National Park Service
U.S. Department of the Interior

THEODORE ROOSEVELT NATIONAL PARK

ELK MANAGEMENT PLAN

and Draft Environmental Impact Statement

December 2008

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DRAFT ELK MANAGEMENT PLAN / ENVIRONMENTAL IMPACT STATEMENT THEODORE ROOSEVELT NATIONAL PARK

Billings and McKenzie Counties, North Dakota

Forty-seven elk (*Cervus elaphus*) were reintroduced to the South Unit of Theodore Roosevelt National Park (the park) in 1985. A forage allocation model was developed specifically for ungulates in the South Unit of the park in the early 1990s, and was used to inform the establishment of a maximum elk population objective. In 1993 and 2000, this population objective was exceeded, and live elk were relocated off site to other federal entities, Indian tribes, and states for reintroduction programs in North Dakota, South Dakota, and Kentucky. In 2002, the Director of the National Park Service (NPS) issued a memorandum regarding NPS response to chronic wasting disease (CWD), including a policy that limited translocation of elk from NPS units only when adequate testing had been completed. Since this memorandum was issued, the park has not tested enough elk for CWD, and translocations for the purposes of population reduction have not occurred since 2000.

In the absence of NPS management, or other effective population controls (e.g., predation, hunting), the presence of high quality habitat found in the park and surrounding agricultural areas creates the potential for this elk population to quickly reach unnaturally high levels. The NPS is concerned that an unchecked elk population at the South Unit would create resource impacts that are not consistent with *NPS Management Policies 2006*. As a result, the purpose of this *Draft Elk Management Plan / Environmental Impact Statement* (plan/EIS) is to develop and implement an elk management strategy compatible with the long-term protection and preservation of park resources. Action is needed now to prevent elk-related undesirable adverse impacts to natural resources in the park consistent with NPS policy. There is also a need to consider the land use and users outside the park, including livestock grazing, hunting, and agriculture. The park has a responsibility to manage the elk population as outlined in agreements with the U.S. Forest Service and North Dakota Game and Fish Department and it is necessary to reevaluate objectives and management options given the 2002 Director's Guidance Memorandum on CWD.

This draft plan/EIS for the park analyzes the no-action alternative, four action alternatives for initial elk population reduction (and eventual population maintenance), and one additional action alternative for elk population maintenance only. Under alternative A (no action), existing management practices would be followed and no new management actions would be implemented beyond those available when the elk management planning process started. This would be limited to vegetation monitoring in elk use areas of the South Unit, as well as monitoring of the elk population. Under alternative B, direct reduction with firearms would be used to lethally remove elk from the park during both initial reduction and maintenance phases. Under alternative C, roundup and euthanasia would be used for both the initial reduction and maintenance phases. Under alternative D, the NPS would seek to conduct initial reduction and maintenance actions using CWD testing and translocation. Under alternative E, the NPS would look to increase elk hunting opportunities outside the park, coordinated with state actions to reduce and maintain the elk population. Alternative F would rely on fertility control of female elk as a maintenance tool only. This is an unproven technology that does not currently meet criteria set forth in this plan/EIS and could only be implemented when and if it meets criteria and in combination with another method (alternative B through E) used for initial reduction.

The potential environmental consequences of the alternatives are addressed in detail for soils, erosion, water resources, vegetation, the elk population, other wildlife and wildlife habitat, wildlife species of special concern, wilderness, socioeconomics, land management adjacent to the park, visitor use and experience, employee and visitor health and safety, and park operations and management. Under alternative A, no action would be taken to reverse the expected long term growth in the elk population that could result in impacts associated with sustained, heavy use by elk. The analysis indicates that impairment to vegetation, as well as grassland habitats for elk and other wildlife (including wildlife species of concern), could occur in the long term if alternative A is implemented.

This draft plan/EIS will be available for public review and comment for a 60-day minimum review period beginning when the Environmental Protection Agency Notice of Availability is published in the *Federal Register*. At this time, the NPS has not identified an agency preferred alternative or an environmentally preferred alternative. These will be evaluated after the public has the opportunity to review and comment on the plan/EIS, and those comments have been fully considered. A final version of this document, incorporating responses to public comments, will then be released and a 30-day no-action period will follow. Following the 30-day period, the alternative or actions constituting the approved plan will be documented in a record of decision that will be signed by the Regional Director of the Midwest Region. For further information:

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Theodore Roosevelt National Park
North Dakota

THEODORE ROOSEVELT NATIONAL PARK
ELK MANAGEMENT PLAN AND
DRAFT ENVIRONMENTAL IMPACT STATEMENT

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THEODORE ROOSEVELT NATIONAL PARK

SUMMARY

PURPOSE OF AND NEED FOR ACTION

The purpose of this Elk Management Plan/Environmental Impact Statement (plan/EIS) for Theodore Roosevelt National Park (the park) is to develop and implement an elk management strategy compatible with the long term protection and preservation of park resources. As a result of past and current actions within and beyond the park, several conditions have led to the increase of the park elk population to the approximately 900 that occur in the South Unit today. This includes the absence of effective elk predators; public hunting outside the park which does not appear to control population size within the park; high reproductive, survival, and population growth rates; lack of elk mortality such as winter kill; and the inability of the park to translocate elk without testing to show that the NPS is 99% confident that chronic wasting disease (CWD) is present in less than 1% of the population. These conditions are expected to continue and the population is projected to increase for the foreseeable future.

Large populations of elk could, over the long term, affect plant communities and other resources as a result of sustained, heavy grazing. Large elk populations could affect other herbivores by competing for forage. Other considerations include land use and users outside the park, including livestock grazing, hunting, and agriculture; visitors to the park; and the ability of the park to effectively manage resources.

As a result of these concerns, an elk management plan is needed:

- To prevent elk-related undesirable adverse impacts to natural resources in the park consistent with NPS policy;
- Because elk population growth is largely unchecked by controls such as natural predation, hunting, and nutritional restriction;
- To consider the concerns of area land owners and other land managers;
- Because the park has a responsibility to control the elk population as outlined in agreements with the U.S. Forest Service (USFS) and North Dakota Game and Fish Department (NDGF); and
- To reevaluate current objectives and management options given the 2002 Director's Guidance Memorandum on CWD (NPS 2002a).

This document has been prepared to satisfy the National Environmental Policy Act of 1969, as amended, which requires a range of reasonable alternatives be developed and the potential impacts resulting from these alternatives be analyzed. Six alternatives are presented: the no action alternative (continuation of current management), four action alternatives that were developed for initial reduction and maintenance of the elk population, and one action alternative for maintenance only. The document also describes the environment that would be affected by the alternatives and the environmental consequences of implementing any of the alternatives.

PARK PURPOSE AND SIGNIFICANCE

The purpose and significance of Theodore Roosevelt National Park are based on the park's management documents, which provide the general direction for each alternative. The purpose and significance are stated below to provide the reader with adequate background when examining the summary of the alternatives and the environmental consequences.

The purpose of Theodore Roosevelt National Park is to:

- Memorialize and pay tribute to Theodore Roosevelt for his enduring contributions to the conservation of our nation's resources;

- Conserve, unimpaired, the scenery and the natural and cultural resources, and facilitate scientific interests in the park;
- Provide for the benefit, use, and enjoyment of the people; and
- Manage the Theodore Roosevelt Wilderness as part of the National Wilderness Preservation System.

Among the reasons that Theodore Roosevelt National Park is significant are the following:

- The colorful North Dakota badlands provide the scenic backdrop to the park, which memorializes Theodore Roosevelt for his enduring contributions to the conservation of our nation's resources;
- The park allows people to enjoy panoramic vistas and a sense of solitude, inspiration, and timelessness similar to Theodore Roosevelt's experience in the Dakota Territory in the 1880s;
- The park provides an opportunity to learn about an environment and way of life that helped shape Theodore Roosevelt's attitudes and philosophy regarding conservation;
- The Little Missouri River has shaped the land which is home to a variety of prairie plants and animals including bison, elk, bighorn sheep, and prairie dogs;
- A significant park experience is created by the interplay of natural forces, including weather, vegetation, wildlife, vistas, smells, color and shape of landform, air quality, varied light, and seasons;
- The park contains one of the few islands of designated wilderness in the Northern Great Plains;
- The park is the most popular visitor attraction in North Dakota and provides significant economic and employment benefits for the state and region;
- Ongoing geological forces create spectacular examples of badlands and provide opportunities for visual interpretation of erosion processes;
- The park is designated as a Class I air quality area (Clean Air Act Amendments, 1977), providing for clean air, brilliantly clear day and night skies, and outstanding examples of a relatively unpolluted environment;
- Important cultural resources associated with prehistoric and historic occupation and use attest to millennia of human interaction with the rugged badlands environment;
- The park is a prime example of ecosystem restoration in progress, including reestablishing native flora and fauna and managing exotic species; and
- The park has one of the largest petrified forests in the United States, providing outstanding examples for visitor viewing.

OBJECTIVES IN TAKING ACTION

The following objectives related to elk management were developed for this plan. They are grounded in the park's purpose and significance and are compatible with the direction and guidance provided by both the general management plan and current strategic plan for the park.

- Prevent major adverse impacts to physical and biological components of the park and surrounding environments.
- Develop and implement actions consistent with the guidance and bounds set by the NPS Management Policies 2006.
- Establish indicators to guide management of elk.

- Minimize scope or frequency of manipulating the elk population in the park, while maintaining long-term elk population viability.
- Incorporate management flexibility to account for information obtained regarding wildlife disease or other factors influencing elk populations.
- Provide public outreach opportunities to inform the public of the complexity of managing elk within the park.
- Coordinate and cooperate with stakeholders, such as other federal agencies, state, and private entities, including sharing data on the elk population and its management.
- To the extent practicable, enhance elk hunting opportunities on the lands surrounding the park.

ELK AT THEODORE ROOSEVELT NATIONAL PARK

Historically, elk were a prominent native species in the badlands of North Dakota. However, elk populations in the badlands began to decline in the 1880s, and by the late 1800s, elk were extirpated from the North Dakota badlands (Bryant and Maser 1982).

To restore this extirpated native species and a missing component of the badlands ecosystem, as well as enhance visitor experience, 47 elk were reintroduced to the South Unit of the park in March of 1985. Elk reintroduction was made possible through a memorandum of understanding among the park, USFS and NDGF. Because the park was concerned about how elk might affect other park resources (e.g., plant communities and other wildlife species) in the fenced environment of the South Unit, they initiated research in 1985 to provide insight into the ecology and dynamics of the elk population.

A forage allocation model was developed in 1993 using estimates of forage production as well as diet and population data on major ungulates in the park (including bison [*Bison bison*], elk, feral horses [*Equus caballus*], and mule deer [*Odocoileus hemionus*]). Using that model, the park selected a maximum population objective of approximately 360 elk for the South Unit. In 1993 and 2000, this population objective was exceeded, and elk were relocated off site to other federal entities, Indian tribes, and states for reintroduction programs in North Dakota, South Dakota, and Kentucky. At these levels, the elk population helped promote the lightly grazed, northern plains mixed-grass prairie system protected in the South Unit of the park.

In 2002, due to concerns over chronic wasting disease (a fatal disease of elk, deer, and moose [*Alces alces*]), the Director of the National Park Service issued a guidance memorandum that limited the transfer of deer and elk from parks unless the population had been tested extensively for the disease. The park does not have an existing planning document that anticipated or authorized the large scale, lethal removals currently required to meet these CWD testing requirements and has not removed elk since 2000. In the absence of this management, the state has made numerous attempts to increase hunting success outside the park, such as revising hunting seasons and adding more licenses to increase opportunities. Given these considerations, the lack of effective predation, the high quality habitat found in the park and surrounding agricultural areas, and the flexibility of elk diets, the elk population in the South Unit has the potential to quickly reach unnaturally high levels (presently, the population is estimated at 900 elk). This could lead to resource degradation that would require restoration, and could potentially result in impairment of park resources. These impacts would be inconsistent with the NPS Organic Act of 1916 and/or *NPS Management Policies 2006*.

In light of the potential effects associated with sustained heavy grazing by a large elk population, including an undesirable shift in grassland communities in the South Unit, the National Park Service has developed this elk management plan for Theodore Roosevelt National Park.

ALTERNATIVES CONSIDERED

The alternatives under consideration include a required "no-action" alternative plus four action alternatives that were developed by an interdisciplinary planning team and through feedback from the public, other agencies, and the scientific community during the planning process. The four action alternatives for initial reduction and maintenance (alternatives B-E) would meet, to a large degree, the elk management objectives for Theodore Roosevelt National Park and also the purpose of and need for action. The maintenance only alternative (alternative F) would meet these objectives only if a fertility control agent is developed that meets NPS criteria.

Under alternative A (no action) existing management practices would be followed and no new management actions would be implemented beyond those available when the elk management planning process started. This would be limited to vegetation monitoring in elk use areas of the South Unit, as well as monitoring of the elk population.

Under alternative B, direct reduction with firearms would be used to reduce and maintain elk numbers consistent with the protection of the lightly-grazed system in the South Unit.

Under alternative C, the elk herd would be reduced and maintained using roundups and euthanasia at off-site locations.

Under alternative D the NPS would seek to reduce and maintain the elk population using CWD testing and translocation (roundup and relocation of animals to willing recipients outside the park).

Under alternative E, the NPS would look to increase elk hunting opportunities outside the park, coordinated with state actions to reduce and maintain the elk population.

Alternative F would rely on fertility control of female elk as a maintenance tool only. This is an unproven technology that does not currently meet criteria set forth in this plan/EIS and could only be implemented when and if it meets those criteria and in combination with another method (alternative B through E) used for initial reduction.

Upon conclusion of the plan/EIS and decision-making process, one of the alternatives, or a combination of actions from multiple alternatives, would become the elk management plan and guide future actions for a period of 15 years or until conditions necessitate the plan be revised.

Preferred and Environmentally Preferable Alternative

The National Park Service has not yet identified the preferred alternative and an environmentally preferable alternative for this plan/EIS. The Council on Environmental Quality NEPA regulations define the preferred alternative as that "which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors" (Q4a; CFR 1502.14(e)) and the environmentally preferable as the one that "…causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves and enhances historic, cultural and natural resources (Q 6a)."

The preferred and environmentally preferable alternatives will be identified after consideration of comments received during public review of this draft plan/EIS, and will be made available for further public review and comment.

ENVIRONMENTAL CONSEQUENCES

The summary of environmental consequences considers the actions being proposed and the cumulative impacts from occurrences inside and outside the park. The potential environmental consequences of the actions are addressed for soils, erosion, water resources, vegetation, elk population, other wildlife and wildlife habitat, wildlife species of special concern, wilderness, socioeconomics, land management adjacent to the park, visitor use and experience, employee and visitor health and safety, and park operations and management. The following table is a summary of environmental consequences.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

	Alternative A – No Action (Continue Existing Elk Management Program)	Alternative B – Direct Reduction with Firearms	Alternative C – Roundup and Euthanasia	Alternative D – Testing and Translocation	Alternative E – Hunting Outside of the Park	Alternative F – Fertility Control (Maintenance Only)
Soils, Erosion, and Water Resources						
Impacts of management action	No action taken to reduce the elk population. Actions would include minimal foot traffic from routine research and monitoring that would contribute minimally to the impacts from the larger elk population.	Annual management activities would have long-term, local, negligible impacts associated with routine field activities that could result in temporary impacts such as localized soil compaction and vegetation loss.	Periodic management activities would have long-term, local, minor impacts associated with normal roundup activities that could result in temporary impacts, such as localized soil compaction and vegetation loss as elk are driven across the landscape.	Same as alternative C but impacts would be long-term, local, and negligible to minor as the frequency of roundups would be reduced.	Directed dispersal of elk outside the park to increase hunting opportunities would have impacts similar to alternative C, but impacts would be long-term, local, and negligible to minor as the scope of dispersals are smaller (although more frequent) during initial reduction. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park.	Same as alternative C but impacts would be long-term, local, and negligible as scope of annual roundups are much smaller throughout the life of the plan.
Impacts of elk population reduction	No reduction would occur in the elk population. Heavy sustained grazing would increase soil erosion, decrease soil fertility, and increase sediment (turbidity) in nearby surface waters. Impacts would be long-term, minor to moderate, adverse.	Elk population would be reduced and maintained between 100 and 400 elk. The potential for sustained heavy use, vegetative cover loss, and soil erosion would decrease resulting in the decrease of sediment in surface waters and long-term beneficial impacts.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Vegetation						
Impacts of management action	Vegetation research and annual population surveys would be conducted, resulting in minimal trampling and long-term negligible adverse impacts.	Annual management activities would have long-term, local, negligible impacts associated with routine filed activities that could result in temporary impacts such as trampling of vegetation from foot traffic.	Periodic management activities would have long-term, local, minor impacts associated with normal roundup activities that could result in temporary impacts, such as trampling of vegetation.	Same as alternative C but impacts would be long-term, local, and negligible to minor as the frequency of roundups would be reduced.	Directed dispersal of elk outside the park to increase hunting opportunities would have impacts similar to alternative C, but impacts would be long-term, local, and negligible to minor as the scope of dispersals are smaller (although more frequent) during initial reduction. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park.	Same as alternative C but impacts would be long-term, local, and negligible to minor as scope of annual roundups are much smaller throughout the life of the plan.
Impacts of elk population reduction	No reduction would occur in the elk population. Heavy sustained browsing, grazing, and trampling of vegetation would decrease stability of plant communities, especially grasslands, and cause shifts in or reduce the diversity of native species composition both inside and outside the South Unit. Impacts would be long-term, moderate to major, adverse.	Elk population would be reduced and maintained between 100 and 400 elk. Browsing and grazing pressure, as well as trampling of vegetation, would be reduced both inside and outside the South Unit. With reduced browsing pressure, more elk would stay inside the South Unit reducing browse on adjacent lands. Long-term beneficial impacts would occur both inside and outside of the South Unit.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

