4.0 Environmental Consequences

4.1 Introduction

Consequences, including adverse and beneficial direct and indirect effects, were assessed by impact topic for each of the three alternatives for the hunting program at CACO and cumulatively in the region. The impact topics include:

- Natural Resources: Wildlife (game, non-game, rare species), Vegetation (plants, rare plants, natural communities);
- Cultural Resources: Cultural Heritage (customary hunting activities, berry picking, mushroom gathering), Cultural Landscapes;
- Public Use: Land Use and Recreation, Health and Safety, Public Use and Experience, Socioeconomic Values (effects on local/regional economy); and
- Management and Operations: Consistency with CACO and NPS goals, plans, policies, guidelines, and mandates. Potential changes to staff duties and responsibilities relative to hunting and the costs to implement the hunting program.

Effects were divided into three categories: direct; indirect; and cumulative. Direct and indirect effects were assessed for each impact topic within the boundaries of CACO. Using the definitions below, cumulative effects were assessed based on the combined effects of the hunting program and other related projects in the entire Cape Cod region. The goal of this assessment is to document potential effects that can assist in the decision-making process and to determine if implementing any of the alternatives would impair CACO resources.

4.2 Impairment of CACO Resources

The NPS Management Policies 2006 (NPS 2006a) require analysis of potential effects to determine whether or not actions would impair CACO resources. The fundamental purpose of the NPS, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely effecting resources and values. However, the laws do give the NPS the management discretion to allow effects to CACO resources and values when necessary and appropriate to fulfill the goals and purposes, as long as the effect does not constitute impairment of the affected resources and values. Although Congress has given the NPS the management discretion to allow certain impacts within CACO, that discretion is limited by the statutory requirement that the NPS must leave resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is defined as, "an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of Park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values." An impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of CACO;
- key to the natural or cultural integrity of CACO or to opportunities for enjoyment of CACO; or
- identified in CACO's GMP or other relevant NPS planning documents as being significant.

A determination on impairment is made in section 4.6 for natural resources (wildlife and vegetation) and cultural resources (cultural heritage) for the preferred alternative. An assessment of impairment is not made for public use, management and operations, and non-federal lands within CACO.

4.3 Methodology for Assessing Impacts

4.3.1 Definitions

***Type of Effect*:** Effects are categorized in two different and contrasting types: adverse and beneficial. Adverse effects are considered contrary to the goals, objectives, management policies, and practices of the NPS and the public interest or welfare. These effects are of a kind likely to be damaging, harmful, or unfavorable to one or more of the various impact topics. Beneficial effects are believed to promote favorable conditions for the impact topics.

***Levels of Intensity*:** Levels of intensity refers to severity of the effect, whether it is negligible or major, or somewhere in between. The gradient of this grading system can be general or very detailed, but ultimately the assumptions and subjectivity of the system affect its sensitivity. A simple and subjective rating system is used in this Final EIS, which includes a rating scale of "no effect, negligible, minor, moderate, and major effects." The authors of this Final EIS based the rating system score on studies completed, data and information obtained from scientific and administrative sources, discussions with relevant individuals, subject matter experts, public comments, common sense, and professional opinion.

The definition of "no effect" would be the same for each of the general impact topics. No effect would mean that no measurable effects could be recorded or surmised. Each of these gradient levels is further defined below.

- For natural resource effects, including wildlife and vegetation, the gradients are defined to be:
  - *Negligible*: Effects would be barely detectable, measurable, or observable.
  - *Minor*: Adverse effects would be detectable, but not expected to have an overall effect on a species and/or any natural community. Impacts generally affect less than one-half acre of vegetation or would not be expected to influence the population of any wildlife species, or may influence a small number of individuals of a species. Beneficial effects would enhance the ecology for a small number of individuals.
  - *Moderate*: Effects would be clearly detectable, but could have short-term appreciable effects on a species and/or any natural community. Impacts may affect up to one acre of vegetation, but would not threaten the continued existence of any natural community. Impacts would have short-term effects. Beneficial effects would enhance the population of any wildlife species on CACO.
  - *Major*: Long-term or permanent, highly noticeable effects on the population of a species and/or any natural community. Impacts may affect over one acre of vegetation or may affect the continued existence of any natural community or wildlife species within CACO. Beneficial effects would enhance the population of more than one species over the long-term.

In reviewing the assessments of effects to hunted species, it should be understood that hunting at the Park occurs within a broader context, and:

1. Analyses concerning the impacts to species hunted at CACO are generally not CACO-specific (work being completed concerning the status of the New England cottontail at CACO is one exception);
2. In some cases, species-specific data-gathering is conducted annually and results in regulations and limitations on hunted species in Massachusetts which also affect CACO (waterfowl, for example); and,

3. Hunting at CACO does not occur in order to manage species, but in order to provide a full suite of recreational opportunities, some of which are part of maintaining the cultural heritage on the Outer Cape, without jeopardizing the ability of the Park to maintain the integrity of the natural resources at CACO.

Therefore, rather than assessing the value or absence thereof in the incidental management of species at CACO through hunting, this FEIS focuses the analysis of impacts on whether hunting affects either the short or long-term presence and overall health of the species hunted at CACO. This reflects the fact that hunting occurs at CACO as part of the preservation of CACO's cultural heritage, and not to manage the population of any given species at CACO.

- For cultural resource effects, including cultural heritage and cultural landscapes, the gradients are defined to be:
  - *Negligible*: Effects would be barely perceptible and not measurable and confined to a very small local area.
  - *Minor*: Adverse effects would not affect a character-defining pattern, behaviors of individuals, and features of the local heritage. Furthermore, these effects would not affect the defining characteristics of cultural landscapes either natural or man-made elements. Beneficial effects would include maintaining and making slight improvements, having a positive influence on the use and behavior patterns of visitors on a small-scale, local level. Beneficial effects on cultural landscapes would augment the important features of those areas.
  - *Moderate*: Adverse effects would alter a character-defining pattern or features of the local heritage and cultural landscapes, but would not diminish the integrity of either. Beneficial effects would include improving the character and features of the local heritage and cultural landscapes.
  - *Major*: Adverse effects would alter a character-defining pattern or features of the local heritage and cultural landscapes and diminish the integrity of either. Beneficial effects would include improving the character-defining patterns and features of the local heritage and cultural landscapes by including an increase in the number of people involved with heritage defining patterns and create significant improvements to the cultural landscapes.

- For land use and recreation—health and safety effects—the gradients are defined to be:
  - *Negligible*: Effects would be barely detectable, measurable, or perceptible.
  - *Minor*: Adverse effects would be limited to a small number of visitors and could be avoided or minimized through enforcement, public education, signage, and brochures. Beneficial effects would enhance law enforcement efforts, improve hunting season safety, improve education for hunters and non-hunters.
  - *Moderate*: Compromised safety conditions, resulting in permanently increased accident rates, would occur despite implementing all minimization and mitigation efforts. Beneficial effects would include notable improvements in safety of both hunters and non-hunters.
  - *Major*: Significant compromised safety conditions that would warrant the closing of the facilities and possibly portions of the entire site for a long-term period or permanently. Beneficial effects would include significant increases in safety.

- For land use and recreation—public use and experience effects—the gradients are defined to be:
  - *Negligible*: Effects would be barely detectable, hence visitors would not be aware of any effects or changes to the hunting program. There would be no noticeable change in public use and experience or in any indicators of visitor satisfaction or behavior.
  - *Minor*: For adverse effects, visitors would be aware of the effects, but this would not appreciably limit critical characteristics of a majority of the visitors. For beneficial effects, public satisfaction would be enhanced for a small number of visitors.

  - *Moderate*: Adverse effects would result in a change of a few critical characteristics of the desired public experience and/or the number of participants engaging in an activity would decrease. Public satisfaction would begin to decline as a result of the effect. Beneficial effects would improve a few critical characteristics of the public experience and/or the number of visitors would increase.
  - *Major*: Multiple critical characteristics of the desired public experience would change and/or the number of participants engaging in an activity would be greatly reduced or increased. The public would be aware of the effects associated with implementing the alternative and public satisfaction would markedly decline or increase. Beneficial effects would improve multiple characteristics of the public experience and/or the number of visitors would increase, substantially.

- For land use and recreation—socioeconomic effects—the gradients are defined to be:
  - *Negligible*: Effects on local businesses and communities would be barely perceptible, not measurable, and confined to a very small area.
  - *Minor*: Limited adverse and beneficial effects on local businesses and communities would be temporary and restricted to hunting related businesses in the immediate area.
  - *Moderate*: Local businesses, including those not directly related to hunting, would loose or gain visitor or hunter related business in the immediate area and other portions of Cape Cod.
  - *Major*: Significant losses or gains of visitor or hunter generated business in the immediate area and throughout Cape Cod.

- Management operations—consistency with CACO and NPS legislative mandates, goals, plans, policies, and guidelines—the gradients are defined to be:
  - *Negligible*: Effects would be barely detectable, any alterations or conflicts with legislative mandates, goals, and policies could be alleviated through a brief administrative process. Beneficial effects would include the termination of one policy waiver.
  - *Minor*: A waiver or other administrative process for two management policies would be required or the NPS would deviate from two policies or guidelines. Beneficial effects would include the termination of two policy waivers.
  - *Moderate*: A waiver from more than two management policies would be required or the NPS would deviate from one or two policies and guidelines. The NPS would deviate from any legislative mandate. Beneficial effects would include the elimination or two or more policy waivers or the elimination of one deviation from a legislative mandate.
  - *Major*: Adverse effects include deviation from NPS policies and/or guidelines would require extensive administrative change. Beneficial effects would eliminate all deviations from policies and guidelines.

