and avoidance of construction during the nesting period; impacts to seabeach amaranth (*Amaranthus pumilus*) would be mitigated by use of cages and signage to protect plants from trampling. These impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting threatened and endangered species habitats, within the context of threatened and endangered species habitat throughout the seashore.

Beneficial impacts on threatened and endangered species would result from several management actions in alternative 3. As the island evolves naturally, fortification of the Maryland Island Developed Area would stop, allowing natural coastal processes to resume, including formation of overwash gaps in the dunes and overwash fans, potentially providing additional habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Visitor use facilities would gradually be relocated (as long as vehicle access to the island exists), to more sustainable locations in grasslands and forest habitat where piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) do not occur. Once access is lost, roads, parking areas, and campgrounds would be removed from the developed area and the sites restored to foster return to natural conditions, which as the island evolves naturally, could further foster formation of new habitat suitable for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). In the north end, reduced boat access to the beach would limit the number of visitors who using areas for recreation where plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) occur. The north end Restoration Project and NPS management actions in the north end, aimed at restoring natural overwash processes interrupted by the 1999 emergency storm berm, would continue to facilitate evolution of sparsely vegetated overwash areas providing habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Reducing the feral horse population to a sustainable population of 80 to 100 individuals would better protect piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) by reducing overgrazing, vegetation trampling, and addition of nutrients. Expanded research by the NPS and others would increase monitoring of piping plover (*Charadrius melodus*) nesting success and occurrences of seabeach amaranth (*Amaranthus pumilus*) and more studies would occur that enhance understanding of management needs to protect better both species from impacts of visitor use and the effects of climate change/sea level rise. Collectively, the beneficial

impacts would be significant and long-term because they would benefit threatened and endangered species that are fundamental to the seashore and would address significant threats to those species within the context of the threatened and endangered species throughout the seashore.

4.5.6 ALTERNATIVE 4 – NATURAL ISLAND EVOLUTION AND A PRIMITIVE ISLAND EXPERIENCE

- **Impact Analysis**

Coastal Response Management Actions. Seashore management would allow the island to evolve naturally, maintaining facilities only until they are lost, severely damaged, or become obsolete. As in alternative 3, the seashore would no longer work with the USACE to provide additional sand to provide additional sand to mitigate the erosional forces associated with storms and/or sea level rise. No new investments would be made in dune fortification through planting and fencing installation. Over time natural overwash would resume throughout the developed area. This would benefit threatened and endangered species by encouraging evolution of sparsely vegetated overwash areas that could provide habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) within the developed area.

Development on the island would become less intensive, with fewer facilities and less impervious surfaces as visitor use facilities are removed, resulting in a beneficial impact on threatened and endangered species. Replacement of facilities lost or damaged would be limited to new primitive campsites; should there be potential for disturbance, actions would be taken during project design and planning to avoid impacts; construction with the potential to disturb plovers would not occur when plovers are present in the area, generally from April through October. As facilities are relocated, in combination with stopping beach fortification (see above) there would be greater potential for evolution of suitable habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) within what is now the developed area, due to restoration of overwash processes, removal of visitor use facilities, and less human disturbance.

As in alternative 3, if bridge access is lost, access would transition to all water access. Beneficial impacts to threatened and endangered species would generally result from removal of most vehicles from the island (with the exception of NPS operations vehicles and beach shuttles) and from removal of 150 campsites, other visitor facilities, paved roads, and the NPS maintenance yard. This would benefit piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) by reducing human activity and associated disturbances, and by fostering a return to natural conditions that promote evolution of habitat that could become suitable for their use in the future.

Natural Resource Management Actions. Natural resource management programs and activities would continue as in alternative 1 although over time programs would expand to address mitigation of human impacts and climate change adaptation. These efforts would continue to monitor plover nesting success and occurrences of seabeach amaranth (*Amaranthus pumilus*) and to conduct studies needed to protect better both species from impacts of visitor use and the effects of climate change/sea level rise. In alternative 4, monitoring key climate drivers and resource conditions would increase. Collectively these expanded programs would support actions to enhance resiliency of vulnerable resources resulting in a beneficial impact on the seashore's wildlife populations and their habitats, including piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*).

Visitor use impacts on piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) in the north end would be largely eliminated by prohibiting boat-in visitor use to the area. This would have a beneficial impact on both species because most visitors who now access the area by boat would no longer be able or willing to do so. In the future, only visitors willing to hike or paddle the distance to the north end will visit the area. This will significantly reducing the potential for adverse impacts to piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*).

Expanded cooperative research would include more basic science and barrier island ecology research. New ecological research, would provide additional information needed to better understand habitat conditions, trends, and management issues that could help accomplish management goals for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*).

As in alternative 1, hunting management would continue to benefit the seashore's threatened and endangered species by reducing the size of the non-native sika deer and white-tailed deer population to levels which would contain impacts on plant species native to the seashore's forest and shrubland habitat, and a new hunting monitoring program would better inform management decisions aimed at protecting native plant and wildlife species, such as seabeach amaranth (*Amaranthus pumilus*) and piping plovers (*Charadrius melodus*). In alternative 4, if access to the OSV area is lost, no action would be taken to restore it; access for public hunting could be significantly reduced or lost and deer populations could increase with potential adverse impacts on native plant and wildlife species, such as seabeach amaranth (*Amaranthus pumilus*) and piping plovers (*Charadrius melodus*). NPS would explore alternative public hunting strategies to manage deer populations.

As in alternative 3, working with Worcester County, Accomack County, and conservation organizations, NPS would support efforts to protect land (through fee simple purchase or conveyance of conservation easements) within the watersheds of Chincoteague Bay and Newport Bay for conservation and climate change adaptation purposes.

Conservation of these lands would not affect habitat used by threatened and endangered species.

Cultural Resource Management Actions. As in alternative 3, implementation of non-structural storm protection measures (such as dune nourishment and planting) to protect the Assateague Beach U.S. Coast Guard Station would continue to prevent natural processes of sand overwash in the station vicinity. This would continue to prevent evolution of sparsely vegetated overwash areas that could provide habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) in the coast guard station vicinity.

Visitor Use and Visitor Experience Management Actions. New facility development would include development of up to 150 primitive campsites, replacing developed campsites lost to natural coastal processes and the impacts of climate change/sea level rise. Campsites would be located in habitat that is not used by piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); should there be potential for disturbance, actions would be taken during project design and planning to avoid impacts; construction with the potential to disturb plovers would not occur when plovers are present in the area, generally from April through October.

As in alternative 1, confinement of oversand vehicle use within the existing designated OSV use area would continue to limit the area within which potential adverse impacts could occur to piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) on the intertidal beach and in overwash gaps in the dunes. NPS would continue to close portions of the OSV use area, as appropriate, when plover nesting occurs within the OSV use area. NPS would continue to use cages, signs, and marking to protect seabeach amaranth (*Amaranthus pumilus*) from disturbance by visitors. If vehicular access is lost, and the breach management plan recommends that the breach remain open, there would be a beneficial impact to threatened or endangered species because vehicles would be eliminated from part or all of the OSV use area.

Seashore Operations Management Actions. As in alternative 3, seashore operations would be relocated to a new headquarters complex in the MD 611 corridor near the seashore entrance. Construction of this facility on the mainland would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); human activity associated its operation would not disturb either species.

As in alternative 3, approximately 10 acres at the existing seashore headquarters site would be rehabilitated as a shuttle staging area and associated visitor unpaved parking area (for approximately 360 cars). Construction of this facility on the mainland would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth

(*Amaranthus pumilus*); human activity associated its operation would not disturb either species.

As in alternative 3, when vehicular access to the island is no longer possible, access to the island would shift to a ferry based operation for visitor access and seashore operations at waterfront locations on the mainland and on the island. Construction of the docking facilities would not affect habitat of piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); human activity associated its operation would not disturb either species. On the island, a new shuttle route from the bayshore to the beach and other island attractions would generally be located in habitat that is not used by piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*); should there be potential for disturbance, actions would be taken during project design and planning to avoid impacts; construction with the potential to disturb plovers would not occur when piping plovers (*Charadrius melodus*) are present in the area, generally from April through October.

Removal of the existing maintenance yard in the Maryland Island Developed Area and rehabilitation of the site to foster a return to natural conditions would not affect piping plovers (*Charadrius melodus*) or seabeach amaranth (*Amaranthus pumilus*).

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on threatened and endangered species would be the same as those identified for alternative 1.

The overall cumulative impacts on federally designated or endangered species would be primarily beneficial because of improvements to the overall condition of seashore habitats because of collaborative efforts by public agencies, local governments, and non-profit partners to reduce water pollutant loads from point and non-point sources throughout the coastal bay watersheds, and because of national programs to enhance air quality which help to reduce ozone and atmospheric deposition of nitrogen. Alternative 4 would add an appreciable increment to the overall beneficial cumulative impact through expansion of natural resource management actions that restore island habitats altered by historic land use and mosquito ditching, remove invasive *Phragmites australis*, manage horses to reduce impacts to habitats, continue to reduce deer populations through managed hunting, and – once access is lost – removal of visitor facilities and reduced visitation. There would also be adverse cumulative impacts on federally listed threatened or endangered species associated with pollutant discharges from previously permitted and new construction activities and land uses within the watershed, particularly where they occur outside sewer service areas, as well as with continued air quality impacts. Alternative 4 would add an imperceptible adverse increment to the overall adverse cumulative impact due to habitat disturbance and clearing for new seashore facilities, and due to annual growth in visitation (as long as

there is vehicular access to the island) with the potential to impact adversely habitat and to increase loss of federally listed threatened or endangered species because of human interactions.

- **Conclusions**

In alternative 4 management actions would have both adverse and beneficial impacts on threatened and endangered species and would add an imperceptible adverse increment and a noticeable beneficial increment to the total cumulative adverse and beneficial impacts on federally listed threatened and endangered species, respectively.

Development of new seashore facilities, most repairs to existing facilities, and replacement of existing facilities damaged or lost by natural coastal processes and/or the effects of climate change/sea level rise would occur on the mainland or on sites within the Maryland Island Developed Area in forest, shrubland, and grassland habitat. Continuation of natural resource management actions to restore island habitats altered by historic land use would occur in forest, shrubland, and saltmarsh. *Phragmites australis* removal would occur primarily in saltmarsh, forest, shrubland, inland wetlands, and grassland. Similarly, filling of mosquito ditches would occur in saltmarsh habitat, and stabilization of the shoreline near the new visitor center would occur in bay subtidal and mudflat habitat, all habitats that are not used by plovers or amaranth.

Potential adverse impacts on threatened and endangered species could result from several management actions in alternative 4. Dune maintenance to protect the Assateague Beach U.S. Coast Guard Station would continue to prevent evolution of sparse vegetation in overwash areas that could provide habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Growth in visitation, as long as vehicular access to the island exists, would increase the potential for human disturbance in areas where piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) could occur, particularly as fortification ceases and areas within the Maryland Island Developed Area are permitted to evolve naturally, including evolution of habitat suitable for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Once access is lost, island roads and parking would be largely removed, retaining only those needed for seashore operations; over time, the island could evolve such that these seashore roads could traverse or be near habitat that has become suitable habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*), resulting in the potential for adverse impacts due to human disturbance. Replacement of developed campgrounds with up to 150 primitive campsites would have the potential to impact piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) if any campsites are located in areas where habitat conditions have evolved to create potential habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). As in alternative 1, OSV use would continue within the existing OSV use area, with potential adverse impacts to piping plovers (*Charadrius melodus*) and seabeach amaranth

(*Amaranthus pumilus*) due to trampling, human activity, noise, and sand compaction. In the north end, visitors would continue to use areas for recreation where plovers and seabeach amaranth (*Amaranthus pumilus*) are known to occur, although the number of visitors and potential for adverse impacts on the species would be greatly reduced by no longer allowing boat access to the north end. As in alternative 1, at the Assateague Beach U.S. Coast Guard Station, restoration of electrical service would require trenching through overwash areas where piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) could be present. Impacts to plovers would be mitigated by closures during the nesting period (if plovers are present) and avoidance of construction during the nesting period; impacts to seabeach amaranth (*Amaranthus pumilus*) would be mitigated by use of cages and signage to protect plants from trampling. Reduced or lost access for public hunting via the OSV route (if access is lost), would lead to increased deer populations and associated overgrazing of areas where seabeach amaranth (*Amaranthus pumilus*) could occur or that provide habitat for piping plovers (*Charadrius melodus*). These impacts would not be significant because of the simultaneous implementation of best management practices and continued actions consistent with NPS management policies protecting threatened and endangered species habitats, within the context of threatened and endangered species habitat throughout the seashore.

Beneficial impacts on threatened and endangered species would result from several management actions in alternative 4. As the island evolves naturally, fortification of the Maryland Island Developed Area would stop, allowing natural coastal processes to resume, including formation of overwash gaps in the dunes and overwash fans, potentially providing additional habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Visitor use facilities would gradually be relocated (as long as vehicle access to the island exists), to more sustainable locations in grasslands and forest habitat where piping plover (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) do not occur. Once access is lost, roads, parking areas, and campgrounds would be removed from the developed area and the sites restored to foster return to natural conditions, which as the island evolves naturally, could further foster formation of new habitat suitable for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). In the north end, boat access to the beach would no longer be permitted, thereby reducing the number of visitors who using areas for recreation where plovers and seabeach amaranth (*Amaranthus pumilus*) occur. The north end Restoration Project and NPS management actions in the north end, aimed at restoring natural overwash processes interrupted by the 1999 emergency storm berm, would continue to facilitate evolution of sparsely vegetated overwash areas providing habitat for piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*). Reducing the feral horse population to a sustainable population of 80 to 100 individuals would better protect piping plovers (*Charadrius melodus*) and seabeach amaranth (*Amaranthus pumilus*) by reducing overgrazing, vegetation trampling, and addition of nutrients. Expanded research by the NPS and others would increase

monitoring of plover nesting success and occurrences of seabeach amaranth (*Amaranthus pumilus*) and more studies would occur that enhance understanding of management needs to protect better both species from impacts of visitor use and the effects of climate change/sea level rise. Collectively, the beneficial impacts would be significant and long-term because they would benefit threatened and endangered species that are fundamental to the seashore and would address significant threats to those species within the context of the threatened and endangered species throughout the seashore.

4.6 Historic Structures

4.6.1 METHODOLOGY FOR ANALYZING IMPACTS

Impacts on historic structures are described in terms consistent with the Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) that require that the impacts of the alternatives and their component actions be disclosed. The analysis of individual actions includes identification and characterization of impacts, including a discussion of the type of impact (beneficial or adverse), duration (short-term, long-term, or permanent), and significance.

The planning team based its impact analysis and conclusions largely on the review of existing research and studies and the professional judgment of Assateague Island National Seashore staff.

The resource-specific context for the evaluation of impacts on historic structures is as follows:

- The seashore contains significant historic structures that are important resources to the seashore, although they are not fundamental to the seashore's purpose and significance.
- Two structures have been determined eligible for listing in the *National Register*:
 - The Assateague Beach U.S. Coast Guard Station is architecturally significant as a representative example of early 20th century U.S. Coast Guard Buildings constructed primarily to execute the boat and life rescue service along the Atlantic Coast. It is also a Virginia state landmark.
 - Green Run Lodge is significant as a representative example waterfowl hunting camps associated with historical commercial and recreational hunting on Assateague Island.

4.6.2 ALTERNATIVE 1 – CONTINUATION OF CURRENT MANAGEMENT

- **Impact Analysis**

Coastal Response Management Actions. At the Assateague Beach U.S. Coast Guard Station, NPS would take limited actions to protect or stabilize the ocean dunes or bay shoreline now or in the event of future storm damage to the dune or shoreline. The ocean side primary dune and the bayside shoreline are currently stable, for the time being protecting the land area where the station is located. Limited action would increase the potential for damage or loss of historic structures at the coast guard station by natural coastal processes and/or the effects of climate change/sea level rise.

At Green Run Lodge, the NPS would not take action to protect or stabilize the bay shoreline now or in the event of future storm damage to the shoreline. The bayside shoreline is currently stable, for the time being protecting the land area where the lodge is located. Lack of action would increase the potential for damage or loss of historic structures at Green Run Lodge by natural coastal processes and/or the effects of climate change/sea level rise.

If damage occurs to either historic property, the NPS would conduct a value analysis to determine whether or not repairs would be made, taking into consideration the historic significance of the structures and cultural landscape, the level of damage, and the likelihood of further damage from natural coastal processes and the effects of climate change/sea level rise. NPS would also follow NPS guidelines for the treatment of historic structures likely to be affected by climate change. If it is determined that historic structures could no longer be maintained due to recurring damage, the NPS would likely demolish the structure and rehabilitate the site to foster a return to natural conditions. Prior to demolition, resources would be documented in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995c) and other NPS policies, guidelines, and standards.

Natural Resource Management Actions. Analysis of natural resource management actions identified no associated impacts on historic structures.

Cultural Resource Management Actions. At the Assateague Beach U.S. Coast Guard Station, the NPS would maintain current management practices. All structures would be maintained, as they are considered part of one historic complex or system, although priority would continue to be placed on maintaining the station house and boathouse. The seashore would continue basic resource maintenance and stabilization of structures. Current management practices include stabilizing the structures and conducting repair or rehabilitation projects as funds become available. Maintenance could include painting, roof and foundation stabilization, and waterproofing. Current planned and programmed management actions include replacement of primary electrical service to the station and repairs to the boat dock to retain historic character.

Collectively these actions would result in a short-term beneficial impact on the character-defining features of historic structures at the coast guard station (by maintaining power supply and repairing the boat dock).

At Green Run Lodge, NPS would maintain current management practices. The lodge would remain vacant. The seashore would continue basic resource maintenance and stabilization of the structure. Planned and programmed management actions include shell stabilization and waterproofing. Availability of funding for additional repairs would continue to be inconsistent and scarce, as other seashore resources that are used regularly receive funding priority. Collectively these actions would continue to protect minimally the character-defining features of Green Run Lodge, resulting in a short-term beneficial impact on historic structures.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on historic structures.

Seashore Operations Management Actions. Analysis of seashore operations management actions identified no associated impacts on historic structures.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on historic structures generally include growth and development on private property on the mainland adjoining the seashore, as well as public development and transportation system improvements on the mainland. With the exception of the town of Berlin, there are no local regulations in place to protect historic structures on private land during the land development process in Worcester County (MD), Accomack County (VA), or incorporated municipalities within the counties. As a result, historic structures have been lost and will continue to be lost or impacted by private development actions that adversely impact their character-defining features. Conversely, public development and transportation system projects with federal funding are required to engage in a consultation process to identify ways to minimize potential adverse effects to historic structures in accordance with section 106 of the National Historic Preservation Act of 1966, as amended (NHPA).

The overall cumulative impacts would be primarily adverse because historic structures on the mainland would continue to be adversely impacted by development projects. Alternative 1 would add an imperceptible increment to the overall adverse cumulative impact because of impacts to the seashore's historic structures over the long-term from coastal processes and the effects of climate change/sea level rise. There would also be beneficial cumulative impacts associated with actions taken to minimize or avoid impacts to historic structures associated with land development projects on the mainland. Alternative 1 would add an imperceptible increment to the beneficial impact

due to continued efforts to maintain the seashore's historic structures until they may be lost or irrevocably damaged.

- **Conclusions**

In alternative 1 management actions would both adverse and beneficial impacts on historic structures, and would add an imperceptible adverse increment and an imperceptible beneficial increment to the total cumulative impacts on historic structures, respectively.

Limited management actions to stabilize and further protect the primary ocean dune and the bay shoreline would continue to expose the station structures and lodge to significant damage and/or potential loss of the land mass upon which they are located. Ultimately, the historic structures would likely be significantly damaged and/or lost, resulting in long-term adverse impacts on historic structures. The potential adverse impacts would be significant because the resources, which are eligible for listing on the *National Register*, would be lost.

The beneficial impacts would result from continuing to maintain the character-defining features of the Assateague Beach U.S. Coast Guard Station and Green Run Lodge.

4.6.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

In alternatives 2, 3, and 4, the NPS would initially maintain current management practices and uses for historic structures at the coast guard station as in alternative 1. Collectively these actions would result in a short-term beneficial impact on the character-defining features of historic structures at the coast guard station by maintaining power supply and repairing the boat dock.

4.6.4 ALTERNATIVE 2 – CONCENTRATED TRADITIONAL BEACH RECREATION

- **Impact Analysis**

Coastal Response Management Actions. At the Assateague Beach U.S. Coast Guard Station and at Green Run Lodge, the NPS would no longer protect and stabilize the dunes and shoreline to more effectively withstand future storm damage. This would increase the potential for damage or loss by natural coastal processes and/or the effects of climate change/sea level rise.

If it is determined that the historic structures and cultural landscape have become so damaged by coastal storms, sea level rise, or other climate change related issues that they create a hazard, NPS would likely demolish the structures and rehabilitate the sites to foster a return to natural conditions. Prior to demolition, resources would be documented in accordance with the *Secretary of the Interior's Standards for the*

Treatment of Historic Properties (NPS 1995c) and other NPS policies, guidelines, and standards.

Natural Resource Management Actions. Analysis of natural resource management actions identified no associated impacts on historic structures.

Cultural Resource Management Actions. Both Assateague Beach U.S. Coast Guard Station and the former Green Run Lodge sites are vulnerable to sea level rise, and understanding this, NPS would not take any further actions to stabilize or maintain historic structures at these sites. Over time, lack of maintenance would result in the gradual loss of the character-defining features of the historic structures, resulting in a likely long-term adverse impact on historic structures.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on historic structures.

Seashore Operations Management Actions. Analysis of seashore operations management actions identified no associated impacts on historic structures.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on historic structures would be the same as those identified for alternative 1 (section 4.6.2).

The overall cumulative impacts would be primarily adverse because historic structures on the mainland would continue to be adversely impacted by development projects. Alternative 2 would add an imperceptible increment to the overall adverse cumulative impact because of impacts to the seashore's historic structures over the long-term from lack of maintenance and from coastal processes and the effects of climate change/sea level rise. There would also be beneficial cumulative impacts associated with actions taken to minimize or avoid impacts to historic structures associated with land development projects on the mainland. Alternative 2 would add an imperceptible increment to the adverse impact due to lack of continued efforts to maintain the seashore's few historic structures until they may be lost or irrevocably damaged.

- **Conclusions**

In alternative 2 management actions would have an adverse impact on historic structures and would add an imperceptible increment to the total cumulative adverse impacts on historic structures.

At the former Assateague Beach U.S. Coast Guard Station and the former Green Run Lodge, lack of maintenance and management actions to stabilize and further protect the

bay shoreline would continue to expose the historic structures to significant damage and/or potential loss of the land mass upon which they are located. Ultimately, the historic structures would likely be significantly damaged and/or lost, resulting in long-term adverse impacts on historic structures. The potential adverse impact would be significant because the former Assateague Beach U.S. Coast Guard Station and the former Green Run Lodge, which are eligible for listing on the *National Register*, would be lost.

4.6.5 ALTERNATIVE 3 – SUSTAINABLE RECREATION AND CLIMATE CHANGE ADAPTATION (NPS PREFERRED ALTERNATIVE)

Coastal Response Management Actions. At the Assateague Beach U.S. Coast Guard Station, the NPS would protect and stabilize the dunes and shoreline to withstand future storm damage more effectively. As investments are made in rehabilitating the station structures, there would be additional incentives and financial resources available from a partner organization for further protecting and stabilizing the dunes and shoreline to withstand potential impacts of natural coastal processes and the effects of climate change/sea level rise.

At Green Run Lodge, the NPS would protect and stabilize the bay shoreline to withstand future storm damage more effectively. These actions would decrease the potential for damage or loss of historic structures at Green Run Lodge. There would be potential for a future beneficial impact on the lodge by protecting it from natural coastal processes and/or the effects of climate change/sea level rise that would have otherwise damaged or destroyed the structure. However, it is likely that over time the protection and stabilization measures would be unable to provide adequate protection.

As in alternatives 1 and 4, if damage occurs to either historic property, the NPS would conduct a value analysis to determine whether or not repairs would be made, taking into consideration the historic significance of the structures and cultural landscape, the level of damage, and the likelihood of further damage from natural coastal processes and the effects of climate change/sea level rise. NPS would also follow agency and departmental guidelines for the treatment of historic structures likely to be affected by climate change. If it is determined that historic structures could no longer be maintained due to recurring damage, the NPS would likely demolish the structure and rehabilitate the site to foster a return to natural conditions. Prior to demolition, resources would be documented in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995c) and other NPS policies, guidelines, and standards.