	Alternative A – No Action (Continue Existing Elk Management Program)	Alternative B – Direct Reduction with Firearms	Alternative C – Roundup and Euthanasia	Alternative D – Testing and Translocation	Alternative E – Hunting Outside of the Park	Alternative F – Fertility Control (Maintenance Only)
Elk Population						
Impacts of management action	No action taken to reduce the elk population. Actions would include minimal foot traffic from routine research and monitoring that would contribute minimally to the impacts from the elk population.	Annual direct reduction would cause intermittent disturbances, from the use of firearms, presence of people, and removal of carcasses, that could make elk more wary of people and impact elk movements during management actions. Because these actions could be carried out in fall, during the rut, they could affect breeding behavior. As a result, there would be long-term minor to major adverse impacts on elk. Minimal impacts to elk habitat would occur from trampling during management actions, which would occur outside the growing season.	Periodic roundups would be conducted for initial reduction and maintenance. The periodic use of helicopters to roundup elk during management actions would have intermittent, long-term, major impacts on elk movement. Roundups would result in some trampling of vegetation and long-term negligible adverse impacts to elk habitat. These would occur outside the growing season minimizing effects.	Roundup activities for testing and translocation would have similar impacts to alternative C, including long-term major impacts on elk movements from and long-term negligible impacts from trampling of elk habitat. However, the frequency of roundups would be reduced. Routine research and monitoring would contribute minimally to these impacts	Directed dispersal of elk outside the park to increase hunting opportunities would have similar impacts to alternative C, including long-term negligible impacts from trampling and long-term moderate to major impacts on elk movements from helicopter use as the duration of the activity would be less than alternative C. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park.	Roundup activities for fertility control would have similar impacts to alternative C, including long-term negligible impacts from trampling and long-term moderate to major impacts on elk movements from helicopter use as the duration of the activity would be less than alternative C. Impacts would be greatest in the first year and minimized during maintenance.
Impacts of elk population reduction	No reduction would occur in the elk population.	Elk population would be reduced and maintained to between 100 and 400 elk.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Available Forage/Cover	The amount of forage would be reduced and there would be changes in the structural diversity in woodlands that provide hiding, resting and thermal cover for elk.	Trampling and foraging would be reduced, increasing the amount of forage and cover available.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Competition between elk	Increased competition between elk would result in increased energy expenditures, elevated levels of stress, diminished health and reduction in reproductive capacity.	Density-dependent competition would not occur, creating beneficial impacts to overall population health such as reproductive capability, body condition, and other characteristics.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Movement of elk	The number of elk that leave the park, as well as the time of year they leave could change.	The number of elk that leave the park, or move long distances within the park would be expected to decline, as more forage and habitat would be available within the South Unit creating long-term moderate impacts.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Elk/human interactions	The potential for elk/human interaction would increase.	The potential for elk/human interactions would decrease.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Hunting opportunities	Hunting opportunities could increase with increased population.	Hunting opportunities would be expected to decrease over the long-term.	Same as alternative B.	Same as alternative B.	Same as alternative B, although periodic dispersals of elk outside the park to increase hunting opportunities would slightly offset these impacts.	Same as alternative B.
Disease transmission	Transmission and risk of spreading of inter- and intra-species diseases could increase.	Transmission and risk of spreading inter- and intra-species diseases would decrease, creating a beneficial impact.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Overall impact to elk population	Overall impacts to the elk population would be long-term, moderate to major adverse.	Reduction of population would have long-term beneficial impacts, with long-term moderate changes to elk distribution.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

	Alternative A – No Action (Continue Existing Elk Management Program)	Alternative B – Direct Reduction with Firearms	Alternative C – Roundup and Euthanasia	Alternative D – Testing and Translocation	Alternative E – Hunting Outside of the Park	Alternative F – Fertility Control (Maintenance Only)
Other Wildlife and Wildlife Habitat						
Impacts of **management action**	No action taken to reduce the elk population. Actions would include minimal foot traffic from routine research and monitoring that would have long-term, negligible adverse impacts as a result of displacement from human disturbance.	Annual direct reduction would cause intermittent disturbances, from the use of firearms, presence of people, and removal of carcasses, that would increase energy expenditures and stress of wildlife, possibly in the wintertime when they are more susceptible to mortality, resulting in long-term minor to moderate adverse impacts. Management actions could also result in the trampling of vegetation and displacement of wildlife from noise disturbance that would contribute to these impacts.	Roundups would be conducted using helicopters for initial reduction and periodic maintenance that would result in some trampling of vegetation and displacement of wildlife. These could occur during the winter, when wildlife are more susceptible to mortality, and would have long-term, minor, and adverse impacts on wildlife and wildlife habitat.	Roundup activities for testing and translocation would have similar impacts to alternative C, including long-term, minor, and localized impacts from trampling of vegetation, displacement of wildlife, and increased wildlife energy expenditures.	Directed dispersal of elk outside the park to increase hunting opportunities would have similar impacts to alternative C, including long-term, minor, localized adverse impacts from trampling vegetation, displacement of wildlife, and increased wildlife energy expenditures. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park.	Roundup activities for fertility control would have similar impacts to alternative C, including long-term, minor, localized adverse impacts from trampling vegetation, displacement of wildlife, and increased wildlife energy expenditures.
Impacts of elk population reduction	No reduction **would** occur in the elk population. Sustained heavy use by a growing elk population would result in a reduction of habitat and forage for all wildlife, including other ungulates, which may need to be managed at lower levels to compensate. Impacts would be long-term, negligible to major adverse, depending on the wildlife species (e.g., negligible for those species that use the canopy of woodlands versus major for those that use grasslands) Predators and scavengers that use elk as a food source could benefit from higher populations.	Elk population would be reduced and maintained to between 100 and 400 elk, which would decrease the potential for heavy use by elk and increase the available habitat and forage for other wildlife species, including ungulates, resulting in long-term beneficial impacts. Greatest benefits would be realized by species that depend on ground cover for protection from predation and as a food source. Predators and scavengers would experience long-term, adverse negligible to minor impacts as increased ground cover may make it more difficult to find their prey, and fewer elk (and carrion) would be available.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Special Status Species (Upland Sandpiper, Long-Billed Curlew, Baird's Sparrow, Grasshopper Sparrow, Lark Bunting, Sprague's Pipit, and Chestnut-Collared Longspur (State Sensitive Species)						
Impacts of management action	No action taken to reduce the elk population. Actions would include minimal foot traffic from routine research and monitoring that would have long-term, negligible adverse impacts as a result of displacement from human disturbance.	Annual direct reduction would cause intermittent disturbances, from the use of firearms, presence of people, and removal of carcasses, that could result in the trampling of vegetation and displacement of sensitive species from noise disturbance. However, management actions would be taken in the fall and winter, outside the sensitive portion of these species lives; actions taken in winter would have no impact on these birds as they are typically not present during this time of year. As a result, there would be long-term, negligible adverse impacts from management actions	Roundups would be conducted using helicopters for initial reduction and periodic maintenance that would result in some trampling of vegetation and displacement of special status birds. However, management actions would be taken in the fall and winter, outside the sensitive portion of these species lives; actions taken in winter would have no impact on these birds as they are typically not present during this time of year. As a result, there would be long-term, minor adverse impacts from management actions.	Roundup activities for testing and translocation would have similar impacts to alternative C, including long-term, minor, and localized impacts.	Directed dispersal of elk outside the park to increase hunting opportunities would have similar impacts to alternative C, including long-term, minor, localized adverse impacts. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park.	Roundup activities for fertility control would have similar impacts to alternative C, including long-term, negligible, localized adverse impacts.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

	Alternative A – No Action (Continue Existing Elk Management Program)	Alternative B – Direct Reduction with Firearms	Alternative C – Roundup and Euthanasia	Alternative D – Testing and Translocation	Alternative E – Hunting Outside of the Park	Alternative F – Fertility Control (Maintenance Only)
Impacts of elk population reduction	Sustained heavy use by a growing elk population would result in a reduction of the grassland habitat used by these species, including a reduction in cover that make them more susceptible to predation. This would have long-term, moderate to major, adverse impacts.	Elk population would be reduced and maintained to between 100 and 400 elk. This would decrease the potential for sustained heavy use by elk and increase the available grassland habitat, including forage and cover, for sensitive species resulting in long-term beneficial impacts.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Wilderness						
Impacts of management action	No action taken to reduce the elk population. Actions would include minimal foot traffic from routine research and monitoring that would not have discernable impacts. Use of fixed-wing during population surveys would have temporary short-term, negligible to major adverse impacts on the solitude of the wilderness areas depending on the distance to the activity.	Management actions, including the use of firearms, would take place in wilderness areas, and would create a noise intrusion on solitude near the management actions. These impacts would dissipate with distance and would decrease as the scope of annual management actions decrease. Impacts would be long-term, negligible to moderate adverse.	Management actions, including use of helicopters for roundups, would take place in wilderness areas. Use of helicopters in the wilderness area would create a noise intrusion on solitude near the management actions, however, these actions would be minimized as they would only originate in the wilderness area for a short period of time. These impacts would dissipate with distance and occur less frequently after initial reduction (during periodic maintenance). Impacts would be long-term, minor adverse.	Roundup activities for testing and translocation would have similar impacts to alternative C, which would be long-term, minor and adverse.	Directed dispersal of elk outside the park to increase hunting opportunities would have similar impacts to alternative C. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park. The whole of the management activity (dispersal and state actions) would result in long-term, moderate, adverse impacts to wilderness.	Roundup activities for fertility control, would have similar impacts to alternative C, including long-term, minor, adverse impacts. Routine research and monitoring would contribute minimally to these impacts.
Impacts of elk population reduction	No reduction would occur in the elk population. Continued growth of the elk population would increase grazing and could cause shifts in grassland communities that would alter the natural character of the wilderness area and have long-term moderate to major adverse impacts.	Elk population would be reduced and maintained to between 100 and 400 individuals. While elk would be removed, they would remain a component of the wilderness ecosystem. A reduced elk population would eliminate sustained heavy use of vegetation that contributes to the character of the wilderness area, resulting in long-term beneficial effects to wilderness.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Socioeconomics						
Impacts to adjacent lands	The elk population would continue to grow, resulting in increased damage to adjacent agricultural/ grazing lands, including fences, and landscape vegetation as competition for these resources increases. Impacts would be long-term, moderate, adverse.	A gradual reduction in the elk population would have long-term beneficial impacts to adjacent landowners as pressure on their crop and grazing lands would be reduced, increasing their crop yield and profits. Impacts to fencing and landscape vegetation would also be expected to decline as well, providing beneficial effects.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B, although dispersing elk onto adjacent lands to increase hunting opportunities could have long-term, minor to moderate, adverse impacts during periodic management actions from the temporary increase in potential damage to crops, pastures, fencing, and landscaping.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

	Alternative A – No Action (Continue Existing Elk Management Program)	Alternative B – Direct Reduction with Firearms	Alternative C – Roundup and Euthanasia	Alternative D – Testing and Translocation	Alternative E – Hunting Outside of the Park	Alternative F – Fertility Control (Maintenance Only)
Protection mechanisms and costs	Long-term, minor, adverse impacts would occur from the increased costs to adjacent land owners for protection mechanisms as the elk population increases.	Although some costs would still be experienced by adjacent landowners, the need for protective measures is expected to reduce, reducing the costs and resulting in beneficial effects.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B, although dispersing elk onto adjacent lands to increase hunting opportunities could have long-term, minor to moderate, adverse impacts during periodic management actions from the temporary increase in costs for fencing and other forms of elk control to protect landscaping, crops, and pastures.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Impacts to tourism and recreation	Long-term beneficial effects would occur due to the increased opportunities to see or hunt elk.	Long-term moderate adverse effects would be experienced as the number of elk would be reduced, hunting opportunities would decrease and the amount hunters spend in the surrounding area would decrease. Long-term negligible to minor impacts may occur from changes in park visitation levels.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B, although dispersing elk onto adjacent lands to increase hunting opportunities would slightly offset the effects by periodically increasing elk available for removal outside the park.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Land Management Adjacent to the Park						
Impacts of management action	No management action would be taken that would affect land management adjacent to the park.	Management actions would occur within the park and would not impact adjacent land management.	Management actions would occur within the park and would not impact adjacent land management.	Management actions would occur within the park and would not impact adjacent land management.	Directed dispersal of elk outside the park to increase hunting opportunities would require coordination with state that would involve a substantial amount of oversight and changes to current management options. These changes would result in long-term moderate adverse impacts during period management actions.	Management actions would occur within the park and would not impact adjacent land management.
Impacts of elk population reduction	No reduction would occur in the elk population. An increase in the elk population could cause the state to have to change management options outside the park as well as require the USFS to reduce permitted grazing to address competition for resources. Changes in these agency plans as a result of an increasing elk population would have long-term minor to moderate adverse impacts.	As the browsing pressure in the South unit decreases, the number of elk moving outside of the park is also expected to decrease. Changes in management as a result of a smaller elk population would have long term, negligible to minor, impacts on management of surrounding lands.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, but the presence of female elk treated with fertility control agents could also change management.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

	Alternative A – No Action (Continue Existing Elk Management Program)	Alternative B – Direct Reduction with Firearms	Alternative C – Roundup and Euthanasia	Alternative D – Testing and Translocation	Alternative E – Hunting Outside of the Park	Alternative F – Fertility Control (Maintenance Only)
Visitor Use and Experience						
Impacts of management action (including noise)	No action taken to reduce the elk population. Actions would include minimal foot traffic from routine research and monitoring, including an annual population survey by aircraft, that would have long-term, negligible adverse impacts to visitor experience and noise.	Annual management actions would include direct reduction with firearms that would create a substantial noise intrusion on the natural landscape for several weeks or months per year. As a result, there would be long-term, minor to moderate, adverse impacts of short duration. Closures and leaving carcasses in the South Unit would contribute to these impacts.	Management actions would include the use of helicopters for routine roundups that would create a substantial noise intrusion on the natural landscape. These actions would only last a few days and during times of low visitation resulting in minor, long-term, adverse impacts. Closures would have long-term, minor to moderate, adverse impacts for short-periods of time during management actions.	Roundup activities for testing and translocation would have similar impacts to alternative C, which would be long-term, minor and adverse. Closures would have long-term, minor to moderate, adverse impacts for short-periods of time during management actions.	Directed dispersal of elk outside the park to increase hunting opportunities would have similar impacts to alternative C, which would be long-term, minor and adverse. Closures would have long-term, minor to moderate, adverse impacts for short-periods of time during management actions. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park.	Long-term minor to Roundup activities for testing and translocation would have similar impacts to alternative C, which would be long-term, minor and adverse. Closures would have long-term, minor to moderate, adverse impacts for short-periods of time during management actions.
Impacts of elk population reduction	No reduction would occur in the elk population. As the elk population continues to increase, the opportunity for visitors to view elk would also increase and benefit the visitors desiring this experience. However, increased elk would also result in increased browse that would increase competition with other species and change the natural setting, such as reducing vegetation, reducing species diversity, and increasing exotic species that would have long-term, minor to moderate adverse impacts on other visitors.	A reduction in the elk population would maintain a lightly grazed system and provide long-term beneficial impacts to visitors seeking this experience. For those visitors wishing to see elk, negligible to minor impacts would occur as elk would still be present, but chances to see them would be reduced.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Employee and Visitor Health and Safety						
Impacts of management action	No management actions would be taken to reduce the elk population. Vegetation and population monitoring would continue and would not impact visitor safety. Employees would use aircraft for population survey actions, but would be trained for such use and result in short-term minor adverse impacts.	The use of firearms in the park would increase health and safety risk, but the use of qualified federal employees and authorized agents would minimize this potential. Following all applicable regulations and safety guidelines, impacts to employee safety would be long-term, minor to moderate adverse. Management activities would be conducted during low visitor use times and visitors would be restricted from these areas, resulting in long-term, negligible to minor adverse impacts to visitor health and safety.	Normal roundup activities and driving elk to the handling facility at the South Unit would increase health and safety risk, but the use of qualified federal employees and authorized agents would minimize this potential. Management actions would occur during period of low visitor use and areas where management actions occur would be closed to park visitors. Impacts to employee and visitor health and safety would be long-term, negligible to minor adverse.	Roundup activities for testing and translocation would have similar impacts to alternative C, resulting in long-term, negligible to minor adverse effects.	Directed dispersal of elk outside the park to increase hunting opportunities would have similar impacts to alternative C, resulting in long-term, negligible to minor adverse effects. Increased hunting opportunities are expected to have similar impacts to alternative B, although slightly less intense as it would occur outside the park.	Roundup activities for fertility control would have the same impacts as alternatives C and D, which would be long-term, negligible to minor adverse.
Impacts of elk population reduction	No reduction would occur in the elk population. An increase in the elk population would result in increase in the spread of diseases transmitted from animals to humans and increase the potential for wildlife-vehicle interactions. These would result in long-term minor adverse impacts to health and safety.	A reduction in elk would reduce the potential for wildlife-vehicle interaction, creating long-term beneficial effects.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.