***Duration*:** Duration describes how long an effect would be expected to last. In this Final EIS, effects are described as either being short-term or long-term. Short-term is an effect that would last no more than two years. Long-term would be an effect that would last for more than two years.

***Context*:** Context is the setting within which an effect is analyzed, such as the affected region or locality and the affected interests. In this Final EIS, the intensity of effects is evaluated within a local context, primarily considering effects on Outer Cape Cod. The intensity of effects on cumulative effects is evaluated in a regional context, and considers effects further in time and effects from other projects. The context of these effects would extend to upper Cape Cod and southeastern Massachusetts.

***Direct and Indirect Effects*:** Direct effects include effects on the resource actually caused by the proposed action, generally at the immediate site of the action and at the time of the action. Direct effects can extend into the future and are often permanent, but can be temporary. A direct effect is an effect that

is caused by an action and occurs at the same time and place. An example of a direct effect would be the filling of a portion of a stream, which immediately causes habitat loss at that location.

Indirect effects generally occur as a result of a "side-effect" of a direct effect, but occur later in time or further in distance than the action. An indirect effect could result from silt flowing downstream, creating turbid conditions, and adversely affecting water quality.

***Cumulative Effects*:** The CEQ regulations, which implement the NEPA (42 USC 4321 *et seq*.), require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects are considered for all alternatives and focus on a regional area well beyond the CACO boundary.

Cumulative effects were determined by combining the effects of each alternative with other past, present, and reasonably foreseeable future actions within CACO and the vicinity. These effects are assessed on a regional basis. These projects include development within the Cape Cod region, long-term population trends, as well as cultural and social changes.

4.3.2 Impact Matrix Comparisons

Comparisons of potential adverse and beneficial effects are made between Alternatives A, B, and C to help determine which alternative is the most environmentally preferable and which should be the preferred alternative. This type of comparison is important to the decision making process.

4.4 Impact Assessment

4.4.1 Alternative A – No Action

The short-term and long-term impacts of retaining the hunting program, the "No Action" alternative, at CACO are discussed for each species is followed by a summary of effects on wildlife and other natural resources. A discussion of impacts to the remaining impact topics follows. Effects on public use are divided into three categories: land use and recreation; health and safety; and experience. The experience topic focuses on public visitation and experiences at CACO. Therefore, this topic is analyzed by the types of visitors expected at CACO: hunters; winter (non-hunter) visitors; summer visitors.

Effects of the No Action Alternative on Birds
There is no established population of ring-necked pheasants on CACO. The impacts of continuing the pheasant stocking and hunting program would be to those individuals raised expressly for this purpose.

Ruffed grouse do not have an established population on Cape Cod and are not specifically pursued by hunters on CACO. The lack of suitable early successional habitat underlies the low grouse population on Cape Cod. Therefore, there are no beneficial or adverse effects expected from any incidental hunting mortality. A small quail population exists on CACO. The quail population is not sufficient to support or generate any consistent hunting pressure or interest by local hunters. Quail are taken incidentally while pursuing other game species. Given the small amount of hunting pressure, beneficial and adverse effects are likely to be negligible.

Hunting pressure for agricultural pest species such as common crows, starlings, and English sparrows is very limited on CACO. All are common and very abundant and the hunting pressure likely does not

effect the local and regional populations of these species. Continuing the hunting program should have no effect on these species.

The hunting of waterfowl, including dabbling ducks, diving ducks, mergansers, and geese, is a popular hunting program at CACO and is largely restricted to estuarine, marine, and tidal marsh areas. Hunting limitations for these species is determined by data gathered throughout their range, resulting in regulations by USFWS. Limitations are established based upon field surveys to ensure that regional management for the continued health of these species occurs consistently throughout the states. Generally, hunting mortality is considered compensatory for waterfowl populations. As such, continued hunting at CACO is not expected to adversely effect waterfowl populations.

Effects of the No Action Alternative on Mammals

Although detailed monitoring and analyses have not been performed with respect to the effects of hunting on deer populations at CACO, deer hunting at its present level at CACO may help prevent deer populations from increasing to densities that are damaging to native plant communities.

Hunting mortality is thought compensatory for Eastern cottontail rabbits elsewhere. A two-year study of Eastern cottontails at CACO indicates that hunting mortality is likely compensatory for cottontails at CACO as well (Boland and Litvaitis 2007). However, this study also indicates that under some conditions, such as the heavy snowfall experienced in the winter of 2005, hunting mortality may be additive for cottontails at CACO. Nonetheless, adverse effects to the eastern cottontail are not expected as Payne (1964) found that even a 75 percent harvest level was not sufficient to depress the population the following fall. Hunting mortality is likely less than 50 percent of the population on CACO. The highest hunting mortality documented at CACO was 6 of the 84 rabbits whose fate was determined, or less than 10 percent (Boland and Litvaitis 2007). New England cottontails have not been found at CACO, and therefore adverse impacts to this species are not anticipated. The methods and results of the recent study of New England cottontail distribution on the Outer Cape (Boland and Litvaitis 2007) will be shared with MDFW and USFWS. If recommendations or new information arises indicating that New England cottontails are put at risk from Eastern cottontail hunting at CACO, the park may alter or discontinue the Eastern cottontail hunt.

The effects of hunting on gray squirrels would not be considered either beneficial or adverse. Harvest mortality is compensatory and likely does not adversely effect the population in the short-term or long-term. Hunting probably does not effect squirrel populations as high population levels do not adversely affect the habitat.

Red and gray foxes, coyotes, and raccoons are predators on tern and plover nests and, in other areas, targeted removal of individual predators has been undertaken to increase tern and plover survival and recruitment. The effects of recreational predator hunting on beach-nesting birds are unknown, but benefits are possible if individual predators that prey on nesting birds are removed. Local hunters' observations (Personal Communication by local hunters with NPS staff) suggests that hunting pressure for coyotes is relatively higher than expected; however, since coyote populations tend to compensate for hunting mortality through increases in litter sizes, reproduction in yearlings, and juvenile survival, it is unlikely that hunting at CACO controls the coyote population. The potential for reduced predation on nesting shorebirds is determined to be negligible and long-term as long as hunting continues. The presence of pheasants is a negligible food source (Bump and Field 1999).

Studies of raccoon hunting mortality indicate that harvest levels below 40 percent are compensatory and do not adversely effect the population (Clark 1990, Hasbrouck *et al.* 1992). This assessment is based on the assumption that Kennedy's (1988) findings regarding low hunter demand for raccoon are still valid and the expectation that raccoon harvest in CACO is, therefore, well below the 40-percent threshold.

Retaining the pheasant program would continue the mortality resulting from predation and scavenging. This situation would reduce a potential negligible food source, as described above, and ultimately would have a negligible effect on the populations of predator species or any indirect effects on other species.

Effects of the No Action Alternative on Natural Resources: ***Wildlife (Game, Non-Game, Rare Species)***
Direct Adverse Effects: There are minor direct, long-term, and local adverse effects due to the wildlife mortality that results from hunting. This loss of taken individuals is a short-term and local situation. Hunting mortality is generally considered compensatory and should not reduce local populations of hunted species over the long-term. Experience with the hunting program at CACO indicates that this is the case, and that experience is expected to continue. The following direct adverse effects would be expected from the No Action alternative:

- Loss of some individuals from a population would be considered a temporary effect;
- Considered to be an ongoing effect to hunted species; and
- Generally only affects the immediate local populations of hunted species, but can extend to adjacent areas.

Adverse effects are restricted to CACO and the immediate area, as the upland hunted species do not migrate to areas outside of the Outer Cape. One exception is the hunting of waterfowl for which effects may extend beyond the Outer Cape, but the harvest of waterfowl here represents a negligible fraction of the international harvest, and is regulated within the context of international species data analysis with hunting limits established consistent with the goal of protecting waterfowl populations.

Federally listed threatened and endangered wildlife that occur in CACO either do not use the areas of the park where hunting occurs (i.e., marine species) or are not present during hunting season (i.e., piping plovers), and therefore would not be affected by the No Action Alternative. Some state listed wildlife species occur in the same areas and at the same time as hunting. Minor adverse impacts are possible to these state listed species if they are mistakenly shot or are disturbed by hunters

Direct Beneficial Effects: Short-term reductions in population due to hunting during the winter likely benefit the remaining individuals, improving winter survival. Furthermore, the long-term effects of hunting are observed in the current populations of game species. The level of game species appears to be healthy and as abundant as the habitats can support, despite the fact that hunting has been practiced at CACO since before CACO was established. Hunting may remove individual predators, such as coyotes, that can adversely affect endangered species, such as piping plovers. Beneficial effects are also seasonal or annual, but do occur over the long-term as long as hunting continues. Retaining the pheasant program would probably not effect predator populations.

The following beneficial effects would be expected:

- The loss of individuals is often considered compensatory mortality;
- Beneficial effects would be ongoing without timeframe limitations; and
- Generally only affects local populations, but can extend to adjacent areas.

Indirect Beneficial Effects: Minor beneficial effects result from hunting and incidentally result from management. The following effects would be expected:

- Beneficial effects would be ongoing without timeframe limitations; and
- Generally only affects the local area, but can benefit habitat and landscape vegetation adjacent to CACO.

Cumulative Beneficial Effects: Negligible beneficial effects can result from hunting when taken in consideration with other hunting activity within the Outer Cape region. The benefits of hunting can be further enhanced as human populations encroach on habitat and adverse interactions become more likely. The following effects would be expected:

- Hunting on other public and private lands in conjunction with deer hunting on CACO provides the indirect benefits described above;
- Benefits extend to areas on and around lands that are hunted; and
- This is an ongoing benefit in the region.