Natural Resource Management Actions. Analysis of natural resource management actions identified no associated impacts on historic structures.

Cultural Resource Management Actions. At the Assateague Beach U.S. Coast Guard Station, the NPS would seek partners to adaptively reuse the coast guard station as a site for environmental research and/or education. Once a partnership is in place, the NPS would collaborate to develop and implement a suitable plan for rehabilitating the structures for adaptive reuse. Rehabilitation would be in conformance with the *Secretary of the Interior's Standards for Historic Preservation*. Additional funding would likely be available on a consistent basis from the partner organization to enhance long-term maintenance and stabilization of structures. Occupancy and ongoing use of the structures would generally enhance maintenance and care of structures, helping to preserve them. Collectively these actions would result in a beneficial impact on historic structures.

At Green Run Lodge, the NPS would rehabilitate and adaptively reuse the historic structure. Rehabilitation would be in conformance with the *Secretary of the Interior's Standards for Historic Preservation*. Occupancy and ongoing use of the structures would generally enhance maintenance and care of structures, helping to preserve them. Collectively these actions would result in a beneficial impact on historic structures.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on historic structures.

Seashore Operations Management Actions. Analysis of seashore operations management actions identified no associated impacts on historic structures.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on historic structures would be the same as those identified for alternative 1 (section 4.6.2).

The overall cumulative impacts would be primarily adverse because historic structures on the mainland would continue to be adversely impacted by development projects. Alternative 3 would add an imperceptible increment to the overall adverse cumulative impact because of impacts to the seashore's historic structures over the long-term from coastal processes and the effects of climate change/sea level rise. There would also be beneficial cumulative impacts associated with actions taken to minimize or avoid impacts to historic structures associated with land development projects on the mainland. Alternative 3 would add an imperceptible increment to the beneficial impact due to continued efforts to maintain the seashore's historic structures until they may be lost or irrevocably damaged.

- **Conclusions**

In alternative 3 management actions would have both adverse and beneficial impacts on historic structures and would add an imperceptible adverse increment and an imperceptible beneficial increment to the total cumulative impacts on historic structures, respectively.

Additional protective actions at both the Assateague Beach U.S. Coast Guard Station and Green Run Lodge would reduce exposure to significant damage and/or potential loss from the impacts of natural coastal processes and/or climate change/sea level rise. While these actions might prolong the ability to maintain the structures, resulting in a short-term beneficial impact on historic structures, over time these actions would likely prove inadequate. Ultimately, historic structures would likely be significantly damaged and/or lost, resulting in long-term adverse impacts on historic structures. The potential adverse impacts would be significant because historic structures, which are eligible for listing on the *National Register*, would be lost.

As in alternative 1, the beneficial impacts would result from continuing to maintain the character-defining features of the Assateague Beach U.S. Coast Guard Station and Green Run Lodge. In addition, in alternative 3, both the Assateague Beach U.S. Coast Guard Station and Green Run Lodge would be rehabilitated in accordance with the Secretary's Standards for Historic Preservation and adaptively reused. There would be a beneficial impact on historic structures due to enhanced maintenance and compatible reuse and occupancy of the structures.

4.6.6 ALTERNATIVE 4 – NATURAL ISLAND EVOLUTION AND A PRIMITIVE ISLAND EXPERIENCE

- **Impact Analysis**

Coastal Response Management Actions. At the Assateague Beach U.S. Coast Guard Station, the NPS would implement only limited actions to protect and stabilize the dunes and shoreline to withstand future storm damage more effectively.

At Green Run Lodge, the NPS would protect and stabilize the bay shoreline to withstand future storm damage more effectively. These actions would decrease the potential for damage or loss of historic structures at Green Run Lodge. There would be potential for a future beneficial impact on the lodge by protecting it from natural coastal processes and/or the effects of climate change/sea level rise that would have otherwise damaged or destroyed the structure. However, it is likely that over time the protection and stabilization measures would be unable to provide adequate protection.

As in alternatives 1 and 3, If damage occurs to either historic property, the NPS would conduct a value analysis to determine whether or not repairs would be made, taking into consideration the historic significance of the structures and cultural landscape, the

level of damage, and the likelihood of further damage from natural coastal processes and the effects of climate change/sea level rise. NPS would also follow agency and departmental guidelines for the treatment of historic structures likely to be affected by climate change. If it is determined that historic structures could no longer be maintained due to recurring damage, the NPS would likely demolish the structure and rehabilitate the site to foster a return to natural conditions. Prior to demolition, resources would be documented in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995c) and other NPS policies, guidelines, and standards.

Natural Resource Management Actions. Analysis of natural resource management actions identified no associated impacts on historic structures.

Cultural Resource Management Actions. At the Assateague Beach U.S. Coast Guard Station, the NPS would maintain current management practices, as in alternative 1. Collectively these actions would result in a short-term beneficial impact on the character-defining features of historic structures at the coast guard station (by maintaining power supply and repairing the boat dock).

As in alternative 3, at Green Run Lodge, the NPS would rehabilitate and adaptively reuse the historic structure. Rehabilitation would be in conformance with the *Secretary of the Interior's Standards for Historic Preservation*. Occupancy and ongoing use of the structures would generally enhance maintenance and care of structures, helping to preserve them. Collectively these actions would result in a beneficial impact on historic structures.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on historic structures.

Seashore Operations Management Actions. Analysis of seashore operations management actions identified no associated impacts on historic structures.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on historic structures would be the same as those identified for alternative 1 (section 4.6.2).

The overall cumulative impacts would be primarily adverse because historic structures on the mainland would continue to be adversely impacted by development projects. Alternative 4 would add an imperceptible increment to the overall adverse cumulative impact because of impacts to the seashore's historic structures over the long-term from coastal processes and the effects of climate change/sea level rise. There would also be

beneficial cumulative impacts associated with actions taken to minimize or avoid impacts to historic structures associated with land development projects on the mainland. Alternative 4 would add an imperceptible increment to the beneficial impact due to continued efforts to maintain the seashore's historic structures until they may be lost or irrevocably damaged.

- **Conclusions**

In alternative 4 management actions would have both adverse and beneficial impacts on historic structures and would add an imperceptible adverse increment and an imperceptible beneficial increment to the total cumulative impacts on historic structures, respectively.

Limited additional protective actions at the Assateague Beach U.S. Coast Guard Station would slightly reduce exposure to significant damage and/or potential loss from the impacts of natural coastal processes and/or climate change/sea level rise. At Green Run Lodge, more aggressive protective actions would provide additional defense. While these actions might prolong the ability to maintain the structures, resulting in a short-term beneficial impact on historic structures, over time these actions would likely prove inadequate. Ultimately, historic structures would likely be significantly damaged and/or lost, resulting in long-term adverse impacts on historic structures. The potential adverse impacts would be significant because historic structures, which are eligible for listing on the *National Register*, would be lost.

As in alternative 1, the beneficial impacts would result from continuing to maintain the character-defining features of the Assateague Beach U.S. Coast Guard Station and Green Run Lodge. In addition, in alternative 4, Green Run Lodge would be rehabilitated in accordance with the *Secretary's Standards for Historic Preservation* and adaptively reused. There would be a beneficial impact on historic structures due to enhanced maintenance and compatible reuse and occupancy of the structures.

4.7 Cultural Landscapes

4.7.1 METHODOLOGY FOR ANALYZING IMPACTS

Impacts on cultural landscapes are described in terms consistent with the Council on Environmental Quality (CEQ) for implementing the National Environmental Policy Act (NEPA) as described above for historic structures (see section 4.6.1).

The resource-specific context for the evaluation of impacts on cultural landscapes is as follows:

- Assateague Island represents a cultural landscape that has been shaped by both human intervention and the forces of nature. In particular, the cultural

landscape associated with the Assateague Beach U.S. Coast Guard Station complex is an important resource to the seashore, although it is not fundamental to the seashore's purpose and significance.

- The cultural landscape at the Assateague Beach U.S. Coast Guard Station is significant (determined eligible for listing in the *National Register*) as an individual landscape within the seashore that contains systems and features that contribute significantly to the unique qualities of the coast guard station complex. Views to and from the property add to the story of the U.S. Coast Guard's history by providing a visual of how life may have been for the life-savers of the surf on an isolated barrier island along the Atlantic coast (NPS 2004).

4.7.2 ALTERNATIVE 1 – CONTINUATION OF CURRENT MANAGEMENT

- **Impact Analysis**

Coastal Response Management Actions. At the Assateague Beach U.S. Coast Guard Station, the ocean side primary dune and the bayside shoreline are currently stable, for the time being protecting the land area where the station is located. The NPS would not take action to protect or stabilize the ocean dunes or bay shoreline now or in the event of future storm damage to the dune or shoreline. Lack of action would increase the potential for damage or loss of the cultural landscape by natural coastal processes and/or the effects of climate change/sea level rise. Some character-defining features of the cultural landscape such as circulation patterns would continue to deteriorate and eventually be lost.

If damage occurs to the station and its cultural landscape, the NPS would conduct a value analysis to determine whether or not repairs would be made, taking into consideration the historic significance of the structures and cultural landscape, the level of damage, and the likelihood of further damage from natural coastal processes and the effects of climate change/sea level rise. NPS would also follow agency and departmental guidelines for the treatment of historic structures likely to be affected by climate change. If it is determined that the station could no longer be maintained due to recurring damage, the NPS would likely demolish the station and rehabilitate the site to foster a return to natural conditions. Prior to demolition, resources would be documented in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995c) and other NPS policies, guidelines, and standards.

Natural Resource Management Actions. Analysis of natural resource management actions identified no associated impacts on the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

Cultural Resource Management Actions. At the Assateague Beach U.S. Coast Guard Station, the NPS would continue current management practices to maintain the cultural landscape and keep it eligible for the *National Register*. The NPS would continue to maintain circulation patterns and other character-defining features of the cultural landscape. Landscape features such as views and vistas would not be altered. Current planned and programmed management actions include replacement of primary electrical service to the station and repairs to the boat dock to retain historic character. Availability of funding for additional repairs would continue to be inconsistent and scarce, as other seashore resources that are used more regularly receive funding priority. Collectively these actions would result in a short-term beneficial impact on the character-defining features of the cultural landscape at the coast guard station by maintaining power supply and repairing the boat dock.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

Seashore Operations Management Actions. Analysis of seashore operations management actions identified no associated impacts on the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on cultural landscapes generally include growth and development on private property on the mainland adjoining the seashore, as well as public development and transportation system improvements on the mainland. There are no local regulations in place to protect cultural landscapes on private land during the land development process in Worcester County (MD), Accomack County (VA), or incorporated municipalities within the counties. As a result, significant cultural landscapes have been lost and will continue to be lost or impacted by private development actions that adversely impact their character-defining features. Conversely, public development and transportation system projects with federal funding are required to engage in a consultation process to identify ways to avoid or minimize potential adverse impacts to cultural landscapes in accordance with section 106 of the National Historic Preservation Act of 1966, as amended (NHPA).

The overall cumulative impacts would be primarily adverse because cultural landscapes on the mainland would continue to be adversely impacted by development projects. Alternative 1 would add an imperceptible increment to the overall adverse cumulative impact because of impacts to the seashore's cultural landscapes over the long-term from coastal processes and the effects of climate change/sea level rise. There would also be beneficial cumulative impacts associated with actions taken to minimize or avoid impacts to cultural landscapes associated with land development projects on the

mainland. Alternative 1 would add an imperceptible increment to the beneficial impact due to continued efforts to maintain the seashore's cultural landscapes until they may be lost or irrevocably damaged.

- **Conclusions**

In alternative 1 management actions would have both adverse and beneficial impacts on cultural landscapes and would add an imperceptible adverse increment and an imperceptible beneficial increment to the total cumulative impacts on cultural landscapes, respectively.

Lack of management actions to stabilize and further protect the primary ocean dune and the bay shoreline would continue to expose the coast guard station's cultural landscape to significant damage and/or potential loss of the land mass upon which it is located. Ultimately, the cultural landscape would likely be significantly damaged and/or lost, resulting in adverse impacts on the cultural landscape. The potential adverse impact would be significant because the resource, which is eligible for listing on the *National Register*, would be lost.

The beneficial impact would result from continuing to maintain the character-defining features of the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

4.7.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

In alternatives 2, 3, and 4, the NPS would initially continue to maintain the Assateague Beach U.S. Coast Guard Station cultural landscape to keep it eligible for the *National Register* as in alternative 1. Collectively these actions would result in a beneficial impact on the character-defining features of the coast guard station's cultural landscape.

4.7.4 ALTERNATIVE 2 – CONCENTRATED TRADITIONAL BEACH RECREATION

- **Impact Analysis**

Coastal Response Management Actions. At the Assateague Beach U.S. Coast Guard Station the NPS would no longer protect and stabilize the dunes and shoreline to withstand more effectively future storm damage. This would increase the potential for damage or loss by natural coastal processes and/or the effects of climate change/sea level rise resulting in a likely adverse impact on the station's cultural landscape.

If it is determined that the historic structures and cultural landscape have become so damaged by coastal storms, sea level rise, or other climate change related issues that they create a hazard, NPS would likely demolish the structures and rehabilitate the sites to foster a return to natural conditions. Prior to demolition, resources would be documented in accordance with the *Secretary of the Interior's Standards for the*

Treatment of Historic Properties (NPS 1995c) and other NPS policies, guidelines, and standards.

Natural Resource Management Actions. Analysis of natural resource management actions identified no associated impacts on the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

Cultural Resource Management Actions. NPS would not take any further actions to stabilize or maintain the cultural landscape at the Assateague Beach U.S. Coast Guard Station. Over time, lack of maintenance would result in the loss of character-defining features of the cultural landscape, resulting in a likely long-term adverse impact on cultural landscapes.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

Seashore Operations Management Actions. Analysis of seashore operations management actions identified no associated impacts on the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on cultural landscapes would be the same as those identified for alternative 1 (section 4.7.2).

The overall cumulative impacts would be primarily adverse because cultural landscapes on the mainland would continue to be adversely impacted by development projects. Alternative 2 would add an imperceptible increment to the overall adverse cumulative impact because of impacts to the seashore's cultural landscapes over the long-term from coastal processes and the effects of climate change/sea level rise. There would also be beneficial cumulative impacts associated with actions taken to minimize or avoid impacts to cultural landscapes associated with land development projects on the mainland.

- **Conclusions**

In alternative 2 management actions would have adverse impacts on cultural landscapes and would add an imperceptible increment to the total cumulative adverse impacts on cultural landscapes.

At the former Assateague Beach U.S. Coast Guard Station, lack of maintenance and lack of management actions to stabilize and further protect the bay shoreline would continue to expose the cultural landscape to significant damage and/or potential loss of

the land mass upon which it is located. Ultimately, the cultural landscape would likely be significantly damaged and/or lost, resulting in a long-term adverse impact on cultural landscapes. The potential adverse impact would be significant because the former Assateague Beach U.S. Coast Guard Station cultural landscape, which is eligible for listing on the *National Register*, would be lost.

4.7.5 ALTERNATIVE 3 – SUSTAINABLE RECREATION AND CLIMATE CHANGE ADAPTATION (NPS PREFERRED ALTERNATIVE)

Coastal Response Management Actions. At the Assateague Beach U.S. Coast Guard Station, the NPS would protect and stabilize the dunes and shoreline to withstand future storm damage more effectively. As investments are made in rehabilitating the station structures for adaptive reuse, there would be additional incentives and financial resources available from the partner organization for further protecting and stabilizing the dunes and shoreline to withstand potential impacts of natural coastal processes and the effects of climate change/sea level rise. As a result, it would likely be possible to maintain the station structures in situ and their cultural landscape for a longer time, resulting in a short-term beneficial impact.

As in alternatives 1 and 4, if damage occurs to the station and its cultural landscape, the NPS would conduct a value analysis to determine whether or not repairs would be made, taking into consideration the historic significance of the structures and cultural landscape, the level of damage, and the likelihood of further damage from natural coastal processes and the effects of climate change/sea level rise. NPS would also follow NPS guidelines for the treatment of historic structures likely to be affected by climate change. If it is determined that the station could no longer be maintained due to recurring damage, the NPS would likely demolish the station and rehabilitate the site to foster a return to natural conditions. Prior to demolition, resources would be documented in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995c) and other NPS policies, guidelines, and standards.

Natural Resource Management Actions. Analysis of natural resource management actions identified no associated impacts on the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

Cultural Resource Management Actions. At the Assateague Beach U.S. Coast Guard Station, the NPS would seek partners to adaptively reuse the coast guard station as a site for environmental research and/or education. Until a partnership exists, the NPS would continue to maintain the cultural landscape to keep it eligible for the *National Register* as in alternative 1. Once a partnership is in place, the NPS would collaborate to develop and implement a suitable plan for rehabilitating the structures and cultural landscape for adaptive reuse. Rehabilitation would be in conformance with the *Secretary of the Interior's Standards for Historic Preservation*. Additional funding would

likely be available on a consistent basis from the partner organization to enhance long-term maintenance and stabilization of structures. Occupancy and ongoing use of the structures and the surrounding landscape would generally enhance maintenance and care of structures and the landscape, helping to preserve them. Most or all of the contributing landscape features would be maintained or rehabilitated to reflect the station's period of significance. Collectively these actions would result in a short-term beneficial impact on the station's cultural landscape.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

Seashore Operations Management Actions. Analysis of seashore operations management actions identified no associated impacts on the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on cultural landscapes would be the same as those identified for alternative 1 (section 4.7.2).

The overall cumulative impacts would be primarily adverse because cultural landscapes on the mainland would continue to be adversely impacted by development projects. Alternative 3 would add an imperceptible increment to the overall adverse cumulative impact because of impacts to the seashore's cultural landscapes over the long-term from coastal processes and the effects of climate change/sea level rise. There would also be beneficial cumulative impacts associated with actions taken to minimize or avoid impacts to cultural landscapes associated with land development projects on the mainland. Alternative 3 would add an imperceptible increment to the beneficial impact due to continued efforts to maintain the seashore's cultural landscapes until they may be lost or irrevocably damaged.

- **Conclusions**

In alternative 3 management actions would have both adverse and beneficial impacts on cultural landscapes and would add an imperceptible adverse increment and an imperceptible beneficial increment to the total cumulative impacts on cultural landscapes, respectively.

Additional protective actions would reduce exposure of the cultural landscape to significant damage and/or potential loss from the impacts of natural coastal processes and/or climate change/sea level rise. While these actions might prolong the ability to maintain the cultural landscape, resulting in a short-term beneficial impact on cultural

landscapes, over time these actions would likely prove inadequate. Ultimately, the cultural landscape would likely be significantly damaged and/or lost, resulting in a long-term adverse impact. The potential adverse impact would be significant because the cultural landscape – which is eligible for the *National Register* – would be lost.

As in alternative 1, the beneficial impact would result from continuing to maintain the character-defining features of the cultural landscape at the Assateague Beach U.S. Coast Guard Station. In addition, in alternative 3, the cultural landscape would be rehabilitated in accordance with the Secretary's Standards for Historic Preservation and adaptively reused. There would be a short-term beneficial impact on the cultural landscape due to enhanced maintenance and compatible reuse and occupancy of the site.

4.7.6 ALTERNATIVE 4 – NATURAL ISLAND EVOLUTION AND A PRIMITIVE ISLAND EXPERIENCE

- **Impact Analysis**

Coastal Response Management Actions. At the Assateague Beach U.S. Coast Guard Station, the NPS would not take action to protect or stabilize the ocean dunes or bay shoreline now or in the event of future storm damage to the dune or shoreline, as in alternative 1. Lack of action would increase the potential for damage or loss by natural coastal processes and/or the effects of climate change/sea level rise. Some character-defining features such as circulation patterns would continue to deteriorate and eventually be lost.

As in alternatives 1 and 3, if damage occurs to the station and its cultural landscape, the NPS would conduct a value analysis to determine whether or not repairs would be made, taking into consideration the historic significance of the structures and cultural landscape, the level of damage, and the likelihood of further damage from natural coastal processes and the effects of climate change/sea level rise. NPS would also follow NPS guidelines for the treatment of historic structures likely to be affected by climate change. If it is determined that the station could no longer be maintained due to recurring damage, the NPS would likely demolish the station and rehabilitate the site to foster a return to natural conditions. Prior to demolition, resources would be documented in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995c) and other NPS policies, guidelines, and standards.

Natural Resource Management Actions. Analysis of natural resource management actions identified no associated impacts on the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

Cultural Resource Management Actions. At the Assateague Beach U.S. Coast Guard Station, the NPS would maintain current management practices, as in alternative 1. Collectively these actions would result in a short-term beneficial impact on the character-defining features of the cultural landscape at the coast guard station.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

Seashore Operations Management Actions. Analysis of seashore operations management actions identified no associated impacts on the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on cultural landscapes would be the same as those identified for alternative 1 (section 4.7.2).

The overall cumulative impacts would be primarily adverse because cultural landscapes on the mainland would continue to be adversely impacted by development projects. Alternative 4 would add an imperceptible increment to the overall adverse cumulative impact because of impacts to the seashore's cultural landscapes over the long-term from coastal processes and the effects of climate change/sea level rise. There would also be beneficial cumulative impacts associated with actions taken to minimize or avoid impacts to cultural landscapes associated with land development projects on the mainland. Alternative 4 would add an imperceptible increment to the beneficial impact due to continued efforts to maintain the seashore's cultural landscapes until they may be lost or irrevocably damaged.

- **Conclusions**

In alternative 4 management actions would have both adverse and beneficial impacts on cultural landscapes and would add an imperceptible adverse increment and an imperceptible beneficial increment to the total cumulative impacts on cultural landscapes, respectively.

Limited additional protective actions at the Assateague Beach U.S. Coast Guard Station would slightly reduce exposure of the cultural landscape to significant damage and/or potential loss from the impacts of natural coastal processes and/or climate change/sea level rise. While these actions might prolong the ability to maintain the cultural landscape, resulting in a short-term beneficial impact on cultural landscapes, over time these actions would likely prove inadequate. Ultimately, the cultural landscape would likely be significantly damaged and/or lost, resulting in a long-term adverse impact. The

potential adverse impact would be significant because the cultural landscape – which is eligible for the *National Register* – would be lost.

As in alternative 1, the beneficial impact would result from continuing to maintain the character-defining features of the cultural landscape at the Assateague Beach U.S. Coast Guard Station.

4.8 Seashore Operations

4.8.1 METHODOLOGY

Analysis of impacts on seashore operations focuses on the need for effective organizational management of the seashore, specifically considering how well each alternative accomplishes the following:

- reduces existing risks of impacts to seashore operations from catastrophic storms and the effects of climate change/sea level rise
- increases the extent to which infrastructure is sustainable and effectively supports seashore operations
- supports staffing levels that are adequate to protect and preserve the seashore’s resources and infrastructure and to maintain and enhance the visitor experiences
- promotes partnerships and volunteer programs that effectively support seashore operations

The resource-specific context for the evaluation of impacts on seashore operations is as follows:

- The seashore’s enabling legislation explicitly states that one of the two purposes for the seashore is to provide high quality resource-compatible recreational opportunities for visitors.
- Opportunities for visitors to experience the seashore through a wide variety of active and passive recreational and educational opportunities are values that are fundamental to the seashore’s purpose and significance.
- The seashore currently lacks a contingency plan for mitigating the impacts from catastrophic storms and the effects of climate change/sea level rise. This raises uncertainty as to the sustainability of seashore infrastructure as well as access for seashore operations that are dependent upon land access via bridges and roads that are highly susceptible to recurring storm damage.
- The state of Maryland owns the only bridge that provides land access to the seashore in Maryland and controls how public funds are spent for maintenance. NPS owns the bridges that provide land access to the seashore in Virginia; FHWA generally assists the NPS with bridge maintenance.

- The seashore must operate within the constraints of the unit-specific budget and number of staff positions allocated by congress and the NPS Director's Office.

4.8.2 ALTERNATIVE 1 – CONTINUATION OF CURRENT MANAGEMENT

- **Impact Analysis**

Coastal Response Management Actions. In alternative 1, the seashore would not develop a specific contingency plan for responding to catastrophic storms and the effects of climate change/sea level rise. Over the long-term lack of contingency planning would increase the risks of impacts on seashore operations from catastrophic storms and the effects of climate change/sea level rise.

The location and spatial relationship of facilities and infrastructure would generally remain unchanged. In general, facility management needs would become more challenging and complex over time as NPS seeks to maintain recreation opportunities despite the continued evolution of the seashore's land base, damage to its infrastructure, and consolidation of visitor use facilities in an increasingly smaller developed area. Without fortification of the developed area, facilities and infrastructure would continue to be threatened by catastrophic storms and the effects of climate change/sea level rise. This management approach would have an adverse impact on seashore operations because over the long-term visitor use facilities and infrastructure would likely be non-sustainable due to lack of funding and ultimately due to the shrinking island land area.