SUMMARY OF ENVIRONMENTAL CONSEQUENCES

	Alternative A – No Action (Continue Existing Elk Management Program)	Alternative B – Direct Reduction with Firearms	Alternative C – Roundup and Euthanasia	Alternative D – Testing and Translocation	Alternative E – Hunting Outside of the Park	Alternative F – Fertility Control (Maintenance Only)
Park Management and Operations						
Impacts of management action	No action would be taken to reduce the elk population. Vegetation monitoring and population surveys would continue, and existing staff would be sufficient to conduct these activities. Support would continue to be provided by the USGS and USFS. Cost of management = approximately $840,000.	Direct reduction activities would require staff time to accompany qualified federal employees and coordinate logistics. Annual management action would require temporary shifts in priorities in most divisions for weeks or months, resulting in long-term, moderate to major, adverse impacts. Impacts would be greatest if it is necessary to manage a pool of skilled volunteers. These annual impacts would not last as long after the initial reduction. Cost of management = approximately $1.75 million, increasing by $1 million if skilled volunteers are used.	Roundup activities would require staff time to plan and implement the roundups, work in the handling facility, and process the elk. Periodic management actions would require temporary shifts in priorities in most divisions for the short duration of management activities, resulting in long-term, minor to moderate, adverse impacts. These impacts would occur less frequently after the initial reduction. Cost of management = approximately $1.4 million to $1.8 million.	As with alternative C, roundup and translocation activities would require staff time to identify willing recipients, plan and implement the roundups, work in the handling facility, and process the elk, requiring temporary shifts in priorities in most divisions for the short duration of the management activity. This would have long-term, minor to moderate, adverse impacts. These impacts would occur less frequently after the initial reduction. Cost of management = approximately $1.0 million to $1.2 million.	Directed dispersal of elk outside the park to increase hunting opportunities could require park staff to alter fences, and would require they coordinate with surrounding landowners and the state. Management actions would require temporary shifts in priorities in most divisions for the short duration of periodic management activity resulting in long-term, minor to moderate, adverse impacts. Cost of management = approximately $2.2 million to $2.3 million. Costs of state actions would be covered by permit fees.	Roundup and fertility control activities would require staff time to plan and implement the roundups, administer fertility agents, and work in the handling facility. Management actions would require temporary shifts in priorities in most divisions for the short duration of annual management activities resulting in long-term, minor to moderate, adverse impacts. Cost of management = approximately $1.0 million to $1.2 million.
Impacts of elk population reduction	No reduction would occur in the elk population. As the elk population grows, more surveying and management of other resources in the park would need to occur, resulting in adverse, short- and long-term minor to moderate impacts.	Reduction of the elk population to between 100 and 400 individuals would require additional staff commitments and funding, while a smaller population would lessen the responsibility of staff for other management issues such as fence maintenance and ungulate management. This would have a long-term beneficial effect.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.

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ATTACHMENT

Attachment 1. Final Recommendations of the Scientific Advisory Team; Recommendations for Management of Elk at Theodore Roosevelt National Park

PURPOSE OF AND NEED FOR ACTION

THEODORE ROOSEVELT NATIONAL PARK

CHAPTER 1: PURPOSE OF AND NEED FOR ACTION

This Draft Elk Management Plan / Environmental Impact Statement (plan/EIS) analyzes the impacts that could result from continuation of the current management framework (the no-action alternative), as well as the impacts that could result from four action alternatives for initial elk (*Cervus elaphus*) population reduction and maintenance, and one additional action alternative for elk population maintenance only.

This Environmental Impact Statement analyzes the impacts that could result from continuation of the current management framework (the no-action alternative), as well as the impacts that could result from four action alternatives for initial elk population reduction and maintenance, and one additional action alternative for elk population maintenance only.

This chapter describes the reasons the National Park Service (NPS) is taking action at this time to evaluate a range of alternatives and management actions for the elk population at Theodore Roosevelt National Park, North Dakota. This chapter includes:

- An introduction to the history of elk at the park;
- Present-day management concerns;
- Statements of the purpose and need for taking action, as well as objectives in taking action, developed during internal and public scoping;
- A description of the desired conditions;
- The threshold for taking action;
- A description of the project site and a background of the park;
- A summary of elk and vegetation research at the park;
- A discussion of issues and impact topics identified during the scoping process and considered in preparation of the plan/EIS, as well as issues dismissed from further analysis; and
- Related laws, policies, plans, and other constraints.

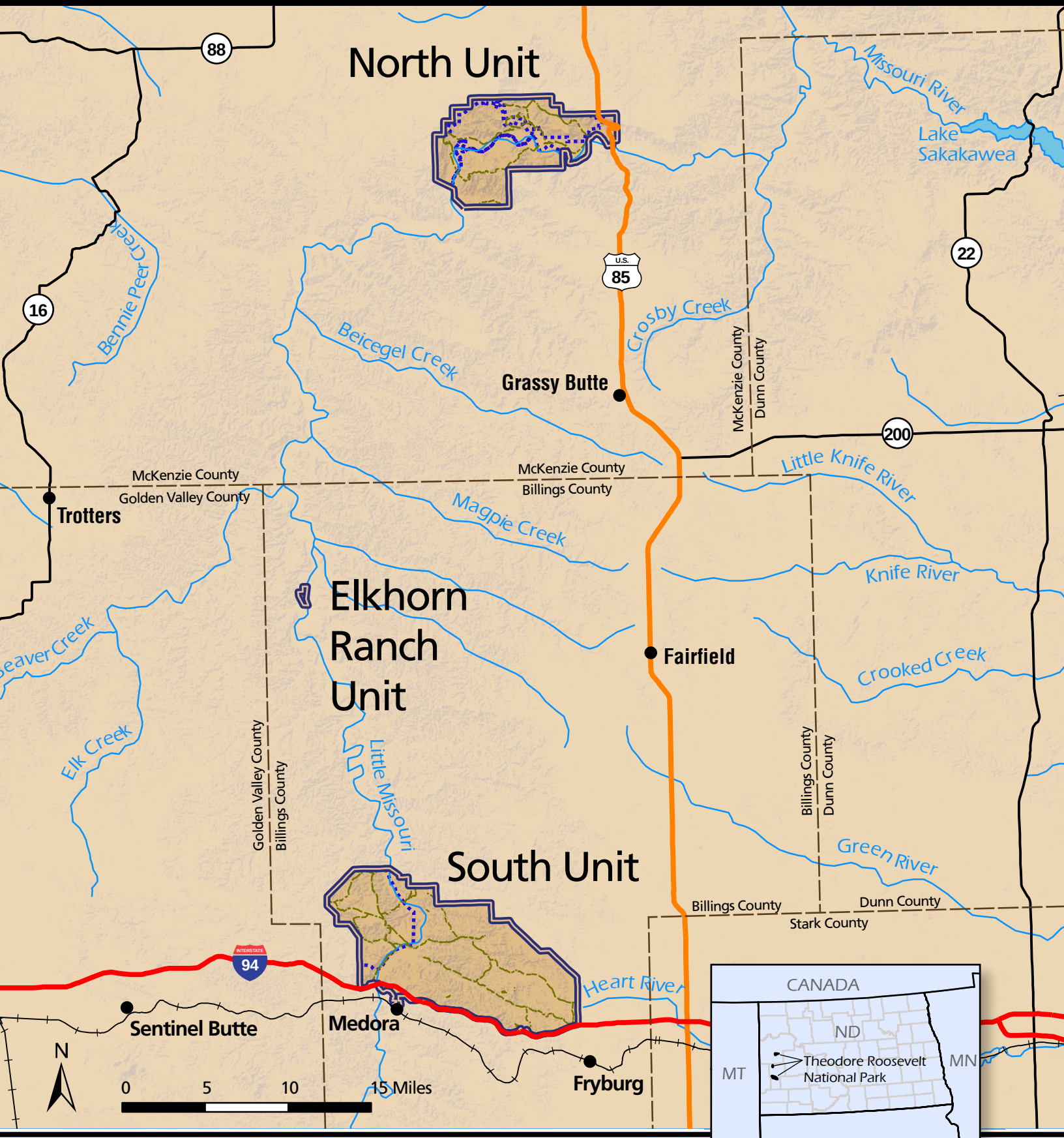
Although the park consists of three units (see map 1), elk were only reintroduced to the South Unit in 1985 after having been extirpated from western North Dakota. Upon conclusion of the plan/EIS and decision-making process, one of the alternatives, or a combination of actions from multiple alternatives, would become the elk management plan and guide future actions for a period of 15 years or until conditions necessitate the plan be revised.

HISTORY OF ELK AT THEODORE ROOSEVELT NATIONAL PARK

Theodore Roosevelt National Park lies in the Little Missouri Badlands of western North Dakota (map 1). Historically, densities of native ungulates on the northern plains were spatially and temporally variable (Bailey 1926; Roe 1970; Hart 2001), subject to the influences of hunting by native people, predation, nutrition, and animal movement that profoundly influenced local herbivore densities (Laliberte and Ripple 2003).

Theodore Roosevelt National Park
North Dakota

National Park Service
U.S. Department of the Interior



Park Boundary
Park Wilderness
Populated Places
Interstate
U.S. Hwy
State Hwy
Park Trails
Railroads
Streams

Map 1: Vicinity Map

Elk were a prominent part of the native ungulate mix in this part of the state. Reflecting on a trip down the Little Missouri River, John James Audubon noted in 1843, "We saw three elk swimming across it and the number of this fine species of deer that are about us now is almost inconceivable" (NPS 2004a). However, elk populations in the badlands began to decline in the 1880s. Theodore Roosevelt noted in 1888, "This stately and splendid deer, the lordliest of its kind throughout the world, is now fast vanishing. In our own neighborhood it is already almost a thing of the past." By the late 1800s, elk were extirpated from the badlands of North Dakota (Bryant and Maser 2004).

Elk, naturally abundant in the pre-Columbian Northern Great Plains, were extirpated from the area by the late 1800's. They were reintroduced in the park in 1985 and have thrived there ever since.

Almost since its establishment as Theodore Roosevelt National Memorial Park in April 1947, the NPS has restored missing components of the badlands ecosystem, including native wildlife historically found at the park. As a result, pronghorn (*Antilocapra americana*), bison (*Bison bison*), and California bighorn sheep (*Ovis canadensis california*) were reintroduced into the South Unit of the park in 1951, 1956, and 1959 respectively (see map 2). Continuing this trend, and to enhance visitor experience, an elk reintroduction was conducted in the South Unit of the park in 1985. Together with resident mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginianus*) populations, these species represent the historic ungulate assemblage in the badlands ecosystem of western North Dakota (Westfall et al. 1993). However, bighorn sheep are only observed occasionally in the South Unit today.

Elk reintroduction was made possible through an MOU among the park, U.S. Forest Service (USFS), and North Dakota Game and Fish Department (NDGF).

Elk reintroduction was made possible through a memorandum of understanding (MOU) among the park, U.S. Forest Service (USFS), and North Dakota Game and Fish Department (NDGF). Since 1985, these entities have signed four MOUs regarding the management of elk in and around Theodore Roosevelt National Park (see appendix A). Responsibilities for management of elk within the park and outside the park are established in these MOUs and are briefly summarized as follows:

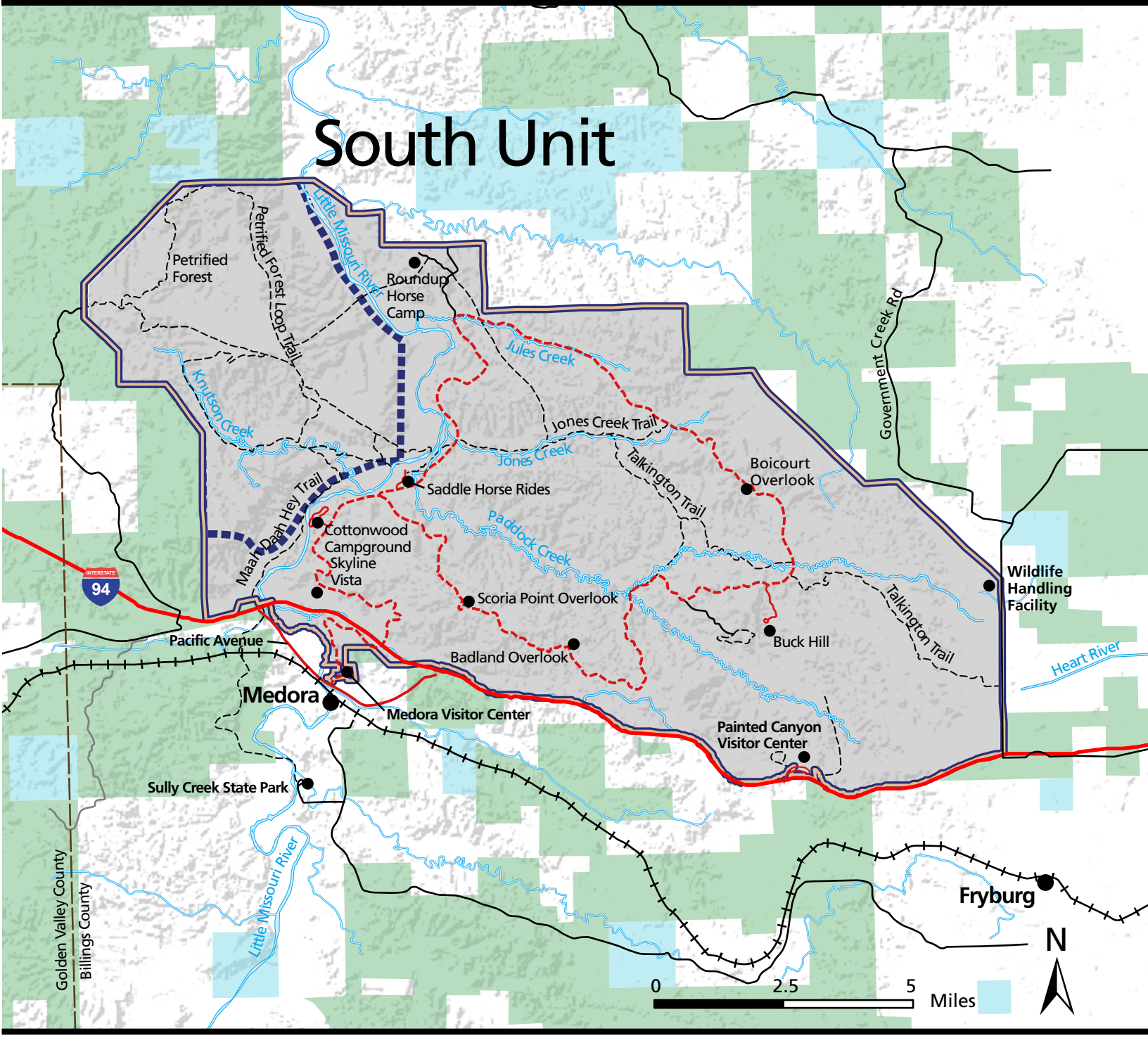
- Theodore Roosevelt National Park is responsible for elk management within the park boundary;
- NDGF is responsible for elk management on state and private lands outside the park boundary; and
- USFS will consider elk management in conjunction with other uses on the Dakota Prairie Grasslands that surround the park.

In addition, USFS is a cooperating agency in preparing this elk management plan (see appendix A).

From 1985 to 1993, most of the newly reintroduced elk gathered seasonally near the reintroduction site, where they were counted. During this time, the population showed an average increase of 22% per year (see table 1), which may have been artificially high because the population was heavily skewed towards females.