Effects of the No Action Alternative on Natural Resources*: *Vegetation (Plants, Rare Plants, Natural Communities)

Direct Adverse Effects: No adverse effects are expected to state listed or rare plants, or to plant communities. Clearing vegetation is not necessary for hunting. Small social trails may be created by hunters and other visitors, but the contribution to the creation of these trails by hunters is negligible and not measurable. The number of hunters spread across CACO for short periods during the fall and early winter does not likely create social trails, although their activity may use and/or contribute to them. The following effects would be expected:

- Hunting does not involve clearing or removing vegetation; and
- Hunters likely only contribute a negligible amount to the development of social trails.

Direct Beneficial Effects: Beneficial direct effects are not expected as hunting does not directl benefit vegetation.

Effects of the No Action Alternative on Cultural Resources*: *Cultural Heritage

Direct Beneficial Effects: Moderate direct long-term, local beneficial effects result from the opportunities for hunting that exist within CACO. Since hunting is an important part of the way of life on the Outer Cape for a number of individuals, it contributes to the local culture and retaining the local heritage for future generations. The following direct benefits would be expected:

- Hunting has been part of the cultural heritage of the Outer Cape for generations;
- Many individuals have grown up with a hunting tradition that is still fostered by many;
- Benefits are primarily related to local hunters and those from nearby communities; and
- These are ongoing benefits.

Direct Adverse Effects: Some individuals use CACO for berry picking and mushroom gathering during hunting season. These individuals may choose to more selectively use CACO during the hunting seasons (Sundays rather than Saturdays, for example, or non-hunting areas only), which would be considered a negligible effect.

Indirect Beneficial Effects: Negligible beneficial effects occur by maintaining hunting as part of the cultural heritage. There are many aspects of the local cultural heritage: fishing, shellfishing, berry picking, and other outdoor activities, including hunting. The following effects would be expected:

- Hunting is one aspect of many that make up the cultural heritage;
- This benefit is both local and regional; and
- This is an ongoing benefit.

Cumulative Beneficial Effects: Minor beneficial effects occur to the cultural heritage from hunting on CACO and on other public and private lands on Cape Cod. The benefits that hunting contributes to the

culture of the region are additive with all other hunting activities on the cape. Hunting is part of the cultural heritage throughout Cape Cod. Hunting contributes to the cultural heritage within the communities that extends beyond the five towns around CACO. The following cumulative benefits would be expected:

- Cultural heritage benefits from continuing hunting are additive with hunting in other communities and in the region; and
- This is an ongoing benefit.

Effects of the No Action Alternative on Cultural Resources: Cultural Landscapes
Direct Adverse and Beneficial Effects: Hunting activity does not take place at or within the immediate vicinity of the many cultural landscape features found on CACO. Therefore, no adverse effects to these features would be expected. Hunting does not contribute direct benefits to the cultural landscape as it does not take place in the immediate vicinity of these features and it does not alter or improve these areas.

Effects of the No Action Alternative on Public Use: Land-use and Recreation
Direct Adverse Effects: The hunting seasons occur when most summer residents and summer visitors have left and use of CACO is reduced to the annual lowest population levels. However, some negligible adverse effects are expected to fall hikers and other non-hunters seeking to get away from roads, developed sites, and other centers of human activity. Also, some visitors and residents report avoiding portions of CACO during the hunting season. Potential conflicts between hunting and other recreational and residential activities are minimized by prohibiting hunting in specific areas, and the prohibition on hunting on Sundays.

Direct Beneficial Effects: Moderate direct, long-term, local beneficial effects to recreational activities occur as hunting is a long established recreation activity on CACO and part of the culture of the region. Beneficial effects are not expected to land-use activities, as discussed above.

Indirect Beneficial Effects: The recreational benefits of hunting on CACO extend to areas outside CACO. Many hunters come from areas outside the Outer Cape to participate in the hunting opportunities provided on CACO. These benefits would be considered minor. Effects on land-use are not expected.

Indirect Adverse Effects: Hunting creates some minor indirect adverse effects among the perceptions of the non-hunting users. Individuals may avoid visiting CACO due to perceptions of unsafe conditions due to hunting.

Cumulative Beneficial Effects: Moderate beneficial effects to recreational uses are expected when considering the benefits of hunting on CACO and within other areas on Cape Cod. No effects are expected to land-use components of the region.

Effects of the No Action Alternative on Public Use: Health and Safety
Direct Adverse Effects: Negligible direct, long-term, local adverse effects occur due to the annual hunting seasons. Hunting, based on its history at CACO and general facts relating to hunting safety, does not jeopardize safety on CACO, as discussed in Section 3.5. Hunters and non-hunters are not substantially jeopardized by customary hunting activity, although there is always a small potential for risk of an accident. The discussion provided in the affected environment section of this Final EIS describes hunting safety, accidents, and shotgun ballistics. There is the potential, albeit negligible, for an increase in risk to non-hunters for the reasons discussed above.

Direct Beneficial Effects: Hunting does not create a substantially safer or less safe environment.

Indirect Effects: The continuation of hunting does not create any adverse indirect effects as the safety concerns of hunting probably do not extend beyond the CACO boundaries and do not extend further in time than each individual hunting season.

Cumulative Adverse Effects: Hunting could have a negligible cumulative adverse effect on safety if shoulder and off-season visitor use increases the potential for accidents and conflicts. Given the potential for the numbers of hunters to decrease and the positive safety history, such cumulative effects seem unlikely.

Effects of the No Action Alternative on Public Use: Visitor Experience

Hunters: Maintaining the hunting program would have moderate benefits to hunters, as it would allow them to continue their long-standing hunting traditions on CACO. Hunting activities would not be interrupted, and pheasant hunting would be reinstated. Adverse effects would not be expected as maintaining a hunting program is a favorable situation to hunters. Indirect beneficial effects would be minor, with benefits to hunters in other areas who could continue to travel and hunt at CACO and would not have to seek other areas to hunt. Hunting would continue to add to the overall diversity of recreational activities and would have a minor cumulative benefit.

Year-round residents and winter visitors (non-hunters): Minor adverse effects could occur to residents and visitors who hike during hunting season or seek to get away from roads, developed sites, and other centers of human activity. Minor indirect adverse effects may occur if individuals avoid traveling to CACO during the hunting season. Cumulative effects to use and experience at CACO by winter users would not be expected.

Summer visitors: Given that summer visitors or residents are not present on CACO during the hunting season, no effects either adverse or beneficial would be expected.

Effects of the No Action Alternative on Public Use: Socioeconomic Values (Effects on Local/Regional Economy)

Direct Beneficial Effects: Maintaining the hunting program would continue the economic benefits as discussed above. The level of these monetary benefits to the Outer Cape is relatively small and these direct beneficial effects would be minor.

Indirect and Cumulative Beneficial Effects: Indirect and cumulative benefits would be negligible to the regional economy when considered as part of the overall contribution made by CACO to the local and regional economy.

Effects of the No Action Alternative on Management and Operations: Consistency with CACO and NPS Goals, Plans, Policies, Guidelines, and Mandates

Direct Beneficial Effects: Retaining the current hunting program would not have any direct beneficial effects on management and operations. Hunting does not create any new or additional duties for CACO rangers. The hunting program does not create any additional costs other than production of hunting related brochures.

Direct Adverse Effects: Retaining the pheasant stocking and hunting program will require a policy waiver; as such, there would be a negligible adverse effect.

Indirect Adverse and Beneficial Effects: There are no indirect adverse or beneficial effects relating to management and operations.

Cumulative Adverse and Beneficial Effects: There are no cumulative adverse or beneficial effects expected when considering hunting and other operational consistency issues.

4.4.2 Alternative B – Create a Modified Hunting Program

The short-term and long-term beneficial effects of modifying the hunting program at CACO are determined to be minor, and adverse effects are determined to be negligible, although some species are affected differently than others. For this reason, a brief discussion of any beneficial and adverse effects for each species is provided, although many of the effects are the same as for Alternative A. This assessment is followed by a summary of effects on wildlife and other natural resources and the remaining impact topics.

As stated in Section 2.6, Alternative B would alter the current hunting program to provide the following modifications:

- increase hunting opportunities for native upland game bird species;
- apply adaptive management to phase out the pheasant stocking and hunting program;
- simplify and more clearly define hunting areas;
- expand hunting-related outreach to hunting and non-hunting users; and
- provide cooperative monitoring and management.

Effects of a Modified Hunting Program on Birds
There are three differences regarding bird species hunted proposed in Alternative B that deviate from Alternative A: establishing a hunting season for eastern wild turkey; ancillary enhancement of upland habitat with one expected side effect being an increase in quail numbers and potential hunting yield; and applying adaptive management to phase out the pheasant stocking and hunting program. A summary of the proposed modified program from Section 2.4 follows, and brief discussions are provided for each. The effects to all other avian game species from Alternative B would be the same as for Alternative A.

Turkey: A new hunting season for eastern wild turkeys consistent with MDFW regulations would be established. A turkey hunt would likely be held for two weeks in late April and early May. A change to CACO's special hunting regulations would be required to add the spring hunting season. Fall turkey hunting would be initiated if MDFW established such a season in their southeast region. This element would not expand the hunting season for any other species. This would be a controlled hunt requiring a permit, limiting the number of hunters, and likely managed through a lottery system. Specific areas would be designated as open to turkey hunting.

Effects on turkey: Mortality from hunting turkeys during a spring season has only negligible impacts, as a nominal harvest of male turkeys will not cause the population to decline. Spring turkey hunting is limited to juvenile and adult males and does not include nesting females. There is a minimal amount of disruption to the breeding cycle, since dominant male turkeys mate with a disproportionate number of females and the start of hunting season is timed to begin after the main mating period. In addition, turkeys are traditionally hunted from a stationary point and all harvested birds must be brought to an official check station, therefore the potential for disturbance to nesting females is low and check station experience indicates that illegal take of nesting females is very unlikely.