The seashore would be exposed to very high risk of becoming abruptly inaccessible by vehicle in the event that a catastrophic storm destroys the MD Route 611 Bridge or breaches the island in the northern portion of the developed area. When this happens, without a contingency plan in place vehicular access to the island would be lost for months to years until either the bridge could be replaced or a water-based alternative transportation system (passenger ferry) for visitor access and seashore operations could be implemented. During this period, access to the island for seashore operations would be limited to small watercraft using public launch sites on the mainland and soft landings on the island. Maintaining and using seashore vehicles and equipment needed for maintenance on the island would become very difficult. This would result in a long-term adverse impact on seashore operations.

Natural Resource Management Actions. NPS would continue existing operations to protect and manage the seashore's natural resources focusing on research, monitoring, mitigation, and protection. Management would continue to require staff time and management that exceeds the seashore's current capacity and could have a long-term adverse impact on seashore operations.

Cultural Resource Management Actions. NPS would continue existing operations to protect and manage the seashore’s cultural resources focusing on research, monitoring, mitigation, and protection. Management would continue to require staff time and management that exceeds the seashore’s current capacity and could have a long-term adverse impact on seashore operations.

Visitor Use and Visitor Experience Management Actions. NPS would continue existing operations related to visitor use, public safety, interpretation, and environmental education, with a focus on the island developed area in Maryland, the developed area in Virginia, the OSV use area, and backcountry visitor use areas. Management would continue to require staff time that exceeds the seashore’s current capacity and could have a long-term adverse impact on seashore operations.

Seashore Operations Management Actions. In alternative 1 existing management practices related to day-to-day seashore operations would continue. Filling some of the vacancies that currently impede the seashore’s ability to maintain visitor facilities and infrastructure, complete needed resource management and stewardship activities, and provide the full range of visitor services would have a beneficial effect on seashore operations. However, it would be highly uncertain that staffing levels in alternative 1 could support operational needs if catastrophic storms and the effects of climate change/sea level rise damage seashore infrastructure and access; in that event there would be an adverse impact on seashore operations.

Continued use of the existing headquarters complex with miscellaneous repairs would have a long-term adverse impact on seashore operations. The complex is undersized and obsolete and does not support efficient administrative and maintenance functions at the seashore.

Additional beds for seasonal employees would become available in Maryland and Virginia. This would completely address the seashore’s housing deficit, enabling the seashore to hire staff more easily for the summer season, resulting in a long-term beneficial impact on seashore operations.

The seashore’s partnerships and volunteer program would continue to have a beneficial impact on seashore operations by facilitating a broad range of functions needed to protect seashore resources and provide recreational opportunities for visitors. Existing partnerships and cooperative relationships that support ongoing management programs and activities would continue. By collaborating with MD DNR at Assateague State Park the NPS would continue to address shared operational issues related to road congestion, provision of visitor services, and chronic resource management issues such as shoreline protection and horse management within the Maryland developed area. The seashore would continue to benefit from its partnership with the USACE to address the chronic sand supply impacts to the north end of Assateague Island from the jetty-

stabilized Ocean City Inlet (north end Restoration Project). Emergency service providers would continue to assist the NPS with law enforcement and fire protection/emergency services/search and rescue/hazardous material response. The Assateague Island Alliance – the seashore’s primary friends group – would continue to assist the NPS with a variety of operations. The Volunteers in Parks (VIP) program would continue to benefit the seashore by contributing approximately 20,000 hours of time annually, representing a savings of approximately 7 percent of the seashore’s annual operating budget. Seashore operations within CNWR would continue in collaboration with the US FWS pursuant to the memorandum of agreement whereby the NPS would provide visitor services, interpretive services, visitor and resource protection, and facility management in the assigned area within the refuge.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on NPS seashore operations generally include actions by the MD DNR and the FWS. Each agency has constructed administrative and maintenance facilities at the seashore and on the mainland to support their operations; each agency in the future will continue to invest in facilities to address new and changing operational needs, including new facilities as well as rehabilitation/expansion of existing facilities. These facilities vary with respect to their sustainability and their capacity to support each agency’s mission given the potential impacts of catastrophic storms and the effects of climate change/sea level rise.

To date contingency planning by the NPS, MD DNR, and FWS has focused on replacing some visitor use facilities and infrastructure that has reached the end of its life cycle, or that have been damaged by storms, with temporary structures that can be moved off the island to safe locations on the mainland in advance of coastal storms. In the future contingency planning will likely include more aggressive measures to relocate some visitor use facilities to the mainland. FWS is considering implementation of a summertime alternative transportation system for access to CNWR that would reduce the need for infrastructure on the island and that would prepare for water-based operations should access be lost.

NPS, MD DNR, and the FWS each have relied in the past, and will continue to rely in the future, on a network of public, private, and non-profit partners, volunteers, and friends groups who support various aspects of their mission at the seashore.

The overall cumulative impacts on seashore operations would be primarily adverse because contingency planning would continue to focus on replacing some visitor use facilities and infrastructure that has reached the end of its life cycle, or that have been damaged by storms, with temporary structures that can be moved off the island to safe locations on the mainland in advance of coastal storms. An adverse impact would also result from the uncertainty of federal and state funding to support staffing needed to

manage public lands within the seashore's boundary. Alternative 1 would add an appreciable increment to the overall adverse cumulative impact because lands managed by the NPS would continue to lack a comprehensive planning framework that addresses the full range of issues affecting seashore operations, particularly the potential adverse impacts of coastal processes and climate change/sea level rise. There would also be beneficial cumulative impacts associated with continuation of partnerships and volunteer programs that facilitate resource protection and enhance the visitor experience throughout the seashore. Alternative 1 would add an imperceptible increment to the beneficial impact due to continuation of existing seashore partnerships.

- **Conclusions**

In alternative 1 management actions would have both adverse and beneficial impacts on seashore operations and would add an appreciable adverse increment and an imperceptible beneficial increment to the total cumulative impacts on seashore operations, respectively.

The seashore would continue to operate without a contingency plan for responding to catastrophic storms and the effects of climate change/sea level rise; lack of a contingency plan would ultimately not mitigate the eventual impacts due to catastrophic storms and climate change/sea level rise resulting in an adverse impact on seashore operations. Visitor use facilities and infrastructure would remain in non-sustainable locations subject to recurring damage and eventual loss as the island's land area continues to shrink. The adverse impacts of alternative 1 on seashore operations would be significant. The seashore would be exposed to very high risk and uncertainty of becoming abruptly inaccessible by vehicle in the event of a catastrophic storm. Without vehicular access, the seashore would be unable to operate as needed to accomplish its purpose of providing high quality resource-compatible recreation opportunities and preserving coastal resources for months to years.

In alternative 1, staffing would be adequate under current conditions within existing budgetary constraints to maintain visitor use facilities and infrastructure, complete needed resource management and stewardship activities, and provide the full range of visitor services, resulting in a beneficial impact on seashore operations. Partnerships and volunteer programs would facilitate a broad range of functions needed to protect seashore resources and provide recreational opportunities for visitors, also resulting in a beneficial impact on seashore operations. The beneficial impacts on seashore operations would not be significant because there would be uncertainty as to whether staffing levels in alternative 1 could support operational needs if catastrophic storms and the effects of climate change/sea level rise damage seashore infrastructure and access.

4.8.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

- **Impact Analysis**

Natural Resource Management Actions. Resource management and protection staff time would work with Virginia to assess privately owned structures located within the seashore's Virginia waters, eliminate illegal structures, and ensure appropriate wastewater management at legal structures. Resource management and protection staff time would also work with the states to address concerns regarding management of marine resources. These actions would require staff time and management that further exceeds the seashore's current capacity and could have a long-term adverse impact on seashore operations.

Visitor Use and Visitor Experience Management Actions. NPS would increase visitor services within the Maryland island developed area. This would require addition of a few small structures with parking to support commercial services provided by partners. Maintenance of these structures would require staff time and management that further exceeds the seashore's current capacity and could have a long-term adverse impact on seashore operations.

The former visitor center would be rehabilitated as a stand-alone environmental education center without expansion or change in the type or size of the facility. This would not appreciably add to the management responsibilities of seashore staff.

Seashore Operations Management Actions. In alternatives 2, 3, and 4 NPS and MD DNR would expand their existing partnership to address chronic congestion issues at the seashore during summer months. Together they would relocate the island entrance station to the mainland and cooperatively manage the facility. This would improve the flow of traffic onto the island during the summer months, make it easier to close the seashore to additional traffic once parking lots are full, facilitate implementation of the new NPS alternative transportation system, and protect seashore resources from damage due to illegal parking. This would result in a beneficial impact on seashore operations by reducing staff time needed for visitor use management, law enforcement, and resource protection.

Implementation of a concession-operated alternative transportation system (ATS) and relocation of the entrance station to the mainland would address existing vehicular congestion on the island and generally enhance the sustainability of the seashore's transportation infrastructure. Implementation would require a shift in seashore operations from congestion management on the island to management of mainland parking, visitor orientation, and management of visitor pedestrian circulation within the shuttle staging area. Management of the entrance station would be less complicated due to adequate space for queuing vehicles and shared responsibilities with MD DNR. Some additional administrative functions would be required to oversee the shuttle

concession. Overall staffing needs associated with the seashore entrance station would be reduced, resulting in a beneficial impact on seashore operations.

4.8.4 ALTERNATIVE 2 – CONCENTRATED TRADITIONAL BEACH RECREATION

- **Impact Analysis**

Coastal Response Management Actions. In alternative 2 the NPS would take steps to prepare for catastrophic storms and the effects of climate change/sea level rise by fortifying the Maryland developed area and letting the remainder of the island evolve naturally, driven by the full effects of natural coastal processes and climate change/sea level rise. The NPS would maintain existing visitor use facilities and infrastructure as long as feasible (e.g. land base exists and maintenance funding is available).

Overall, this approach to contingency planning would have an adverse impact on seashore operations. Over the long-term visitor use facilities and infrastructure could be sustained only by expensive engineering solutions that protect against catastrophic storms and the effects of climate change/sea level rise made possible by ongoing congressional funding appropriated for construction and emergency repairs. Risks of impacts to seashore operations from catastrophic storms and the effects of climate change/sea level rise would not be reduced. In the future, it would be likely that recreational uses could no longer be maintained within the developed area.

The seashore would be exposed to very high risk of becoming abruptly inaccessible by vehicle in the event that a catastrophic storm destroys the MD Route 611 Bridge or breaches the island in the northern portion of the developed area. When this happens, without a contingency plan in place access to the island would be lost for months to years until either the bridge could be replaced or a water-based alternative transportation system (passenger ferry) for visitor access and seashore operations could be implemented. During this period, access to the island for seashore operations would be limited to small watercraft using public launch sites on the mainland and soft landings on the island. Maintaining and using seashore vehicles and equipment needed for maintenance on the island would become very difficult. This would result in a long-term adverse impact on seashore operations.

Natural Resource Management Actions. In the event of a breach or other events that limit automobile access, the complexity of resource protection/management functions would significantly increase due to the logistical difficulties of water-based access. The reduction in the size of the OSV route would limit traditional access for public deer hunting, and could impact the ability to meet deer management objectives; in this event seashore managers would explore options and take actions to manage herd sizes, as appropriate. Collectively these additional management actions would require staff time and management that further exceeds the seashore's current capacity and could have a long-term adverse impact on seashore operations.

Cultural Resource Management Actions. Cultural resource management actions would require less resource management and maintenance capacity at the Assateague Beach U.S. Coast Guard Station. Less staff time would be needed resulting in a beneficial impact on seashore operations.

Visitor Use and Visitor Experience Management Actions. More intense focus on recreation in the Maryland developed area would likely require additional visitor use management capacity, such as expanded lifeguard and visitor and resource protection service. Reducing the OSV use area could increase visitor use management needs by concentrating the same number of OSV users within a smaller area. Collectively these additional visitor use management actions would require staff time and management that further exceeds the seashore's current capacity and could have a long-term adverse impact on seashore operations.

Seashore Operations Management Actions. In alternative 2 existing management practices related to day-to-day seashore operations would increase as visitor use and recreational infrastructure are consolidated within a smaller developed area where additional visitor facilities and services requiring staffing and maintenance would be added. The extent of facility management needs would also increase as natural coastal processes and the effects of climate change/sea level rise impact the island developed area, making protection increasingly complex and challenging. Estimates of long-term staffing requirements for alternative 2 indicate a need for an additional 4.5 FTE staff (compared to 2012 staff levels). If funding is available to support the additional 4.5 FTE, there would be a beneficial impact on seashore operations because all positions would be filled that are needed maintain public use facilities and infrastructure, complete needed resource management and stewardship activities, and provide the full range of visitor services. If additional funding were not available, there would be an adverse impact on seashore operations due to continuation of approximately six vacant positions at the seashore.

Replacement of the existing undersized and obsolete seashore headquarters complex at its current location would benefit seashore operations by facilitating more efficient and safe administrative and maintenance functions at the seashore.

Existing partnerships and cooperative relationships that support seashore management would continue. In order to fortify the Maryland developed area the NPS would seek to expand its existing partnership with the U.S. USACE. NPS would also seek to expand visitor services offered by tourism and recreation interests within the developed area. Successful partnerships in these areas would protect the NPS investment in visitor use facilities and infrastructure and enhance the recreational opportunities for visitors. This would reduce staff time needed for maintenance of facilities and infrastructure and for providing visitor services, resulting in a beneficial impact on seashore operations. However, over time the NPS management action in partnership with the USACE would

likely have a long-term adverse impact on seashore operations. Ultimately, this partnership would not support reduced risks of impacts to seashore operations from catastrophic storms and the effects of climate change/sea level rise for the reasons noted under contingency planning for alternative 2.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on seashore operations would be the same as those identified for alternative 1 (section 4.8.2).

The overall cumulative impacts on seashore operations would be primarily adverse because contingency planning would continue to focus on fortification in combination with replacing some visitor use facilities and infrastructure that has reached the end of its life cycle, or that have been damaged by storms, with temporary structures that can be moved off the island to safe locations on the mainland in advance of coastal storms. An adverse impact would also result from the uncertainty of federal and state funding to support staffing needed to manage public lands within the seashore's boundary. Alternative 2 would add an appreciable increment to the overall adverse cumulative impact because NPS would manage its lands within the seashore's boundary with a contingency plan that would ultimately not mitigate the eventual impacts from catastrophic storms and climate change/sea level rise, and because of uncertainty of ONPS funding to support NPS staffing needed to accomplish the seashore's purposes. There would also be beneficial cumulative impacts associated with continuation of partnerships and volunteer programs that facilitate resource protection and enhance the visitor experience throughout the seashore. Alternative 2 would add a noticeable increment to the beneficial impact due to enhanced partnerships, particularly with the USACE.

- **Conclusions**

In alternative 2 management actions would have both adverse and beneficial impacts on seashore operations and would add an appreciable adverse increment and a noticeable beneficial increment to the total cumulative impacts on seashore operations, respectively.

The seashore would operate with a contingency plan that would ultimately not mitigate the eventual impacts from catastrophic storms and climate change/sea level rise, resulting in an adverse impact on seashore operations. Only through ongoing congressional funding appropriated for construction and emergency repairs could the seashore continue to maintain visitor use facilities and infrastructure and protect them from catastrophic storms and the effects of climate change/sea level rise resulting in an adverse impact on seashore operations. Only if increased ONPS funding becomes available for approximately six additional FTEs would staffing be adequate to maintain

visitor use facilities and infrastructure, to complete needed resource management and stewardship activities, and to provide the full range of visitor services, resulting in an adverse impact on seashore operations. Overall, the adverse impact of alternative 2 on seashore operations would be significant. Despite the contingency plan, the seashore would be exposed to very high risk and uncertainty of becoming abruptly inaccessible by vehicle in the event of a catastrophic storm. Without vehicular access, the seashore would be unable to operate as needed to accomplish its purpose of providing high quality resource-compatible recreation opportunities and preserving coastal resources for months to years. The uncertainty of ONPS funding to support the six FTEs required for seashore operations would jeopardize NPS's ability to accomplish the seashore's purposes.

As in alternative 1 partnerships and volunteer programs would facilitate a broad range of functions needed to protect seashore resources and provide recreational opportunities for visitors, resulting in a beneficial impact on seashore operations. An expanded partnership with the USACE would protect NPS investments in visitor use facilities and infrastructure within the Maryland developed area, reducing the potential for damage or loss and consequent impacts on seashore operations, resulting in a beneficial impact on seashore operations. The beneficial impacts on seashore operations would be significant because they would enhance the seashore's ability to accomplish its purpose of providing high quality resource-compatible recreation opportunities. However, the significant beneficial impact would exist only for as long as there is adequate land area to maintain recreational use within the developed area. Once catastrophic storms and the effects of climate change/sea level rise result in loss of land or vehicular access to the island the significant beneficial impact would be lost.

4.8.5 ALTERNATIVE 3 – SUSTAINABLE RECREATION AND CLIMATE CHANGE ADAPTATION (NPS PREFERRED ALTERNATIVE)

- **Impact Analysis**

Coastal Response Management Actions. In alternative 3 the NPS would prepare for catastrophic storms and climate change/sea level rise by transitioning to sustainable design of facilities and infrastructure and by planning and developing alternative transportation systems.

Overall, this approach to contingency planning would have a beneficial impact on seashore operations over the long-term. The NPS would maintain visitor use facilities and infrastructure using an adaptive management approach. Visitor use facilities and infrastructure on the island would be reduced and their sustainability would increase. Facilities relocated to the mainland, where the potential for damage from catastrophic storms and climate change/sea level rise, would be reduced.

Contingency planning would enable relatively quick restoration of access to the seashore following the loss of vehicular access. The NPS would complete planning for implementation of water-based alternative transportation system (passenger ferry) for visitor access and seashore operations in advance of losing island vehicular access. As part of planning the NPS would have selected sites for facility development on the mainland and taken action to acquire the land from willing sellers and to complete required design and engineering of new facilities. Assuming funding would be available, the NPS would be immediately prepared to proceed with implementing the transportation contingency plans, including construction of docking facilities on the island and the mainland for the passenger ferry and for seashore operations. Overall, contingency planning would enable relatively quick restoration of access to the seashore following the loss of vehicular access due to catastrophic storms and the effects of climate change/sea level rise, resulting in a beneficial impact on seashore operations.

Natural Resource Management Actions. The loss of automobile access to the island and/or backcountry would add complexity to resource management functions owing to the logistical difficulties of water-based access. Should the size of the OSV use area decrease over time, the loss of access for public deer hunting could affect the ability to meet deer management objectives; in this event seashore managers would explore options and take actions to manage herd sizes, as appropriate. Resource management and protection staff would work with the states to enforce a prohibition on harvesting horseshoe crabs and to continue the state of Maryland's prohibition on commercial aquaculture within seashore waters (Maryland only), and to establish public oyster grounds. . Collectively these additional management actions would require staff time and management that further exceeds the seashore's current capacity and could have a long-term adverse impact on seashore operations.

Cultural Resource Management Actions. Cultural resource management actions would require additional resource management and maintenance capacity. At the Assateague Beach U.S. Coast Guard Station and Green Run Lodge future protection and stabilization of the dunes and shoreline to withstand storm damage more effectively would require ongoing maintenance. Adaptive reuse of Green Run Lodge would also require additional maintenance depending upon the type of use and potential partner involvement. Collectively these additional management actions would require staff time and management that further exceeds the seashore's current capacity and could have a long-term adverse impact on seashore operations.

Visitor Use and Visitor Experience Management Actions. Visitor use management would become more complex as use of the backcountry expands with the development of new bayside access points (e.g. camping reservation system, enhanced patrol and visitor protection needs) and acquisition of one to three new points of departure on the mainland. If natural coastal processes alter OSV access and use, the scope of required management activities would likely change. Reduced OSV access to the southern

portion of the seashore would likely require that some management activities become water-based. Should all automobile access be lost, overall visitation to the island would likely decline and reduce the demand for visitor use management, although the distribution of visitor use would remain relatively unchanged. The loss of traditional access would complicate emergency response, and likely require more staff with advanced training. Collectively these additional management actions would require staff time and management that further exceeds the seashore's current capacity and could have a long-term adverse impact on seashore operations.

Seashore Operations Management Actions. In alternative 3 existing management practices related to day-to-day seashore operations would change as the island developed area's visitor use infrastructure becomes more sustainable and as new opportunities to access the backcountry become available. Estimates of long-term staffing requirements for alternative 3 indicate a need for an additional 6 FTE staff (compared to 2012 staff levels). If funding is available to support the additional 6 FTE, there would be a beneficial impact on seashore operations because all positions would be filled that are needed maintain public use facilities and infrastructure, complete needed resource management and stewardship activities, and provide the full range of visitor services. If additional funding were not available, there would be an adverse impact on seashore operations due to approximately ten vacant positions at the seashore.

Replacement of the existing undersized and obsolete seashore headquarters complex at a new location would benefit seashore operations by facilitating more efficient and safe administrative and maintenance functions at the seashore.

Partnerships and Volunteer Support. In alternative 3, existing partnerships and cooperative relationships that support ongoing management would generally expand to focus on preparing for catastrophic storms and climate change/sea level rise by transitioning to sustainably designed facilities and infrastructure and by planning and developing alternative transportation systems. To address the potential effects of catastrophic storms and sea level rise, NPS would generally expand its partnerships with FWS and Assateague State Park to accomplish joint resilience planning more effectively. To prepare for the potential loss of land on the island and generally to enhance the sustainability of visitor use facilities, the NPS and Assateague State Park would expand their partnership to collaborate on finding mainland sites for jointly located facilities, including relocated island visitor use facilities, NPS administrative offices and maintenance facility, and various state park facilities. This would make the existing NPS visitor center site available for reuse for alternative transportation system infrastructure on the mainland. NPS and the state park would also seek to implement management actions that would enhance operational efficiency and cost effectiveness by co-locating and jointly operating facilities , sharing resources and expertise, and collaborating to

address conservation and resource management needs both on and off the island. Collectively these actions would have a beneficial impact on seashore operations.

Many expanded and new partnerships would have a beneficial impact on seashore operations. Partners in the scientific and educational communities would assist with efforts to enhance resource resiliency and climate change adaptation. Worcester County would become a more active partner with the NPS assisting with efforts to relocate recreational amenities to the mainland once the island cannot be accessed by vehicle. Commercial service providers would likely expand their support by making new and improved options available for accessing the island's backcountry from the mainland. A potential partnership at the Assateague Beach U.S. Coast Guard Station would likely reduce NPS maintenance responsibilities for historic structures and the cultural landscape.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on seashore operations would be the same as those identified for alternative 1 (section 4.8.2).

The overall cumulative impacts on seashore operations would be primarily beneficial because NPS would increasingly manage lands within the seashore to better withstand the impacts of coastal processes and climate change/sea level rise. An adverse impact would also result from the uncertainty of federal and state funding to support staffing needed to manage public lands within the seashore's boundary. Alternative 3 would add an appreciable increment to the overall beneficial cumulative impact because NPS would operate its lands within the seashore's boundary with a contingency plan that would transition visitor facilities and infrastructure to more sustainable locations and designs, and because expanded and new partnerships and volunteer programs would facilitate more sustainable seashore operations. There would also be adverse cumulative impacts because of uncertainty of federal and state funding to support staffing needed to manage public lands within the seashore's boundary. Alternative 3 would add a perceptible increment to the adverse impact because of uncertainty of federal funding to support staffing needed to accomplish the seashore's purposes.

- **Conclusions**

In alternative 3 management actions would have both adverse and beneficial impacts on seashore operations and would add a noticeable adverse increment and an appreciable beneficial increment to the total cumulative impacts on seashore operations, respectively.

The seashore would operate with a contingency plan that would transition visitor facilities and infrastructure to more sustainable locations and designs, resulting in a

beneficial impact on seashore operations. Planning would begin immediately to position the seashore to relocate some visitor use facilities and infrastructure to sustainable locations on the adjacent mainland, resulting in a beneficial impact on seashore operations. The partnership with MD DNR at Assateague State Park would focus on preparing for catastrophic storms and climate change/sea level rise by transitioning to sustainably designed facilities and by planning and developing alternative transportation systems for visitor access and seashore operations in the event that vehicle access to the island is lost, resulting in a beneficial impact on seashore operations. Many expanded and new partnerships and volunteer programs would facilitate a broad range of functions needed to protect seashore resources and provide recreational opportunities for visitors, resulting in a beneficial impact on seashore operations. Overall, the beneficial impact on seashore operations would be significant because the contingency plan together with expanded partnerships, would expose the seashore to a low risk of becoming abruptly inaccessible by vehicle due to a catastrophic storm. The uncertainty as to whether the seashore would suddenly be unable to operate as needed would be largely eliminated.