Theodore Roosevelt National Park
North Dakota

National Park Service
U.S. Department of the Interior



- Park Boundary
- Park Wilderness
- USFS Lands
- ND State Lands
- Private Lands
- Points of Interest
- Interstate
- Roads
- Scenic Loop Drive
- Trails
- Railroads
- Streams

Map 2:
South Unit of Theodore Roosevelt National Park

TABLE 1. ELK POPULATION GROWTH IN THE SOUTH UNIT OF THEODORE ROOSEVELT NATIONAL PARK, 1985-1992[1]

Year	Elk	Population Growth (%)
1985	47	--
1986	63	25
1987	82	23
1988	111	26
1989	148	25
1990	176	16
1991	215	18
1992	259	17
Average Population Growth -1985-1993		22

Source: Sargeant and Oehler 2007.

[1]The original population was heavily skewed toward females, resulting in an artificially high growth rate for these years.

The rapid growth of the elk population led to concerns it could quickly become overpopulated, and could eventually have negative effects on park vegetation. As a result, a forage allocation model (Westfall et al. 1993) was developed in the early 1990s to provide park managers with a park-specific, science-based approach to establish ungulate population objectives that would maintain a healthy native plant community and provide sufficient forage for the major ungulates in the South Unit, including elk, mule deer, bison, and feral horses (*Equus caballus*) (see the "Summary of Existing Research/Modeling" section later in this chapter for more details on this model). Based on the model outputs, the park staff selected maximum population objectives for ungulates that could be managed given their relatively small population sizes (i.e., bison, feral horses, and elk). These objectives represented the point at which the NPS would implement management actions to protect vegetation and ensure adequate forage. The objective selected for elk in the South Unit was approximately 360 animals.

Elk at the park

Consistent with these management objectives, park staff reduced the elk population through roundup and translocation in the fall of 1993 when the elk population reached approximately 350. Approximately 221 elk were removed during this effort and 143 were counted during the early winter census that year (Sargeant and Oehler 2007). The elk population reached this threshold again in 2000 when early winter estimates indicated more than 410 elk in the South Unit (Sargeant and Oehler 2007). Another set of roundups and translocations were conducted in January 2000, and 203 elk were removed leaving at least 198 elk in the South Unit of the park (Sargeant and Oehler 2007). For these roundups, helicopters were used to direct elk to the South Unit handling facility, and corralled elk were then transferred off site to other federal entities, Indian tribes, and states for reintroduction programs in North Dakota, South Dakota, and Kentucky.

A third reduction, also to be achieved via roundup and translocation, was scheduled for January 2003. However, on July 26, 2002, the Director of the National Park Service issued a guidance memorandum regarding the NPS response to chronic wasting disease (CWD) of deer and elk (NPS 2002a) that effectively cancelled the 2003 roundup. CWD is a fatal neurological disease identified in free-ranging as well as captive mule deer, white-tailed deer, elk, and most recently moose (*Alces alces*). While much is still unknown about how this disease spreads among natural hosts and the long-term effects, there is the potential for long-term, population-level impacts. As a result, the 2002 Director's Guidance Memorandum on CWD established policy for managing elk or deer that exhibit signs of CWD and for proposed translocation of deer or elk from NPS units (NPS 2002a).

Although CWD has not been identified in the ungulate populations at the park, or in the state of North Dakota, an NPS memorandum prohibits translocation of elk from NPS units unless sufficient testing is conducted to detect CWD if it were present at 1% or greater prevalence.

Although CWD has not been identified in the ungulate populations at the park, or in the state of North Dakota, the memorandum prohibits translocation of elk from NPS units unless sufficient testing is conducted to detect CWD (with 99% confidence) if it were present at 1% or greater prevalence. Since this memorandum was issued, the park has not tested enough elk to make this determination. As a result, elk have not been translocated for the purposes of population reduction in the park since 2000.

Early winter, pre-calving aerial surveys were completed in 2001 and 2004 and resulted in population estimates of approximately 304 and 528 elk, respectively (Sargeant and Oehler 2007). This is an average growth of 20% annually during this timeframe. Although surveys were attempted in 2007 and 2008, the 2007 survey was cancelled because ground conditions (snow cover) were not appropriate. The 2008 survey was conducted but the timing did not allow for an accurate count (it was conducted in March when movement data collected in 2003 and 2004 indicated approximately 25% of the elk could be outside the park). Taking into account the timing, the minimum numbers of elk seen, and survey correction factors, park staff estimated there were approximately 900 elk in the South Unit in early winter of 2008.

A recently completed population model (Sargeant and Oehler 2007) accurately reconstructed the elk population growth that occurred between 1985 and 2006, taking into account survival, fecundity (reproductive capability), and removals by both hunters and the NPS. The model showed that growth varied from approximately 20% to 36% and exhibited a potential 26% rate of increase. The corresponding elk survival and reproduction rates in the South Unit were among the highest reported for an elk population (Sargeant and Oehler 2007). Park staff have no reason to expect natural mortality will increase or recruitment to decline in the near future unless the population is allowed to increase to very high levels.

PRESENT-DAY MANAGEMENT CONCERNS: POTENTIAL EFFECTS OF OVERPOPULATION

Modern-day circumstances influencing the elk population at Theodore Roosevelt National Park are much different from those prior to human dominance over the landscape. Despite attempts by NDGF to increase hunting success outside the park, such as revising hunting seasons and adding more licenses to increase hunting opportunities, recreational hunting surrounding the park has not resulted in population-level controls. Predation is also minimal because there are few species and insufficient numbers of elk predators in the area. In addition, as described in the preceding section, since the 2002 CWD policy memorandum was issued, the park has not tested enough elk to conduct translocations for the purposes of population reduction.

Nutritional restriction, which occurs as forage availability becomes limited by factors such as weather or population size, can lead to a decline in ungulate survival and recruitment rates that subsequently cause a decline in the growth of a population. However, because elk are generalists with flexible diets (Cook 2002), they are able to eat different vegetation as their preferred forage becomes limited. Consequently, elk may be able to defer the effects of nutritional restriction by broadening their diets.

Recruitment: Number of organisms surviving and being added to a population at a certain point in time.

The South Unit is surrounded by a 7-foot high woven-wire fence, with numerous natural and specially designed crossings to allow for the natural movement of most wildlife. At the time of elk reintroduction, it was believed that elk would migrate beyond park boundaries and use areas outside the park. Research indicates that some elk do migrate seasonally beyond the park boundaries (see the "Elk Movement and Distribution" section of this chapter, as well as the "Elk Population" section in chapter 3), although in much fewer numbers than expected. The park is also situated in a matrix of public and private lands managed for livestock ranching, mineral extraction, and agriculture, which likely contribute to disproportionate use of the park by elk.

The science team convened for this project (including scientists and technical experts with a scientific background in elk management, research, and range ecology; NPS staff; and others with background experience with the park or park ecosystems) discussed the consequences for ungulate populations not limited by nutrition, predation, or hunting in their recommendations for this project (Oehler et al. 2007; see appendix C of attachment 1). As described by Caughley (1970), the consequence is typically an "irruptive sequence" that involves a rapid increase in ungulate numbers over at least two generations that ultimately exceeds the forage capacity of the available habitat. The resulting effect of the persistent grazing and browsing on plants limits available vegetation resources and subsequently causes a large reduction in the size of the ungulate population (Caughley 1970).

The forage allocation model authors also recognized several limiting forage species, both shrubs and grasses, and indicated that a substantial decline in these species would be an indicator that there are too many ungulates in the South Unit (Westfall et al. 1993). This was particularly true of browse species like winterfat (*Krascheninnikovia lanata*) and chokecherry (*Prunus virginiana*), which were identified in previous studies as important components of the diet for elk, horses, and bison and likely to be adversely affected if over-utilized (Sullivan et al. 1988; Westfall 1989).

More recently, Irby and others (2002) provided an evaluation of expected vegetation trends at the park should sustained ungulate overpopulation occur. In grasslands, this included decreases in climax and other grasses, such as western wheatgrass (*Pascopyrum smithii*), thickspike wheatgrass (*Agropyron dasystacyium*), green needlegrass (*Nassella viridula*), and needle-and-thread (*Hesperostipa comata*); decreases in litter; and increases in forbs. In wooded draws, this included decreases in stems of shrubs

(green ash [*Fraxinus pennsylvanica*], chokecherry, and serviceberry [*Amelanchier alnifolia*]) 2 meters in size or less and climax grasses (Virgrinia wildrye [*Elymus virginicus*], little ricegrass [*Piptatherum exiguum*], and Sprengel's sedge [*Carex sprengelii*]); and increases in western snowberry (*Symphoricarpos occidentalis*) stems, bare ground, and introduced/invasive species. The authors also indicated that rare habitat types that support highly desirable forage species would likely be affected at lower numbers of ungulates than more common habitat types with a broader distribution of palatable species (Irby et al. 2002).

Irby and others (2002) also evaluated actual trends based on monitoring data from 1993 to 1996, and, although no conclusive patterns were observed, the following were some trends that emerged after elk were reintroduced in 1985:

- Green ash, snowberry, and stems of all shrub species in woodlands were lower in years when the elk population was greater than 300 when compared to years prior to reintroduction.
- Coverage of climax grasses in years with high elk populations was lower than compared to coverage before reintroduction of elk.
- Bare ground increased in years with high elk numbers and low precipitation (Irby et al. 2002).

As the science team discussed, the changes in vegetation can occur rapidly, and restoration after such a transition may require changes in management and a much longer period of time (Oehler et al. 2007; see "Maximum Population Size and Considerations for Preventing Undesirable Impacts to Plant Communities" section of attachment 1).

In addition to impacts on vegetation, overpopulation of elk also has consequences for elk themselves, other wildlife in the South Unit, and lands surrounding the park. As described in the "Elk Population" section of chapter 4, an overpopulated elk herd would experience increased competition, contributing to a decline in overall population health. This could include reductions in reproductive success, body condition, and other population characteristics (i.e., recruitment and juvenile survival) that would ultimately contribute to the decline of the elk population described by Caughley (1970). Competition for resources would increase energy expenditures by elk, which cause responses including elevated heart rate and metabolism, elevated levels of stress hormones, and diminished health (NPS 2006d). Overpopulation of elk could also lead to concerns about diseases such as CWD. Although not currently known to occur in North Dakota, high densities of susceptible animals, including elk, are considered an amplification factor for the disease. In other words, once such a disease is introduced, a high-density elk population increases the potential for nose-to-nose contact or environmental contamination that can increase transmission rates and cause the disease to spread faster (NPS 2007l).

Elk overpopulation has the potential to impact other wildlife that graze in the South Unit, including other ungulates. When the forage allocation model was run to allow ungulate numbers to range freely, elk numbers were always the highest because their forage intake is relatively low when compared to that of bison or feral horses (Westfall et al. 1993). The model always allocated some forage to bison, and the authors concluded that horses would have to be managed at lower levels compared to the other ungulates to maintain the diversity of species in the South Unit (Westfall et al. 1993). When the models were run with a lower bound for ungulates, most forage was allocated to elk and bison. If the lower bounds for bison and horses were raised, the model showed that the overall ungulate population decreased, although not at the same rate.

This model demonstrates the relationships between these ungulate populations, and, although forage intake by elk is relatively low, the continued growth of the elk population is expected to limit available forage over time and require the park to manage other ungulate species at lower levels. This idea is further supported by the conclusions of the science team for this plan/EIS, which indicated that high elk densities and the effects on forage availability are likely to have repercussions for the welfare of bison and feral horses, which are confined to the park by the boundary fence (Oehler et al. 2007; see appendix

C of attachment 1). This could also affect populations of unmanaged ungulate species found in the South Unit, such as mule deer (adverse effects), as well as other grazers, such as prairie dogs (*Cynomys ludovicianus*) (beneficial effects). For example, Irby and others (2002) noted that mule deer numbers declined steadily from 1989 to 1996, during which time the elk population grew to approximately 400 individuals.

Large populations of elk can cause damage to crops, hay supplies, and fences and may compete with livestock for forage. These impacts tend to increase as elk in search of available resources increase the area that they use. This issue ultimately resulted in the creation of special elk depredation management licenses to be issued to landowners around the South Unit of the park in 1997. By 2008, in response to increasing concerns raised by landowners about the number of elk on private lands and the potential for damage, the state issued additional licenses and expanded hunting time periods in the units adjacent to the park. Although this has resulted in increased hunting-related elk removals (see the "Elk Population" section in chapter 3), data are not available regarding the effects on depredation. In addition, the state manages a big game depredation fund that provides money for activities used to alleviate/minimize damage to private livestock feed supplies caused by big game animals, including manpower, technical assistance, temporary fencing, repellents, scare devices, etc.

PURPOSE OF AND NEED FOR ACTION

As reported by the science team (see appendix A in attachment 1), although the enabling legislation for Theodore Roosevelt National Park does not provide detailed guidance for natural resource management, the NPS has broad authority to manage wildlife and other natural resources within the boundaries of units of the national park system. The prevailing legal authority and guidance for management of natural resources on NPS lands is the NPS Organic Act of 1916. The Organic Act states that the NPS:

> "shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified… by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

In defining this discretion, the 10th Circuit Court of Appeals overturned a district court decision, holding in part that the NPS "need not wait until the damage through overbrowsing has taken its toll on park plant life … before taking preventative action" *New Mexico State Game Commission v. Udall*, 410 F.2d 1197, 1201 (10th Cir. 1969). This discretion has been reinforced over time. In *United States v. Moore*, 640 F.Supp. 164, 166 (S.D. W.VA. 1986), the court found Congress had given the Secretary of the Interior great discretion in regulating and controlling wildlife within the National Park System. This discretion is further defined in the NPS *Management Policies 2006* (NPS 2006a).

NPS has broad authority and an explicit mandate to actively manage wildlife, if doing so is required in order to fulfill its primary mission of conservation.

The science team acknowledged that these management policies provide a service-wide framework for natural resource management in all park units (see appendix A in attachment 1). These policies state that the NPS will strive to maintain "natural conditions" associated with all the components and processes of naturally evolving park ecosystems. Section 4.1 of the NPS *Management Policies 2006* uses the word "natural condition" to describe the condition of resources that would be present in the absence of human dominance over the landscape.

The NPS is concerned that an unchecked elk population at Theodore Roosevelt National Park would create conditions that do not reflect those present prior to human dominance over the landscape. This could include impacts to grassland vegetation that would require restoration, which is inconsistent with direction in Section 4.1 of the NPS *Management Policies 2006* which state that the NPS will manage the components and processes of park ecosystems for natural conditions to prevent resource degradation, and any subsequent need for restoration.

NPS Management Policies 2006 directs the National Park Service to maintain "natural conditions" – defined as the condition of resources that would be present in the absence of human dominance over the landscape – to prevent resource degradation and any subsequent need for restoration.

These impacts could also ultimately lead to the impairment of grassland vegetation in the South Unit, as well as impacts to the elk themselves, other wildlife and wildlife habitat, and surrounding lands. The potential impairment that could occur without management of the elk population is prohibited by the Organic Act of 1916, as described in the NPS *Management Policies 2006.* As defined by Section 1.4.4 of the NPS *Management Policies 2006*, this is the cornerstone of the Organic Act of 1916, and ensures that park resources and values will continue to exist in a condition that will allow the American people to have present and future opportunities to enjoy the park resources.

These policies allow for active management of biological or physical processes to restore them to and maintain the closest approximation of a natural condition possible. Section 4.4.2 states that "[w]henever possible, natural processes will be relied upon to maintain native plant and animal species and influence natural fluctuations in populations of these species. The Service may intervene to manage populations or individuals of native wildlife species only when such intervention will not cause unacceptable impacts to the populations of the species or to other components and processes of the ecosystems that support them." In addition, the policy restricts management to times when certain conditions exist. One such condition is when "a population occurs in an unnaturally high or low concentration as a result of human influences (such as loss of seasonal habitat, the extirpation of predators, the creation of highly productive habitat through agriculture or urban landscapes) and it is not possible to mitigate the effects of the human influences."

The elk population at Theodore Roosevelt National Park has the potential to quickly reach unnaturally high levels due to the absence of effective predation and the presence of the high quality habitat found in the park and surrounding agricultural areas. This could lead to resource degradation that would require restoration. Active management of elk to avoid these effects is consistent with guiding policies. However, as part of any animal population management action, the NPS is required to follow an established planning process, including provisions for public review and comment. NPS *Management Policies 2006* require that parks "assess the results of managing plant and animal populations by conducting follow-up monitoring or other studies to determine the impacts of the management methods on nontargeted and targeted components of the ecosystem" (section 4.4.2). This strategy is described in this plan including specific thresholds for taking action and end points on management actions.

Purpose of the Plan

The purpose of this plan/EIS is to develop and implement an elk management strategy compatible with the long term protection and preservation of park resources.