Quail: Instituting a cultural landscape restoration focusing on heathland and grassland will result in the likelihood for a higher population of quail, and a resulting increase in numbers hunted and taken. For all heathland and grassland communities and species, there is an expected potential major beneficial effect for quail and other species native to CACO that have been marginalized over time as heathland and coastal grassland have dwindled in the landscape.

Effects on quail: The expected effect of any increase in hunting pressure would be related to an increase in the population, and the effects of the modified hunting program would be negligible to minor.

Pheasant: An adaptive management approach would be used to phase out pheasant stocking as opportunities to hunt native upland game birds increase. The number of pheasants stocked during the first year the program is resumed will be determined in coordination with MDFW, but will not exceed 800. In each subsequent year, the number of pheasants stocked would be reduced as the number of restored heathland and grassland acres increases. This element would result in the end of pheasant stocking and hunting at CACO within 14 to 17 years. In no case will pheasant stocking continue beyond 17 years. Additionally, CACO will require that MDFW ensure that medications will be withdrawn from pheasants according to the drug's prescribed withdrawal period and MDFW contract specifications and MDFW will provide CACO with written documentation certifying the health of the birds released. This procedure will reduce any impacts associated with release of birds with antibiotics in their system and avoid the potential for introducing disease into the natural environment.

Effects on pheasant: Altering the pheasant program would not affect this species at CACO, as pheasants do not have an established population. Given that the predation and scavenging of pheasants by predators has no effect to negligible effects, phasing out the program should not adversely affect predators. Application of an adaptive strategy for phasing out the pheasant hunting program will result in fewer birds released to the CACO reflective of the general hunter numbers over time as discussed in Section 2.4.1.

Effects of Creating a Modified Hunting Program on Mammals

There are no changes proposed to the hunting program relating to mammals. Therefore, direct effects on particular species are the same for Alternative B as those previously discussed for Alternative A. Indirect effects could occur to mammalian predators as the numbers of pheasants stocked is reduced. Given that pheasants are a negligible food source for foxes and coyotes, systematically reducing the stocking numbers would likely have no effect or a negligible effect.

Effects of Creating a Modified Hunting Program on Natural Resources: Wildlife (Game, Non-Game, Rare Species)

Direct Beneficial Effects: The beneficial effects on wildlife resources from Alternative B would be the same as for Alternative A, with one notable exception: the cultural landscape restoration initiatives will likely result in some net enhancement of quail habitat and thus likely an increase in hunting yield over time. This would improve wildlife diversity, since heathlands on Cape Cod have been largely lost to plant community succession; therefore, habitat would be created for birds and mammals that use herbaceous and shrub habitat. Beneficial effects would be expected as follows:

- Activities associated with Alternative B would increase the population of native quail;
- Habitat diversity would contribute to increased wildlife diversity;
- An exotic species would eventually not be stocked at CACO;
- The loss of individuals is often considered compensatory mortality;
- Beneficial effects would be ongoing without timeframe limitations; and
- Generally only affects local populations, but can extend to adjacent areas.

Direct Adverse Effects: The adverse effects from Alternative B, as with Alternative A, would be largely limited to the loss of individuals from hunting mortality as follows:

- Loss of some individuals from a population would be considered a temporary population effect;
- Considered to be an ongoing effect to hunted species; and

- Generally only affects the immediate local populations of hunted species, but can extend to adjacent areas.

Most Federally listed threatened and endangered wildlife that occur in CACO do not use the areas of the park where hunting occurs. The proposed spring turkey hunting season would overlap with the piping plover nesting season, but turkey hunting would not occur in or near piping plover habitat. As a result, federal threatened and endangered wildlife would not be affected by the Alternative B. Some state listed wildlife species occur in the same areas and at the same time as hunting. Minor adverse impacts are possible to these state listed species if they are mistakenly shot or are disturbed by hunters.

Indirect Beneficial Effects: The beneficial effects from Alternative B would be the same as for Alternative A. The following benefits would be expected:

- Beneficial effects would be ongoing without timeframe limitations; and
- Generally only affects the local area, but can benefit habitat and landscape vegetation adjacent to CACO.

Indirect Adverse Effects: Applying an adaptive management approach to the pheasant-stocking program would reduce and ultimately eliminate the availability of this species to predators. This adverse effect is considered to be negligible based on the assessment that pheasant stocking has very little effect on predator species (Bump and Field 1999). This potential adverse effect would be less than what would be expected from continuing the full pheasant program. The following effects would be expected:

- Pheasants not taken by hunters provide a negligible food source for mammalian predators and have the unlikely potential to enhance the population of these predators.

Cumulative Beneficial Effects: The benefits from Alternative B would be the same as for Alternative A:

- Hunting on other public and private lands in conjunction with deer hunting on CACO provides the indirect benefits described above that extend beyond CACO boundaries;
- Benefits extend to areas on and around lands that are hunted; and
- This is an ongoing benefit in the region.

Effects of Creating a Modified Hunting Program on Natural Resources: Vegetation (Plants, Rare Plants, Natural Communities)

Direct Beneficial Effects: Implementing the elements of Alternative B, especially the landscape restoration activities, would improve conditions for the state listed broom crowberry (*Corema conradii*). Expanding heath and grassland habitat would create diversity of vegetative communities and may also help control some invasive plant species. These beneficial effects would be expected to be moderate in intensity, of long-term duration, and generally of a local nature. Adverse direct, indirect, and cumulative effects would not be expected.

Direct adverse effects, indirect effects, and cumulative effects would be the same as for Alterntive A.

Effects of Creating a Modified Hunting Program on Cultural Resources: Cultural Heritage

Direct Beneficial Effects: All the benefits described for Alternative A would also be realized here, plus those described below. Minor to moderate beneficial long-term, local effects would result from potentially improved quail populations and hunting opportunities and the initiation of a spring wild turkey hunting season. There would be minor to moderate long-term benefit from the cultural landscape restoration initiatives resulting in enhanced cultural landscapes as well as the potentially improved opportunity to hunt a native species (i.e., quail). The following effects would be expected:

- Hunting has been part of the cultural heritage of the Outer Cape for generations and would continue under this alternative;
- As the number of hunters declines, the benefits to the local heritage may become less apparent;
- Benefits are primarily related to local hunters and those from nearby communities;
- Initiating an adaptive management approach to the pheasant stocking and hunting program would retain the cultural aspects of this hunting activity for as long as the program remains in effect; and
- Adding a spring wild turkey hunting season would restore a portion of the hunting heritage of the Outer Cape;
- Improving native upland game species (i.e., quail) numbers through cultural landscape restoration provides the potential to improve the cultural heritage aspects for hunting a native species; and
- These are ongoing benefits.

Direct Adverse Effects: Some individuals use CACO for berry picking and mushroom gathering. These individuals may avoid using CACO on hunting days during the hunting seasons, which would be considered a negligible adverse effect. These effects are the same as Alternative A.

Indirect and Cumulative Effects: Indirect and cumulative effects would be the same as for Alternative A, with cultural heritage benefits extending to the local vicinity and region. Indirect beneficial effects that would be expected include:

- Hunting is one aspect of many that make up the cultural heritage;
- This benefit is both local and regional; and
- These are ongoing benefits.

Beneficial cumulative effects would be similar to those for Alternative A, including the following:

- Cultural heritage benefits from continuing hunting are additive with hunting in other communities and in the region; and
- This is an ongoing benefit.

Effects of Creating a Modified Hunting Program on Cultural Resources: Cultural Landscapes

Direct Beneficial Effects: Moderate to major beneficial effects would result with the restoration of the cultural landscape and historic heath habitat in many areas of CACO. This community has declined significantly as a result of vegetative community succession and elimination of grazing and other cultural practices that maintained heathlands. Much of CACO was likely heath habitat, especially during the mid 19th century, and increasing this habitat helps to provide a view of what the Outer Cape was like during those times. The landscape view would likely change from forested and shrub habitat to an open view that would extend the view towards the ocean and bays.

- Landscape restoration would likely improve quail habitat and subsequently their population;
- Portions of CACO would be restored to native heath habitat consistent with the mid 19th century and more consistent with the historical buildings and other historical features of CACO;
- The cultural viewscape would be improved; and
- These would be ongoing benefits at CACO and in the immediate areas.

Indirect and Cumulative Effects: The benefits of the landscape restoration efforts would probably not extend beyond CACO to the local area and the Outer Cape region.

Effects of Creating a Modified Hunting Program on Public Use: Land Use and Recreation

Direct, Indirect, and Cumulative Beneficial Effects: Direct, indirect, and cumulative effects would be the same as for Alternative A, except that Alternative B would apply an adaptive management approach to the pheasant program, resulting in the phase out of the pheasant hunt. At the same time, opportunities for native species hunts for turkeys and potentially an increase in quail will be instituted. This effort will create short-term adverse effects for local hunters who participated in the pheasant hunt once it is phased out. In the long-term, the cultural landscape restoration would have some long-term minor to perhaps moderate benefits as the native quail population increases and hunting potentially alters as a result. Benefits of the landscape restoration would extend to hunters as well as visitors and residents in the local and regional areas and as such would provide some indirect and cumulative effects.

The proposed modifications to the areas open to hunting and those closed may encourage more visitations during the hunting season, resulting in beneficial effects.

The following beneficial effects would be expected:

- Increased opportunities for hunting native game birds;
- Opportunity to experience wildlife associated with an important and otherwise diminishing landscape; and,
- Improving the designation of hunting areas and increasing the setback from bike trails may encourage more visitors during the hunting seasons.