Only if increased ONPS funding becomes available for approximately ten additional FTEs would staffing be adequate to maintain visitor use facilities and infrastructure, to complete needed resource management and stewardship activities, and to provide the full range of visitor services, resulting in an adverse impact on seashore operations. The adverse impact could be significant because of the uncertainty of ONPS funding to support the ten FTEs required for seashore operations. Without the ten FTEs, following a catastrophic storm that would make the island inaccessible by vehicle, the seashore might not have adequate staff to implement water-based operations needed to accomplish its purpose of providing high quality resource-compatible recreation opportunities and preserving the island's coastal resources.

4.8.6 ALTERNATIVE 4 – NATURAL ISLAND EVOLUTION AND A PRIMITIVE ISLAND EXPERIENCE

- **Impact Analysis**

Coastal Response Management Actions. In alternative 4 the NPS would prepare for catastrophic storms and sea level rise by replacing existing facilities as they are damaged or lost with minimalist facilities and by developing alternative transportation systems.

Overall, this approach to contingency planning would have a beneficial impact on seashore operations. Over the long-term the NPS would maintain existing facilities and infrastructure only until they become obsolete or are lost or damaged by catastrophic storms or the effects of climate change/sea level rise. Sustainably designed minimal facilities needed for day-use would replace what is lost or damaged, reducing the demand for long-term maintenance.

As in alternative 3, contingency planning would enable relatively quick restoration of access to the seashore following the loss of vehicular access. The NPS would have completed planning for implementation of a water-based alternative transportation system (passenger ferry) for visitor access and seashore operations in advance of losing island vehicular access. As part of planning the NPS would have selected sites for facility development on the mainland and taken action to acquire the land from willing sellers and to complete required design and engineering of new facilities. Assuming funding would be available the NPS would be immediately prepared to proceed with implementing the transportation contingency plans, including construction of docking facilities on the island and the mainland for the passenger ferry and for seashore operations. Overall, contingency planning would enable relatively quick restoration of access to the seashore following the loss of vehicular access due to catastrophic storms and the effects of climate change/sea level rise, resulting in a beneficial impact on seashore operations.

Natural Resource Management Actions. As in alternative 3, the loss of automobile access to the island and/or backcountry would add complexity to resource protection/management functions owing to the logistical difficulties of water-based access. As in alternative 3, should the size of the OSV use area decrease over time, the loss of access for public deer hunting could affect the ability to meet deer management objectives; in this event, seashore managers would explore options and takes actions to manage herd sizes, as appropriate. Resource management and protection staff would work with the states to enforce a prohibition on harvesting horseshoe crabs and to continue the state of Maryland's prohibition on commercial aquaculture within seashore waters (Maryland only), and to establish public oyster grounds. Collectively these additional management actions would require staff time and management that further exceeds the seashore's current capacity and could have a long-term adverse impact on seashore operations.

Cultural Resource Management Actions. Adaptive reuse of Green Run Lodge would require additional resource management and maintenance capacity depending upon the type of use and potential partner involvement. This would further exceed the seashore's current capacity and could have a long-term adverse impact on seashore operations.

Visitor Use and Visitor Experience Management Actions. If a breach occurs that limits (or eliminates) OSV use, the scope of required activities would be reduced. Restricted OSV access would likely require that some management activities become water-based. Should all automobile access to the island be lost, overall visitation to the island would likely decline, and become predominantly day-use, thus reducing the demand for and complexity of visitor use management. The loss of traditional access to the island would complicate emergency response, and likely require more staff with advanced training. Collectively these additional management actions would require staff time and

management that further exceeds the seashore's current capacity and could have a long-term adverse impact on seashore operations.

Seashore Operations Management Actions. In alternative 4 existing management practices related to day-to-day seashore operations would change as traditional recreational facilities and infrastructure are removed from the island and are replaced by smaller less developed backcountry facilities that do not accommodate large numbers of visitors. Estimates of long-term staffing requirements for alternative 4 indicate a need for an additional 6 FTE staff (compared to 2012 staff levels). If funding is available to support the additional 6 FTE, there would be a beneficial impact on seashore operations because all positions would be filled that are needed maintain public use facilities and infrastructure, complete needed resource management and stewardship activities, and provide the full range of visitor services. If additional funding were not available, there would be an adverse impact on seashore operations due to approximately ten vacant positions at the seashore.

Partnerships and Volunteer Support. In alternative 4 existing partnerships and cooperative relationships that support ongoing management would continue. NPS would generally expand its partnership with Assateague State Park to collaborate on finding mainland sites for jointly located facilities, including NPS administrative offices and maintenance facility, and various state park facilities. This would make the existing NPS visitor center site available for reuse for alternative transportation system infrastructure on the mainland. Collectively these actions would have a beneficial impact on seashore operations.

Replacement of the existing undersized and obsolete seashore headquarters complex at a new location would benefit seashore operations by facilitating more efficient and safe administrative and maintenance functions at the seashore.

A few expanded and new partnerships would have a beneficial impact on seashore operations. Partners in the scientific and educational communities would assist with efforts to enhance resource resiliency and climate change adaptation. Commercial service providers would likely expand their support by making new and improved options available for accessing the island's backcountry from the mainland.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on seashore operations would be the same as those identified for alternative 1 (section 4.8.2).

The overall cumulative impacts on seashore operations would be primarily beneficial because NPS would increasingly manage lands within the seashore to better withstand the impacts of coastal processes and climate change/sea level rise. An adverse impact

would also result from the uncertainty of federal and state funding to support staffing needed to manage public lands within the seashore's boundary. Alternative 4 would add an appreciable increment to the overall beneficial cumulative impact because NPS would operate its lands within the seashore's boundary with a contingency plan that would prepare for catastrophic storms and the effects of climate change/sea level rise by replacing existing facilities as they are damaged or lost with facilities that support day-use only, and because expanded and new partnerships and volunteer programs would facilitate more sustainable seashore operations. There would also be adverse cumulative impacts because of uncertainty of federal and state funding to support staffing needed to manage public lands within the seashore's boundary. Alternative 4 would add a perceptible increment to the adverse impact because of uncertainty of federal funding to support staffing needed to accomplish the seashore's purposes.

- **Conclusions**

In alternative 4 management actions would have both adverse and beneficial impacts on seashore operations and would add an imperceptible adverse increment and an appreciable beneficial increment to the total cumulative impacts on seashore operations, respectively.

The seashore would operate with a contingency plan that would prepare for catastrophic storms and the effects of climate change/sea level rise by replacing existing facilities as they are damaged or lost with facilities that support day-use only and by developing alternative transportation systems for visitor access and water-based operations, resulting in a beneficial impact on seashore operations. A few expanded and new partnerships and volunteer programs would facilitate a broad range of functions needed to protect seashore resources and provide recreational opportunities for visitors, resulting in a beneficial impact on seashore operations. The partnership with MD DNR at Assateague State Park would focus on finding mainland sites for jointly located administrative and maintenance facilities, resulting in a beneficial impact on seashore operations. Overall, the beneficial impact on seashore operations would be significant because the contingency plan together with a few expanded partnerships, would expose the seashore to a low risk of becoming abruptly inaccessible by vehicle due to a catastrophic storm. The uncertainty as to whether the seashore would suddenly be unable to operate as needed would be largely eliminated.

Only if increased ONPS funding becomes available for approximately ten additional FTEs would staffing be adequate to maintain visitor use facilities and infrastructure, to complete needed resource management and stewardship activities, and to provide the full range of visitor services, resulting in an adverse impact on seashore operations. The adverse impact could be significant because of the uncertainty of ONPS funding to support the ten FTEs required for seashore operations. Without the ten FTEs, following a catastrophic storm that would make the island inaccessible by vehicle, the seashore might not have adequate staff to implement water-based operations needed to

accomplish its purpose of providing high quality resource-compatible recreation opportunities and preserving the island's coastal resources.

4.9 Access and Circulation

4.9.1 METHODOLOGY

- **Methodology**

Analysis of impacts on access and circulation focuses on the need to provide sustainable access for visitors and seashore operations, specifically considering how well each alternative accomplishes the following:

- enables visitors to access and move around the seashore and to enable NPS staff to maintain the seashore and provide visitor services.
- reduces the risks of disruption or loss of access due to catastrophic storms and the effects of climate change/sea level rise
- enables access within the Maryland developed area that is sustainable and sufficient to support large numbers of visitors (including access needed for seashore operations)
- supports low density, low impact visitor use in the backcountry accessible by foot or by boat (except for the OSV use area) (including access needed for seashore operations)

The resource-specific context for the evaluation of impacts on seashore operations is as follows:

- Approximately 2 million people visit the seashore annually seeking recreation experiences on the beach, many of whom return year after year during family summer vacations. Most visitors arrive by private vehicle, although a growing number of visitors arrive by bus (approximately 44,000 in 2013). Some also arrive via commercial vessels (approximately 27,000 in 2013). Private motorized and non-motorized boats provide access for a small number of visitors, the majority of whom visit the seashore's north end.
- The seashore's enabling legislation explicitly states that one of the two purposes for the seashore is to provide high quality resource-compatible recreational opportunities for visitors.
- Opportunities for visitors to experience the seashore through a wide variety of active and passive recreational and educational opportunities are values that are fundamental to the seashore.
- The seashore currently lacks a contingency plan for mitigating the impacts from catastrophic storms and the effects of climate change/sea level rise. This raises uncertainty as to the sustainability of seashore access that is dependent upon bridges and roads that are highly susceptible to recurring damage.

- The seashore offers one of the few opportunities for oversand vehicle use on an undeveloped beach on the east coast of the United States. Many visitors to the seashore are there explicitly for recreational experiences made possible by OSV. A large stakeholder group of OSV users has expressed concern that the OSV use area remain in at least its current extent.
- In recent years, the north end of the seashore has gained popularity and is heavily used during summer months by visitors who access the north end beach by boat.
- NPS owns the bridges that provide land access to the seashore in Virginia; FHWA generally assists the NPS with bridge maintenance. The state of Maryland owns the only bridge that provides land access to the seashore in Maryland and controls how public funds are spent for maintenance.
- NPS owns and maintains the seashore roads that provide land access on the island in Maryland. FWS owns and maintains the refuge roads that provide land access to the Toms Cove assigned area (managed by the NPS within CNWR).

4.9.2 ALTERNATIVE 1 – CONTINUATION OF CURRENT MANAGEMENT

- **Impact Analysis**

Coastal Response Management Actions. The seashore would continue to lack a contingency plan for responding to catastrophic storms and the effects of climate change/sea level rise. NPS would manage seashore resources and visitor use as it does today, with no major change in scope or direction. There would be limited actions to protect transportation system infrastructure from storm damage. Recurring damage would occur due to coastal storms temporarily restricting or closing access to recreation experiences. Parking capacity on the island would be reduced as the developed area shrinks enabling fewer and fewer visitors to have vehicular access to the seashore. Over the long-term there would be an adverse impact on access and circulation.

Lack of a contingency plan would not mitigate the eventual impacts from catastrophic storms and climate change/sea level rise. The seashore would continue to be exposed to very high risk of becoming abruptly inaccessible by vehicle in the event that a catastrophic storm destroys the MD Route 611 bridge or breaches the island in the northern portion of the developed area. When that happens, without a contingency plan in place, access to the seashore could be lost for months to years, resulting in a long-term adverse impact on access and circulation.

Response to breaches and/or new inlet formation would be uncertain. As a result, in the future it is possible that some or all of the OSV use area and the backcountry could become inaccessible by vehicle and by walking, either temporarily or permanently. Should this occur, there would be an adverse impact on access and circulation.

Natural Resource Management Actions. Analysis of natural resource management actions identified no associated impacts on access and circulation.

Cultural Resource Management Actions. Repairs to the boat dock at the Assateague Beach U.S. Coast Guard Station would make it possible to continue to provide visitor access to the coast guard station via water. There would be a beneficial impact on access and circulation because when land access is closed due to piping plover (*Charadrius melodus*) activity, water access would be the only means of access to the station for seashore maintenance staff and visitors.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on access and circulation.

Seashore Operations Management Actions. Existing transportation system management practices would continue to support traditional access to the seashore via private passenger automobile with the following adverse impacts on access and circulation:

- Maintaining the entrance station on the island would continue to contribute to serious congestion on Bayberry Drive resulting in an adverse impact on access and circulation. Vehicles would continue to back up at the entrance station for long periods with the queue sometimes stretching more than one-quarter mile, blocking access for campers, impeding emergency access, and encouraging illegal parking that damages seashore resources and requires enforcement actions.
- Lack of management actions to reduce the number of vehicles within the Maryland developed area would continue to result in an adverse impact on access and circulation. Serious congestion would continue during summer months, caused by too many vehicles seeking desirable parking spaces close to recreational beaches and changing facilities. Illegal parking, particularly in areas that provide access to South Beach, would continue to pose safety problems, contribute to congestion, and damage coastal resources.
- Lack of an alternate means of access to the island would continue to have an adverse impact on access and circulation. During summer months, demand would continue to exceed capacity for access to visitor use facilities within the Maryland developed area. The seashore would continue to have 770 parking spaces within the Maryland developed area, well below the demand for parking on peak days that sometimes reaches as many as 2,000 spaces. Current management policy is to permit vehicles to enter the seashore even though spaces are not available, causing visitors to circulate through parking areas until a space becomes available or to park illegally alongside seashore roads, impeding emergency access and damaging seashore resources.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on access and circulation generally include past, present, and planned/programmed investments in the transportation infrastructure in the communities providing access it. At the seashore the MD DNR (at Assateague State Park) and the FWS (at CNWR) have made investments in the transportation infrastructure to provide visitor access and facilitate seashore operations; each agency in the future will continue to invest in the seashore's transportation infrastructure, including development of new facilities as well as maintenance of existing facilities. Other actions affecting seashore access include existing and planned transportation system investments by local, county, and state governments in Worcester County (MD) and Accomack County (VA), including roads, bridges, trails, transit facilities, airports, navigation channels, and public access sites. Other actions also include the network of public access facilities along the shorelines of adjoining bay waters in Maryland and Virginia from which visitors can access the seashore by boat. In general, public agencies and local governments have taken few management actions to protect transportation system infrastructure from catastrophic storm damage and the effects of climate change/sea level rise. Management agencies generally repair recurring damage to transportation infrastructure from coastal storms in lieu of relocating facilities and/or developing alternative transportation options that could maintain access and circulation in the seashore vicinity more effectively in the event of catastrophic storms and the effects of climate change/sea level rise.

The overall cumulative impacts on access and circulation would be primarily adverse because contingency planning would continue to place the seashore at very high risk of losing access for months to years in the event that a catastrophic storm destroys transportation infrastructure that provides vehicular access to the island. Alternative 1 would add an appreciable increment to the overall adverse cumulative impact because transportation infrastructure on lands managed by the NPS would remain in non-sustainable locations subject to recurring damage and eventual loss as the island's land area continues to shrink, and because management actions would not address chronic overcrowding and excess demand for access to the seashore. There would also be beneficial cumulative impacts associated with minor transportation system improvements on public lands within the seashore's boundaries. Alternative 1 would add an imperceptible increment to the beneficial impact due to minor transportation system improvements on NPS lands and restoration of boat access to the Assateague Beach U.S. Coast Guard Station.

- **Conclusions**

In alternative 1 management actions would have both adverse and beneficial impacts on access and circulation and would add an appreciable adverse increment and an imperceptible beneficial increment to the total cumulative impacts on access and circulation, respectively.

Current management actions would result in adverse impacts on access and circulation because they would not address chronic access issues affecting the Maryland developed area during summer months including inadequate parking to meet demand, congestion within the Maryland developed area due to the presence of too many vehicles, and congestion on Bayberry Drive due to the presence of the entrance station on the island and the long queue of waiting vehicles that block access for campers, bikers, seashore management staff, and emergency vehicles. The seashore would continue to operate without a contingency plan for responding to catastrophic storms and the effects of climate change/sea level rise; transportation infrastructure would remain in non-sustainable locations subject to recurring damage and eventual loss as the island's land area continues to shrink, resulting in an adverse impact on access and circulation. Lack of a contingency plan would not mitigate the likely eventual impacts due to catastrophic storms and climate change/sea level rise.

The adverse impacts of alternative 1 on access and circulation would be significant. Adverse impacts would result because management actions would not address chronic overcrowding and excess demand for access to the seashore. The seashore would be at very high risk of losing access for months to years in the event that a catastrophic storm destroys transportation infrastructure that provides vehicular access to the island. As a result, the seashore would be unable to operate as needed to accomplish its purpose of providing recreation opportunities and preserving coastal resources. Only through congressional or state funding appropriated for emergency repairs could the seashore continue to be accessible by private vehicle. There would be uncertainty as to when access would be lost and how long it would take to restore access via reconstructed transportation infrastructure and/or development of a water-based transportation system. Loss of access to the island would be highly disappointing to seashore visitors, many of whom assume that they will be able to return to the seashore year after year to enjoy recreation experiences.

An adverse impact on access and circulation would also result if access to all or some of the OSV use area is lost. NPS would not seek to relocate OSV use to another area of the island. By allowing natural processes to predominate, access to the OSV use area would be reduced or lost. This would result in a significant adverse impact on access and circulation because access for some visitors to a variety of long-standing recreational uses on the beach would be reduced or eliminated. This would be controversial to some seashore visitors.

The beneficial impact of alternative 1 would result from repair of the boat dock at the Assateague Beach U.S. Coast Guard Station, making it possible for visitors and seashore maintenance staff to access the site by motorized vessels when overland routes are closed due to plover nesting. This impact would not be significant.

4.9.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

- **Impact Analysis**

Seashore Operations Management Actions. In alternatives 2, 3, and 4 the NPS and MD DNR would explore the potential for a consolidated, jointly operated entrance station to the island located on the mainland. Relocation of the entrance station would manage more effectively the number of vehicles accessing the island and facilitating operation of a new visitor shuttle system. It would eliminate congestion in the Maryland developed area caused by back-ups at the existing NPS and state park entrance stations. It would also reduce the total number of vehicles on the island on peak days. In conjunction with these actions, the NPS would implement an alternative transportation system (ATS). Visitors arriving once parking capacity on the island is reached would have the option to park on the mainland and transfer to a shuttle that would take them to recreational beaches and other sites within the Maryland developed area. Collectively these actions would have a beneficial impact on access and circulation by reducing the number of vehicles on the island and the associated congestion in the Maryland developed area, by providing access to the island for visitors who would otherwise be turned away, and by eliminating congestion on Bayberry Drive caused by the current location of the seashore entrance station.

In alternatives 2, 3, and 4 implementation of an alternative transportation system (ATS) and relocation of the entrance station to the mainland would generally enhance the ability of NPS and MD DNR to sustain visitor access to the seashore. Future catastrophic storms and the effects of climate change/sea level rise would continue to reduce the land available for visitor use and transportation infrastructure within the developed area. By implementing an ATS in advance of the loss of land, the seashore in collaboration with MD DNR could progressively implement shuttle-based access to visitor use areas on the island. In this way, NPS would maintain access to the seashore without disruption as the Maryland developed area shrinks due to catastrophic storms and the effects of climate change/sea level rise. The decrease in vehicle parking capacity would require more visitors seeking island recreation experiences to use the mainland-based shuttle more frequently. At the same time, expansions to shuttle facilities would support a progressively larger shuttle operation, providing additional parking to meet growing demand, and offering service more frequently with more shuttle vehicles. Collectively these actions would have a beneficial impact on access and circulation. The beneficial impact could be short-term or long-term depending upon when vehicular access to the seashore is lost due to catastrophic storms and the effects of climate change/sea level rise.

4.9.4 ALTERNATIVE 2 – CONCENTRATED TRADITIONAL BEACH RECREATION

- **Impact Analysis**

Coastal Response Management Actions. The NPS would prepare for catastrophic storms and the effects of climate change/sea level rise by fortifying the Maryland developed area and letting the remainder of the island evolve naturally, driven by the full effects of natural coastal processes and climate change/sea level rise. The general lack of contingency planning would expose the NPS visitor use facilities on the island to very high risk of becoming abruptly inaccessible by vehicle. In that event, without a contingency plan in place access would be lost for months to years until the bridge is replaced or a water-based alternative transportation system (passenger ferry) for visitor access and seashore operations could be implemented. There would be an adverse impact on access and circulation.

Breach management protocols would generally seek to repair storm overwash and breaches in the island developed area and to let the island's backcountry areas evolve naturally – without interference – subject to the full effects of natural coastal processes and climate change/sea level rise. As a result, in the future it is possible that some or all of the OSV use area and the backcountry could become inaccessible by vehicle and by walking, either temporarily or permanently. This would result in an adverse impact on access and circulation (see Visitor Use and Visitor Experience Management Actions below).

Natural Resource Management Actions. Use of the north end beach would be restricted to limit resource impacts by implementing a permit system requiring a docking/mooring pass. While this action would address resource management concerns, it would have an adverse impact on seashore access and circulation by making it more difficult for visitors to plan trips by boat to a popular seashore recreation site.

Cultural Resource Management Actions. Analysis of cultural resource management actions identified no associated impacts on access and circulation.

Visitor Use and Visitor Experience Management Actions. OSV use would continue within a smaller designated OSV use area that is limited to the beach outside of the proposed wilderness (south of the island developed area to approximately KM 23.4). This would reduce the length of the OSV use area to 38 percent of its current size (from 19.4 KM to 7.4 KM), resulting in an adverse impact on access and circulation. NPS would not take action to restore access to the OSV use area if it is cut off by catastrophic storms or the effects of climate change/sea level rise (e.g., a persistent breach/new inlet occurs in the OSV use area). Should this occur, management actions would further reduce or eliminate the areas that OSVs could access, resulting in an adverse impact on access and circulation.

Seashore Operations Management Actions. Analysis of seashore operations management actions identified no associated impacts on access and circulation.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on access and circulation would be the same as those identified for alternative 1 (section 4.9.2).

The overall cumulative impacts on access and circulation would be primarily adverse because contingency planning would continue to place the seashore at very high risk of losing access for months to years in the event that a catastrophic storm destroys transportation infrastructure that provides vehicular access to the island. Alternative 2 would add an appreciable increment to the overall adverse cumulative impact because transportation infrastructure on lands managed by the NPS would remain in locations that would be inherently not sustainable. There would also be beneficial cumulative impacts associated with transportation system improvements on public lands within the seashore's boundaries. Alternative 2 would add a perceptible increment to the beneficial impact because of management actions that would address some aspects of the chronic access issues affecting the Maryland developed area during summer months and restoration of boat access to the Assateague Beach U.S. Coast Guard Station.

- **Conclusions**

In alternative 2 management actions would have both adverse and beneficial impacts on access and circulation and would add an appreciable adverse increment and an imperceptible beneficial increment to the total cumulative impacts on access and circulation, respectively.

The seashore would operate without a contingency plan, maintaining transportation infrastructure in locations that would be inherently not sustainable resulting in an adverse impact on access and circulation. Only through ongoing congressional funding appropriated for construction and emergency repairs could the seashore continue to maintain transportation infrastructure and protect them from catastrophic storms and the effects of climate change/sea level rise. Congestion within the Maryland developed area due to the presence of too many vehicles would continue; vehicles would still enter the seashore until existing parking areas are full, resulting in an adverse impact on access and circulation.

Collectively these adverse impacts of alternative 2 on access and circulation would be significant. The seashore would be at very high risk of losing access for months to years in the event that a catastrophic storm destroys transportation infrastructure that provides vehicular access to the island. As a result, the seashore would be unable to operate as needed to accomplish its purpose of providing recreation opportunities and

preserving coastal resources. There would be uncertainty as to when access would be lost and how long it would take to restore access via reconstructed transportation infrastructure and/or development of a water-based transportation system. Loss of access to the island would be highly disappointing to seashore visitors, many of whom assume that they will be able to return to the seashore year after year to enjoy recreation experiences.

Adverse impacts on access and circulation would also result from reduction in the size of the OSV use area. The adverse impacts would be significant because by allowing natural processes to predominate, access to the beach for OSV use would be reduced. These actions would reduce or eliminate access for some visitors to a variety of long-standing recreational uses on the beach. This would be controversial to some seashore visitors. Furthermore, if access to all or some of the reduced OSV use area is lost, NPS would not seek to relocate OSV use to another area of the island. By allowing natural processes to predominate, access to the OSV use area would be reduced or lost. This would result in a significant adverse impact on access and circulation because access for some visitors to a variety of long-standing recreational uses on the beach would be reduced or eliminated. This would be controversial to some seashore visitors.