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Need for Action

As a result of past and current actions within and beyond Theodore Roosevelt National Park, several conditions have led to the increase of the park elk population to the approximately 900 that occur there today. As described previously in this chapter, these conditions include only a few species and insufficient numbers of elk predators to effectively control the elk population in the park; public hunting outside the park which does not appear to control population size within the park; high reproductive, survival, and population growth rates; lack of elk mortality such as winter kill; and the inability of the park to translocate elk without testing to show that the NPS is 99% confident that CWD would be detected if present in 1% or more of the population. These conditions are expected to continue and the population is projected to increase. Large populations of elk could, over the long term, affect plant communities and other resources as a result of sustained, heavy grazing. Large elk populations could also affect other herbivores by competing for forage. Other considerations include land use and users outside the park, including livestock grazing, hunting, and agriculture; visitors to the park; and the ability of the park to effectively manage resources.

As a result of these concerns, an elk management plan is needed:

- To prevent elk-related undesirable adverse impacts to natural resources in the park consistent with NPS policy;
- Because elk population growth is largely unchecked by controls such as natural predation, hunting, and nutritional restriction;
- To consider the concerns of area land owners and other land managers;
- Because the park has a responsibility to manage the elk population within the park as outlined in agreements with the USFS and NDGF; and
- To reevaluate current objectives and management options given the 2002 Director's Guidance Memorandum on CWD (NPS 2002a).

OBJECTIVES IN TAKING ACTION

Any plan the park develops must be consistent with the laws, policies, and regulations that guide the NPS. In addition, specific objectives have been identified for elk management at the park. Objectives are more specific statements of the plan's purpose, as stated in the "Purpose of the Plan" section of this chapter, and help resolve the need for action. An alternative must meet the objectives to a large degree for it to be considered "reasonable" and for this plan to be considered a success. Objectives for elk management are grounded in the park's purpose and significance and are compatible with the direction and guidance provided by both the general management plan (NPS 1987) and current strategic plan for the park.

The following objectives were developed for this plan/EIS.

- Prevent major adverse impacts to physical and biological components of the park and surrounding environments.

  Any elk management strategy implemented by the park must address the potential effects associated with sustained, heavy grazing in high elk use areas of the South Unit. Sustained, heavy grazing can expose soils largely susceptible to erosion and has the potential to cause the degradation of native grassland communities, including impacts to native grasses and other species that are important forage and habitat for wildlife in the South Unit.

- Develop and implement actions consistent with the guidance and bounds set by the NPS *Management Policies 2006*.

  As described throughout this chapter, several NPS management policies relate to restoring and maintaining native species; the need for active management of biological resources; the recognition of parks as part of larger ecosystems and the need for cooperation with others when managing resources; the need for monitoring the outcomes of management actions; applying appropriate population management techniques; and using scientifically valid information to guide decisions on population reductions, if necessary. Any proposed elk management actions must be designed to ensure consistency with these policies.

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- Establish indicators to guide management of elk.

  During development of this plan/EIS, the NPS determined several factors that influence the need for taking elk management actions, or for changing the course of action. These included the elk population size and impacts to vegetation in elk use areas of the South Unit. In this context, any proposed elk management strategy must include an adaptive management strategy that identifies "thresholds" that would trigger actions, monitors the effects of those actions, and adjusts actions to help meet desired outcomes.

- Minimize scope or frequency of manipulating the elk population in the park, while maintaining long-term elk population viability.

  Proposed management strategies should limit the disturbance to the elk population by minimizing the number of animals handled/removed (scope) or the number of actions that must be taken over the life of this plan/EIS (frequency). Minimizing the scope or frequency of actions could also reduce the personnel and financial commitments required by the elk management program. These goals cannot be reached together because some options may have smaller scopes initially, but would require more frequent, small-scale treatments over the life of a plan. Other options with larger initial scopes may require less frequent treatments over the life of the plan, but the subsequent efforts would be relatively large-scale.

- Incorporate management flexibility to account for information obtained regarding wildlife disease or other factors influencing elk populations.

  In addition to the indicators described above, the potential detection of CWD in the elk population and the availability of a willing recipient that meets specific criteria (for actions that involve translocating animals) could affect implementation of elk management strategies. Other ungulate populations in the South Unit may need to be managed differently to account for

changes in the elk population, or other environmental factors that could influence the availability of forage (e.g., weather). As a result, the options for elk management must have contingencies for disease detection and other changes that could affect the selected course of action.

- Provide public outreach opportunities to inform the public of the complexity of managing elk within the park.

  Educating the public, including park visitors, is important to communicate the need for elk management at the park, and to explain the rationale for the strategies that are ultimately implemented. Multi-media public outreach efforts often serve an important role by eliminating misconceptions and promoting an understanding of the issues at hand. Therefore, enhanced public outreach is essential to any strategy selected by the NPS for management of elk in the South Unit.

- Coordinate and cooperate with stakeholders, such as other federal agencies, state, and private entities, including sharing data on the elk population and its management.

  As mentioned before, NPS management policies recognize park units as components of larger ecosystems that extend beyond a park's boundaries. As a result, coordination and cooperation with surrounding land managers and land owners is important to the success of this plan/EIS. The National Park Service has obligations under memorandums of understanding with the NDGF and the USFS. Therefore, NPS elk management strategies must facilitate the needed coordination and cooperation with these stakeholders to achieve their goals as well as the obligations under any agreements in place.

- To the extent practicable, enhance elk hunting opportunities on the lands surrounding the park.

  Although not allowed in the park under current laws and regulations, recreational hunting is a tool used by the state of North Dakota for elk population management outside of the park. Understanding this and the fact that elk move beyond the park boundary, increased hunting opportunities outside of the park would help reduce the number of animals that must be managed by the NPS. As a result, elk management strategies should involve methods for enhancing hunting outside of the park, and would be determined in collaboration with any state efforts.

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DESIRED CONDITIONS

To meet the objectives of preventing major adverse impacts to physical and biological components of the park and surrounding environments, and developing and implementing actions consistent with the guidance and bounds set by the NPS *Management Policies 2006*, the planning team identified a desired condition for the South Unit related to the condition of vegetation and size of the elk population. As described previously, the Organic Act of 1916 and NPS *Management Policies 2006* require that the NPS manage resources in natural conditions, to prevent the need for restoration and leave them unimpaired for the enjoyment of future generations. The policies also acknowledge that park units are parts of much larger ecosystems, and that management of resources should occur within this context (NPS 2006a).

As a result, the desired condition for the South Unit of Theodore Roosevelt National Park is a lightly grazed, mixed-grass prairie system that contributes to the regional diversity historically found in the

northern plains. To accomplish this, the science team recommended the park use the forage allocation model (Westfall et al. 1993) to identify elk population levels that would help meet this desired condition (see following "Elk Population Level" section and appendix B of attachment 1 for a more detailed evaluation of why this model was recommended for use).

A "Lightly Grazed System"

The park is situated in a matrix of public and private lands managed for livestock ranching, mineral extraction, and agriculture. Many of the vegetation studies conducted in the park and the adjacent Forest Service lands over the last 40 years were conducted prior to the introduction of elk in the park in 1985 (Nelson 1961; Sanford 1970; Hladek 1971; Williams 1976; Aipperspach 1980; Hansen et al. 1980; Wali et al. 1980; Mastel 1982; Butler and Goetz 1984; Girard 1985; Hirsch 1985; Butler et al. 1986). One of these studies used the park as an example of a non-grazed or lightly grazed condition (Butler and Goetz 1984), which are analogous to late seral stages. The USFS defines seral stage as "the sequence of a plant community's successional stages to potential natural vegetation" (USDA Forest Service 2002).

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Because many of the surrounding lands are subject to cattle grazing, managing the South Unit to reflect lightly grazed conditions or late seral stages would contribute to the range of variation found historically in the pre-Columbian Northern Great Plains. This would be consistent with the guidance described previously to manage for natural conditions, which are described in Section 4.1 of the NPS *Management Policies 2006* as the condition of resources that would be present in the absence of human dominance over the landscape. Some might argue that late seral stages, or lightly grazed or ungrazed lands, are not "natural" in the Northern Great Plains; however, Kay (1998) suggested that much of the Great Plains was lightly grazed, due in large part to the removal of ungulates by native people. Based on the reports and journals of early explorers, on ecological theory and models, and on existing natural areas, it is fairly well accepted by the scientific community that the pre-Columbian Great Plains was a temporally and spatially dynamic mosaic of grassland seral stages, a product of fire, grazing, weather, soil, and other factors (Collins and Glenn 1995, Knapp et al. 1999, Fuhlendorf and Engle 2001). In addition, Samson and others (2003) recommended that the Little Missouri National Grassland, which occurs in the vicinity of the park, maintain 29% to 46% of its grasslands in "high" structural categories, analogous to late seral stages. This would result in a mix of conditions, including a large portion reflecting a lightly grazed system or late seral stages.

Although numerous vegetation studies have been conducted in the park, quantitative data on seral stage is very limited (Oehler et al. 2007). Park staff have only recently begun collecting baseline data, and will continue vegetation monitoring to quantify current seral stage. Once seral stage has been characterized, the NPS could ultimately develop quantitative desired conditions for vegetation beyond the desire to maintain lightly grazed conditions. These goals may not be as precise as those identified by the USFS, but would ultimately allow managers to better consider the park in a regional context with other adjacent lands, to better evaluate its contributions to biodiversity, and to better evaluate the efficacy of its management actions relative to these goals (Oehler et al. 2007; see appendix A of attachment 1). Until such desired conditions are established and the park can monitor to determine whether or not they are being met, the science team recommended that elk population levels be managed consistent with the forage allocation model (Westfall et al. 1993) developed for ungulates in the South Unit of the park, as described in the next section (see "Maximum Population Size and Considerations for Preventing Undesirable Impacts to Plant Communities" section and appendix B of attachment 1).

Elk Population Levels

Unlike other parks with populations of ungulates that require management (e.g., Rocky Mountain National Park, Catoctin Mountain Park), there has been no overt degradation of plant communities in the South Unit as a result of overuse. The science team has attributed this to past management of elk, as well as other ungulates, since their reintroduction in 1985 (see "Maximum Population Size and Considerations for Preventing Undesirable Impacts to Plant Communities" section of attachment 1). To continue to protect vegetation, prevent degradation, and avoid the need for restoration (as required by NPS *Management Policies 2006*), the science team recommended using the Westfall et al. (1993) forage allocation model to identify the initial maximum elk population objectives for this (plan/EIS). Ultimately, these objectives could be changed as described in the "Potential Adaptive Management Approaches" section of chapter 2.

Although this model was recently reviewed (Irby et al. 2002) and limitations were identified, the science team explained their rationale for its continued use, including the fact that these limitations are not uncommon in modeling; the model was developed specifically for ungulates in the South Unit of the park; it captures the key features of forage allocation for elk and other ungulates; and it has proven useful for maintaining plant communities that contribute to regional biodiversity (Oehler et al. 2007; see appendix B of attachment 1 for a more detailed evaluation of why this model was recommended for use). As described in the "Summary of Existing Research/Modeling" section later in this chapter, the target populations selected from the model would be limited to use of no more than 35% of any one forage species. By applying this light-to-moderate use level during the growing season, it is expected that the South Unit would reflect the desired condition of a lightly-grazed, late seral stage system. Considering the factors applied during the model runs (e.g., removal of forage species, numbers of other ungulates) and their related outputs, the park staff had selected a maximum population objective of approximately 360 elk for the South Unit of the park. The science team recognized this as an estimate and recommended a maximum population of 400 elk (Oehler et al. 2007), which is slightly more conservative and also helps meet the objective of minimizing scope and frequency of elk management actions (please see "Maximum Population Size and Considerations for Preventing Undesirable Impacts to Plant Communities" section of attachment 1 for more details)

When considering a minimum population size, the science team reviewed elk population growth from the time elk were reintroduced to the South Unit in 1985, studies on genetic diversity, and movement data that indicated there is an exchange of individual elk between those found at the park and those in the Killdeer Mountains of North Dakota and the Missouri Breaks of Montana. They concluded the elk population could be managed at less than 100 animals without adverse impacts related to population persistence, lack of genetic variability, and the effects of inbreeding (Oehler et al. 2007). The science team also considered whether or not the elk population could be reduced further than 100 elk, but they acknowledged that population estimates are subject to substantial sampling error, and overestimation of the population size could lead to larger reductions than desired (Oehler et al. 2007). Please see the "Minimum Population Size" section of attachment 1 for more details.

Therefore, based on past management of the elk populations and recommendations of the science team, the NPS would manage the elk population between a minimum of 100 and a maximum of 400 elk to meet the desired condition of a lightly grazed system. The science team recommended that these targets be based on numbers of elk seen during late winter (pre-calving) annual surveys, to minimize the potential for larger reductions than desired (see the "Population Objectives and Population Estimates" section of attachment 1). Managing elk based on this range would allow the elk herd and associated grazing pressure to fluctuate within a range of variability that would be consistent with management toward natural conditions required by NPS *Management Policies 2006*. It would also provide flexibility to implement management actions at any point within this range, depending on monitoring results. However, for the purpose of this plan/EIS, the alternatives discussion in chapter 2 and the impacts analysis in chapter 4

assume initial reduction actions would result in population sizes near the minimum and maintenance actions would generally be taken when the population approaches the maximum.

THRESHOLD FOR TAKING ACTION

The action alternatives (B, C, D, E, and F) were developed to support the desired conditions discussed previously. Each of these alternatives requires two types of elk population management actions: initial reduction and population maintenance (Note that alternative F, which is a fertility control alternative, is only recommended for maintenance, and would be used in combination with one of the other alternatives. For more information, see discussions in "Chapter 2: Alternatives."). To meet the objective of establishing indicators to guide management of elk, the park has determined when a selected management action should occur, also known as the threshold for taking action.

Based on management of elk and other ungulates since elk were reintroduced to the park in 1985, and the science team's conclusion that there has been no overt degradation of the vegetation in the South Unit when ungulates have been managed at these levels (Oehler et al. 2007; see "Maximum Population Size and Considerations for Preventing Undesirable Impacts to Plant Communities" section of attachment 1), the threshold for taking action for this plan/EIS is the maximum population level – 400 elk – recommended by the science team based on consideration of the forage allocation model (Westfall et al. 1993; see appendix B of attachment 1 for a more detailed evaluation of why this model was recommended for use).

Because the forage allocation model provides a park-specific, conservative, science-based approach that appears to have been a responsible strategy for maintaining the long-term health of the plant community (Oehler et al. 2007; see "Maximum Population Size and Considerations for Preventing Undesirable Impacts to Plant Communities" section of attachment 1), as well as the viability of ungulate populations, it is expected that management of the elk population at such levels would meet the desired condition of this plan/EIS to maintain a lightly grazed system. As a result, annual elk population surveys would be conducted (see appendix B) and the minimum elk seen would be used to determine whether the threshold has been met.

The science team investigated the possibility of monitoring vegetation indicators for changes that would prompt the management of the elk population at Theodore Roosevelt National Park. This monitoring would include both an evaluation of current ecological condition (seral stage) and trend, indicating the direction of change from a desired condition (Oehler et al. 2007; see "Maximum Population Size and Considerations for Preventing Undesirable Impacts to Plant Communities" section of attachment 1). As mentioned previously, limited data exists on the current state of vegetation communities in the South Unit, and it would therefore be difficult to determine an appropriate trend, and whether or not the monitoring results are consistent with desired conditions.

In addition, difficulties arise because plant communities do not respond immediately to the effects of herbivory and forage production is subject to considerable environmental variation. Additional complications for using vegetation indicators exist at Theodore Roosevelt National Park because (1) the herbivore community includes not only elk, but also bison, feral horses, white-tailed and mule deer, prairie dogs, pronghorn, and a number of other species with diverse and flexible dietary requirements; (2) numbers of wild herbivores vary annually and are not known with certainty; (3) the landscape is complex and varied, the plant communities are diverse, and the distribution of herbivore activity is uneven; and (4) annual variation in environmental conditions (e.g., rainfall and forage production) is substantial (Oehler et al. 2007; see appendix C of attachment 1).

Grazing, drought, fire, or absence of fire acting singly or in combination can cause fluctuations in plant community composition and cause changes in the seral stage of a plant community. Such fluctuations are within the range of natural variation and are often used to define the dynamic equilibrium boundaries or state for a particular plant community (Herrick et al. 2005; USDA-NRCS 2003). However, plant

communities are often subjected to disturbances outside the natural range of variation, which alters the ecological condition of the community and transitions it into another relatively stable state. Heavy grazing can accelerate the transition process, especially when combined with drought conditions.

Given the rate at which the elk population in the park is growing and the undesirable consequences it would ultimately have for plant communities in the park, the science team recommended the park should not delay management of the elk population until baseline vegetation conditions are characterized, quantitative goals are developed, and trend data are evaluated (see "Maximum Population Size and Considerations for Preventing Undesirable Impacts to Plant Communities" section of attachment 1).