Direct, Indirect, and Cumulative Adverse Effects: As noted above, phasing out the pheasant hunt would be an adverse impact to pheasant hunters as this form of recreation will be eliminated. This should be mitigated somewhat by the enhancement of native upland game bird hunting opportunities, but the loss will not be completely offset since the pheasant hunting experience is distinct from turkey and quail hunting experiences. Some CACO visitors, such as hikers or other seeking solitude, modify or reduce their outdoor activities at CACO during the hunting seasons, hence reducing some recreational opportunities. These effects are largely negligible and may be offset by improving the hunting designations and increased setback along bike trails. Information about these new designations should help clarify how to avoid areas that may be hunted, as well as heighten awareness of the opportunity to access all of CACO's publicly-available resources on Sundays. This should aid users in planning their outdoor activities to maximize their use of the Park.

Effects of Creating a Modified Hunting Program on Public Use: Health and Safety

Direct, Indirect, and Cumulative Effects: Direct, indirect, and cumulative effects would be similar for Alternative B as for Alternative A, with two exceptions: one exception is that the initiation of a turkey hunting program could adversely affect hunter safety. The effect would likely be negligible; turkey hunting can be as safe as any other hunting activity with the proper safety precautions and standards, as indicated by experience elsewhere. In the long-term, potential safety hazards would largely apply only to hunters and it is unlikely that non-hunters would be affected.

The second exception, which is beneficial at a minor intensity, is that any potential for "close calls" would be further reduced or eliminated with the creation of detailed maps of areas open and areas closed to hunting and by increasing the setback from bike trails. Eliminating small areas from the acreage open to hunting, especially those areas near dwellings and other public use areas, and preparing maps of these revised areas would contribute to reducing the risk of an accident. As summarized in Table 8 and depicted in Figure 4, 1,564 acres would be removed from the hunting program. While this area is not significant relative to those areas open to hunting, it is their location, often near dwellings and areas of non-hunting activities that provides safety benefits. Incorporating the modifications to the hunting areas, preparing the corresponding maps, and increasing the setback from the bike trails should reduce any risk of an accident, although that risk is already relatively low based on the information provided in Section

3.3. Additionally, the perception of the risk of a hunting-related accident for non-hunters could be reduced. This effect is a minor benefit with long-term implications that are restricted to CACO.

The following effects would be expected:

- Turkey hunting could create additional safety concerns that should be managed and minimized as a controlled hunt;
- Creating new maps of areas open and closed to hunting and simplifying the configuration of these areas would reduce confusion and potential hunting regulation violations;
- A total of 1,564 acres would be removed from the hunting program, with most of these areas near dwellings and areas of non-hunting activities;
- Extending the setback from 150 feet to 500 feet from bike trails could further reduce the already low risk of accidents;
- There would be a slight, negligible, reduction in the risk of an accident to non-hunters with the creation of the new maps, hence a negligible benefit may result: and
- The perception that visiting CACO during the hunting season is unsafe may be reduced, resulting in a potential increase in non-hunter visits.

Indirect and cumulative effects would be the same as for Alternative A.

Effects of Creating a Modified Hunting Program on Public Use: Visitor Experience

Hunters: Several of these modifications would have little or no adverse effect on hunting activity, including area designation, monitoring, and improved information. Maintaining the hunting program with these improvements would provide similar moderate benefits to hunters as would the No-Action alternative. The net reduction in acres through redefining the areas open to hunting will be 1,564 more acres closed to hunting under Alternative B than under Alternative A (Figure 4). Redefining the areas open and closed to hunting should result in more predictable areas where hunting is likely to be encountered and more predictable areas where it will not; as will consistent buffers for hunting set-backs from roads, residences, and bike paths. These changes will result in little reduction in hunting opportunities. These modifications may even improve the hunting experience by reducing the potential for hunting violations as well as the likelihood for possible conflicts with other CACO visitors.

Establishing a turkey hunting season is the only proposed modification to the hunting seasons, which would further diversify the recreational uses of CACO. The introduction of turkey hunting would create additional hunting days. Several factors suggest that a CACO turkey hunt would be popular. First, turkey hunting grounds are scarce in the region. Otis Air Force Base represents the nearest public turkey hunting location.[21] Likewise, turkey harvest data collected at check-in stations indicates that few turkeys are bagged in Barnstable County relative to the rest of the state. In the spring of 2005, only 6 turkeys were harvested in Barnstable County, a tiny fraction of the nearly 2,300 turkeys harvested statewide (MDFW 2005b). Barnstable County hunters appear to have a strong interest in turkey hunting, and many have stated that they would participate if given the opportunity. Of the hunters intercepted in the field, 91 percent said they would hunt turkey if a program were established at CACO (Kuentzel 2006). Likewise, 74 percent of the respondents from the survey of Barnstable County license holders indicated they would participate in turkey hunting at CACO.

The restoration of cultural landscapes with the secondary benefit of increasing upland game habitat will likely benefit the hunters and other visitors interested in viewing wildlife. The enhancement of the cultural landscape also benefits the visitor by providing viewscapes more in line with those expected while visiting Cape Cod.

[21] R. Kennedy, personal communication, September 13, 2004.

The indirect and cumulative effects would likely be the same as for the No Action alternative, with some benefits to hunters in the region, some improvement in visual landscape for the visiting public, and the potential to expand recreational opportunities.

Year-round residents and winter visitors (non-hunters): The expansion of hunting activity could increase the potential for conflict between hunters and non-hunters (both CACO users and local residents). Conversely, phasing out the pheasant hunt may reduce some conflicts. In particular, the addition of a spring turkey hunt could introduce a new set of interactions between non-hunters and hunters. CACO visitation data show that, while visitation clearly peaks in summer months, April and May have a distinct increase relative to the winter months; hence, there is some potential for interaction. Turkey hunters generally go unnoticed, as their activity requires a very stealthy approach, minimal firearms action and they usually only hunt in the morning hours, which may offset the potential for adverse interactions that could result as visitation increases during the spring.

Adverse effects would be similar to those in the No Action alternative due to potential conflicts with hunters and "close calls." The improved maps and designation of hunting areas may also help some visitors become more comfortable with safety issues and encourage their use of CACO more during the fall and winter. Improved outreach will also help make more visitors aware that hunting does not occur on Sundays. The improvement of information regarding open versus closed areas could alleviate some concerns regarding safety and potential conflicts, especially those that involve individuals hunting too close to dwellings. Indirect and cumulative effects would likely be the same as with the No-Action alternative. There is potential that the benefits resulting from these modifications could be far reaching and might indirectly encourage more visitors to CACO during the winter. If so, these indirect benefits would likely be negligible.

Summer visitors: Given that summer visitors or residents are not present on CACO during the hunting season, no effects either adverse or beneficial would be expected. Exceptions to this are discussed above regarding spring turkey hunting.

Effects of Creating a Modified Hunting Program on Public Use: Socioeconomic Values (Effects on Local/Regional Economy)

Direct, Indirect, and Cumulative Beneficial Effects: The economic benefits to local communities would be greater than the No Action alternative. The addition of a turkey hunting season and the enhancement of upland game hunting opportunities would likely increase CACO hunting activity. The analysis of hunting activity estimates a net addition of between 90 and 300 hunting days per year. Multiplying this range by the average expenditures per hunting day ($9) yields increased expenditures of about $800 to $2,700 at Outer Cape establishments. Because turkey hunting grounds are not widely available on the Cape, the addition of a CACO turkey hunt would likely increase overall hunting activity. Assuming that the hunting activity is newly created, the change in consumer surplus would equal the number of turkey hunting days multiplied by the average consumer surplus per hunting day. The resulting estimate is between $3,000 and $15,000 per year.[22] However, any negligible increase in consumer surplus would be expected to be offset by the loss of economic resources generated by the eventual phase-out of the pheasant hunt, and so the overall effect is a no net effect

[22] A literature search yielded no studies that explicitly estimated consumer surplus per day of turkey hunting; therefore, general hunting consumer surplus figures are used. Studies of small game and waterfowl typically yield consumer surplus estimates that are lower than those for deer hunting. Hence, the analysis may overstate the increase in economic welfare associated with the CACO turkey hunt.

The indirect and cumulative effects would also be similar with negligible benefits in the region and when combined with the overall economic benefits of CACO. These are relatively small when considered in the larger context of the region.

Effects of Creating a Modified Hunting Program on Management and Operations: Consistency with CACO and NPS Goals, Plans, Policies, Guidelines, and Mandates

Direct Adverse Effects: Creating a modified hunting program would have four negligible, long-term, local adverse effects. If the current pheasant hunting policy waiver is not sufficient to meet CACO policies, a revised policy waiver would be required to retain some form of the pheasant program for the period that it remains in place. Once the phase out is complete, the waiver would not be required. Initiating a spring turkey hunt would require an administrative type of modification to the CACO hunting regulations to extend hunting into the spring. Rangers would incur minor additional duties to manage and control the turkey hunting season. Furthermore, CACO staff would need to coordinate and manage the prescribed burn program for restoring the heath habitat. There would not be any direct beneficial effects. The following effects would be expected:

- Rangers would need to enforce and manage the turkey hunting season;
- A policy waiver to update the decision to phase out the pheasant hunt in the manner described may be needed;
- A modification to the CACO hunting regulations would be needed to extend the hunting season into the spring; and
- Natural and Cultural Resources and fire management staff would need to implement the cultural landscape practices if prescribed fire is to be used.

Direct Beneficial Effects: There would be two direct beneficial effects resulting from the termination of the pheasant hunt. As discussed above, once the phase-out is completed a policy waiver would not be needed. Furthermore, eliminating the use of an exotic species for hunting at CACO would provide consistency with the NPS Natural Resource Guidelines.