Management practices would address some aspects of the chronic access issues affecting the Maryland developed area during summer months, resulting in a beneficial impact on access and circulation. Moving the entrance station to the mainland would have a beneficial impact on access and circulation by eliminating chronic congestion on Bayberry Drive that currently blocks access for campers, bikers, seashore management staff, and emergency vehicles. While parking demand would continue to exceed capacity during summer months, visitors who could not access the island by private vehicle because parking lots are full would still be able to reach recreation sites via an alternative transportation system (shuttle), resulting in a beneficial impact on access and circulation.

Collectively these beneficial impacts on access and circulation within the Maryland developed area and the backcountry would be significant because they would support the seashore's purpose of providing access to recreation opportunities for visitors. In particular, implementation of an ATS that would enable visitors currently turned away to access the island by shuttle would significantly enhance the seashore's ability to provide access to recreation opportunities for visitors.

4.9.5 ALTERNATIVE 3 – SUSTAINABLE RECREATION AND CLIMATE CHANGE ADAPTATION (NPS PREFERRED ALTERNATIVE)

- **Impact Analysis**

Coastal Response Management Actions. The NPS would take steps to prepare for catastrophic storms and climate change/sea level rise by transitioning to sustainable

design facilities and infrastructure and by planning and developing alternative transportation systems. In the event that vehicular access is lost, the NPS would have completed planning for a water-based alternative transportation system for visitor access (passenger ferry) and seashore operations in advance of losing island vehicular access. As part of planning the NPS would have selected sites for facility development on the mainland and taken action to acquire the land from willing sellers and to complete required design and engineering of new facilities. The NPS would be immediately prepared to proceed with implementing the transportation contingency plans, including construction of docking facilities on the island and the mainland for the passenger ferry and for seashore operations. Overall, contingency planning would enable relatively quick restoration of access to the seashore following the loss of vehicular access due to catastrophic storms and the effects of climate change/sea level rise, resulting in a beneficial impact on access and circulation.

Breach management protocols would seek a reasonable balance that would generally let the island evolve naturally subject to the effects of natural coast processes and climate change/sea level rise within the context of human safety and protection of property. As a result, in the future it is possible that some or all of the OSV use area and the backcountry could become inaccessible by vehicle and by walking, either temporarily or permanently. Should this occur, there would be an adverse impact on access and circulation. This would be mitigated to some extent by relocating the OSV use area to another more suitable location (see Visitor Use and Visitor Experience Management Actions below).

Natural Resource Management Actions. As in alternative 2, access to the north end Beach by motorized vessels would be significantly reduced in order to limit resource impacts by implementing a permit system requiring a docking/mooring pass. While this action would address resource management concerns, it would have an adverse impact on seashore access by making it more difficult for visitors to plan trips by boat to a popular seashore recreation site.

Cultural Resource Management Actions. As in alternative 1, repairs to the boat dock at the Assateague Beach U.S. Coast Guard Station would make it possible to continue to provide visitor access to the coast guard station via water. There would be a beneficial impact on access and circulation because when land access is closed due to piping plover (*Charadrius melodus*) activity, water access would be the only means of access to the station for seashore maintenance staff and visitors.

Visitor Use and Visitor Experience Management Actions. OSV use would continue within the seashore's existing OSV use area. Also, NPS would consider modifying the OSV use area or relocating it to another more suitable location if it is cut off by catastrophic storms or the effects of climate change/sea level rise (e.g., a persistent breach/new inlet occurs in the OSV use area). As long as vehicular access to the island

remains, there would be the potential to retain the length of the OSV use area at 100 percent of its current size (although the location could be changed), resulting in a potential beneficial impact on access and circulation.

The NPS would implement several management actions to enhance access to the backcountry by water. Three new bayside access points would be developed, including channel markers, a mooring area, and soft landing. NPS would seek to acquire from Worcester County two existing public access sites on the mainland. To promote the use of these sites for seashore access, the NPS would seek to expand and diversify partnerships with commercial service providers to provide both guided and self-guided water access to the seashore. Collectively these actions would result in a beneficial impact on access and circulation.

Seashore Operations Management Actions. When vehicular access to the island is no longer possible, access to the island would shift to a ferry based operation for visitor access and seashore operations at waterfront locations on the mainland and on the island. New mainland facilities near the existing seashore headquarter complex would include a passenger ferry terminal, docking facilities to support seashore operations, and parking for up to 700 cars; new island facilities would include an island terminal facility, docking facilities to support seashore operations, an island shuttle system with shelters and benches, and new trails. Planning for these facilities in advance of losing vehicular access to the seashore and their timely construction as soon as needed would sustain visitor access to the island with minimal interruption resulting in a beneficial impact on access and circulation.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on access and circulation would be the same as those identified for alternative 1 (section 4.9.2).

The overall cumulative impacts on access and circulation would be primarily beneficial because of transportation system improvements on public lands within the seashore's boundaries, and because NPS would increasingly manage lands within the seashore to better withstand the impacts of coastal processes and climate change/sea level rise. Alternative 3 would add an appreciable increment to the overall beneficial cumulative impact because contingency planning would enable relatively quick restoration of access to the seashore following the loss of vehicular access via water-based alternative transportation system for visitor access (passenger ferry) and for seashore operations, and because NPS would implement actions to enhance access to the backcountry, restore water access to the Assateague Beach U.S. Coast Guard Station, and to address many aspects of the chronic access issues affecting the Maryland developed area during summer months. There would also be adverse cumulative impacts associated with reduced access in some areas of the seashore. Alternative 3 would add an

imperceptible increment to the adverse impact because of management actions to reduce visitor access via motorized vessels to the north end.

- **Conclusions**

In alternative 3 management practices would have both adverse and beneficial impacts on access and circulation and would add an imperceptible adverse increment and an appreciable beneficial increment to the total cumulative impacts on access and circulation, respectively.

Management practices would address many aspects of the chronic access issues affecting the Maryland developed area during summer months resulting in a beneficial impact on access and circulation. Moving the entrance station to the mainland would have a beneficial impact on access and circulation by eliminating chronic congestion on Bayberry Drive that currently blocks access for campers, bikers, seashore management staff, and emergency vehicles. While parking demand would continue to exceed capacity during summer months, visitors who could not access the island by private vehicle because parking lots are full would still be able to reach recreation sites via an alternative transportation system (shuttle), resulting in a beneficial impact on access and circulation. As catastrophic storms and the effects of climate change/sea level rise reduce the land area, parking would be reduced and would ultimately no longer be available. At that time, access would be available by shuttle only and vehicular congestion would no longer be an issue as long as recreational uses continue within the developed area. The seashore would also begin to transition to transportation infrastructure that would be more sustainable, including contingency planning to enable relatively quick restoration of access to the seashore following the loss of vehicular access via water-based alternative transportation system for visitor access (passenger ferry) and for seashore operations, resulting in a beneficial impact on access and circulation. Many aspects of backcountry access would continue to provide visitors with desired access to recreation opportunities and water-based access to the backcountry would be managed more effectively through implementation of a docking/mooring pass, also resulting in a beneficial impact on access and circulation. Management actions would also generally enhance access to the backcountry by water, including addition of three new bayside access points, along with enhanced partnerships with commercial service providers to provide both guided and self-guided water access to the seashore. The OSV use area would remain in its current size and location; NPS would consider modifying or relocating it to another location if it is cut off by catastrophic storms or the effects of climate change/sea level rise. As in alternative 1, the repair of the boat dock at the Assateague Beach U.S. Coast Guard Station, would make it possible for visitors and seashore maintenance staff to access the site by motorized vessels when overland routes are closed due to plover nesting.

The beneficial impacts on access and circulation within the Maryland developed area and the backcountry would be significant because they would support the seashore's

purpose of providing access to recreation opportunities for visitors. In particular, implementation of an ATS that would enable visitors currently turned away to access the island by shuttle would significantly enhance the seashore's ability to provide access to recreation opportunities for visitors. Furthermore, contingency planning would reduce to low the risk of long-term seashore inaccessibility due to a catastrophic storm. The NPS would be immediately prepared to proceed with implementing transportation contingency plans, including construction of docking facilities on the island and the mainland for a passenger ferry and for seashore operations, on-island shuttle and enhanced trail system, and acquisition of mainland public access sites for enhanced water access to the island. By potentially relocating the OSV use area in the event of a breach that will remain open, access to a long-standing recreational uses highly valued by seashore visitors would continue.

The adverse impact on access and circulation would result from implementation of a permit system requiring a docking/mooring pass for visitors to the north end. The adverse impact would be significant because by allowing natural processes to predominate, access to the north end Beach by motorized vessel would eliminate access for some to a variety of long-standing recreational uses in the north end. This would be controversial to some seashore visitors.

4.9.6 ALTERNATIVE 4 – NATURAL ISLAND EVOLUTION AND A PRIMITIVE ISLAND EXPERIENCE

- **Impact Analysis**

Coastal Response Management Actions. The NPS would prepare for catastrophic storms and sea level rise by replacing existing facilities as they are damaged or lost with minimalist facilities and by developing alternative transportation systems. This would require federal investment when existing facilities are lost or become obsolete, and assumes that funding would be appropriated at the necessary times. As in alternative 3, contingency planning would enable relatively quick restoration of access to the seashore following the loss of vehicular access. As in alternative 3, in the event that vehicular access is lost, the NPS would have completed planning for implementation of water-based alternative transportation system for visitor access (passenger ferry) and seashore operations in advance of losing island vehicular access. Overall, contingency planning would enable relatively quick restoration of access to the seashore following the loss of vehicular access due to catastrophic storms and the effects of climate change/sea level rise, resulting in a beneficial impact on access and circulation.

Breach management protocols would generally seek to let the island evolve naturally – without interference – subject to the full effects of natural coastal processes and climate change/sea level rise. As a result, in the future it is possible that some or all of the OSV use area and the backcountry could become inaccessible by vehicle and by walking, either temporarily or permanently. Should this occur, there would be an adverse impact

on access and circulation. As in alternative 3, this would be mitigated to some extent by relocating the OSV use area to another more suitable location (see Visitor Use and Visitor Experience Management Actions below).

Natural Resource Management Actions. Access to the north end Beach by motorized vessels would be curtailed. While this action would address resource management concerns, it would have an adverse impact on seashore access by eliminating access for most visitors to a popular recreation site.

Cultural Resource Management Actions. As in alternative 1, repairs to the boat dock at the Assateague Beach U.S. Coast Guard Station would make it possible to continue to provide visitor access to the coast guard station via water. There would be a beneficial impact on access and circulation because when land access is closed due to piping plover (*Charadrius melodus*) activity, water access would be the only means of access to the station for seashore maintenance staff and visitors.

Visitor Use and Visitor Experience Management Actions. OSV use would continue within the seashore's existing OSV use area. If vehicular access is lost (e.g., a persistent breach/new inlet occurs in the OSV use area and the breach management plan calls for it to stay open), then the OSV use area would be reduced or eliminated. This would result in an adverse impact on access and circulation.

NPS would seek to expand and diversify partnerships with commercial service providers to provide both guided and self-guided access to the seashore, resulting in a beneficial impact on access and circulation.

Seashore Operations Management Actions. As in alternative 3, when vehicular access to the island is no longer possible, access to the island would shift to a ferry based operation for visitor access and seashore operations at waterfront locations on the mainland and on the island. New mainland facilities would be similar to those in alternative 3, although parking capacity could be smaller; island facilities would be limited to an expanded trail system and would not include an island shuttle system. Planning for these facilities in advance of losing vehicular access to the seashore and their timely construction as soon as needed would sustain visitor access to the island with minimal interruption resulting in a beneficial impact on access and circulation.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on access and circulation would be the same as those identified for alternative 1 (section 4.9.2).

Other past, present, and reasonably foreseeable actions that have had or would have impacts on access and circulation would be the same as those identified for alternative

4 (section 4.9.2). The overall cumulative impacts on access and circulation would be primarily beneficial because of transportation system improvements on public lands within the seashore's boundaries, and because NPS would increasingly manage lands within the seashore to better withstand the impacts of coastal processes and climate change/sea level rise. Alternative 4 would add an appreciable increment to the overall beneficial cumulative impact because contingency planning would enable relatively quick restoration of access to the seashore following the loss of vehicular access via water-based alternative transportation system for visitor access (passenger ferry) and for seashore operations, and because NPS would implement actions to restore water access to the Assateague Beach U.S. Coast Guard Station and to address many aspects of the chronic access issues affecting the Maryland developed area during summer months. There would also be adverse cumulative impacts associated with reduced access in some areas of the seashore. Alternative 4 would add a perceptible increment to the adverse impact because of management actions to eliminate visitor access via motorized vessels to the north end.

- **Conclusions**

In alternative 4 management practices would have both adverse and beneficial impacts on access and circulation and would add an imperceptible adverse increment and an appreciable beneficial increment to the total cumulative impacts on access and circulation, respectively.

Management practices would address some aspects of the chronic access issues affecting the Maryland developed area during summer months resulting in beneficial impacts on access and circulation. Moving the entrance station to the mainland would have a beneficial impact on access and circulation by eliminating chronic congestion on Bayberry Drive that currently blocks access for campers, bikers, seashore management staff, and emergency vehicles. While parking demand would continue to exceed capacity during summer months, visitors who could not access the island by private vehicle because parking lots are full would still be able to reach recreation sites via alternative transportation system (shuttle) resulting in a beneficial impact on access and circulation. Congestion within the Maryland developed area due to the presence of too many vehicles would continue; vehicles would still enter the seashore until existing parking areas are full, resulting in an adverse impact on access and circulation. Over the long-term congestion would worsen over time as the land area shrinks. As catastrophic storms and the effects of climate change/sea level rise reduce the land area, parking would be reduced and would ultimately no longer be available. At that time, access would be available by shuttle only and vehicular congestion would no longer be an issue as long as recreational uses continue within the developed area.

Many aspects of backcountry access would continue to provide visitors with desired access to recreation opportunities resulting in a beneficial impact on access and circulation. Management actions would also include enhanced partnerships with

commercial service providers to provide both guided and self-guided water access to the seashore, resulting in a beneficial impact on access and circulation. The OSV use area would remain in its current size and location, resulting in a beneficial impact on access and circulation. The seashore would begin to transition to transportation infrastructure that would be more sustainable, including contingency planning to enable relatively quick restoration of access to the seashore following the loss of vehicular access via water-based alternative transportation system for visitor access (passenger ferry) and for seashore operations, also resulting in a beneficial impact on access and circulation. As in alternative 1, the repair of the boat dock at the Assateague Beach U.S. Coast Guard Station, would make it possible for visitors and seashore maintenance staff to access the site by motorized vessels when overland routes are closed due to plover nesting.

The beneficial impacts on access and circulation within the Maryland developed area and the backcountry would be significant because they would support the seashore's purpose of providing access to recreation opportunities for visitors. In particular, implementation of an ATS that would enable visitors currently turned away to access the island by shuttle would significantly enhance the seashore's ability to provide access to recreation opportunities for visitors. Furthermore, contingency planning would reduce to low the risk of long-term seashore inaccessibility due to a catastrophic storm. The NPS would be immediately prepared to proceed with implementing transportation contingency plans, including construction of docking facilities on the island and the mainland for a passenger ferry and for seashore operations, on-island shuttle and enhanced trail system, and acquisition of mainland public access sites for enhanced water access to the island.

An adverse impact on access and circulation would result from elimination of access to the north end via motorized vessels. The adverse impact would be significant because by allowing natural processes to predominate, access for some visitors to a variety of long-standing recreational uses in the north end would be eliminated. This would be controversial to some seashore visitors.

If access to all or some of the OSV use area is lost, NPS would not seek to relocate OSV use to another area of the island. By allowing natural processes to predominate, access to the OSV use area would be reduced or lost. This would result in a significant adverse impact on access and circulation because access for some visitors to a variety of long-standing recreational uses on the beach would be reduced or eliminated. This would be controversial to some seashore visitors.

4.10 Visitor Use and Visitor Experience

4.10.1 METHODOLOGY

Analysis of impacts on visitor use and visitor experience focuses on maintaining and enhancing popular visitor experiences at the seashore, specifically considering how well each alternative accomplishes the following:

- provides visitor facilities and infrastructure the Maryland developed area and the Virginia developed area that support high-density activities and uses
- provides visitor opportunities within the backcountry for low density, low impact activities and uses
- provides visitors opportunities for oversand vehicle use
- provides visitor services that support desired visitor experiences
- offers interpretive and educational programs that tell all seashore stories and promote resource stewardship

The resource-specific context for the evaluation of impacts on visitor use and visitor experience is as follows:

- Approximately 2 million people visit the seashore annually seeking recreation experiences on the beach, many of whom return year after year during family summer vacations. The seashore currently lacks a contingency plan for mitigating the impacts from catastrophic storms and the effects of climate change/sea level rise. This raises uncertainty as to the sustainability of vehicular access to the seashore. Loss of vehicular access to seashore recreation experiences would be highly disappointing to the majority of visitors because they rely on personal automobiles for their beach or camping experience. A relatively small percentage of visitors would find loss of vehicular access attractive because the beach or camping experience would become more primitive.
- The seashore's enabling legislation explicitly states that two purposes for the seashore are to provide high quality resource-compatible recreational opportunities for visitors and to preserve the seashore's outstanding coastal resources and the natural processes upon which they depend.
- Opportunities for visitors to experience the seashore through a wide variety of active and passive recreational and educational opportunities are values that are fundamental to the seashore's purpose and significance.
- Public comment received during the GMP planning process indicated a strong desire for a seashore experience that is more primitive, less intensely developed, and with few visitor services.
- The seashore offers one of the few opportunities for oversand vehicle (OSV) use on an undeveloped beach on the east coast of the United States. Many visitors to the seashore are there explicitly for recreational experiences made

possible by OSVs. A large stakeholder group of OSV users has expressed concern that the OSV use area remain in at least its current extent.

- The Assateague Island Wilderness offers one of the few opportunities for a coastal wilderness experience in the eastern United States.

4.10.2 ALTERNATIVE 1 – CONTINUATION OF CURRENT MANAGEMENT

- **Impact Analysis**

Coastal Response Management Actions. NPS would seek to maintain a variety of traditional beach-oriented recreational activities concentrated within the Maryland developed area for as long as possible without fortification. Despite efforts to protect the Maryland developed area through dune maintenance, catastrophic storms and the effects of climate change/sea level rise would continue to reduce the land area within the Maryland developed area. Over the long-term visitor use facilities would likely be non-sustainable due to lack of funding for maintenance and ultimately due to the shrinking island land area. As the land area shrinks, maintenance of recreational uses would likely become impossible. Overall, this coastal response management approach would result in an adverse impact on visitor use and visitor experience because recreational uses would continue at high risk with the potential for very long-term interruption or complete loss.

Natural Resource Management Actions. Continuation of existing natural resource management programs to restore seashore habitat disturbed by historic land uses would have a beneficial impact on visitor experience by eliminating abandoned buildings, roads, mosquito ditches, and impoundments that detract from the seashore's natural setting in the backcountry.

Access to the OSV use area and to the Assateague Beach U.S. Coast Guard Station would continue to be restricted as needed to protect habitat of the piping plover (*Charadrius melodus*).

Cultural Resource Management Actions. At the Assateague Beach U.S. Coast Guard Station, the NPS would maintain current management practices. All structures would be maintained. Repairs to the boat dock would make it possible to continue to provide visitor access to the coast guard station via water. When land access is closed due to piping plover (*Charadrius melodus*) activity, water access would be the only means of access to the station.

NPS would not take action to protect or stabilize the ocean dunes or bay shoreline now or in the event of future storm damage to the dune or shoreline. This would increase the potential for damage or loss of historic structures at the coast guard station by natural coastal processes and/or the effects of climate change/sea level rise. When the station structures could no longer be maintained, NPS would likely demolish the station

complex and rehabilitate the site to foster a return to natural conditions. This would result in a long-term adverse impact on visitor use and visitor experience because opportunities to visit the historic structures and cultural landscape would be lost.

Visitor Use and Visitor Experience Management Actions. Backcountry hiking and camping opportunities would be maintained, with access by foot or boat only. Visitors would continue to be able to hunt throughout the backcountry during the public hunting season, with access by some portions of backcountry roads.

The designated OSV use area would remain without management changes, maintaining the existing use limit set at 145 vehicles. As long as vehicular access to the Maryland developed area is maintained visitors could experience beach recreation uses via vehicular access generally as they do today.

Visitor services would remain as they are today with no change in the method of delivery and location. The seashore's two visitor centers would provide orientation and information for visitors. Non-personal services would make available additional information via the internet, site bulletins, exhibits, waysides, and other media. Traditional ranger led activities would continue. Commercial service providers would sell camping supplies at a small convenience store and offer kayak rentals. Visitor use facilities would be maintained but not upgraded. Collectively these services would continue to support the desired visitor experience at the seashore. Public comment received during the planning process indicates that visitors generally enjoy the existing level of visitor services offered at the seashore and that the existing level of commercial services is consistent with their desired experience. As a result, visitor services associated with alternative 1 would continue to have a beneficial impact on visitor use and visitor experience.

The NPS would continue interpretive and educational programs as they are today with no change in the method of delivery and location, and thematic message. Existing management programs and practices providing interpretive and educational services would tell the desired range of seashore stories and provide the desired range of educational programs, although with limited opportunities for in-depth learning and immersion experiences. Traditional ranger led activities and curriculum-based programs concentrating on early childhood education would continue. Outreach to underserved communities would continue to be limited and accomplished primarily in association with partners. Collectively these actions would result in a beneficial impact on visitor use and visitor experience for as long as island visitor use facilities and access remain as they are today. Over time, as the island shrinks and vehicular access becomes more constrained or is lost, the capacity for NPS to tell stories and provide education programs would become more limited and would not be guaranteed. As that happens the impact of alternative 1 on visitor use and visitor experience would shift from a beneficial impact to an adverse impact.

Seashore Operations Management Actions. Continuation of current management without provision of an alternative transportation system (ATS) would have an adverse impact on visitor use and visitor experience. Seashore visitation would likely no longer continue to grow at the historic rate of one percent per year (US DOT 2013b). Capacity for additional visitors would be limited to the spring, fall, and winter when parking is typically available for all visitors making the trip to the seashore. During summer months, when parking capacity is reached on most days, more visitors would be forced to wait in a long line at the entrance gate for parking to become available; more would likely leave voluntarily because they chose not to wait.

In the future, when vehicular access is lost, visitation would reduce dramatically. Only visitors arriving by boat would be able to visit the seashore. Over the long-term, the lack of contingency planning to sustain access to the seashore would result in an adverse impact on visitor use and visitor experience because most visitors would no longer be able to get to the seashore.

NPS would continue to lack a comprehensive strategy for addressing overcrowding due to the number of vehicles and the number of visitors seeking to use popular recreation sites within the Maryland developed area. Without a change in management, as the land area shrinks vehicular congestion and overcrowding would worsen, further diminishing the quality of the visitor experience. Maintaining the entrance station on the island would continue to contribute to serious congestion on Bayberry Drive. Illegal parking, particularly in areas that provide access to South Beach, would continue to pose safety problems and contribute to congestion. Visitor density on shrinking recreational beaches would increase, leading to general uncertainty among visitors about being able to enjoy their desired summer holiday experience, disappointment for visitors seeking a more peaceful recreation experience in a natural setting, and overall higher potential for visitor conflicts

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on visitor use and visitor experience generally include past, present, and planned development of visitor use facilities and infrastructure as well as interpretive and educational programming by the U.S. Fish and Wildlife Service at the Chincoteague National Wildlife Refuge. Other actions also include past, present, and planned/programmed investments in the transportation infrastructure in the communities providing access to it as described for cumulative actions related to seashore access and circulation in section 4.9.2.

The overall cumulative impacts on visitor use and visitor experience would be primarily adverse because contingency planning would continue to place the seashore at very high risk of losing access for months to years in the event that a catastrophic storm destroys transportation infrastructure that provides vehicular access to the island.

Alternative 1 would add an appreciable increment to the overall adverse cumulative impact because contingency planning would continue to expose recreational uses throughout the seashore to high risk with the potential for abrupt and very long-term interruption or complete loss, and because management actions would not address chronic overcrowding and excess demand for access to the seashore. There would also be beneficial cumulative impacts associated with management actions that would continue to ensure that visitors have opportunities for traditional activities and experiences at the seashore. Alternative 1 would add an imperceptible increment to the beneficial impact associated with continued maintenance of visitor facilities programs.

- **Conclusions**

In alternative 1 management actions would have both adverse and beneficial impacts on visitor use and visitor experience and would add an appreciable adverse increment and an imperceptible beneficial increment to the total cumulative impacts on visitor use and visitor experience, respectively.