PROJECT SITE LOCATION

Theodore Roosevelt National Park lies in the Little Missouri Badlands of western North Dakota. This 70,447-acre park is divided into the North Unit (24,070 acres), the South Unit (46,159 acres), and the Elkhorn Ranch Unit (218 acres) (see map 1). Both the North and South units are fenced to keep bison in these units of the park and to exclude cattle. Land ownership surrounding the park is a mosaic of USFS, private, and state lands. These areas are characterized by agricultural land uses, primarily livestock grazing, as well as land uses associated with oil and gas production. A central, unifying feature of the park is the free-flowing Little Missouri River, which meanders through the South and North units and forms the eastern boundary of the Elkhorn Ranch Unit.

The South Unit and Elkhorn Ranch Unit are in Billings County, and the North Unit is in McKenzie County. Interstate 94 runs along the southern boundary of the South Unit. It provides access to the park, as well as to Medora, North Dakota, the primary gateway community to the South Unit. U.S. 85 runs north to south, east of the South Unit, and provides access to the North Unit of the park approximately 50 miles north of Belfield and 15 miles south of Watford City. The Elkhorn Ranch Unit can be accessed from gravel roads and requires crossing the Little Missouri River if traveling from the east. Other towns and communities in the vicinity of the park include Grassy Butte, Fairfield, and Fryburg (map 1).

Because elk are primarily found in the South Unit of the park (map 2), elk management actions proposed in this plan/EIS would only be applied in this part of the park. As a result, the discussion of the affected environment and potential effects for this plan/EIS is limited to those resources that may be affected by these activities in the South Unit. However, it is important to note that should elk ever become established in the other units of the park, the tools discussed in this plan/EIS would likely be available for elk management in these areas, but would be subject to additional planning and compliance with the *National Environmental Policy Act* (NEPA), as well as other regulations.

PARK BACKGROUND

Theodore Roosevelt National Park Enabling Legislation

The natural resources in what is now Theodore Roosevelt National Park played an important role in shaping the life of Theodore Roosevelt during the era of the open range cattle industry and, consequently,

influenced his role as a conservationist while President of the United States. However, none of the legislation establishing or expanding the park specifically addressed elk management. The park had its beginnings in August 1934, when Civilian Conservation Corps (CCC) camps, under the sponsorship of the North Dakota State Historical Society and the direction of the NPS, began work in what was often called the Roosevelt Regional State Park. In 1934, a federal relief program was initiated to purchase lands from farmers wanting to sell. In the badlands, these sub-marginal lands were converted to government grazing pastures and made available for park development in the form of Roosevelt Regional Park, which was later designated a Recreational Demonstration Area administered by the NPS.

On April 25, 1947, a locally supported congressional bill that became Public Law (PL) 38 (61 Stat. 52) established the area as Theodore Roosevelt National Memorial Park. As enacted under this law, lands were "dedicated and set apart as a public park for the benefit and enjoyment of the people," subject to the provision of the act of 25 August 1916 (39 Stat. 535), entitled an *Act to Establish the NPS* "…which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." The act of 10 June 1948 (62 Stat. 352) amended the act that established the Theodore Roosevelt National Memorial Park, added more land, and also corrected the description of the Elkhorn Ranch Unit lands. When reporting on the bill to establish Theodore Roosevelt National Memorial Park, the Committee on Public Lands recognized the threefold value of the North Dakota Badlands: the natural features of scenic and scientific interests, the historical value, and the recreational potential.

The act of 12 June 1948 (62 Stat. 384) added the North Unit to the park, while the act of 24 March 1956 (70 Stat. 55) added lands on the north side of the town of Medora, North Dakota for park headquarters development. This act also authorized the Secretary of the Interior to make future boundary adjustments along U.S. 10 and U.S. 85, due to realignment with certain acreage limitations. The secretary adjusted the boundaries in 1963 to conform to the realignment of U.S. 10, now reconstructed and designated Interstate 94. This excluded 398 acres from the park and added 459 acres.

The act of 10 November 1978 redesignated the memorial park as Theodore Roosevelt National Park (PL 95-625, 92 Stat. 3467); designated 29,920 acres within the park as wilderness; and authorized a boundary adjustment at the North Unit to add about 146 acres to and remove approximately 160 acres from the park. At present, there are 19,410 acres of wilderness in the North Unit and 10,510 acres in the South Unit.

Purpose and Significance of Theodore Roosevelt National Park

All units of the national park system were formed for a specific purpose and to preserve significant resources or values for the enjoyment of future generations. The purpose and significance statements identify uses and values that individual NPS plans should support.

Purpose

The purpose of Theodore Roosevelt National Park is reflected in the legislative intent of the park summarized in the following statements.

- Memorialize and pay tribute to Theodore Roosevelt for his enduring contributions to the conservation of our nation's resources;
- Conserve, unimpaired, the scenery and the natural and cultural resources, and facilitate scientific interests in the park;
- Provide for the benefit, use, and enjoyment of the people; and
- Manage the Theodore Roosevelt Wilderness as part of the National Wilderness Preservation System.

Significance

The significance of Theodore Roosevelt National Park is summarized in the following statements, capturing the essence of the park and its importance to our nation's natural and cultural heritage.

- The colorful North Dakota badlands provide the scenic backdrop to the park, which memorializes Theodore Roosevelt for his enduring contributions to the conservation of our nation's resources;
- The park allows people to enjoy panoramic vistas and a sense of solitude, inspiration, and timelessness similar to Theodore Roosevelt's experience in the Dakota Territory in the 1880s;
- The park provides an opportunity to learn about an environment and way of life that helped shape Theodore Roosevelt's attitudes and philosophy regarding conservation;
- The Little Missouri River has shaped the land which is home to a variety of prairie plants and animals including bison, elk, bighorn sheep, and prairie dogs;
- A significant park experience is created by the interplay of natural forces, including weather, vegetation, wildlife, vistas, smells, color and shape of landform, air quality, varied light, and seasons;
- The park contains one of the few islands of designated wilderness in the Northern Great Plains;
- The park is the most popular visitor attraction in North Dakota and provides significant economic and employment benefits for the state and region;
- Ongoing geological forces create spectacular examples of badlands and provide opportunities for visual interpretation of erosion processes;
- The park is designated as a Class I air quality area (*Clean Air Act* Amendments, 1977), providing for clean air, brilliantly clear day and night skies, and outstanding examples of a relatively unpolluted environment;
- Important cultural resources associated with prehistoric and historic occupation and use attest to millennia of human interaction with the rugged badlands environment;
- The park is a prime example of ecosystem restoration in progress, including reestablishing native flora and fauna and managing exotic species; and
- The park has one of the largest petrified forests in the United States, providing outstanding examples for visitor viewing.

SUMMARY OF EXISTING RESEARCH/MODELING

Since elk were reintroduced in 1985, park staff and other researchers have conducted numerous studies monitoring characteristics of the elk population within the park, including associated vegetation research. When the NPS initiated this elk management plan, a number of the scientists and technical experts were invited to become part of a science team to assist in providing technical background information and research references for this plan. The team participants were limited to people with a scientific background in elk management, research, and range ecology; NPS staff; and others with background experience with the park or park ecosystems. Team participants are listed in the "Chapter 5: Consultation and Coordination."

The NPS assembled a science team to provide technical background information and research references for this plan. The team recommended the continued use of the existing forage allocation model for the South Unit to identify elk population levels that would maintain healthy plant communities for elk and other wildlife.

Since the spring of 2005, the science team has formally communicated on 12 occasions, including two face-to-face meetings and numerous conference calls. Smaller working groups have met informally, primarily through conference calls, to address specific issues as well. Topics of discussion included:

- The concept of carrying capacity and its implications for management of elk at the park;
- The policy regarding natural resource management in the NPS;
- Ecological modeling in general (e.g., application, limitations, etc.) and the forage allocation model used by the park to establish ungulate objectives;
- An adaptive strategy (protocol) for monitoring effects of herbivory on plant communities;
- Technical questions received during November 2004 public scoping;
- Existing conditions at the park;
- Alternatives for implementing management actions;
- Thresholds for determining when actions should be taken; and
- Desired conditions.

The results of the science team discussions, and their recommendations for this plan/EIS, are provided in attachment 1.

Forage Allocation Model

In 1993, a model was developed for the allocation of forage resources to the four most numerous ungulate species in Theodore Roosevelt National Park: mule deer, bison, elk, and feral horses. The park managers' objective was to use this science-based model to identify elk population levels that would maintain healthy plant communities and ensure adequate forage was available for all ungulates. In the model, forage was allocated based on food habits only within the growing season, because this is when plants were most susceptible to grazing damage. The model takes into consideration the types of vegetation in the park, the vegetative production of the major dietary items used by ungulates (i.e., edible biomass produced during the growing season); the percentage of allowable use of each dietary item; the food habits of each ungulate; and the average forage intake during the 6-month growing season for a typical animal of each ungulate species (Westfall et al. 1993). These inputs were characterized from existing research or literature and applied to the model designed specifically for this park.

An important constraint underlying the development of the forage allocation model for Theodore Roosevelt National Park was the application of a 35% allowable use factor when calculating use for ungulate species. By applying this allowable use factor, the target populations selected from the model would be limited to using no more than 35% of any one forage species considered in the model. By applying this light-to-moderate use level during the growing season, ample forage would be left over for fall and winter use. While this may have been conservative, the modelers felt it was better to err on the side of underuse than overuse (Westfall et al. 1993).

The model was run with a variety of boundaries set:

- Allowing all ungulate numbers to range freely (with the exception of the mule deer population, which was set at 824 animals for all model runs based on estimated density from aerial surveys);
- Allowing elk numbers to range freely while setting upper and lower bounds for horses and bison based on population levels at the time;
- Allowing elk numbers to range freely while changing bison and feral horse numbers in increments of 50; and
- By sequentially removing limiting forage species (Westfall et al. 1993).

Based on the model outputs, to maintain a healthy native plant community and provide adequate forage for all ungulates, the park staff selected a maximum population objective of approximately 360 elk for the South Unit at the park.

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Elk Population Research

Starting in 2000, the NPS and U.S. Geological Survey (USGS) began studying the elk population at Theodore Roosevelt National Park. To date, elk research projects at the park have focused on three primary areas of interest:

- Survey methods – develop methods for counting elk accurately by evaluating the potential for monitoring elk populations via sighting-rate models for fixed-wing aircraft.
- Population processes and dynamics – determine those factors that influence elk populations by estimating vital rates and developing population projection models.
- Movement and distribution – document and model the movements and distribution of elk that winter within the park.

In addition, research into the diet of elk, as well as elk use of water developments (drinking water sources for wildlife) in the park, is currently ongoing. The following sections provide summaries of the research related to population processes, dynamics, movement, and distribution, as well as the diet and water development research. While survey methodologies that provide accurate population counts are an important part of elk management, their development is not described as the process does not provide insight into the elk population or its effects on the environment.

Population Dynamics

A 2007 report documented the results of studies to estimate vital rates, including pregnancy rates, survival rates, age ratios, and sex ratios in the elk herd at Theodore Roosevelt National Park. These data were combined in a population model that was compared to observed elk numbers and population ratios. The report also discusses the management implications associated with the results of the studies (Sargeant and Oehler 2007).

Elk pregnancy rates were estimated based on blood samples obtained from 373 female elk (of known age classes, 162 of which the actual ages were known) captured in 1993, 2000, 2001, and 2003 to 2006. Survival rates were estimated based on data collected during studies from 2000 to 2005 for 184 females and 24 males. Estimations of age and sex ratio were based on data collected from 177 antlerless elk during the 1993 and 2000 roundups (Sargeant and Oehler 2007). Details regarding the results are provided in the "Elk Population" section of chapter 3.

Elk Movement and Distribution

During 2003 to 2004, 70 female elk older than 1 year-of-age were collared with global positioning systems (GPS) (29 in 2003 and 41 in 2004) to track their movement and distribution. Measurements were taken at 7-hour intervals so that 3 to 4 locations could be recorded per elk per day, distributing the sampling throughout the day and night. Measurements were taken every 15 minutes only 1 or 2 days a month to document movements in relation to features such as water sources and fence crossings (Sargeant et al. 2005). In 2005 and 2006, 34 and 33 elk, respectively, were marked with collars for tracking movement and distribution. Neither the 2005 nor the 2006 data have been analyzed and, as a result, the discussions in the "Elk Population" section of chapter 3 focus on the 2003 and 2004 data.

The results of the study provided insight into the seasonal movement of elk within and outside the park, and more specifically, within three distinct areas of the park (Sargeant et al. 2005):

- West River Area, including areas west of the Little Missouri River (encompassing Petrified Forest Plateau, Big Plateau, and Knutson Creek);
- Central Area, encompassing the area inside of the Auto Tour Loop (encompassing Scoria Point, Jones Creek, and the lower reaches of Paddock Creek); and
- Eastern Area, extending from the eastern limits of the Auto Tour Loop to the eastern park boundary (encompassing Buck Hill, Peck Hill, Painted Canyon Overlook, and the upper reaches of the Paddock Creek Drainage).

It is important to reiterate these findings are preliminary and will be investigated further in light of the 2005 and 2006 data.

Comprehensive Diet Study of Ungulates

The park initiated a comprehensive diet study of ungulates (bison, feral horses, elk, pronghorn, and mule and white-tailed deer) in 2003. This study, expected to conclude in 2008, continues to examine the diets of a subset of the elk population (targeted collections outside the park using radio-collared elk) that seasonally migrate outside the South Unit of the park from April through November, and describes and quantifies dietary overlap of managed ungulates (primarily elk, bison, and feral horses). The data collected in this study may be used to update the forage allocation model discussed previously.

Ungulate Use of Water Developments at Theodore Roosevelt National Park

The NPS maintains 13 water developments in the South Unit of the park, primarily as drinking water sources for ungulate populations. Because the NPS has determined that water developments should be maintained in Theodore Roosevelt National Park only if they serve a compelling need, a study was initiated to determine whether these developments are serving their intended purpose. Using remote camera systems to estimate frequencies of water development use by ungulates, the study seeks to determine which developments are used routinely. Finally, changes in plant community composition are examined to determine if herbivory associated with the use of water developments may be influencing plant succession.

The data collected for this research during the summers of 2003 and 2004 have not been analyzed fully to date. However, based on observation of photos from the remote camera systems and locational data recorded using GPS (see the "Elk Movement and Distribution" section in this chapter), the initial results of this study indicate that elk rarely use water developments within the South Unit of the park.

Vegetation Research

Elk and other ungulates forage and take cover in plant communities in the park, with varying degrees and kinds of impacts on vegetation.

While a body of literature exists regarding elk and ungulate effects on plant communities, this section focuses on studies conducted at the park to correlate elk use of and impacts to vegetation. In addition to studies conducted specifically for these purposes, this section provides data collected as part of other studies (e.g., movement and distribution).

Habitat and Plant Community Use

Five elk (three males, two females) were radio-collared shortly after they were reintroduced (from 1985 to 1987) to monitor, among other things, habitat usage. Each elk was tracked and locational data recorded in the field, as well as the habitat type being utilized at the time of observation. If it was not possible to record the habitat type in the field, the locational information was used with a habitat overlay map to identify the type (Sullivan et al. 1988). The study showed elk use of hardwood and Rocky Mountain juniper (*Juniperus scopulorum*) draws from June 1985 to January 1988 for midday cover and browse, noting that hardwood draws received heavy daytime use during the first summer (1985) of monitoring, while Rocky Mountain juniper draws were used the second summer (1986). Grassland habitats were primarily used during evening from late spring through early fall when elk did not seek out wooded habitats for cover. Upland grasslands received considerable use in every season, but were most important in winter (Sullivan et al. 1988).

Movements of eight elk (three male, five female) were monitored from 1987 to 1988 using radio collars and telemetry to relocate them and record their locations. Information on vegetation was recorded for each site, and locational data was used to identify habitat types on an overlay map (Westfall 1989; Westfall et al. 1989). The research reported habitat selection by elk in the park varied among sex and age

classes. Adult and yearling males preferred rougher terrain and were observed using breaks[1] 40% of the time. In general, elk preferred to forage in open grassland habitats in all seasons, and Rocky Mountain juniper draws were used for overhead cover during spring and summer. Unlike historical accounts of elk in North Dakota, the reintroduced population at the park did not extensively use riparian areas (Westfall 1989; Westfall et al. 1989).

More recently, movement data collected in 2003 and 2004 has been analyzed in relation to plant associations (communities) mapped for the park (Sargeant et al. 2005). The research examined elk use of those plant associations that covered more than 1% of the park and determined the percent of GPS locations recorded in each one. Elk marked for the study were captured in the western, central, and eastern portions of the park. Several GPS locations were recorded at 15-minute and 7-hour intervals and related to the plant associations classified in a 2000 report from the U.S. Geological Survey – National Park Service Vegetation Mapping Program (Von Loh et al. 2000).