Indirect and cumulative effects would be the same for Alternative B as for Alternative A.

4.4.3 Alternative C – Eliminate Hunting

The short-term and long-term adverse effects of terminating hunting at CACO are determined to be minor, although there are potential adverse effects for some species. For this reason, a brief discussion of any beneficial and adverse effects for each species is provided. This assessment is followed by a summary of effects on wildlife and other natural resources and the remaining impact topics.

Although the role of hunting at CACO is recreational rather than to actively manage any particular species, where information and the best professional judgment of Park managers and other experts can offer information about likely changes to species and natural resources, this information is provided. Hunting certainly is a factor in population alteration for some species, particularly deer, and experience at other National Parks and in other managed environments is taken into account to inform the assessment of Alternative C as for both previous alternatives.

Effects of Eliminating Hunting on Birds

Ring-necked pheasants do not have an established breeding population on Cape Cod. Eliminating the stocking and hunting program would not have any beneficial or adverse effects on pheasants and predators.

Hunting pressure is very limited for the agricultural pest species. Eliminating hunting would likely not have any beneficial or adverse effects on local or regional populations of these species since the hunting mortality is very low.

There are very limited populations of quail on Outer Cape Cod. Some quail are harvested incidentally relative to other hunting activities; eliminating the hunting opportunities would likely not benefit or adversely effect the quail population. Ruffed grouse do not have a firmly established population on Outer Cape Cod and eliminating hunting will have no effect on this species.

Eliminating hunting for waterfowl would likely not have any measurable effects on these species. Hunting for these species is regulated at the national level and conditions affecting populations occur regionally and internationally. Changes in hunting at CACO would not alter the populations of these species.

Effects of Eliminating Hunting on Mammals

Terminating deer hunting would result in minor adverse effects to the deer population at CACO. While on first impression, elimination of take on an individual might seem to be positive, if over the long-term, food supply becomes a limiting factor, population reduction could occur through starvation and over-winter mortality. Based on scientific literature concerning the effects of hunting and non-hunting on deer, the density of the CACO deer population could increase and potentially result in long-term adverse effects on vegetation. Reducing vegetative cover would adversely affect deer by reducing forage, especially during the winter and could adversely affect other wildlife that would otherwise use the affected vegetation. Monitoring would be necessary to determine if these types of population changes result.

If cottontail rabbit hunting were terminated there are unlikely to be any beneficial effects on the rabbit population. Hunting mortality is likely compensatory in most years, although it may be an additive form of mortality during extreme winters. In most years, the proportion of the population not taken by hunting would likely succumb to other mortality factors and/or reproduction levels would be reduced in response to an elevated population. As has been stated previously, the effects of hunting on New England cottontails are under review, and modifications to the rabbit hunt may be considered following consultation with USFWS and MDFW.

If hunting were eliminated, squirrel populations would probably increase slightly within one to two years, depending on food availability in the actual year of the closure. Based on the harvest estimate (405 squirrels) provided in Section 3.3.3, a portion of the population would die during the winter without any hunting related mortality. Nonetheless, this harvest level represents 0.03 squirrels per acre of forested habitat. This suggests that the duration of the effects is short-term.

Raccoon populations are known to respond favorably in urban environments where there is no control and human related food sources are available. In that situation, there could be adverse effects of terminating the raccoon hunt.

The short-term and long-term effects of eliminating the fox and coyote hunt at CACO would be negligible to minor. The current annual fox harvest is low (based on MDFW pelt data); therefore, eliminating hunting would have only a minor effect on the current fox population. Although actual coyote harvest levels are not known, an approximate estimate (10 – 20 coyotes per year) suggests that less than 40 percent of the CACO population is harvested each year within CACO. This is well below the 70 percent level that Connolly and Longhurst (1975) suggest would lead to a large effect on overall coyote numbers. Coyote populations tend to be highly dynamic and resilient to hunting for severely decreasing their numbers (Knowlton *et al.* 1999).

Given the lack of interest by hunters in harvesting opossums, it is unlikely that terminating hunting would have any beneficial or adverse effects.

Effects of Eliminating Hunting on Natural Resources*: *Wildlife (Game, Non-game, Rare Species)
Direct Adverse Effects: There are no direct adverse effects that would be expected to result from the termination of hunting. There would be no effects to federally listed threatened and endangered species if hunting were eliminated.

Direct Beneficial Effects: Beneficial effects would include the short-term loss of mortality to the game species, which would be relatively negligible. Increased population numbers of game species could result, but this is not necessarily a benefit, as discussed above. The duration would reflect short-term seasonal and annual cycles. Beneficial effects are restricted to CACO and the immediate area, as the upland hunted species do not migrate to areas outside of the Outer Cape. The following effects would be expected:

- Increased wildlife populations could result;
- Beneficial effects for some species such as waterfowl would not be expected, as CACO is a very small portion of the relevant environment for these species;
- Effects would occur on a local basis; and
- Effects would be long-term as long as the hunting program is terminated.

Indirect Adverse Effects: Eliminating hunting could result in increased numbers of deer, which could lead to indirect effects such as increased browsing. If browsing increased to such an extent that habitat became degraded, this could adversely affect deer and other wildlife that depend on native plant communities. These effects could occur on a seasonal or annual basis and would also occur as long as the hunting program was discontinued. The following effects would be expected:

- If cessation of hunting lead to a damaging level of deer browsing, habitat could become degraded;
- These adverse effects would be largely restricted to the CACO area and immediate local areas; and
- Effects would be long-term.

Cumulative Adverse Effects: Negligible adverse effects could result from an increasing Outer Cape deer population. These effects would not apply to more localized species such as cottontails and far ranging species such as waterfowl. The same adverse effects described for the indirect effects could result, but when considered with the loss of private lands for hunting purposes, adverse effects could be more widespread. The following effects would be expected:

- With the loss of other hunting lands, the adverse effects of habitat degradation would extend to other parts of Cape Cod; and
- Effects would be long-term.

If only the pheasant hunt was eliminated, then the above beneficial and adverse effects would not be expected. In fact, eliminating the pheasant hunt would not affect wildlife resources.

Effects of Eliminating Hunting on Natural Resources*: *Vegetation (Plants, Rare Plants, Natural Communities)
Direct Effects: Terminating the hunting program would remove any contribution hunters make to the formation and maintenance of social trails. This effect is expected to be negligible.

Indirect Adverse Effects: Minor adverse effects are expected locally and over the long-term. It is possible that the deer population may increase, which could result in more browsing of vegetation. These adverse effects on vegetation could adversely affect deer in the long-term by reducing valuable forage. The following effects would be expected:

- These adverse effects would be similar to those described above for wildlife habitat damage relating to indirect effects; and
- Effects would be local, possibly regional, and long-term.

Cumulative Adverse Effects: When evaluating the adverse effects of vegetation loss on CACO with the continued development of the Outer Cape, adverse cumulative effects would likely occur. These would be minor in scope, but would extend over a long period of time. The following effects would be expected:

- These adverse effects would be similar to those described above for wildlife habitat damage relating to cumulative effects; and
- Effects would be regional and long-term.

If only the pheasant hunt was eliminated, then the above beneficial and adverse effects would not be expected. In fact, eliminating the pheasant hunt would not affect vegetation resources.

Effects of Eliminating Hunting on Cultural Resources*: *Cultural Heritage

Direct Beneficial Effects: There would be direct, minor beneficial effects to berry pickers and mushroom gatherers as they would not need to modify their use of CACO if they wish to avoid hunters.

Direct Adverse Effects: The loss of hunting opportunities on CACO would result in moderate, long-term, local and possibly regional adverse effects. CACO is the only public area open to hunting in the Outer Cape and has been a popular hunting area prior to the creation of CACO. Hunting in general, and especially on CACO, has been part of the cultural heritage for many generations. The loss of part of the cultural heritage would affect many local hunters and some from outside the region who travel to enjoy the hunting opportunities afforded by CACO. The following effects would be expected:

- Terminating the hunting program would end the cultural aspects of hunting on the Outer Cape, except for private lands open to hunting;
- Terminating hunting would have a major adverse effect on the hunters' cultural heritage;
- Terminating the hunting program would be contrary to the some of the purposes for creating CACO, which include maintaining the way of life and cultural aspects of the Outer Cape;
- Hunting pressure would be expected to increase on other public and private lands outside CACO;
- Effects would be local and regional; and
- Effects would be long-term.

Indirect Adverse Effects: Minor adverse effects could occur outside of CACO as the adverse effects of the loss of hunting could extend beyond the immediate area. Hunters that otherwise would hunt at CACO would have to use other public or private lands, thereby affecting the cultural heritage of the region. The following effects would be expected:

- Eliminating hunting would cause the loss of one aspect of the local and regional cultural heritage and would indirectly affect other cultural aspects of the Outer Cape.

Cumulative Adverse Effects: The loss of hunting on CACO together with ongoing development pressure in the region could change the cultural heritage of the region to reflect values and practices more typical

of a suburban culture versus the historical, more rural values that CACO was established to protect. These changes would result in minor cumulative adverse effects to the cultural heritage of the region. The following effects would be expected:

- Encroaching development pressure and the loss of private lands for hunting extends the adverse effects to the loss of this aspect of the cultural heritage;
- Adverse effects would be regional;
- Effects would be long-term.

If only the pheasant hunt was eliminated, then the above beneficial or adverse effects would not be expected, except those effects relating to pheasant hunting. Eliminating the pheasant hunt would adversely affect the cultural heritage issues relating to the loss of an established and locally popular hunting program.

Effects of Eliminating Hunting on Cultural Resources: Cultural Landscapes
Direct Effects: The loss of the hunting program at CACO would not create any adverse or beneficial direct effects on cultural landscape features. These areas are generally closed to hunting.