As long as there is vehicular access to the seashore, current management actions in alternative 1 would continue to ensure that visitors have opportunities for traditional activities and experiences at the seashore, resulting in a beneficial impact on visitor use and visitor experience. When vehicular access to the seashore is lost, current management practices in alternative 1 would expose recreational uses throughout the seashore to high risk with the potential for abrupt and very long-term interruption or complete loss resulting in an adverse impact on visitor use and visitor experience. The adverse impacts on visitor use and visitor experience would be significant because the seashore would no longer fulfill its purpose to provide high quality recreation opportunities to most visitors. There would be uncertainty as to when access would be restored via reconstructed transportation infrastructure and/or development of a water-based transportation system. There would also be uncertainty as to whether congressional or state funding would be appropriated for emergency repairs. Loss of access to the island would be disappointing to seashore visitors, most of which assume that they will be able to return to the seashore year after year via private automobile to enjoy recreation experiences. It would be especially controversial to OSV users because access to one of the few opportunities for OSV use on an undeveloped beach on the east coast of the United States would be lost. For a relatively small percentage of visitors, there would be a beneficial impact on the visitor experience because the beach or camping experience would become more primitive.

An adverse impact on visitor use and visitor experience would also result if access to all or some of the OSV use area is lost. NPS would not seek to relocate OSV use to another area of the island. By allowing natural processes to predominate, access to the OSV use area would be reduced or lost. This would result in a significant adverse impact on visitor use and visitor experience because access for some visitors to a variety of long-

standing recreational uses on the beach would be reduced or eliminated. This would be controversial to some seashore visitors.

A beneficial impact of alternative 1 would result from repair of the boat dock at the Assateague Beach U.S. Coast Guard Station, making it possible for visitors and seashore maintenance staff to access the site by motorized vessels when overland routes are closed due to plover nesting. This impact would not be significant.

4.10.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

Seashore Operations Management Actions. In alternatives 2, 3, and 4 implementation of an alternative transportation system (ATS) would have a beneficial impact on visitor use and visitor experience. Seashore visitation could continue to grow at the historic rate of one percent per year (US DOT 2013b) as capacity for additional visitors would be available year-round. During summer months, when parking capacity is reached on most days, visitors would have the option of parking on the mainland and riding the ATS to the beach. While some visitors would continue to wait in a line at the entrance gate for parking to become available, many would choose to ride the ATS in lieu of not waiting. Many visitors who would otherwise have left without entering the seashore would be able to ride the shuttle instead.

In alternatives 2, 3, and 4 the NPS and MD DNR would explore the potential for a consolidated, jointly operated entrance station to the island located on the mainland. Relocation of the entrance station would manage more effectively the number of vehicles accessing the island and facilitate operation of the ATS. It would eliminate congestion in the Maryland developed area caused by back-ups at the existing NPS and state park entrance stations. It would also reduce the total number of vehicles on the island on peak days. In conjunction with these actions, the NPS would implement an alternative transportation system (ATS) giving visitors the option to park on the mainland and transfer to a shuttle that would take them to recreational beaches and other sites within the Maryland developed area. Collectively these actions would have a beneficial impact on visitor use and visitor experience by generally reducing the number of vehicles and the associated congestion in the Maryland developed area.

4.10.4 ALTERNATIVE 2 – CONCENTRATED TRADITIONAL BEACH RECREATION

- **Impact Analysis**

Coastal Response Management Actions. NPS would maintain existing visitor use facilities and infrastructure in the Maryland developed area through fortification for as long as suitable land base exists and funding is available to support fortification measures. There would be a gradual consolidation of visitor use facilities within a smaller area as the developed area contracts, initially to reduce the area requiring protection and ultimately in response to catastrophic storms and the effects of climate change/sea level rise. NPS would repair or replace damaged facilities within the limits

of available funding. Despite efforts to protect the Maryland developed area through fortification, over the long-term visitor use facilities would likely be non-sustainable due to lack of funding for fortification and ultimately due to the shrinking island land area. As the land area shrinks, maintenance of recreational uses would likely become impossible. Overall, this management approach would result in an adverse impact on visitor use and visitor experience because the number and quality of recreational facilities is likely to decrease as the developed area shrinks in size, and because recreational uses would continue at high risk with the potential for very long-term interruption or complete loss. In comparison to alternative 1 this impact would occur later due to the fortification investment, which would protect the developed area for a longer time than dune maintenance alone as proposed in alternative 1.

Natural Resource Management Actions. Other impacts associated with natural resource management actions in alternative 2 would be similar to those described for alternative 1 (section 4.10.2).

In addition, use of the north end beach would be restricted to limit resource impacts by restricting high density use. While this action would address resource management concerns, it would have an adverse impact on visitor use and visitor experience because it would reduce boat access to a popular recreation site.

Cultural Resource Management Actions. The former Assateague Beach U.S. Coast Guard Station and the former Green Run Lodge would not be maintained and would not be reopened for public use. There would be an adverse impact on visitor use and visitor experience because opportunities to visit the station and lodge would be permanently lost.

Visitor Use and Visitor Experience Management Actions. Visitor overcrowding would increase as the land area within the Maryland developed area shrinks. Visitor use limits would be required to address overcrowding, restricting the number of visitors who can access the island on a daily basis. Increased crowding would have an adverse impact on visitor use and visitor experience because the quality of the visitor experience would be diminished. Implementation of use limits would also have an adverse impact on visitor use and visitor experience because it would be impossible for all visitors wanting to access the island to be able to do so.

OSV use would continue within a smaller designated OSV use area that is limited to the beach outside of the proposed wilderness (south of the island developed area to approximately KM 23.4). This would reduce the length of the OSV use area to 38 percent of its current size (from 19.4 KM to 7.4 KM), resulting in an adverse impact on visitor use and visitor experience. Also, NPS would not take action to restore access to the OSV use area if it is cut off by catastrophic storms or the effects of climate change/sea level rise (e.g., a persistent breach/new inlet occurs in the OSV use area).

This would further reduce or eliminate the areas that OSVs could access, resulting in an adverse impact on visitor use and visitor experience.

The method of delivery and location for visitor services would transition over time as the seashore directs more of its resources towards sustaining traditional recreational activities in the Maryland developed area. Visitor center services would remain largely unchanged. Non-personal services, particularly the use of social media, would likely increase as the preferred medium for providing information. As the island's developed zone contracts there would be a shift away from organized programs towards more informal roving interpretive activities. New facilities would be concentrated within the developed zone to enhance recreational opportunities and services, and existing infrastructure within the developed zone would be upgraded to improve visitor amenities. Existing campgrounds within the developed zone would be upgraded, with water and electricity provided to all sites with hard pads. Commercial services providers would play an increasingly important role in providing visitors with opportunities to experience different aspects of the seashore. Commercial services would include an expanded camp store where groceries and prepared foods would be available. Convenience equipment rentals for camping and beach going would be available. Expanded lifeguard services would open up additional areas of protected beach. Collectively these management actions would change the seashore experience within the developed zone to a more intensely developed less primitive and natural experience. Public comment received during the planning process has indicated that most visitors generally prefer the existing seashore experience with developed campgrounds and amenities as they are today; they do not have a strong interest in additional amenities and visitor services. As a result, the visitor service enhancements included in alternative 2 would not support the public's desired visitor experience. Overall, there would be an adverse impact on visitor use and visitor experience.

The NPS would initially continue existing management programs and practices providing interpretive and educational services that tell the desired range of seashore stories and that provide the desired range of educational programs. As in alternative 1, this would be possible for as long as island visitor use facilities and access remain as they are today, resulting in a beneficial impact on visitor use and visitor experience. Over time as the Maryland developed area is fortified, reduced in size, and managed with an emphasis on maintaining recreational uses, the complexity of interpretive and educational programming would decrease, become less flexible, and increasingly focus on orientation, information, and safety. Curriculum-based environmental education programs would likely decrease in scope as resources are gradually redirected towards the traditional summer visitor. There would be a shift away from organized programs towards more informal roving interpretive activities. As a result, the depth and breadth of interpretive and educational programming would be greatly reduced and opportunities to tell all the seashore's stories would diminish, potentially becoming

impossible over time. As this happens the impact of alternative 2 on visitor use and visitor experience would shift from a beneficial impact to an adverse impact.

Seashore Operations Management Actions. As long as there is vehicular access to the seashore and adequate land area remains within the Maryland developed area, visitation would likely continue to grow at the historic rate of one percent per year (US DOT 2013b) (see section 4.10.3 impacts common to all action alternatives). This would be possible due to implementation of an alternative transportation system. There would be a beneficial impact on visitor use and visitor experience. However, at some point, visitor use limits might be required to address overcrowding due to loss of land mass within the Maryland developed area; this would restrict the number of visitors who could access the island, capping visitation or perhaps reducing it resulting in an adverse impact on visitor use and visitor experience.

In the future, when vehicular access is lost, visitation would reduce dramatically. In alternative 2 (as in alternative 1), only visitors arriving by boat would be able to visit the seashore. Over the long-term, the lack of contingency planning to sustain access to the seashore would result in an adverse impact on visitor use and visitor experience because most visitors would no longer be able to get to the seashore. This dramatically reduced level of visitation would remain low indefinitely, until road and bridge repairs could be made or planning and development of water-based access could be implemented.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on visitor use and visitor experience would be the same as those identified for alternative 1 (section 4.10.2).

The overall cumulative impacts on visitor use and visitor experience would be primarily adverse because contingency planning would continue to place the seashore at very high risk of losing access for months to years in the event that a catastrophic storm destroys transportation infrastructure that provides vehicular access to the island. Alternative 2 would add an appreciable increment to the overall adverse cumulative impact because contingency planning would continue to expose recreational uses throughout the seashore to high risk with the potential for abrupt and very long-term interruption or complete loss, and because management actions would not address chronic overcrowding and excess demand for access to the seashore. There would also be beneficial cumulative impacts associated with management actions that would continue to ensure that visitors have opportunities for traditional activities and experiences at the seashore. Alternative 2 would add an imperceptible increment to the beneficial impact associated with continued maintenance of visitor facilities.

- **Conclusions**

In alternative 2 management actions would have both adverse and beneficial impacts on visitor use and visitor experience and would add an appreciable adverse increment and an imperceptible beneficial increment to the total cumulative impacts on visitor use and visitor experience, respectively.

As long as there is vehicular access and the land area within the Maryland developed is effectively protected, management actions would have a beneficial impact on visitor use and visitor experience. They would ensure that visitors have opportunities for traditional activities and experiences at the seashore, enhanced by actions that reduce congestion and visitor crowding and made more accessible through implementation of an alternative transportation system.

As long as there is vehicular access to the seashore, other management actions would have adverse impacts on visitor use and visitor experience in alternative 2. As the Maryland developed area is fortified and visitor use becomes more concentrated within a smaller and smaller area, the visitor experience would change to a more intensely developed visitor experience supported by more and different types of visitor services. Based on public comment received during the GMP planning process these management actions would not support the public's desire for a more primitive, less intensely developed visitor experience with fewer visitor services. As a result, the modifications to visitor services in alternative 2 would result in an adverse impact on visitor use and visitor experience that would be significant. Other management actions with immediate adverse impacts on visitor use and visitor experience in the backcountry would include limiting use at the north end beach and reducing the OSV use area to 38 percent of its current size. These adverse impacts would be significant because they would be disappointing to seashore visitors and would reduce opportunities for popular recreation uses and experiences. Management actions would also reduce the area available for OSV use at one of the few remaining locations open to OSV use on the east coast of the United States.

When vehicular access to the seashore is lost, management practices in alternative 2 would expose recreational uses throughout the seashore to high risk with the potential for abrupt and very long-term interruption or complete loss resulting in a long-term adverse impact on visitor use and visitor experience. The adverse impacts on visitor use and visitor experience would be significant because the seashore would no longer fulfill its purpose to provide high quality recreation opportunities to most visitors. There would be uncertainty as to when access would be restored via reconstructed transportation infrastructure and/or development of a water-based transportation system. There would also be uncertainty as to whether congressional or state funding would be appropriated for emergency repairs. Loss of access to the island would be disappointing to seashore visitors, most of which assume that they will be able to return to the seashore year after year via private automobile to enjoy recreation experiences.

It would be especially controversial to OSV users because access to one of the few opportunities for OSV use on an undeveloped beach on the east coast of the United States would be lost. For a relatively small percentage of visitors, there would be a beneficial impact on the visitor experience because the beach or camping experience would become more primitive.

Adverse impacts on visitor use and visitor experience would also result from reduction in the size of the OSV use area and loss of public access to the former Assateague Beach U.S. Coast Guard Station and the former Green Run Lodge. The adverse impacts would be significant because by allowing natural processes to predominate, access to the beach for OSV use would be reduced. These actions would reduce or eliminate access for some visitors to a variety of long-standing recreational uses on the beach. This would be controversial to some seashore visitors. Furthermore, if access to all or some of the reduced OSV use area is lost, NPS would not seek to relocate OSV use to another area of the island. By allowing natural processes to predominate, access to the OSV use area would be reduced or lost. This would result in a significant adverse impact on visitor use and visitor experience because access for some visitors to a variety of long-standing recreational uses on the beach would be reduced or eliminated. This would be controversial to some seashore visitors.

4.10.5 ALTERNATIVE 3 – SUSTAINABLE RECREATION AND CLIMATE CHANGE ADAPTATION (NPS PREFERRED ALTERNATIVE)

- **Impact Analysis**

Coastal Response Management Actions. NPS would make decisions about which visitor use facilities to repair or replace within the Maryland developed area based on a cost-benefit analysis of their sustainability in the face of catastrophic storms and the effects of climate change/sea level rise. To the extent possible existing visitor uses would be retained within the developed area as long as possible. Once land is no longer available to support sustainable facilities, the uses would be relocated to the mainland, if feasible. Ultimately, visitor use within the developed area would evolve to day-use only. Overall, this management approach would likely prolong the time during which existing visitor uses could be retained on the island while simultaneously preparing for the time when they could no longer be sustained. Contingency planning would ensure that existing visitor uses could be replaced with minimal disruption once island facilities must be abandoned. Collectively these actions would have a beneficial impact on visitor use and visitor experience.

Natural Resource Management Actions. Use of the north end Beach would be restricted to limit resource impacts by implementing a permit system requiring a docking/mooring pass. While this action would address resource management concerns, it would have an adverse impact on visitor use and visitor experience because it would reduce boat access to a popular recreation site.

Other impacts associated with natural resource management actions in alternative 3 would be similar to those described for alternative 1 (section 4.10.2).

Cultural Resource Management Actions. As in alternative 1, at the Assateague Beach U.S. Coast Guard Station the NPS would maintain current management practices. All structures would be maintained. Repairs to the boat dock would make it possible to continue to provide visitor access to the coast guard station via water. When land access is closed due to piping plover (*Charadrius melodus*) activity, water access would be the only means of access to the station, resulting in a beneficial impact on visitor use and visitor experience. Over time, the NPS would take action to protect or stabilize the ocean dunes or bay shoreline. This would help to protect the coast guard station from damage or loss by natural coastal processes and/or the effects of climate change/sea level rise resulting in a beneficial impact on visitor use and visitor experience. As investments are made by NPS's partner(s) in rehabilitating the station structures, there would be additional incentives and financial resources available from a partner organization for further protecting and stabilizing the dunes and shoreline. As a result it would likely be possible to maintain the structures in situ for a longer time, resulting in a longer-term beneficial impact on visitor use and visitor experience. However, over time the protection and stabilization measures would likely be unable to provide adequate protection. When the station structures could no longer be maintained the NPS would likely demolish the station complex and rehabilitate the site to foster a return to natural conditions. At that time there would be an adverse impact on visitor use and visitor experience because opportunities to visit the historic structures and cultural landscape would be lost.

Visitor Use and Visitor Experience Management Actions. The NPS would implement several management actions to enhance access to the backcountry by water. Three new bayside access points would be developed, including channel markers, a mooring area, and soft landing. NPS would seek to acquire from Worcester County two existing public access sites on the mainland. To promote the use of these sites for seashore access, the NPS would seek to expand and diversify partnerships with commercial service providers to provide both guided and self-guided water access to the seashore. Collectively these actions would result in a beneficial impact on visitor use and visitor experience.

New facilities for environmental education on Egging Island would expand opportunities to experience the backcountry. An improved soft landing for canoes and kayaks would enable visitors to more easily access the island, where a new primitive group campsite would offer new opportunities for camping and environmental education programming. There would be a beneficial impact on visitor use and visitor experience.

OSV use would continue within the seashore's existing OSV use area. Also, NPS would consider modifying the OSV use area or relocating it to another more suitable location if

it is cut off by catastrophic storms or the effects of climate change/sea level rise (e.g., a persistent breach/new inlet occurs in the OSV use area). As long as vehicular access to the island remains, there would be the potential to retain the length of the OSV use area at 100 percent of its current size (although the location could be changed), resulting in a beneficial impact on visitor use and visitor experience.

The method of delivery and location for visitor services would expand over time as seashore operations become more sustainable and efficient. While continuing to provide basic services and information, the two existing visitor centers would increasingly become centers of learning. As opportunities for visitor use expand on both the island and mainland, opportunities for visitor services would also expand. When implemented, staff would make use of points of departure such as ferry terminals and shuttle staging areas to provide orientation, safety messaging, and basic information. Non-personal services, particularly the use of social media, would expand as the preferred medium for providing information with an increased emphasis placed on providing comprehensive information on resource issues. Existing visitor services would continue to support the desired visitor experience. Commercial service providers would continue to offer canoe rentals and camping supplies at a small convenience store. As part of the seashore's new alternative transportation system, new commercial service providers would assist with access to the island backcountry from new points of departure on the mainland. As shifts are made in visitor facilities and infrastructure to more sustainable locations the level of visitor amenities, particularly at campgrounds, would generally remain as they are today. Public comment received during the planning process has indicated that most visitors generally prefer the existing seashore experience and do not have a strong interest in additional amenities and visitor services. As a result, the visitor service enhancements included in alternative 3 would support the public's desired visitor experience. Overall, there would be a beneficial impact on visitor use and visitor experience.

The NPS would continue and expand existing management programs and practices providing interpretive and educational programs that tell the desired range of seashore stories and that provide in-depth learning opportunities that promote resource stewardship. There would be more opportunities to tell all the seashore's stories to a greater range of audiences through more diverse experiences. As opportunities for visitor use expand on both the island and mainland, opportunities for interpretation and educational programming would also increase. The emphasis of existing management programs and practices providing interpretive and educational services would shift to climate change response, ocean stewardship, and other resource management issues. Sustainability messaging would become an essential part of all education and interpretive programs. Environmental education programs would be expanded with more opportunities for outreach, education, in-depth learning, and immersion that promote resource stewardship. Recreational programming would begin to emphasize more activities and experiences that promote resource stewardship. Collectively these

actions would have a beneficial impact on visitor use and visitor experience because the depth and breadth of interpretive and educational programming would be expanded and diversified.

Seashore Operations Management Actions. As long as there is vehicular access to the seashore, seashore visitation would likely continue to grow at the historic rate of one percent per year (US DOT 2013b) due to implementation of an alternative transportation system, resulting in a beneficial impact on visitor use and visitor experience (see section 4.10.3 impacts common to all action alternatives).

In the future, when vehicular access is lost, visitation would initially reduce dramatically. In alternative 3 (as in alternatives 1 and 2), only visitors arriving by boat would be able to visit the seashore. However, unlike alternatives 1 and 2, in alternative 3 this dramatically reduced level of visitation would continue for one to two years while previously completed plans for development of water-based access to the seashore would be implemented. Once the ferry is operational and as visitors become familiar with its use, annual visitation levels would begin to increase. Availability of an island shuttle and other visitor service would increase the likelihood of visitation increasing to levels prior to loss of vehicular access. Overall, there would be a beneficial impact on visitor use and visitor experience because visitors who previously arrived by vehicle would once again be able to get to the seashore.

An island-based ATS would disperse visitors over the land remaining within the Maryland developed area. This management approach would reduce visitor crowding, resulting in a beneficial impact on visitor use and visitor experience.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on visitor use and visitor experience would be the same as those identified for alternative 1 (section 4.10.2).

The overall cumulative impacts on visitor use and visitor experience would be primarily beneficial because of management actions that would continue to ensure that visitors have opportunities for traditional activities and experiences at the seashore. Alternative 3 would add an appreciable increment to the overall beneficial cumulative impact because management actions would ensure that visitors have opportunities for traditional activities and experiences at the seashore, enhanced by actions that reduce congestion and visitor crowding and made more accessible through implementation of an alternative transportation system. Furthermore, contingency planning would ensure that over the long-term recreational uses within the Maryland developed area would continue at low risk for abrupt and long-term interruption or complete loss. There would also be adverse cumulative impacts associated with reduced access in some areas of the seashore. Alternative 3 would add an imperceptible increment to the adverse

impact because of management actions to reduce visitor access via motorized vessels to the north end.

- **Conclusions**

In alternative 3 management actions would have both adverse and beneficial impacts on visitor use and visitor experience and would add an imperceptible adverse increment and an appreciable beneficial increment to the total cumulative impacts on visitor use and visitor experience, respectively.

Overall, in alternative 3 there would be a shift in the type of seashore visitors. The seashore's current visitors who seek a beach experience with full amenities or camping in a developed campground would experience an adverse impact on their visitor experience; many would likely seek those experiences elsewhere. Conversely, visitors who are willing to access recreation opportunities by water and alternative transportation and to experience those opportunities in a more natural setting would experience a beneficial impact on their visitor experience.

As long as there is vehicular access, management actions would have a beneficial impact on visitor use and visitor experience, as in alternative 2. They would ensure that visitors have opportunities for traditional activities and experiences at the seashore, enhanced by actions that reduce congestion and visitor crowding and made more accessible through implementation of an alternative transportation system. The OSV use area would remain in its current size and location; NPS would consider modifying or relocating it to another location if it is cut off by catastrophic storms or the effects of climate change/sea level rise. As in alternative 1, the repair of the boat dock at the Assateague Beach U.S. Coast Guard Station, would make it possible for visitors and seashore maintenance staff to access the site by motorized vessels when overland routes are closed due to plover nesting. Unlike alternative 2, in alternative 3 management would also prolong the time during which the desired seashore visitor uses and experiences are available for visitors on the island while making similar uses possible on the mainland when they can no longer be sustained on the island.

When vehicular access to the seashore is lost, contingency planning in alternative 3 would have a beneficial impact on visitor use and visitor experience because access would be guaranteed via a passenger ferry with only a short-term interruption required to implement previously developed ATS plans and because access would be enhanced by additional visitor use facilities and visitor services to support boat access from the mainland. The beneficial impact would be significant. Over the long-term recreational uses within the Maryland developed area would continue at low risk for abrupt and long-term interruption or complete loss. While there would still be uncertainty as to when vehicular access would be lost, there would be certainty as to how long it would take to restore access via development of a water-based transportation system. Loss of access to the island would be less disappointing to some seashore visitors because there

would be a plan in place to restore seashore access to visitors, many of whom assume that they will be able to return to the seashore year after year to enjoy recreation experiences.

An adverse impact on visitor use and visitor experience would result from implementation of a permit system requiring a docking/mooring pass for visitors to the north end. The adverse impact would be significant because by allowing natural processes to predominate, access to the north end Beach by motorized vessel would eliminate access for some to a variety of long-standing recreational uses in the north end. This would be controversial to some seashore visitors.

As in alternative 1, the repair of the boat dock at the Assateague Beach U.S. Coast Guard Station, would result in a beneficial impact on visitor use and visitor experience by making it possible for visitors and seashore maintenance staff to access the site by motorized vessels when overland routes are closed due to plover nesting. This impact would not be significant.

4.10.6 ALTERNATIVE 4 – NATURAL ISLAND EVOLUTION AND A PRIMITIVE ISLAND EXPERIENCE

- **Impact Analysis**

Coastal Response Management Actions. Visitor use facilities within the Maryland developed area that are damaged or lost would be replaced with minimalist facilities in sustainable locations. Visitor uses would transition quickly to day-use only with some primitive campsites. Overall, the response to storm damage would have an adverse impact on visitor use and visitor experience within the Maryland developed area because many visitor uses would change quickly, with some eliminated. However, as in alternative 3, contingency planning would have a beneficial impact on visitor use and visitor experience because access to the island for day-use and primitive camping opportunities would be guaranteed via a passenger ferry with only a short-term interruption required to implement previously developed ATS plans.

Natural Resource Management Actions. Visitor access to the north end via motorized vessels would be prohibited. While this action would address resource management concerns, it would have an adverse impact on visitor use and visitor experience because it would eliminate a popular recreational use at the seashore.