The results of this research show disproportionately high rates of use for green ash, juniper, prairie dog town, and western snowberry communities, and relatively low rates for broom snakeweed (*Gutierrezia sarothrae*), western wheatgrass, silver sage (*Artemisia cana*), and sumac (*Rhus trilobata*) communities. However, seasonal patterns were also identified that are still under investigation, including overall and/or seasonal use of communities dominated by needle-and-thread, crested wheatgrass (*Agropyron cristatum*), juniper communities, and green ash vegetation communities (Sargeant et al. 2005). Further details regarding the results are provided in the "Vegetation" section of chapter 3.

Vegetation Impacts

A 1988 study evaluated impacts of elk on hardwood and Rocky Mountain juniper draws in Theodore Roosevelt National Park by placing twelve permanent transects in these habitat types beginning in the summer of 1985 (Sullivan et al. 1988). Six transects were placed in areas heavily used by elk and six were placed in areas of the park that elk were not expected to reach by 1986. Grazing effects on shrubs were noted and tree densities measured for all transects. The results indicated hardwood draws in high elk use areas experienced higher use during the summer of 1985 when compared to the juniper draws. The authors speculated higher use might have been related to drought conditions in 1985 and the presence of an undeveloped spring and nearby dish tank (free-flowing wells with an open tank for collecting and storing water for livestock/wildlife use). The study identified particular elk browse species, but did not detect any differences in plant use in juniper draws between elk use and non-elk use areas.

Research investigated change to specific vegetation communities within the park by establishing 24 transects (12 in hardwood draws, six in juniper draws, three in cottonwood (*Populus deltoides*) forests, and three in shrubby areas) in 1985, 1986, 1988, and 1989 (Westfall 1989). Based on data collected at these sites when populations were managed within park objectives, the report did not identify any direct links between elk herbivory and damage to vegetation. Woodland habitat types heavily used by elk did show a few detectable differences from similar habitats not used by elk, but variability in vegetation characteristics in and among sites sampled was so great that trends could not be established (Westfall 1989).

In 1986, researchers clipped and weighed green ash leaves as part of a study to investigate available elk browse in four hardwood draws dominated by green ash. The results, documented in a 1989 report, indicated green ash plants provided abundant forage at plant heights available to elk (approximately 0 to

[1] Breaks are defined in literature for Theodore Roosevelt National Park as areas noticeably devoid of vegetation, or if vegetation does exist, the areas are situated on steep slopes (Marlow et al. 1984).

6.5 feet [0 to 2 meters]). Also, the presence of young ash plants in green ash draws indicated the stands were capable of perpetuating themselves under the moderate browsing pressure present within the park at the time (Sullivan et al. 1989).

Vegetation data collected from 1983 to 1996 at eight upland grassland sites and 12 sites dominated by native hardwood trees have recently been evaluated (Irby et al. 2002). Measurements were taken at one to three-year intervals throughout the study period to examine changes in vegetation within sampling sites in an attempt to determine the effects of ungulates on the stability of the plant community and the role that weather played in forage availability. The data recorded at these sites indicated minimal change in plant communities from 1983 to 1996. Changes in most vegetation categories expected when elk numbers exceeded model optimums (based on the forage allocation model described above) for short periods, such as decreases in coverage/stem numbers of palatable plant species and increases in bare ground or unpalatable plant species, were not observed consistently under high or low precipitation conditions (Irby et al. 2002).

SCOPING PROCESS AND PUBLIC PARTICIPATION

National Environmental Policy Act regulations require an "early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action" (40 Code of Federal Regulations (CFR) 1501.7). To determine the scope of issues to be analyzed in depth in this plan, meetings were conducted with park staff, the public, and other parties with an interest in this plan/EIS. As a result of this scoping effort (see chapter 5 for additional information), several issues were identified as requiring further analysis in this plan. These issues represent existing concerns, as well as concerns that might arise during consideration and analysis of alternatives. The issues identified during internal and public scoping are presented below.

National Environmental Policy Act regulations require an "early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action."

The public and agency scoping process also resulted in requests to consider other suggested alternatives, including alternatives that would have amounted to hunting within the park for elk management. For the reasons discussed in chapter 2, "Alternatives Eliminated from Further Consideration," these alternatives were not analyzed in detail. Elements were incorporated into each alternative to help increase hunting opportunities outside the park, including one alternative that was developed to specifically increase such opportunities (see chapter 2, "Alternative E: Hunting Outside the Park").

Issues and Impact Topics

Issues are problems, opportunities, and concerns regarding the current and potential future management strategies for managing elk and impacts of management actions that are included in this plan/EIS. The issues were identified by the NPS, NDGF, USFS, other agencies, and the public through the scoping process. The impact topics are a more refined set of concerns analyzed for each of the management alternatives. The impact topics were derived from issues and, in "Chapter 4: Environmental Consequences," the impact topics were used to examine the extent to which a resource would be affected by the actions of a particular alternative. A summary of the agency and public scoping activities is available in chapter 5.

Vegetation

The lightly-grazed system at Theodore Roosevelt National Park is an important regional resource that contributes to the range of variation found historically in the pre-Columbian Northern Great Plains. Increased and sustained elk densities may contribute to alterations in the structure, composition, and function of these plant communities in the park. Sustained heavy grazing by elk could affect locally uncommon plant communities within the park, which include remnant quaking aspen (*Populus tremuloides*) communities, stands of mixed cottonwood and juniper, woody draws of green ash and elm (*Ulmus* sp.), and sedge (*Carex* sp.) prairies. Elk management activities that include roundups and possibly alter elk movement could also result in the trampling of vegetation.

Elk Population

Increased elk populations could affect ecosystem processes such as fire. Increased grazing by elk can reduce fuels, influencing the way fires burn in the park. Elk populations can also influence other ecosystem attributes such as vegetation structure, composition, and function.

Wildlife and Wildlife Habitat

Increased elk populations, as well as alternatives that include removal of animals or fertility control, would increase potential conflicts for resources with other wildlife (including increased competition with other herbivores) and could have direct effects on wildlife including elk. Increased and sustained elk densities may affect habitat for ground nesting birds, small mammals, and other wildlife, including vegetation-dependent and pollinating species.

There may be an increase in competition for forage species between elk, mule deer, bison, and feral horses that could cause changes in habitat and habitat use patterns. Grazing effects associated with increased elk populations may result in decreases in the number of these other ungulates in the South Unit. Alternatives that result in increased frequency or intensity of large herbivore management actions would likely increase the disturbance to elk, feral horses, and bison.

Wildlife Disease

Increased elk populations may influence inter- and intra-species transmission of wildlife diseases (parasitic, bacterial, viral, or prion), especially for diseases like CWD. If found at the park, high elk densities could facilitate transmission and establishment of the disease (NPS 2007l). Alternatives that reduce the densities of elk populations could serve to have the opposite effect and reduce the potential for transmission and establishment of disease.

Wildlife Species of Special Concern

Fourteen wildlife species identified by the state of North Dakota as having the highest conservation priority in the state have been observed at Theodore Roosevelt National Park. State-sensitive ground-nesting birds, such as the upland sandpiper (*Bartramia longicauda*), long-billed curlew (*Numenius americanus*), Sprague's pipit (*Anthus spragueii*), grasshopper sparrow (*Ammodramus savannarum*), Baird's sparrow (*Ammodramus bairdii*), lark bunting (*Calamospiza melanocorys*), and chestnut-collared longspur (*Calcarius ornatus*), are of primary concern because sustained heavy grazing by a large elk population can affect their habitat. These species are discussed further in chapters 3 and 4.

As described in the next section of this chapter, "Issues Dismissed from Further Consideration," impacts on other state-sensitive species, such as the black-tailed prairie dog, Swainson's hawk (*Buteo swainsonii*), ferruginous hawk (*Buteo regalis*), black-billed cuckoo (*Coccyzus erythropthalmus*), plains spadefoot toad (*Spea bombifrens*), smooth green snake (*Opheodrys vernalis*), and western (plains) hognose snake (*Heterdon nasicus*) would be minimal and, therefore, have been dismissed from further evaluation.

Wilderness

Increased elk populations, as well as alternatives that include the use of helicopters, could diminish those qualities and values that made portions of the park eligible for designation as wilderness areas. Management actions in wilderness would be subject to authorization using a documented process showing these actions are necessary to meet the minimum requirements for administering these areas at the park (a 'minimum tool' analysis; see discussion of *Wilderness Act of 1964* later in this chapter).

Soils, Erosion, and Water Resources

An increase in elk populations could increase erosion potential, accelerate erosion processes, increase compaction, and alter soil structure. Trailing could affect stream banks, streambeds, and areas near water holes. High densities of elk may be detrimental to water quality within the park. Increases in the elk population may increase turbidity and total suspended solids, as could alternatives that involve roundups in which elk have to cross surface waters.

Socioeconomics and Adjacent Landowners

Increased elk populations, as well as alternatives that include a direct reduction within the park or increases in hunting opportunities outside the park, could alter the economic potential for the park, the Medora community, and adjacent landowners. Based on a visitor use survey, many visitors came to the park for the opportunity to see wildlife (NPS 2003a). While not discussed specifically in the survey, it can be expected that some of these visitors came with expectations of seeing elk. As a result, visitation to the park and the local community (including Medora) could be affected by either increases or decreases in elk numbers. Increased elk populations may have additional socioeconomic impacts including:

- Depredation – increases in elk densities could increase the amount of time that elk spend in areas outside the park, and in turn, increase impacts;
- Hunting – increases in elk densities may increase potential for hunting opportunities and associated economic benefits;
- Grazing – increases in elk densities may decrease the value of some grazing lands outside the park;
- Adjacent Landowners – increases in elk densities may increase competition with domestic livestock, increase fence damage, decrease range productivity, and increase potential for conflicts with adjacent landowners. Such changes could have direct and indirect effects;
- Property values – increases in elk densities could increase the value of local properties that could be used for lodging, guiding, and other tourism activities associated with elk hunting or wildlife viewing; and
- Concessionaires – increases in elk densities and management activities may affect concessionaires such as those that provide horseback riding opportunities.

Visitor Use and Experience

Increased elk populations, as well as alternatives that include the use of firearms, helicopters, or direct reduction, may affect (positively and negatively) visitor experience. Sustained elevated elk densities may reach a point of saturation and potentially decrease visitor appeal based on increasingly common occurrence. In addition, higher elk densities have the potential to cause degradation of plant communities, which could also affect visitor experience. In contrast to this scenario, increased elk populations in the park may be viewed as beneficial by visitors because of the increased probability of seeing elk during visits. Elk management actions in Theodore Roosevelt National Park could alter visitor experience by restricting access to some areas of the park during some periods of the year. Park visitation could change

during seasons when management activities are occurring. If sustained elevated elk densities impact feral horses and bison, causing their numbers to decrease, this may also impact visitor experience.

Soundscapes are considered under Visitor Use and Experience as well. Higher or lower densities of elk may increase or decrease opportunities to hear elk bugling during the autumn rut, which may create a desirable soundscape for visitors. The use of equipment that generates noise during elk management activities (e.g., firearms, helicopters) may also temporarily alter the park's soundscape and thereby affect visitor use and experience.

Health and Safety

Alternatives that include the use of firearms or helicopters may affect visitor safety. Increased elk populations could increase the potential or perceived potential for harm to humans. Public and staff safety could be affected by the potential for increased vehicle collisions with elk. Management actions may pose a safety hazard to park staff.

Park Operations and Management

Increased elk populations, as well as many of the alternatives that require direct NPS staff oversight of or involvement in management activities, especially those involving roundups or sharpshooting, would require an increased commitment of NPS resources (staff, money, time, and equipment). Increased elk populations may require additional administration by park staff that could overwhelm the limited budget and staff availability by creating conflicts in developed areas such as campgrounds; creating safety issues (e.g., increased potential for elk-vehicle collisions); increasing maintenance requirements (e.g., fence repairs); and increasing monitoring requirements. Higher elk densities could create a need to modify management objectives for other large herbivores, including feral horses and bison. Compliance with management guidelines for wilderness during elk management efforts may require increased park resources compared with areas outside of wilderness areas.

Issues Dismissed from Further Consideration

Issues that are not relevant to this plan/EIS were eliminated from further consideration by the planning team. In some instances, issues were dismissed because they relate to resources that are not present in the park. In other instances, park staff considered potential issues for certain resource areas, but because the impacts were considered minimal, they were also dismissed from further analysis. These issues, and the rationale for dismissing them, include the following:

Air Quality (Dismissed)

Section 4.7.1 of NPS *Management Policies 2006* (NPS 2006a) states that the NPS has a responsibility to protect air quality under both the NPS *Organic Act of 1916* (Organic Act) and the *Clean Air Act*. The management policies also note that the NPS actively promotes and pursues measures to protect air-quality related values from the adverse impacts of air pollution, and seeks to protect integral vistas (those views perceived from within certain national parks of a specific landmark or panorama located outside the park), through cooperative means (NPS 2006a).

Management actions for elk would have a negligible effect on air quality or integral vistas as a result of using helicopters and vehicles for related activities, and therefore this impact topic was eliminated from further analysis.

Geology (Dismissed)

Section 4.8 of NPS *Management Policies 2006* addresses geologic resource management, including geologic features and processes. This policy states that the NPS "will (1) assess the impacts of natural

processes and human activities on geologic resources; (2) maintain and restore the integrity of existing geologic resources; (3) integrate geologic resource management into Service operations and planning; and (4) interpret geologic resources for park visitors" (NPS 2006a).

Management actions could disturb soils but would have no effect on surficial or subsurface geology, including the petrified forests of Theodore Roosevelt National Park, as they do not require excavations or other ground-disturbances. Therefore, this impact topic was eliminated from further analysis.

Wetlands (Dismissed)

Increased and sustained elk populations could impact wetland vegetation, soils, and hydrology, by physical disturbance of wetland vegetation and wetland soils from trampling. Water quality in wetlands could be affected by potential increases in turbidity, total suspended solids, nutrient levels, and fecal coliform levels in surface waters as a result of increased elk numbers. However, based on preliminary evaluation of research related to elk use of water developments (see "Summary of Existing Research/Modeling" section in this chapter), as well as little observed elk use of wetlands, impacts are expected to be less than minor. Therefore, this impact topic was eliminated from further analysis.

Prime and Unique Agricultural Lands (Dismissed)

Congress enacted the 1981 *Farmland Protection Policy Act* in response to a substantial decrease in the amount of open farmland in the U.S. In the statement of purpose for the *Farmland Protection Policy Act*, it was noted that federal programs that contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses will be minimized. Under the *Farmland Protection Policy Act*, federal programs should be administered in a manner that, as practicable, will be compatible with state and local government and private programs and policies to protect farmland.

No unique agriculture lands exist in Theodore Roosevelt National Park; however, some prime farmland does exist in the park. The United States Department of Agriculture, Natural Resources Conservation Service defines prime farmland as soil which has the best combination of physical and chemical properties to produce general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. None of the alternatives would cause the irreversible conversion of this land (from rangeland/wildlife habitat) to other uses, therefore, this impact topic was eliminated from further analysis.

Water Quantity and Groundwater (Dismissed)

Impacts from high densities of elk or elk management actions would not affect water quantity or groundwater at the park. Given limited use of water developments, higher elk densities are not expected to increase competition for available water sources and would not reduce surface or groundwater quantities. Although there is some potential for spills of petroleum products from equipment used during management actions, the quantities would not influence water quality in groundwater, especially in light of best management practices (spill prevention, control, and countermeasure procedures) that would be implemented. Therefore, these topics were eliminated from further analysis.

Floodplains (Dismissed)

The NPS is required to protect, preserve, and restore the natural resources and functions of floodplains; avoid the long-term and short-term environmental effects associated with the occupancy and modification of floodplains; and, avoid the direct and indirect support of floodplain development and actions that could adversely affect the natural resources and functions of floodplains or increase flood risks (NPS 2006a, section 4.6.4).

Management actions for elk would not result in development in floodplains. There could be some effects on soils and vegetation in floodplains, however, they would be minimal as existing research shows elk do not generally use riparian areas or other water developments in the South Unit. Therefore this impact topic was eliminated from further analysis.

Aquatic Wildlife and Fisheries (Dismissed)

NPS has developed policies and guidance on wildlife management. Section 4.4.1 of NPS *Management Policies 2006* addresses biological resource management, including general wildlife management. This policy states that the NPS "will maintain as parts of the natural ecosystems of parks all plants and animals native to park ecosystems" (NPS 2006a).

Management actions for elk could have indirect effects on aquatic wildlife or fisheries as a result of water quality impacts, such as the potential for increases in turbidity and total suspended solids in surface waters. However, these effects on water quality are not expected have more than minor impacts on aquatic wildlife and fisheries. Therefore, this topic was eliminated from further analysis.