Indirect Adverse Effects: The loss of hunting opportunities could result in increased deer population and potential increased browse of native and landscaped vegetation. Negligible indirect adverse effects could result.

- Effects would be local and long-term.

Cumulative Effects: No adverse or beneficial cumulative effects would be expected.

If only the pheasant hunt was eliminated, no effects on cultural landscapes would be expected.

Effects of Eliminating Hunting on Public Use: Land Use and Recreation
Direct Beneficial Effects: There would be direct, minor beneficial effects to hikers and others seeking solitude as they would not need to modify their use of CACO if they wish to avoid hunters.

Direct Adverse Effects: Moderate, long-term, local adverse effects would result to hunters from the Outer Cape region and from nearby areas. Most hunters that participate in hunting at CACO live locally or travel from nearby communities in southeastern Massachusetts. This aspect of the recreational values provided by CACO would be eliminated and local hunters would be deprived of this recreational opportunity. The following effects would be expected:

- Eliminating hunting would eliminate a form of recreation available at CACO;
- Effects would largely be local, but hunters do travel from other communities and the effects could extend to other areas; and
- Effects would be long-term.

The perceptions of some visitors or residents may improve, but tangible benefits are not expected.

Indirect Adverse Effects: The loss of public hunting areas could push local hunters to public hunting areas in other parts of the state. This shift in hunter use of other areas could adversely affect the quality of hunting opportunities in other areas and as such negligible adverse effects would result.

Cumulative Adverse Effects: Cumulatively the loss of public hunting lands and private areas open to hunting would create moderate adverse effects to local hunters and those that in the nearby communities. As areas open to hunting diminish, the opportunities for hunters to participate in this activity are removed

from Cape Cod, forcing hunters to travel further from their homes and increasing the crowding at other public hunting areas. The following effects would be expected:

- The general trend of the loss of private lands for hunting and the potential to lose other public lands extends and intensifies these adverse effects; and
- Cumulative effects would be long-term.

If only the pheasant hunt was eliminated, then adverse effects relating to the recreational aspect of pheasant hunting would be eliminated. The full measure of the above beneficial and adverse effects would not be expected.

Effects of Eliminating Hunting on Public Use: Health and Safety
Direct Adverse Effects: Adverse effects are not expected.

Direct Beneficial Effects: Negligible beneficial effects are expected to result from the elimination of hunting at CACO in regard to the possibility of a hunting-related accident involving either a hunter or non-hunter. The record suggests that hunting has a very safe track record at CACO. Nonetheless, there is a small potential for such an injury to occur and eliminating hunting would eliminate this potential. The following effects would be expected:

- Despite the low probability of a hunting related accident, there is some potential for improved safety conditions; and
- Benefits would be long-term and restricted to CACO.

Indirect Adverse Effects: No indirect adverse effects would be expected.

Cumulative Adverse Effects: The cumulative effects would include moving the interest in hunting away from CACO lands, thereby increasing the hunting pressure and density of hunting activity in a smaller area of remaining lands open to hunting.

- Hunters would seek other public lands, thereby negligibly increasing the potential for accidents at these locations; and
- Effects would be long-term.

Eliminating only the pheasant hunt could enhance safety at a negligible level. Other beneficial and adverse effects discussed above would not be expected.

Effects of Eliminating Hunting on Public Use: Visitor Experience
Hunters: Terminating the hunting program would have adverse effects on hunters by ending their recreational activity at CACO. Adverse effects would be moderate and long-term. Some hunters indicated that they could find substitute sites of similar quality, but new sites would be less convenient. Alternative C would reduce the diversity of recreational activities at CACO. Terminating hunting could have minor adverse effects on hunters in nearby regions as hunters using CACO would likely seek other public areas for hunting. Cumulatively adverse effects could occur as residential development growth and pressure on other hunting lands could cause hunters to seek other areas outside the region. There would be no beneficial effects for the hunting public. Eliminating only the pheasant hunt would create adverse effects for those hunters that participate in that hunt. The full measure of the adverse effects to hunters would not be expected.

Year-round residents and winter visitors (non-hunters): Adverse effects would not be expected to residents and winter visitors. Minor beneficial effects would be expected as some individuals would

begin using CACO during the hunting seasons. Any potential for "close calls" and conflicts between hunters and non-hunters would be eliminated. Some individuals may visit CACO that would not have with the hunting program in place. Indirect minor beneficial effects would occur if individuals from other areas begin traveling to CACO that would not have otherwise. Cumulative effects would not be expected.

Summer visitors: No beneficial or adverse effects would be expected, as summer visitors are not present during the hunting season.

Effects of Eliminating Hunting on Public Use: ***Socioeconomic Values (Effects on Local/Regional Economy)***

Direct Adverse Effects: This analysis assumes that a CACO hunting ban would eliminate trip-related hunting expenditures in the Outer Cape region. This would be the case regardless of whether hunters choose substitute sites or cease hunting entirely.[23] As noted, CACO hunters spend approximately $89,000 to $256,000 per year at Outer Cape establishments; these expenditures and the benefits they bring to the local economy would be eliminated under Alternative C. Overall, the relocated hunting effort would likely deliver slightly less economic benefit relative to the same amount of hunting activity at CACO. However, survey responses suggest the difference is minimal, and it is difficult to specify the consumer surplus loss associated with the slight change in quality and convenience. The loss of revenue would result in minor effects to the local economy. While not large relative to the overall regional economy, these expenditures may be significant if concentrated in a small number of local businesses.

Indirect and Cumulative Effects: Indirect and cumulative negligible adverse effects would occur in the region due to the loss of locally generated expenditures, but may be offset if off-season visitation increases. Survey responses suggest that if hunting were banned at CACO, a subset of hunters would cease hunting altogether. Society would lose the economic benefit (consumer surplus) associated with the lost hunting days. A separate subset of hunters would redirect effort to substitute sites. Presumably, these substitute sites offer a different hunting experience than CACO. Therefore, the effect of Alternative C on the overall economic welfare depends on a variety of factors that affect the utility that hunters derive from substitute sites relative to CACO and, as stated previously, would be negligible.

If only the pheasant hunt was eliminated, then the above beneficial and adverse effects would not be expected. Eliminating the pheasant hunt would have an adverse effect on socioeconomic values.

Table 31 summarizes the economic effects of the alternatives, including the estimated change in commercial expenditures as well as the estimated change in consumer surplus.

Table 31. Summary of Economic Effects Under Management Alternatives

Type of Economic Effect Assessed		Alternative A	Alternative B	Alternative C
		No-Action Alternative	Modified Hunting Program	Elimination of Hunting
Estimated Hunting-Related Expenditures in Barnstable County	Low	$88,843	$825 increase	$88,843 decrease
	High	$256,102	$2,749 increase	$256,102 decrease
Estimated Consumer Surplus	Low	$339,301	$3,150 increase	$230,725 decrease
	High	$1,397,264	$15,000 increase	$950,139 decrease

[23] Depending on the location of substitute hunting sites, some hunters may still make trip-related purchases at Outer Cape businesses. Hence, the estimated loss of expenditures may be biased upward.

Effects of Eliminating Hunting on Management and Operations*: *Consistency with CACO and NPS Goals, Plans, Policies, Guidelines, and Mandates

Direct Adverse Effects: Terminating hunting would be contrary to CACO goals and the purpose for establishing CACO. Hunting was clearly designated as an acceptable activity and during public hearings positive input was expressed by the public regarding maintaining hunting as a part of the fabric of life on the Outer Cape. Given these facts, terminating hunting would have moderate adverse effects of a long-term nature at CACO on management and operations. The following effects would be expected:

- Hunting is consistent with CACO goals;
- Hunting was positively considered during the process of establishing CACO;
- Adverse effects would be restricted to CACO;
- Adverse effects would be long-term.

Direct Beneficial Effects: Terminating hunting would have negligible, long-term, and local beneficial effects to management and operations at CACO. A policy waiver for pheasant stocking and hunting would not be required. Furthermore, eliminating the use of an exotic species for hunting at CACO would provide consistency with NPS 2006 Management Policies (NPS 2006a). The responsibilities of the CACO rangers relating to hunting would not be required. Benefits in this regard would be negligible. The following effects would be expected:

- A policy waiver would not be required for the pheasant program;
- Ranger duties during the hunting season would be reduced;
- Benefits would only apply to CACO ;
- Benefits would be long-term.

Indirect Effects: No adverse or beneficial indirect effects to management and operations are expected.

Cumulative Effects: No adverse or beneficial cumulative effects to management and operations are expected.

If the pheasant hunt alone was eliminated, the above beneficial effects would be expected relating to the lack of a need for a policy waiver.

4.5 Impact Summary

A summary of effects to all issues and alternatives is provided in Table 32.

4.5.1 Alternative A – No Action

Maintaining the current hunting program provides numerous beneficial effects relating to maintaining habitat quality for game and non-game species, maintaining cultural heritage factors that are part of the fabric of life on the Outer Cape, providing recreational opportunities for local residents and individuals from the region, and maintaining consistency with CACO goals and reasons that CACO was established. This alternative does not address improving safety and awareness of hunting and non-hunting areas and improving recreational opportunities. Adverse effects are relatively minor with regard as to the loss of individuals from the game species populations and negligible relating to safety. Overall the game species populations would be expected to remain stable. The perception by many non-hunters that hunting creates safety risks for them is not addressed specifically. The beneficial effects outweigh the adverse effects.