Other impacts on visitor use and visitor experience associated with natural resource management actions in alternative 4 would be similar to those described for alternative 1 (section 4.10.2).

Cultural Resource Management Actions. At the Assateague Beach U.S. Coast Guard Station, the NPS would maintain current management practices, as in alternative 1.

Collectively these actions would result in a short-term beneficial impact on visitor use and visitor experience. Over time, when the coast guard station is lost due to natural coastal processes and the effects of climate change/sea level rise the visitor experience at the coast guard station would be lost resulting in a long-term adverse impact on visitor use and visitor experience.

Visitor Use and Visitor Experience Management Actions. As in alternative 3, OSV use would continue within the seashore's existing OSV use area. Also, NPS would consider modifying the OSV use area or relocating it to another more suitable location if it is cut off by catastrophic storms or the effects of climate change/sea level rise (e.g., a persistent breach/new inlet occurs in the OSV use area). As long as vehicular access to the island remains, there would be the potential to retain the length of the OSV use area at 100 percent of its current size (although the location could be changed), resulting in a beneficial impact on visitor use and visitor experience.

Existing visitor services would continue, although the relative mix of services, location, and thematic emphasis would gradually shift as the seashore becomes less developed and less accessible. The seashore's two visitor centers would provide orientation and information for visitors. Greater emphasis would be placed on visitor orientation due to changes in seashore accessibility. Resources currently used for on-site programs would be redirected to other services as the seashore shifts to more of a day-use destination. Early childhood education would likely contract as access to and from the seashore becomes more challenging. Non-personal services and web-based information would become a much more important means of communicating with the public about how to access and use the seashore. The thematic emphasis in seashore interpretive and educational programs would shift to climate change messages and information related to the expanding role of the seashore as a laboratory for studying climate change/sea level rise. While opportunities for telling stories and for educational programs would become less flexible and less diverse over time, environmental education programs would be greatly expanded, making available more and new opportunities for in-depth learning that promotes resource stewardship. Collectively these actions would have a beneficial impact on visitor use and visitor experience.

Seashore Operations Management Actions. As long as there is vehicular access to the seashore, seashore visitation would likely continue to grow at the historic rate of one percent per year (US DOT 2013b) due to implementation of an alternative transportation system, resulting in a beneficial impact on visitor use and visitor experience (see section 4.10.3 impacts common to all action alternatives).

In the future, when vehicular access is lost, visitation would initially reduce dramatically. In alternative 4 (as in alternatives 1, 2 and 3), only visitors arriving by boat would be able to visit the seashore in Maryland. However, unlike alternatives 1 and 2, in alternative 4 (as in alternative 3) this dramatically reduced level of visitation would continue for one

to two years while previously completed plans for development of water-based access to the seashore would be implemented. Once the ferry is operational and as visitors become familiar with its use, annual visitation levels would begin to increase. Unlike alternative 3, lack of an island shuttle and reduced level of visitor services would likely deter some visitors, inhibiting return to visitation levels prior to loss of vehicular access. However, overall there would be a beneficial impact on visitor use and visitor experience because visitors who previously arrived by vehicle would once again be able to get to the seashore.

New facility development would include development of up to 150 primitive campsites, replacing developed campsites lost to natural coastal processes and the impacts of climate change/sea level rise. This would have a beneficial impact on visitor use and visitor experience by maintaining camping opportunities on the island, although the range of camping opportunities would diminish as RV campsites are lost and not replaced. For those visitors preferring a more primitive experience this would be a benefit, while those seeking to camp in RVs and more developed campground settings this would be an adverse impact.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on visitor use and visitor experience would be the same as those identified for alternative 1 (section 4.10.2).

The overall cumulative impacts on visitor use and visitor experience would be primarily beneficial because of management actions that would continue to ensure that visitors have opportunities for traditional activities and experiences at the seashore. Alternative 4 would add an appreciable increment to the overall beneficial cumulative impact because management actions would ensure that visitors have opportunities for traditional activities and experiences at the seashore, enhanced by actions that reduce congestion and visitor crowding and made more accessible through implementation of an alternative transportation system. Furthermore, contingency planning would ensure that over the long-term recreational uses within the Maryland developed area would continue at low risk for abrupt and long-term interruption or complete loss. There would also be adverse cumulative impacts associated with reduced access in some areas of the seashore. Alternative 4 would add a perceptible increment to the adverse impact because of management actions to eliminate visitor access via motorized vessels to the north end.

- **Conclusions**

In alternative 4 management actions would have both adverse and beneficial impacts on visitor use and visitor experience and would add an imperceptible adverse increment

and an appreciable beneficial increment to the total cumulative impacts on visitor use and visitor experience, respectively.

Overall, in alternative 4 there would be a shift in the type of seashore visitors. The seashore's current visitors who seek a beach experience with full amenities or camping in a developed campground would experience an adverse impact on their visitor experience; many would likely seek those experiences elsewhere. Conversely, over time as facilities are removed from the island and replaced with fewer more primitive facilities, visitors who prefer more solitude in a more natural setting would experience a beneficial impact on their visitor experience.

As long as there is vehicular access, management actions would have a beneficial impact on visitor use and visitor experience, as in alternatives 2 and 3. They would ensure that visitors have opportunities for traditional activities and experiences at the seashore, enhanced by actions that reduce congestion and visitor crowding and made more accessible through implementation of an alternative transportation system.

When vehicular access to the seashore is lost, contingency planning in alternative 3 would have a beneficial impact on visitor use and visitor experience because access would be guaranteed via a passenger ferry with only a short-term interruption required to implement previously developed ATS plans and because access would be enhanced by additional visitor use facilities and visitor services to support boat access from the mainland. The beneficial impact would be significant. Over the long-term recreational uses within the Maryland developed area would continue at low risk for abrupt and long-term interruption or complete loss. While there would still be uncertainty as to when vehicular access would be lost, there would be certainty as to how long it would take to restore access via development of a water-based transportation system. Loss of access to the island would be less disappointing to some seashore visitors because there would be a plan in place to restore seashore access to visitors, many of whom assume that they will be able to return to the seashore year after year to enjoy recreation experiences.

As long as there is vehicular access to the seashore other management actions would have adverse impacts on visitor use and visitor experience in alternative 4 because many visitor uses would change quickly, with some eliminated and some having the potential for long-term interruption. This adverse impact would not be significant because the quality of some visitor experiences that are fundamental to the seashore would be greatly enhanced and over the long-term most recreation opportunities for visitors that are interrupted would be restored.

An adverse impact on visitor use and visitor experience would result from elimination of access to the north end via motorized vessels. The adverse impact would be significant because by allowing natural processes to predominate, access for some visitors to a

variety of long-standing recreational uses in the north end would be eliminated. This would be controversial to some seashore visitors.

If access to all or some of the OSV use area is lost, NPS would not seek to relocate OSV use to another area of the island. By allowing natural processes to predominate, access to the OSV use area would be reduced or lost. This would result in a significant adverse impact on visitor use and visitor experience because access for some visitors to a variety of long-standing recreational uses on the beach would be reduced or eliminated. This would be controversial to some seashore visitors.

As in alternative 1, the repair of the boat dock at the Assateague Beach U.S. Coast Guard Station, would result in a beneficial impact on visitor use and visitor experience by making it possible for visitors and seashore maintenance staff to access the site by motorized vessels when overland routes are closed due to plover nesting. This impact would not be significant.

4.11 Socio-Economic Environment

4.11.1 METHODOLOGY

Seashore management actions by the NPS at the Maryland District have the potential to impact the socio-economic environment of local communities. Analysis of impacts on the socio-economic environment focuses on how seashore management in the Maryland District would affect local communities, specifically considering the extent to which each alternative accomplishes the following:

- management actions help to sustain tourism that directly and indirectly benefits the local economy
- visitor use and seashore operations are compatible with existing land uses and planning recommendations for gateway communities in the seashore vicinity
- resource management and land protection actions help to accomplish state and local land preservation goals

This analysis does not consider impacts associated with visitation at Assateague State Park and how it could be affected by management decisions by MD DNR in response to natural coastal processes and the effects of climate change/sea level rise.

In Virginia, the impacts of seashore management on the socio-economic environment of local communities are determined primarily by management decisions of the FWS at Chincoteague National Wildlife Refuge, including management actions that are assigned by the FWS to the NPS for providing public recreation opportunities in the Toms Cove area. As a result, the analysis of impacts on the socio-economic environment focuses on the impacts of NPS management actions in the Maryland District.

The resource-specific context for the evaluation of impacts on the socio-economic environment is as follows:

- Approximately 2.1 million people visited the seashore annually on average from 2004 through 2013. Approximately 60 percent of the visitation occurs 40 percent of the visitation occurs in the Maryland District at the Toms Cove area in Virginia (US DOT 2012). Analysis of historic visitation counts over the decade from 2000 to 2009 has indicated that if visitation growth continues at the same rate (one percent over ten years), visitation to the seashore would increase by approximately 8,000 visitors per year (US DOT 2012).
- In 2009, economic benefits of the seashore to local communities included creation of 2,173 jobs and value added equal to \$100.36 million (NPS 2011c).
- The seashore currently lacks a contingency plan for mitigating the impacts from catastrophic storms and the effects of climate change/sea level rise. This raises uncertainty as to the sustainability of seashore access that is dependent upon bridges and roads that are highly susceptible to recurring damage. Should the MD 611 bridge (Verrazano Bridge) be lost, most tourists now visiting the seashore would not be able to get there. As a result, most of the associated economic benefits to local communities would be lost.
- The MD 611 corridor south of Assateague Road (MD 376) is the sole means of vehicular access to the seashore in Maryland and is the area within which the greatest potential impacts on gateway communities could occur because of seashore management actions.
- The annual value of horseshoe crab harvesting in the Toms Cove area of the seashore is estimated at a maximum of approximately \$55,261 (US FWS 2015).

4.11.2 ALTERNATIVE 1 – CONTINUATION OF CURRENT MANAGEMENT

- **Impact Analysis**

Coastal Response Management Actions. Continued lack of contingency planning to maintain access to the island would have an adverse impact on the socio-economic environment (see seashore operations management actions).

Natural Resource Management Actions. NPS would continue to support local land preservation efforts in Worcester and Accomack Counties by providing technical assistance to county departments and to non-profit conservation organizations, and by partnering in the Maryland Coastal Bays Program. NPS would continue to not participate in local land preservation efforts as a partner engaged in land protection by fee purchase or easement conveyance. This level of involvement in local land preservation efforts would result in a minor beneficial impact on the socio-economic environment.

NPS would continue to not enforce existing federal laws prohibiting horseshoe crab harvest, resulting in a beneficial impact to some commercial watermen. The horseshoe crab industry in the Toms Cove area is estimated at a maximum of approximately \$55,261 dollars (US FWS 2015).

Cultural Resource Management Actions. Analysis of cultural resource management actions identified no associated impacts on the socio-economic environment.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on the socio-economic environment.

Seashore Operations Management Actions. Seashore visitation would likely no longer continue to grow at the historic rate of one percent per year (US DOT 2013b). Potential growth in visitation has become increasingly constrained in recent years due to lack of adequate parking during the peak summer period. During summer months when demand to visit the seashore is highest, parking capacity is typically reached early in the day; many potential visitors are deterred from making the trip at all, knowing that parking may not be available. Consequently, capacity for future growth in visitation is largely limited to the spring, fall, and winter when demand is relatively low and parking is typically available for all visitors making the trip to the seashore.

Overall, because of these constraints, the future rate of growth in annual visitation in alternative 1 could decline as parking becomes increasingly difficult. This visitation trend would likely continue for as long as vehicular access to the seashore remains and adequate land area exists to provide parking at its current or reduced capacity. Given these conditions, by 2023 (ten years following GMP implementation) annual recreation visits would likely reach approximately 843,000 (table 4.1). Visitors (non-local and local) would spend approximately \$63.2 million annually. Non-local visitor spending alone would generate approximately 818 jobs, \$20.3 million in labor income, and \$39.2 million in value added. Overall visitation and visitor spending associated with alternative 1 would continue to have a beneficial economic impact on the region as long as vehicular access is maintained, although this impact would be reduced when compared to the existing condition.

In the future, when vehicular access is lost, visitation and beneficial economic impacts of visitor spending would reduce dramatically when compared to baseline conditions (table 4.1). Projections for such an outcome – assumed for hypothetical purposes in 2024 – indicate that annual recreation visits could drop to approximately 67,000, including only visitors arriving by private boats or on commercial vessels. Visitor spending (non-local and local) would also drop to approximately \$3.2 million annually, representing only five percent of prior year visitor spending. Non-local visitor spending

Table 4.1 Estimated Local-Level Impacts of NPS Visitor Spending on Local Economies – Alternative 1 (Maryland)

Year	GMP Management Context	Public Use		Visitor Spending		Impacts of Non-Local Visitor Spending		
		Recreation Visits (MD only)	Overnight Stays	All Visitors (\$000s)	Non-Local Visitors (\$000s)	Jobs	Labor Income (\$000s)	Value Added (\$000s)
2023	visitation trends and access continue from 2014 through 2023	842,631	31,223	63,186	59,975	818	20,290	39,193
2024	vehicular access is lost (hypothetical)	67,132	1,561	3,159	2,999	41	1,014	1,960
2029	no vehicular or water-based access (hypothetical)	67,132	1,561	3,159	2,999	41	1,014	1,960
2034	no vehicular or water-based access (hypothetical)	67,132	1,561	3,159	2,999	41	1,014	1,960

¹ Source: Derived from visitor spending estimates in NPS 2013b

annually would generate only approximately 40 jobs, \$1.0 million in labor income, and \$2.0 million in value added. This dramatically reduced level of visitor spending and the associated beneficial economic impacts would remain low indefinitely, until road and bridge repairs could be made or planning and development of water-based access could be implemented.

Implementation of other seashore operations management actions by NPS in alternative 1 affecting land use in the MD 611 corridor would have a negligible impact on the socio-economic environment. The NPS would maintain its existing seashore headquarters complex, visitor center, and wastewater treatment facilities on the mainland in the MD 611 corridor. Future changes in land use and traffic patterns in the MD 611 corridor from Assateague Road (MD 376) to the seashore would result from market-driven private investments that would occur irrespective of management actions by the NPS at the seashore. Other changes could occur in the MD 611 corridor if MD DNR decides to build additional facilities on land it recently acquired.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on the socio-economic environment generally include development on private property, public development projects, transportation system improvements, and growth management programs that have resulted in or could result in changes in the intensity of economic activity. This ongoing activity will continue to produce moderate

long-term growth in the overall regional economy, based largely on the tourism industry and agriculture.

The overall cumulative impacts on the socio-economic environment would be primarily adverse because contingency planning would continue to place the seashore at very high risk of losing access for months to years in the event that a catastrophic storm destroys transportation infrastructure that provides vehicular access to the island. Alternative 1 would add an appreciable increment to the overall adverse cumulative impact because contingency planning would continue to expose recreational uses throughout the seashore to high risk with the potential for abrupt and very long-term interruption or complete loss, with ensuing associated abrupt decline in visitor spending and loss of jobs, labor income, and value added to the local economy. There would also be beneficial cumulative impacts associated with management actions that would continue to ensure that visitors have opportunities for traditional activities and experiences at the seashore as long as there is vehicular access to the seashore. As long as there is vehicular access to the island, alternative 1 would add an appreciable increment to the beneficial impact associated with continued access to recreation experiences.

- **Conclusions**

In alternative 1 management actions would have both adverse and beneficial impacts on the socio-economic environment and would add an appreciable adverse increment and an appreciable beneficial increment (as long as vehicular access is possible) to the total cumulative impacts on the socio-economic environment, respectively.

As long as there is vehicular access to the seashore, current management actions in alternative 1 would continue to ensure that visitors have opportunities for traditional activities and experiences at the seashore, resulting in a beneficial impact on the socio-economic environment. The beneficial impact would be significant because management actions would continue to maintain existing levels of visitation with associated visitor spending, job generation, labor income, and value added to the local economy.

When vehicular access to the seashore is lost, current management practices in alternative 1 would expose recreational uses throughout the seashore to high risk with the potential for abrupt and very long-term interruption or complete loss resulting in an adverse impact on the socio-economic environment. The adverse impacts on the socio-economic environment would be significant because when vehicular access is lost visitor spending would drop to approximately 5 percent of its previous levels, with similar drops in job generation, labor income, and value added to the local economy. There would be uncertainty as to when access would be restored via reconstructed transportation infrastructure and/or development of a water-based transportation system. There would also be uncertainty as to whether congressional or state funding

would be appropriated for emergency repairs. The decline in visitation and associated visitor spending would be upsetting to local businesses that are dependent upon seashore visitors and local residents who are employed in the tourism industry.

Continuation of the horseshoe crab harvesting would continue to result in beneficial impacts to some commercial watermen (US FWS 2015).

Other management actions affecting gateway community land use in the MD 611 corridor would have a negligible impact on the socio-economic environment.

Continuation of NPS's current role in local land preservation efforts would have a minor beneficial impact on the socio-economic environment.

4.11.3 IMPACTS COMMON TO ALL ACTION ALTERNATIVES

Natural Resource Management Actions. Enforcement of existing federal laws prohibiting harvest of horseshoe crabs (as proposed by FWS in the Final CCP/EIS) would effectively eliminate illegal horseshoe crab harvesting in the Toms Cove area, likely resulting in a negative impact to some commercial watermen (US FWS 2015). The annual value of horseshoe crab harvesting in the Toms Cove area is estimated at approximately \$55,261 (US FWS 2015).

Seashore Operations Management Actions. In alternatives 2, 3, and 4 implementation of an alternative transportation system and fortification of the Maryland developed area would enable seashore visitation to continue to grow at the historic rate of one percent per year. This rate of growth would continue as long as vehicular access to the seashore continues and adequate land area exists. By 2023 (ten years following GMP implementation) annual recreation visits would reach approximately 909,000 (tables 4.2, 4.3 and 4.4). Visitors (non-local and local) would spend approximately \$68.1 million annually. Non-local visitor spending alone would generate approximately 882 jobs, \$21.9 million in labor income, and \$42.3 million in value added. Overall visitation and visitor spending associated with alternatives 2, 3, and 4 would have a beneficial economic impact on the region as long as vehicular access is maintained.

In alternatives 2, 3, and 4 NPS would develop a new consolidated, jointly operated entrance station (with MD DNR) within an expanded MD 611 right-of-way near the Verrazano Bridge, near existing NPS and MD DNR operations facilities. NPS would also complete rehabilitation of the previous visitor center as a stand-alone environmental education center. These investments would likely occur on existing public land owned by the NPS, MD DNR, or MD DOT with the impact confined to the MD 611 corridor near existing NPS and MD DNR operations facilities. These investments would not alter the character of the MD 611 corridor beyond the entrance station vicinity and would not induce new private development within the MD 611 corridor. Overall, implementation of management actions by NPS common to alternatives 2, 3, and 4 affecting land use in

the MD 611 corridor would have a negligible impact on the socio-economic environment.

4.11.4 ALTERNATIVE 2 – CONCENTRATED TRADITIONAL BEACH RECREATION

- **Impact Analysis**

Coastal Response Management Actions. Continued lack of contingency planning to maintain access to the island would have an adverse impact on the socio-economic environment (see seashore operations management actions).

Natural Resource Management Actions. As in alternative 1, in alternative 4 NPS would continue to support local land preservation efforts in Worcester and Accomack Counties (section 4.11.2).

Cultural Resource Management Actions. Analysis of cultural resource management actions identified no associated impacts on the socio-economic environment.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on the socio-economic environment.

Seashore Operations Management Actions. In alternative 2, as in alternatives 3 and 4, implementation of an alternative transportation system and fortification of the Maryland developed area would enable seashore visitation to continue to grow at the historic rate of one percent per year. Overall visitation and visitor spending associated with alternatives 2, 3, and 4 would have a beneficial economic impact on the region as long as vehicular access is maintained (see section 4.11.3).

In the future, once vehicular access is lost, seashore visitation would reduce dramatically. In alternative 2 (as in alternative 1), only visitors arriving by boat would be able to visit the seashore in Maryland. Over the long-term, the lack of contingency planning to sustain access to the seashore would result in an adverse impact on the socio-economic environment because most visitors would no longer be able to get to the seashore. This dramatically reduced level of visitation would remain low indefinitely, until road and bridge repairs could be made or planning, and development of water-based access could be implemented. Projections for such an outcome – assumed for hypothetical purposes in 2024 – indicate that annual recreation visits could drop to 70,000. Visitors spending (non-local and local) would drop to approximately \$3.4 million annually, representing only five percent of prior year visitor spending (table 4.2). Non-local visitor spending annually would generate only approximately 44 jobs, \$1.1 million in labor income, and \$2.1 million in value added. This dramatically reduced level of visitor spending and the associated beneficial economic impacts would remain low indefinitely, until road and bridge repairs could be made or planning and

Table 4.2 Estimated Local-Level Impacts of NPS Visitor Spending on Local Economies – Alternative 2 (Maryland)

Year	GMP Management Context	Public Use		Visitor Spending		Impacts of Non-Local Visitor Spending		
		Recreation Visits (MD only)	Overnight Stays	All Visitors (\$000s)	Non-Local Visitors (\$000s)	Jobs	Labor Income (\$000s)	Value Added (\$000s)
2023	visitation trends and access continue from 2014 through 2023	908,807	33,675	68,148	64,686	882	21,883	42,271
2024	vehicular access is lost (hypothetical)	70,440	1,684	3,407	3,234	44	1,094	2,114
2029	no vehicular or water-based access (hypothetical)	70,440	1,684	3,407	3,234	44	1,094	2,114
2034	no vehicular or water-based access (hypothetical)	70,440	1,684	3,407	3,234	44	1,094	2,114

¹ Source: Derived from visitor spending estimates in NPS 2013b

development of water-based access could be implemented. Over the long-term, in alternative 2 there would be potential for an adverse economic impact due to likely losses in economic activity to the region in the absence of access to the seashore.

Implementation of seashore operations management actions by NPS in alternative 2 affecting land use in the MD 611 corridor would have a negligible impact on the socio-economic environment. NPS would make additional investments in new facilities in the MD 611 corridor that would change the character near the existing seashore headquarters complex. The existing seashore headquarters complex would be demolished and replaced with a new structure at the same location. NPS would also acquire approximately 10 acres as close as possible to the entrance station for development of the mainland base of operation for the new visitor shuttle, including an entrance station and administrative office, visitor parking, and shuttle vehicle storage and maintenance area. These investments would likely occur on existing public land owned by the NPS or MD DNR with the impact confined to the MD 611 corridor near existing NPS and MD DNR operations facilities. These investments would not alter the character of the MD 611 corridor beyond the entrance station vicinity, which is already used to support seashore operations and visitor education, and would not induce new private development within the MD 611 corridor.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on the socio-economic environment would be the same as those identified for alternative 1 (section 4.11.2).

The overall cumulative impacts on the socio-economic environment would be primarily adverse because contingency planning would continue to place the seashore at very high risk of losing access for months to years in the event that a catastrophic storm destroys transportation infrastructure that provides vehicular access to the island. Alternative 2 would add an appreciable increment to the overall adverse cumulative impact because contingency planning would continue to expose recreational uses throughout the seashore to high risk with the potential for abrupt and very long-term interruption or complete loss, with ensuing associated abrupt decline in visitor spending and loss of jobs, labor income, and value added to the local economy. There would also be beneficial cumulative impacts associated with management actions that would continue to ensure that visitors have opportunities for traditional activities and experiences at the seashore as long as there is vehicular access to the seashore. As long as there is vehicular access to the island, alternative 2 would add an appreciable increment to the beneficial impact associated with continued access to recreation experiences.

- **Conclusions**

In alternative 2 management actions would have both adverse and beneficial impacts on the socio-economic environment and would add an appreciable adverse increment and an appreciable beneficial increment (as long as vehicular access is possible) to the total cumulative impacts on the socio-economic environment, respectively.

The beneficial impact would be significant because management actions would continue to maintain existing levels of visitation with associated visitor spending, job generation, labor income, and value added to the local economy. As in alternative 1, when vehicular access to the seashore is lost, current management practices in alternative 2 would expose recreational uses throughout the seashore to high risk with the potential for abrupt and very long-term interruption or complete loss resulting in an adverse impact on the socio-economic environment. The adverse impacts on the socio-economic environment would be significant because when vehicular access is lost visitor spending would drop to approximately 5 percent of its previous levels, with similar drops in job generation, labor income, and value added to the local economy. There would be uncertainty as to when access would be restored via reconstructed transportation infrastructure and/or development of a water-based transportation system. There would also be uncertainty as to whether congressional or state funding would be appropriated for emergency repairs. The decline in visitation and associated visitor spending would be upsetting to local businesses that are dependent upon seashore visitors and local residents who are employed in the tourism industry.

Other management actions including development of new visitor use and seashore operations facilities potentially affecting gateway community land use in the MD 611 corridor would have a negligible impact on the socio-economic environment. As in

alternative 1, continuation of NPS's current role in local land preservation efforts would have a minor beneficial impact on the socio-economic environment.

4.11.5 ALTERNATIVE 3 – SUSTAINABLE RECREATION AND CLIMATE CHANGE ADAPTATION (NPS PREFERRED ALTERNATIVE)

- **Impact Analysis**

Coastal Response Management Actions. Contingency planning in alternative 3 would have a beneficial impact on the socio-economic environment by enabling relatively quick restoration of access to the island and potentially enabling visitation and associated visitor spending to return to previous levels within a few years (see seashore operations management actions).

Natural Resource Management Actions. Acquisition of 250 to 200 acres around each of two public access sites by the NPS or one of its conservation partners would have a beneficial impact on the socio-economic environment. Such land protection would further help to accomplish local land preservation goals as summarized above for land protection within the Chincoteague Bay and Newport Bay watersheds.

Cultural Resource Management Actions. Analysis of cultural resource management actions identified no associated impacts on the socio-economic environment.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on the socio-economic environment.

Seashore Operations Management Actions. As in alternatives 2 and 4, implementation of an alternative transportation system and fortification of the Maryland developed area would enable seashore visitation to continue to grow at the historic rate of one percent per year. Overall visitation and visitor spending associated with alternatives 2, 3, and 4 would have a beneficial economic impact on the region as long as vehicular access is maintained (see section 4.11.3).

In the future, once vehicular access is lost, seashore visitation would initially reduce dramatically. In alternative 3 (as in alternatives 1 and 2), only visitors arriving by boat would be able to visit the seashore in Maryland. However, unlike alternatives 1 and 2, in alternative 3 this dramatically reduced level of visitation would continue for one to two years while previously completed plans for development of water-based access to the seashore would be implemented. Once the ferry is operational and as visitors become familiar with its use, annual visitation levels would begin to increase. Availability of an island shuttle and other visitor service would increase the likelihood of visitation increasing to levels prior to loss of vehicular access. Overall, there would be a

Table 4.3 **Estimated Local-Level Impacts of NPS Visitor Spending on Local Economies – Alternative 3 (Maryland)**

Year	GMP Management Context	Public Use		Visitor Spending		Impacts of Non-Local Visitor Spending		
		Recreation Visits (MD only)	Overnight Stays	All Visitors (\$000s)	Non-Local Visitors (\$000s)	Jobs	Labor Income (\$000s)	Value Added (\$000s)
2023	visitation trends and access continue from 2014 through 2023	908,807	33,675	68,148	64,686	882	21,883	42,271
2024	vehicular access is lost (hypothetical)	70,440	1,684	3,407	3,234	44	1,094	2,114
2029	passenger ferry operational (starting in 2025) (hypothetical)	524,844	18,521	37,481	35,577	485	12,036	23,249
2034	passenger ferry operational (starting in 2025) (hypothetical)	979,247	35,359	71,556	67,920	926	22,977	44,384

¹ Source: Derived from visitor spending estimates in NPS 2013b

beneficial impact on visitor use and visitor experience because visitors who previously arrived by vehicle would once again be able to get to the seashore.

Projections for such an outcome – assumed for hypothetical purposes in 2024 – indicate that as in alternatives 2 and 4 annual recreation visits could drop to under 70,000. Visitors spending (non-local and local) would drop to approximately \$3.4 million annually, representing only five percent of prior year visitor spending (table 4.3). Non-local visitor spending annually would generate only approximately 44 jobs, \$1.1 million in labor income, and \$2.1 million in value added. Unlike alternative 2, in alternative 3 this dramatically reduced level of visitor spending and the associated beneficial economic impacts would continue for only one year while previously completed plans for development of water-based access would be implemented. Plans for replacing other visitor use facilities on the mainland would also be implemented immediately. Assuming that 10 percent of visitors return to the seashore annually once a ferry is operating, within five years (by 2029) visitation levels would return to slightly more than half of their 2023 level before access was lost. At this rate of visitor return – and assuming the ferry operation and island-based shuttle system are designed with adequate capacity – visitation could regain the 2022 level after ten years (by 2034).

Overall visitation and visitor spending associated with alternative 3 would have a beneficial economic impact on the region while vehicular access is maintained, as in alternatives 2 and 4. After vehicular access is lost, alternative 3 would continue to have a beneficial economic impact by quickly restoring access and potentially enabling

visitation and associated visitor spending to return to previous levels within a few years. Additionally, there would likely be an increase in visitors who prefer primitive, backcountry experiences; these visitors would utilize local services for boat or canoe rentals and guides, as well as spend for other commercial services during their visit to the area, compensating slightly for revenue lost from traditional beach and camping visitation and resulting in a beneficial economic impact.

Implementation of seashore operations management actions by NPS in alternative 3 affecting land use NPS would make additional investments in new facilities in the MD 611 corridor that would change the character of the area near the existing seashore headquarters complex. The existing seashore headquarters complex would be demolished and the site reused for development of the mainland base of operation for the new visitor shuttle, including an entrance station and administrative office, visitor parking, and shuttle vehicle storage and maintenance area. These investments would occur on existing public land owned by the NPS, with the impact confined to the MD 611 corridor very near the Verrazano Bridge where NPS and MD DNR functions are currently based. These investments would not alter the character of the MD 611 corridor beyond the entrance station vicinity, which is already used to support seashore operations and visitor education, and would not induce new private development within the MD 611 corridor. Overall, implementation of these management actions near the existing seashore headquarters complex by NPS in alternative 3 affecting land use in the MD 611 corridor would have a negligible impact on the socio-economic environment.

The NPS would relocate the seashore headquarters complex to a new site in the MD 611 corridor, as close as possible to the existing headquarters complex (final decision dependent upon outcome of value analysis). The new complex would likely be located on land now owned by MD DNR and co-located with new Assateague State Park facilities. These investments would alter the scenic character of the MD 611 corridor near the development site but would not induce new private development within the MD 611 corridor. Because of these actions, there would be a minor adverse impact on the socio-economic environment.

The NPS would possibly develop a new campground on the mainland after consultation with Assateague State Park. This campground would be built to replace existing campsites on Assateague Island that have been lost, or are in imminent danger of being lost, due to the effects of catastrophic storms and/or climate change/sea level rise. The site would likely be on existing public land owned by MD DNR, but could be elsewhere in the MD 611 corridor south of MD 376. This investment would alter the scenic character of the MD 611 corridor by converting currently rural agricultural or forested land to a developed campground use. There would be only slight potential to induce new private commercial development in the corridor because the action would be replacement (not expansion) of existing campsites that are already served by existing commercial

development. Because of these actions affecting land use in the MD 611 corridor, there would be a minor adverse impact on the socio-economic environment.

When vehicular access to the seashore is lost, the NPS would implement plans for an expanded alternative transportation system (including development of a ferry terminal facility and ferry terminal building) and for water-based seashore operations (including development of a mainland docking facility and storage area). The site for these facilities would likely be on Sinepuxent Bay, either through an expansion of the existing MD DNR public access site near the Verrazano Bridge or on private land to be acquired somewhere in the MD 611 corridor. Prospective sites would be identified and evaluated through a future implementation planning/NEPA compliance process by the NPS. In general, it can be assumed that development of water-based access facilities would alter the scenic character of the MD 611 corridor by converting currently rural agricultural or forested land and the shoreline area at the development site to transportation and operations uses (for roads, parking, docking facilities, storage/maintenance area, and office). There would be only slight potential to induce new private commercial development in the corridor because the number of visitors to the seashore using the new facilities would initially be lower than it is today and would not return to current levels for several years following the commencement of water-based operations. Assuming a site located off MD 611, existing traffic volumes in the MD 611 corridor would initially decline and then slowly return to existing levels. Because of these actions affecting land use in the MD 611 corridor, there would be a minor adverse impact on the socio-economic environment.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on the socio-economic environment would be the same as those identified for alternative 1 (section 4.11.2).

The overall cumulative impacts on the socio-economic environment would be primarily beneficial because contingency planning by the NPS would enable relatively quick restoration of access to the seashore following the loss of vehicular access. Alternative 3 would add an appreciable increment to the overall adverse cumulative impact because contingency planning for a water-based alternative transportation system for visitor access (passenger ferry) and for seashore operations would fairly quickly restore access to the island. When access is lost there would be an abrupt decline in visitor spending and loss of jobs, labor income, and value added to the local economy; this decline would be relatively short term when compared to alternatives 1 and 2. There would also be adverse cumulative impacts associated with loss of visitor spending, jobs, labor income, and value added to the local economy during time it takes to restore access to the island. During the time it takes to restore access, alternative 3 would add an appreciable increment to the adverse impact associated with continued access to recreation experiences.

- **Conclusions**

In alternative 3 management actions would have both adverse and beneficial impacts on the socio-economic environment and would add an appreciable adverse increment (significantly shorter duration than in alternatives 1 and 2) and an appreciable beneficial increment to the total cumulative impacts on the socio-economic environment, respectively.

As in alternatives 2 and 4, as long as there is vehicular access (with a shuttle option) to the seashore, management actions would ensure that visitors have opportunities for traditional activities and experiences at the seashore, resulting in a beneficial impact on the socio-economic environment. The beneficial impact would be significant because management actions would continue to maintain existing levels of visitation with associated visitor spending, job generation, labor income, and value added to the local economy.

When vehicular access to the seashore is lost, contingency planning in alternative 3 would have a beneficial impact on the socio-economic environment. The beneficial impacts on the socio-economic environment would be significant. Although visitor spending would initially drop to approximately 5 percent of its previous levels as in alternatives 1, 2, and 4 (with similar drops in job generation, labor income, and value added to the local economy), this dramatically reduced level of visitor spending and the associated adverse economic impacts would continue for only one year while previously completed plans for development of water-based access would be implemented. Within a few years of losing access visitation levels would return to or near levels when vehicular access was possible. While there would still be uncertainty as to when vehicular access would be lost, there would be certainty as to how long it would take to restore access via development of a water-based transportation system. Loss of access to the island – along with the loss of visitors and visitor spending – would be less upsetting to local businesses and residents relying on employment generated by visitor spending because there would be a plan in place to restore seashore access to visitors.

Increased visitation to the backcountry and associated spending would compensate slightly for revenue lost from traditional beach and camping visitation, resulting in a beneficial economic impact.

Other management actions including development of new visitor use and seashore operations facilities potentially affecting gateway community land use in the MD 611 corridor would have negligible to moderate adverse impacts on the socio-economic environment that would not be significant.

4.11.6 ALTERNATIVE 4 – NATURAL ISLAND EVOLUTION AND A PRIMITIVE ISLAND EXPERIENCE

- **Impact Analysis**

Coastal Response Management Actions. Contingency planning in alternative 4 would have a beneficial impact on the socio-economic environment by enabling relatively quick restoration of access to the island and potentially enabling visitation and associated visitor spending to resume, although at a level slightly more than half of that prior to the loss of access (see seashore operations management actions).

Natural Resource Management Actions. Analysis of cultural resource management actions identified no associated impacts on the socio-economic environment.

Cultural Resource Management Actions. Analysis of cultural resource management actions identified no associated impacts on the socio-economic environment.

Visitor Use and Visitor Experience Management Actions. Analysis of visitor use and visitor experience management actions identified no associated impacts on the socio-economic environment.

Seashore Operations Management Actions. As in alternatives 2 and 3, implementation of an alternative transportation system and fortification of the Maryland developed area would enable seashore visitation to continue to grow at the historic rate of one percent per year. Overall visitation and visitor spending associated with alternatives 2, 3, and 4 would have a beneficial economic impact on the region as long as vehicular access is maintained (see section 4.11.3).

In the future, once vehicular access is lost, seashore visitation would initially reduce dramatically. In alternative 4 (as in alternatives 1, 2 and 3), only visitors arriving by boat would be able to visit the seashore in Maryland. However, unlike alternatives 1 and 2, in alternative 4 as in alternative 3, this dramatically reduced level of visitation would continue for one to two years while previously completed plans for development of water-based access to the seashore would be implemented. Once the ferry is operational and as visitors become familiar with its use, annual visitation levels would begin to increase. Unlike alternative 3, lack of an island shuttle and reduced level of visitor services would likely deter some visitors, inhibiting return to visitation levels prior to loss of vehicular access. However, overall there would be a beneficial impact on visitor use and visitor experience because visitors who previously arrived by vehicle would once again be able to get to the seashore.

Projections for such an outcome – assumed for hypothetical purposes in 2024 – indicate that as in alternatives 2 and 3 annual recreation visits could drop to 70,000. Visitors spending (non-local and local) would drop to approximately \$8.4 million annually,

Table 4.4 **Estimated Local-Level Impacts of NPS Visitor Spending on Local Economies – Alternative 4 (Maryland)**

Year	GMP Management Context	Public Use		Visitor Spending		Impacts of Non-Local Visitor Spending		
		Recreation Visits (MD only)	Overnight Stays	All Visitors (\$000s)	Non-Local Visitors (\$000s)	Jobs	Labor Income (\$000s)	Value Added (\$000s)
2023	visitation trends and access continue from 2014 through 2023	908,807	33,675	68,148	64,686	882	21,883	42,271
2024	vehicular access is lost (hypothetical)	70,440	1,684	3,407	3,234	44	1,094	2,114
2029	passenger ferry operational (starting in 2025) (hypothetical)	297,642	10,102	20,444	19,406	265	6,565	12,681
2034	passenger ferry operational (starting in 2025) (hypothetical)	524,844	18,521	37,481	35,577	485	12,036	23,249

¹ Source: Derived from visitor spending estimates in NPS 2013b

representing only five percent of prior year visitor spending (table 4.4). Non-local visitor spending annually would generate only approximately 44 jobs, \$1.1 million in labor income, and \$2.1 million in value added. Unlike alternative 2, in alternative 3 this dramatically reduced level of visitor spending and the associated beneficial economic impacts would continue for only one year while previously completed plans for development of water-based access would be implemented. Plans for replacing other visitor use facilities on the mainland would also be implemented immediately. Assuming that 5 percent of visitors return to the seashore annually once a ferry is operating, within five years (by 2029) visitation levels would return to slightly more than a quarter of their 2023 level before access was lost. At this rate of visitor return – and assuming the ferry operation and island-based shuttle system are designed with adequate capacity – visitation could regain one-half of the 2022 level after ten years (by 2034). Visitation would be lower than in alternative 3 because of the lack of an island shuttle and the limited day-use and primitive camping opportunities for visitors.

Overall visitation and visitor spending associated with alternative 4 would have a beneficial economic impact on the region while vehicular access is maintained, as in alternatives 2 and 3. After vehicular access is lost, alternative 4 would continue to have a beneficial economic impact by quickly restoring access and potentially enabling visitation and associated visitor spending to resume, although at a level slightly more than half of that prior to the loss of access. As in alternative 3, there would also likely be an increase in visitors who prefer primitive, backcountry experiences; these visitors would utilize local services for boat or canoe rentals and guides, as well as spend for

other commercial services during their visit to the area, compensating slightly for revenue lost from traditional beach and camping visitation and resulting in a beneficial economic impact.

As in alternative 3, NPS would make additional investments in new facilities in the MD 611 corridor that would change the character of the area near the existing seashore headquarters complex (see section 4.11.5). Because of these actions, implementation of management actions near the existing seashore headquarters complex by NPS in alternative 3 affecting land use in the MD 611 corridor would have a negligible impact on the socio-economic environment.

As in alternative 3, in alternative 4 the NPS would relocate the seashore headquarters complex to a new site in the MD 611 corridor, as close as possible to the existing headquarters complex (final decision dependent upon outcome of value analysis) (see section 4.11.5). Because of these actions affecting land use in the MD 611 corridor, there would be a minor adverse impact on the socio-economic environment.

As in alternative 3, in alternative 4 when vehicular access to the seashore is lost, the NPS would implement plans for an expanded alternative transportation system (including development of a ferry terminal facility and ferry terminal building) and for water-based seashore operations (including development of a mainland docking facility and storage area) (see section 4.11.5). Unlike alternative 3, visitor levels would likely not return to existing levels in alternative 4, suggesting that the facility could be smaller and would likely result in reduced traffic volumes in the MD 611 corridor. Because of these actions affecting land use in the MD 611 corridor, there would be a moderate adverse impact on the socio-economic environment.

- **Cumulative Impacts**

Other past, present, and reasonably foreseeable actions that have had or would have impacts on the socio-economic environment would be the same as those identified for alternative 1 (section 4.11.2).

The overall cumulative impacts on the socio-economic environment would be primarily beneficial because contingency planning by the NPS would enable relatively quick restoration of access to the seashore following the loss of vehicular access. Alternative 4 would add an appreciable increment to the overall adverse cumulative impact because contingency planning for a water-based alternative transportation system for visitor access (passenger ferry) and for seashore operations would fairly quickly restore access to the island. When access is lost there would be an abrupt decline in visitor spending and loss of jobs, labor income, and value added to the local economy; this decline would be relatively short term when compared to alternatives 1 and 2. There would also be adverse cumulative impacts associated with loss of visitor spending, jobs, labor income, and value added to the local economy during time it takes to restore

access to the island. During the time it takes to restore access, alternative 4 would add an appreciable increment to the adverse impact associated with continued access to recreation experiences.

- **Conclusions**

In alternative 4 management actions would have both adverse and beneficial impacts on the socio-economic environment and would add an appreciable adverse increment (significantly shorter duration than in alternatives 1 and 2) and an appreciable beneficial increment to the total cumulative impacts on the socio-economic environment, respectively.

As in alternatives 2 and 3, as long as there is vehicular access (with a shuttle option) to the seashore, management actions would ensure that visitors have opportunities for traditional activities and experiences at the seashore, resulting in a beneficial impact on the socio-economic environment. The beneficial impact would be significant because management actions would continue to maintain existing levels of visitation with associated visitor spending, job generation, labor income, and value added to the local economy.

When vehicular access to the seashore is lost, contingency planning in alternative 4 would have a beneficial impact on the socio-economic environment. The beneficial impacts on the socio-economic environment would be significant. Although visitor spending would initially drop to approximately 5 percent of its previous levels as in alternatives 1, 2, and 3 (with similar drops in job generation, labor income, and value added to the local economy), this dramatically reduced level of visitor spending and the associated adverse economic impacts would continue for only one year while previously completed plans for development of water-based access would be implemented. Within a few years of losing access, visitation levels would return to approximately half of visitation levels when vehicular access was possible. While there would still be uncertainty as to when vehicular access would be lost, there would be certainty as to how long it would take to restore access via development of a water-based transportation system. Loss of access to the island – along with the loss of visitors and visitor spending – would be less disappointing to local businesses and residents relying on employment generated by visitor spending because there would be a plan in place to restore seashore access to visitors.

Increased visitation to the backcountry and associated spending would compensate slightly for revenue lost from traditional beach and camping visitation, resulting in a beneficial economic impact.

Other management actions including development of new seashore operations facilities potentially affecting gateway community land use in the MD 611 corridor would have

negligible to moderate adverse impacts on the socio-economic environment that would not be significant.

4.12 Relationship between Local Short-term Uses of the Environment and Maintenance and Enhancement of Long-term Productivity

In all of the alternatives, the NPS would continue to manage the seashore to maintain ecological processes and native and biological communities, and to provide for appropriate recreational activities consistent with the preservation of natural and cultural resources. Previously disturbed areas would be restored to return them to productivity, as funding permits. Any actions the NPS takes in the seashore would be taken with consideration to ensure that uses do not adversely affect the productivity of biotic communities. Disturbance of the seashores's soils, water quality, vegetation, and wildlife, due to visitor use and the construction of new facilities would reduce the long-term productivity of the seashore in localized areas; however, overall there would likely be only a small effect on the seashore's long-term productivity.

4.13 Irreversible or Irretrievable Commitments of Resources

Irreversible commitments of resources are actions that result in the loss of resources that cannot be reversed. Irretrievable commitments are actions that result in the loss of resources but only for a limited period of time.

4.13.1 ALTERNATIVE 1

Under alternative 1, no action would be taken because of this alternative that would result in consumption of nonrenewable natural resources or in use of renewable resources that would preclude other uses for a period of time. There would be no irreversible or irretrievable commitments of natural resources in the seashore by the NPS.

No actions would be taken that would result in irreversible or irretrievable effects on historic properties. The seashore would continue to conduct appropriate cultural resource management in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995c) and *NPS Management Policies* (NPS 2006c).

4.13.2 ALTERNATIVE 2

Under alternative 2, no action would be taken because of this alternative that would result in consumption of nonrenewable natural resources or in use of renewable resources that would preclude other uses for a period of time. There would be no irreversible or irretrievable commitments of natural resources in the seashore by the NPS.

No actions would be taken that would result in irreversible or irretrievable effects on historic properties. The seashore would continue to conduct appropriate cultural resource management in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995c) and *NPS Management Policies* (NPS 2006c).

4.13.3 ALTERNATIVE 3 (NPS PREFERRED ALTERNATIVE)

Under alternative 3, no action would be taken because of this alternative that would result in consumption of nonrenewable natural resources or in use of renewable resources that would preclude other uses for a period of time. There would be no irreversible or irretrievable commitments of natural resources in the seashore by the NPS.

No actions would be taken that would result in irreversible or irretrievable effects on historic properties. The seashore would continue to conduct appropriate cultural resource management in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995c) and *NPS Management Policies* (NPS 2006c).

4.13.4 ALTERNATIVE 4

Under alternative 4, no action would be taken because of this alternative that would result in consumption of nonrenewable natural resources or in use of renewable resources that would preclude other uses for a period of time. There would be no irreversible or irretrievable commitments of natural resources in the seashore by the NPS.

No actions would be taken that would result in irreversible or irretrievable effects on historic properties. The seashore would continue to conduct appropriate cultural resource management in accordance with the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS 1995c) and *NPS Management Policies* (NPS 2006c).

4.14 Adverse Impacts that could not be Avoided

Unavoidable adverse impacts are defined as moderate to major impacts that cannot be fully mitigated or avoided.

4.14.1 ALTERNATIVE 1

In alternative 1 (continuation of current management), existing conditions may have resulted in unavoidable adverse impacts. The location of seashore facilities on Assateague Island and on the Maryland mainland would continue to impact the floodplain, as all of the land on the island and most of the land on the mainland within

the seashore boundary is within the 100-year floodplain. Cultural resources would continue to be exposed to unavoidable adverse impacts associated with coastal processes and the effects of climate change/sea level rise.

4.14.2 ALTERNATIVE 2

In alternative 2, facilities would be concentrated within a fortified area on the island and new mainland facilities, including a new entrance station and ATS parking facility, would be constructed within the 100-year floodplain because no alternative sites would be available that are outside the floodplain. Once the land area within the developed area can no longer be fortified or is lost, most permanent visitor facilities would likely be removed from the island floodplain. Cultural resources would continue to be exposed to unavoidable adverse impacts associated with natural coastal processes and the effects of climate change/sea level rise.

4.14.3 ALTERNATIVE 3 (NPS PREFERRED ALTERNATIVE)

In alternative 3, damaged or lost facilities would be relocated to more sustainable locations on the island, but would still be located within the 100-year floodplain because the entire island is within the floodplain. New mainland facilities, including a new entrance station and ATS parking facility, would be constructed within the 100-year floodplain because no suitable alternative sites would be available. Once vehicular access to the island is lost, most permanent developed visitor facilities would be relocated to the mainland and new facilities needed to support water-based visitor access and seashore operations would be developed on the mainland and the island. Some new facilities would be located within the 100-year floodplain because they are water dependent or no suitable alternative sites would be available that are outside the floodplain. To the maximum extent possible, site selection for replacement facilities that are not water dependent would seek to locate them above the 100-year floodplain on the mainland. Cultural resources would continue to be exposed to unavoidable adverse impacts associated with natural coastal processes and the effects of climate change/sea level rise.

4.14.4 ALTERNATIVE 4

In alternative 4, damaged or lost facilities would not be replaced, thus eliminating structures and uses from the 100-year floodplain. New mainland facilities, including a new entrance station and ATS parking facility, would be constructed within the 100-year floodplain because no suitable alternative sites would be available. Once vehicular access to the island is lost, new facilities needed to support water-based visitor access and seashore operations would be developed within the 100-year floodplain on the mainland and the island. These facilities would be located within the 100-year floodplain because they are water dependent. Cultural resources would continue to be exposed to unavoidable adverse impacts associated with natural coastal processes and the effects of climate change/sea level rise.