Table 32. Effect Summary Matrix for the CACO Hunting Program Alternatives

Effect Category	Alternative A – No Action Effect intensity rating	Alternative B – Modified Hunting Program Effect intensity rating	Alternative C – Eliminate Hunting Effect intensity rating
Natural Resources			
Wildlife	Adverse: Minor Beneficial: Minor Indirect: Minor beneficial Cumulative: Negligible beneficial **Net negligible beneficial effects**	Adverse: Minor Beneficial: Minor Indirect: Minor beneficial Cumulative: Negligible beneficial **Net negligible beneficial effects**	Adverse: None Beneficial: Negligible Indirect: Negligible adverse Cumulative: Negligible adverse **Net negligible adverse effects**
Vegetation Natural Communities	Adverse: Negligible Beneficial: None Indirect: None Cumulative: None **Net negligible adverse effects**	Adverse: Negligible Beneficial: Moderate Indirect:None Cumulative: None **Net minor beneficial effects**	Adverse: None Beneficial: Negligible Indirect: Minor adverse Cumulative: Minor adverse **Net minor adverse effects**
Cultural Resources			
Cultural Heritage	Adverse: Negligible Beneficial: Moderate Indirect: Negligible beneficial Cumulative: Minor beneficial **Net minor beneficial effects**	Adverse: Negligible Beneficial: Moderate Indirect: Negligible beneficial Cumulative: Minor beneficial **Net minor beneficial effects**	Adverse: Moderate Beneficial: Minor Indirect: Minor adverse Cumulative: Minor adverse **Net moderate adverse effects**
Cultural Landscape	Adverse: None Beneficial: None Indirect: None Cumulative: None **No effects**	Adverse: None Beneficial: Moderate to major Indirect: None Cumulative: None **Net moderate to major beneficial effects**	Adverse: None Beneficial: None Indirect: Negligible adverse effects Cumulative: None **Net negligible adverse effects**

(*continued*)

Effect Category	Alternative A – No Action Effect, duration, intensity rating, and context	Alternative B – Modified Hunting Program Effect, duration, intensity rating, and context	Alternative C – E liminate Hunting Effect, duration, intensity rating, and context
Public Use			
Public Use: Land Use and Recreation	Adverse: Negligible, long-term, local Beneficial: Moderate, long-term, local Indirect: Minor beneficial Cumulative: Moderate beneficial **Net moderate beneficial effects**	Adverse: Negligible, long-term, local Beneficial: Moderate, long-term, local Indirect: Minor beneficial Cumulative: Moderate beneficial **Net moderate beneficial effects**	Adverse: Moderate, long-term, local Beneficial: Minor effects Indirect: Negligible adverse Cumulative: Moderate adverse **Net moderate adverse effects**
Public Use: Health and Safety	Adverse: Negligible, long-term, local Beneficial: Negligible, long-term, local Indirect: None Cumulative: Negligible beneficial **Net negligible beneficial effects**	Adverse: Negligible, long-term, local Beneficial: Minor, long-term, local Indirect: None Cumulative: Negligible beneficial **Net minor beneficial effects**	Adverse: None Beneficial: Negligible effects, long term, local Indirect: Negligible adverse Cumulative: Negligible adverse **Net neutral effects**
Public Use and Experience: Year-round residents and winter visitors	Adverse: Minor, long-term, local Beneficial: None Indirect: Minor adverse Cumulative: None **Net minor adverse effects**	Adverse: Minor, long-term, local Beneficial: Minor, long-term, local Indirect: Minor beneficial Cumulative: None **Net minor beneficial effects**	Adverse: None Beneficial: Minor, long-term, local Indirect: Minor beneficial Cumulative: None **Net minor beneficial effects**
Public Use and Experience: Summer visitors	Adverse: None Beneficial: None Indirect: None Cumulative: None **No adverse or beneficial effects**	Adverse: None Beneficial: None Indirect: None Cumulative: None **No adverse or beneficial effects**	Adverse: None Beneficial: None Indirect: None Cumulative: None **No adverse or beneficial effects**
Socioeconomic Values: Economics	Adverse: No effects Beneficial: Minor, long-term, local Indirect: Negligible beneficial Cumulative: Negligible beneficial **Net minor beneficial effects**	Adverse: No effects Beneficial: Minor, long-term, local Indirect: Negligible beneficial Cumulative: Negligible beneficial **Net minor beneficial effects**	Adverse: Minor, long-term, local Beneficial: No effects Indirect: Negligible adverse Cumulative: Negligible adverse **Net minor adverse effects**
Socioeconomic Values: Social	Adverse: Minor, long-term local Beneficial: Minor, long-term, local Indirect: Negligible beneficial Cumulative: No effects **Net negligible beneficial effects**	Adverse: Minor, long-term local Beneficial: Moderate, long-term, local Indirect: Negligible beneficial Cumulative: No effects **Net minor beneficial effects**	Adverse: Minor, long-term, local Beneficial: Minor, long-term, local Indirect: Negligible beneficial Cumulative: No effects **Net negligible beneficial effects**

(*continued*)

Effect Category	Alternative A – No Action Effect, duration, intensity rating, and context	Alternative B – Modified Hunting Program Effect, duration, intensity rating, and context	Alternative C – Eliminate Hunting Effect, duration, intensity rating, and context
Management and Operations			
Consistency with NPS goals, plans, and policies	Adverse: Negligible effects Beneficial: Negligible, long-term, local Indirect: No effects Cumulative: No effects **Net neutral effects**	Adverse: Negligible, long-term, local Beneficial: Negligible, long-term, local Indirect: No effects Cumulative: No effects **Net Negligible beneficial effects**	Adverse: Moderate, long-term, local Beneficial: Negligible, long-term, local Indirect: No effects Cumulative: No effects **Net minor adverse effects**
Net Effects	**Minor beneficial**	**Minor beneficial**	**Minor adverse**

4.5.2 Alternative B – Modified Hunting Program

Modifying the current hunting program addresses many of the concerns that were raised during the scoping process and provides numerous beneficial effects. The elements of Alternative B would maintain habitat quality for game and non-game species. While there would be a short-term loss of upland game bird hunting involving a non-native species, there would be long-term increases for upland game bird hunting focusing on native species. The proposed modifications to the hunting program would maintain cultural heritage factors that are part of the fabric of life on the Outer Cape, continue to provide hunting opportunities, and expand native game bird hunting opportunities. The modified approach to designating open and closed hunting areas should ease the safety concerns of fall and winter visitors, thus encouraging more recreational use by local residents and individuals from the region. Alternative B maintains consistency with CACO goals and with the reasons that CACO was established. Furthermore, this alternative addresses improving the cultural landscape, which would have moderate to major lasting benefits to visitors, scenic vistas, and for hunting opportunities. Modifying the hunting program would maintain the socioeconomic vales that hunting provides. It may increase some recreational opportunities, providing small economic benefits. Adverse effects are relatively minor concerning the loss of individuals from game species populations. Overall wildlife populations may benefit slightly from hunting. The beneficial effects outweigh the adverse effects.

4.5.3 Alternative C – Eliminate Hunting

Terminating the hunting program has beneficial effects as it relates to eliminating the loss of individuals from game species' populations. Negligible benefits to safety could occur, although hunting at CACO has a safe track record. The perception by many non-hunters that hunting creates safety risks for them is addressed, and any such perceptions would cease. Terminating the hunting program would have adverse effects relating to infringement on hunting as part of the cultural heritage and the loss of recreational opportunities. The effects to deer populations, and potential indirect effects to plant communities, are unknown and would need to be monitored. The adverse effects that would result from terminating hunting outweigh the beneficial effects that would result.

4.6 Determination of Impairment to CACO Resources

The following provides a determination on impairment for natural resources (wildlife and vegetation) and cultural resources (cultural heritage and cultural landscapes) as focused on implementation of Alternative B – Create a Modified Hunting Program. An assessment of impairment is not made for public use, management and operations, and non-federal lands within CACO. The preferred alternative, Alternative B "Improving the Hunting Program," would provide numerous beneficial effects and some adverse effects. Analysis of all available information suggests that although there may be some negligible to minor adverse effects, overall they are outweighed by the beneficial effects. Implementing Alternative B would provide the following benefits to CACO resources:

- Improve and retain cultural heritage aspects relating to hunting as part of the fabric of life of the Outer Cape;
- Expand and improve the rare heath vegetative community, which improves the cultural landscape;
- Improve populations of native quail;
- Provide expanded upland game bird hunting opportunities for native turkey and quail;
- Eventually phase-out the pheasant hunting program;
- Achieve compliance with NPS Management Policies and eventually eliminate the need for a policy waiver by phasing out pheasant stocking;

- Clarify and simplify the areas open and closed to hunting and increase the setback from bike trails;
- Provide modest improvements for reducing the potential risk of hunting related accidents;
- Encourage visitors to use CACO during the hunting season; and
- Retain and expand the socioeconomic benefits of hunting.

Adverse effects that would be expected include:

- The ongoing loss of individuals from game populations; and
- The eventual loss of pheasant hunting will eliminate this particular recreational activity. This should be mitigated somewhat by increased native upland game bird hunting.

Cape Cod National Seashore determined the implementation of Alternative B, the Preferred Alternative, will not constitute an impairment of the seashore's resources and values. This project is an alteration to a longstanding activity and park use, and does not meet any threshold to be viewed as impairment to the resources and values of the seashore. This conclusion is based on a thorough analysis of the impacts described in this Final EIS, agency and public comments, and the professional judgement of the decision-maker in accordance with the *NPS Management Policies 2006* (NPS 2006a). Implementation will not result in major adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Cape Cod National Seashore; (2) key to the natural or cultural integrity of the seashore or to opportunities for enjoyment of the seashore; or (3) identified in the seashore's general management plan or other relevant NPS planning documents as being of significance. Based on the assessment of effects on CACO resources, implementing the preferred Alternative B will not impair CACO resources.