Federally Listed Threatened and Endangered Species (Dismissed)

The U.S. Fish and Wildlife Service (USFWS) has published a list of candidate, threatened, and endangered species by county in North Dakota (USFWS 2007a). This list included the black-footed ferret (*Mustela nigripes*), gray wolf (*Canis lupus*), and whooping crane (*Grus americana*) as those species with the potential to occur in Billings County. However, there are no records of black-footed ferret within the park, and the state of North Dakota also has no records of black-footed ferrets in recent years. The South Unit contains marginal habitat for ferrets, and reintroduction may be possible in the future.

The gray wolf is an occasional visitor in North Dakota and is most frequently observed in McKenzie and Williams counties (USFWS 2006). However, it is highly unlikely that wolves, especially resident animals, are present in the park or the region and, therefore, they would not be affected by elk management.

Currently, the only self-sustaining population of whooping cranes is a migratory group that winters at Aransas National Wildlife Refuge and migrates through Nebraska, South Dakota, and North Dakota to Wood Buffalo National Park in northwestern Alberta, Canada. The Aransas-Wood Buffalo population reached 220 individual whooping cranes in 2006. Young adult whooping cranes summered in North Dakota in 1989, 1990, and 1993 in the vicinity of Theodore Roosevelt National Park (USFWS 2006b); however, no whooping cranes have been observed within the park.

There is no designated critical habitat in the park for these species, and because they are not known to occur in the South Unit of Theodore Roosevelt National Park, they would not be affected by any of the alternatives in this plan/EIS. As a result, the NPS has determined that there would be "no effect," as defined under section 7 of the Endangered Species Act, on any of these species. Therefore, they have been dismissed from further consideration.

Other Wildlife Species of Special Concern (Dismissed)

Impacts to Black-tailed Prairie Dogs

The black-tailed prairie dog, which is found in grazed short-grass prairie, is considered by the state as one of the species in greatest need of conservation in North Dakota (NDGF 2004). In the absence of management under the no action alternative, continued growth of the elk population would result in increased grazing, which would create conditions that are more suitable to prairie dog colonization in the long-term. This would ultimately have a beneficial effect for the black-tailed prairie dog.

Elk management activities under any of the action alternatives would have minimal, short-term, localized adverse impacts to prairie dogs and their habitat, due to associated disturbance and noise. However, management actions would take place in fall and/or winter, outside sensitive reproductive periods and would not have population level effects; any displaced prairie dogs would return following completion of management actions. Over the long term, reduced elk numbers would limit the potential for the sustained heavy grazing that actually benefits black-tailed prairie dog habitat. Although this could have detectable changes in the distribution and abundance of prairie dogs in the South Unit, lower elk numbers would not affect the viability or stability of the species, including the ecological integrity of black-tailed prairie dog habitat. Because these long-term, adverse impacts would be minor, this issue was dismissed from further analysis.

Impacts to Swainson's and Ferruginous Hawks

These hawks are considered by the state to be two of the species in greatest need of conservation in North Dakota (NDGF 2004). Both the Swainson's and ferruginous hawks are migratory birds that occasionally pass through and forage in the grassland habitats of the park. The most common prey items for these raptors include small mammals, including black-tailed prairie dogs, and other birds. Increased elk use of grassland environments could decrease cover for prey, or even increase abundance of small mammals such as black-tailed prairie dogs, making hunting easier for these raptors. This change in habitat would be detectable, but because these are not resident birds, it would not measurably affect these native species.

These hawks are not found in the park during fall and winter, so they would not be affected by management activities associated with the action alternatives which would only be conducted during these times. The reduction of the elk population and maintenance at levels that would meet the desired conditions described previously would increase habitat for and populations of prey species, creating more foraging opportunities. However, ground cover would be greater as sustained heavy grazing in grasslands is unlikely, which would make it more difficult for these birds to spot their prey. The effects on habitat for these hawks would be detectable, but would not measurably affect these native species. Because the impacts to Swainson's and ferruginous hawks would be at or below the level of detection, these species have been dismissed from further analysis.

Impacts to Black-billed Cuckoo

The black-billed cuckoo is considered by the state to be one of the species in greatest need of conservation in North Dakota (NDGF 2004). This bird has been observed in Theodore Roosevelt National Park and generally occupies woodlands, thickets, prairie shrublands, and shelterbelts (NDGF 2004). If no action is taken, the growing elk population in the South Unit could cause some localized sustained, heavy browsing of trees and shrubs in elk use areas that may support the black-billed cuckoo; however, it is assumed that there is suitable available habitat throughout the South Unit to accommodate any birds that may be displaced. As a result, any localized habitat degradation would have minimal adverse effects on the status of this species over the long term. Elk management activities under any of the action alternatives would have minimal, short-term, localized adverse impacts as a result of displacement from the associated disturbance and noise. However, any displaced black-billed cuckoos would return following completion of any activities, which would be conducted outside of critical periods (e.g., breeding). There would be some long-term, beneficial effects of reduced elk browsing on black-billed cuckoo habitat under these alternatives, but the effects would necessarily not change the ability of the habitat to support this species. Because these short-term and long-term impacts to the black-billed cuckoo would be negligible, this issue was dismissed from further analysis.

Impacts to State Sensitive Reptiles and Amphibians

Two reptiles (the smooth green snake and the western [plains] hognose snake) and one amphibian (the plains spadefoot toad) have been observed at Theodore Roosevelt National Park and are considered by the

state to be species in greatest need of conservation in North Dakota (NDGF 2004). The western hognose snake is often found in sandy or gravelly areas near rivers. Increased elk numbers are not expected to affect this species. The smooth green snake and plains spadefoot toad are generally found in grasslands. Increased elk feeding in grassland areas could occur if the population continues to grow and could reduce cover for these species, increasing the potential for predation. Any impacts on soils and water resources from increased erosion associated with sustained, heavy grazing could affect habitat for the western hognose snake. However, these adverse impacts would be localized and are not expected to affect the population status or alter the ecological integrity of the habitat for these species. Elk management activities under any of the action alternatives could have minimal temporary, localized adverse impacts as a result of displacement from the associated disturbance and noise. However, these species are generally inactive when management actions would be taken (NatureServe 2008), and any displaced reptiles and amphibians would return following completion of any activities. Over the long term, the increase in cover in elk use areas expected due to the decrease in elk numbers would have a beneficial effect by lowering the potential for predation. Because impacts to these species would generally be negligible and localized, this issue was dismissed from further analysis.

Plant Species of Special Concern (Dismissed)

Based on a comparison of a park species list (NPS 2007a) and the North Dakota plant species of concern list (Dirk 2007), five plant species of concern have been documented within the park. These include the smooth goosefoot (C*henopodium subglabrum*), lanceleaf cottonwood (*Populus* x *acuminata*), alkali sacaton (*Sporobolus airodes*), nine-anthered dalea (prairie-clover) (*Dalea enneandra*), and white locoweed (*Oxytropis sericea*). The smooth goosefoot, lanceleaf cottonwood, and alkali sacaton generally occur in wet environments, such as river banks and terraces, riparian areas, and seeps. Elk have not been known to use these habitats in the South Unit, and the loss of vegetative ground cover from elk foraging has not been documented since reintroduction. The nine-anthered dalea (prairie-clover) and white locoweed are found in grassland environments used more frequently by elk, especially for forage. As mentioned above, although impacts have not been documented to date, the loss of vegetative ground cover from foraging and trampling in elk use areas that support these plants could have localized, long-term, negligible to minor adverse impacts. Elk management activities under any of the action alternatives could have temporary, short-term, negligible to minor adverse impacts to these plants as a result of ground disturbances. Over time, the reduced elk population would minimize the potential for overuse or trampling of state plant species of concern. As a result, there would be localized, long-term, beneficial effects to state plant species of concern found in elk use areas. Because short-term and long-term impacts on these plants would be localized and negligible to minor, this impact topic was dismissed from further analysis.

Marine or Estuarine Resources (Dismissed)

There are no marine or estuarine resources present in Theodore Roosevelt National Park. Therefore, this impact topic was eliminated from further analysis.

Lightscapes or Night Sky (Dismissed)

Section 4.10 of the NPS *Management Policies 2006* states that "The Service will preserve, to the greatest extent possible, the natural lightscapes of parks, which are natural resources and values that exist in the absence of human-caused light…Recognizing the roles that light and dark periods and darkness play in natural resource processes and the evolution of species, the Service will protect natural darkness and other components of the natural lightscape in parks…. The Service will not use artificial lighting in areas…where the presence of the artificial lighting will disrupt a park's dark-dependent natural resource components" (NPS 2006a).

Artificial lighting that could alter lightscapes or the night sky would not be introduced in Theodore Roosevelt National Park as a result of management actions for elk. Therefore, there would be no impacts on natural lightscapes or night sky and this impact topic was eliminated from further analysis.

Hazardous Materials (Dismissed)

Numerous federal laws exist for managing hazardous materials. One of these laws is the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), commonly known as Superfund. This law provided broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health and the environment. The *Superfund Amendments* and *Reauthorization Act* amended CERCLA. The *Resource Conservation and Recovery Act* gave U.S. Environmental Protection Agency the authority to control hazardous waste from "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste.

Waste management and contamination issues are also covered in section 9.1.6 of NPS *Management Policies 2006*. This section states that NPS "recognizes the far-reaching impacts that waste products, contaminants, and wasteful practices have, not only on national park resources, but also on biotic and abiotic resources elsewhere in the nation and around the world. The Service will therefore demonstrate environmental leadership and serve as a model for others to follow in managing wastes and contaminants" (NPS 2006a).

Hazardous substances that may endanger public health and the environment are not expected to be used in elk management activities at the park. This impact topic was therefore eliminated from further analysis.

Minority and Low Income Populations (Environmental Justice) (Dismissed)

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directs federal agencies to avoid the disproportionate placement of any adverse effects from federal policies and actions on these populations. This topic is dismissed from further consideration in this plan/EIS for the following reasons:

- Visitors to Theodore Roosevelt National Park are not disproportionately minority or low-income; and
- Minority or low-income populations would not be disproportionately affected by changes in elk management.

Archeological Resources (Dismissed)

No known impacts to archeological resources are currently associated with elk or their browsing, nor are they expected in the future, despite projected population growth. Known archeological sites would be avoided during implementation of any of the action alternatives, and any ground-disturbing activities (primarily from foot traffic) would be similar to those associated with routine field activities and other roundups. Based on the park's past experience with such activities, impacts to archeological resources are not expected, and if they did occur, would be localized and negligible. Therefore, this topic was eliminated from further analysis.

Ethnographic Resources (Dismissed)

Ethnographic resources are those identified by groups that have an ancestral association – either cultural affiliation or traditional affiliation – with a given area. A "Cultural Affiliation Statement and Ethnographic Resource Assessment Study" (Zedeño et al. 2006) was prepared for the national parks in North Dakota, including Theodore Roosevelt National Park. The study identified that affiliated Native

American tribes have connections to the area and resources encompassed by Theodore Roosevelt National Park, including elk.

There would be no impacts to known ethnographic resources if the elk population is not managed. During implementation of the action alternatives, especially roundups, known sacred and ceremonial sites, or traditional plant resources, would be avoided. Ground disturbances with the potential to affect sacred or ceremonial sites or traditional plant resources would be similar to those associated with routine field activities and other roundups, and would have localized, negligible to minor impacts. The reduction of elk may be considered by some Native Americans as an impact to their traditional use of the animal for food, utilitarian, or ceremonial purposes. However, the gradual reduction and subsequent maintenance of the population would not affect the status of elk as an available resource for Native Americans. Therefore, this topic was eliminated from further analysis.

Historic Structures (Dismissed)

The NPS Cultural Resource Management Guideline (NPS 1998a) defines historic structures as material assemblies that extend the limits of human capability. The park contains 15 historic structures on the List of Classified Structures (LCS), including 11 from the CCC era, three from the ranching period, and Theodore Roosevelt's Maltese Cross Cabin. Three buildings at Peaceful Valley Ranch in the South Unit are on the National Register of Historic Places (NRHP) because of their historical and architectural significance: the main ranch house (about 1885), the barn (1905), and the bunk house (1920) are remnants representing the entire history of European American settlement in western North Dakota. Other facilities in zones within the park are pending nomination to the NRHP. However, none of the management actions would be taken within or adjacent to historic structures. Therefore, Historic Structures was dismissed as an impact topic in this document.

Cultural Landscapes (Dismissed)

The NPS Cultural Resource Management Guideline (NPS 1998a) defines cultural landscapes as settings that humans have created in the natural world. There are no designated cultural landscapes in the South Unit of Theodore Roosevelt National Park; therefore, it was dismissed as an impact topic in this document.

Museum Collections (Dismissed)

Museum objects are manifestations and records of behavior and ideas that span the breadth of human experience and depth of natural history (NPS 1998a). No museum objects would be affected by the alternatives; therefore, it was dismissed as an impact topic in this document.

RELATED LAWS, POLICIES, PLANS, AND CONSTRAINTS

The following laws, policies, and plans of the NPS, NDGF, USFS, or agencies with neighboring land or relevant management authority, are described in this section to show the constraints this plan/EIS must operate under and the goals and policies that it must meet.

Guiding Laws and Policies

NPS Organic Act of 1916

By enacting the NPS *Organic Act of 1916*, Congress directed the U.S. Department of the Interior and the NPS to manage units "to conserve the scenery and the natural and historic objects and wild life therein and to provide for the enjoyment of the same in such a manner and by such a means as will leave them unimpaired for the enjoyment of future generations" (16 USC §1). The *Redwood National Park*

Expansion Act of 1978 reiterates this mandate by stating that the NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 USC §1a-1).

Despite these mandates, the *Organic Act* and its amendments afford the National Park Service latitude when making resource decisions. Because conservation remains predominant, the National Park Service seeks to avoid or to minimize adverse impacts on park resources and values. In addition, the NPS *Organic Act* does give the Secretary of the Interior discretion to provide "for the destruction of such animal and of such plant life as may be detrimental to the use of any of said parks, monuments, or reservations" (16 USC §3), and section 1.4.3 of NPS *Management Policies 2006* gives the NPS discretion to allow negative impacts when necessary (NPS 2006a). This ability to manage natural resources, specifically wildlife, within park boundaries was upheld by *New Mexico State Game Commission v. Udall*, 410 F.2d 1197 (10th Cir 1969) when the 10th Circuit Court of Appeals determined that "(t)he obvious purpose of this language is to require the Secretary to determine when it is necessary to destroy animals which, for any reason, may be detrimental to the use of the park." As a general rule, the NPS has broad authority to manage wildlife and other natural resources within the boundaries of units of the National Park System. As provided in 16 USC § 1, the NPS "shall promote and regulate the use of the Federal areas known as national parks…by such means and measures as conform to the fundamental purpose of the parks…to conserve the scenery and natural and historic objects and the wild life therein….". The NPS's ability to manage wildlife resources has also been upheld in *Kleppe v. New Mexico* and *United States v. Moore*, even despite conflicting state laws.

While some actions and activities can cause impacts, according to section 1.4.3 of NPS *Management Policies 2006*, the NPS cannot allow an adverse impact that constitutes resource impairment (NPS 2006a). The *Organic Act* prohibits actions that impair park resources unless a law directly and specifically allows for such actions (16 USC §1a-1). Section 1.4.4 of NPS *Management Policies 2006* states that an action constitutes an impairment when its effects "harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values" (NPS 2006a). To determine impairment, this section directs the NPS to evaluate "the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts" (NPS 2006a).

Because park units vary based on enabling legislation, natural resources, cultural resources, and missions, management activities appropriate for each unit and for areas within each unit vary as well. An action appropriate in one unit could impair resources in another unit. Thus, this environmental impact statement will analyze the context, duration, and intensity of impacts related to elk management activities within Theodore Roosevelt National Park, as well as the potential for resource impairment, as required by Director's Order 12 (NPS 2001a).

NPS *Management Policies 2006*

The introduction to "Chapter 4, Natural Resources Management" of NPS *Management Policies 2006* states that parks "will strive to understand, maintain, restore, and protect the inherent integrity of the natural resources, processes, systems, and values of the parks;" and that the NPS "manages the natural resources of parks to maintain them in an unimpaired condition for present and future generations" (NPS 2006a). Several sections of this chapter are relevant to elk management at the park and are described below.

Section 4.1, General Management Concepts. This section provides the guidance on general resource management within national parks. It states the Service "will try to maintain all the components and processes of naturally evolving park ecosystems, including the natural abundance, diversity, and genetic

and ecological integrity of the plant and animal species native to those ecosystems." In this context, the word "natural" is used to describe the condition of resources that would be present in the absence of human dominance over the landscape. The policies do not dictate what the natural conditions are for a specific park unit, but rather, leave it for the individual parks to determine. Section 4.1 also acknowledges that the NPS may need to actively manage biological or physical processes to restore them to and maintain the closest approximation of a natural condition possible (NPS 2006a).

NPS *Management Policies 2006* acknowledge that park units are parts of much larger ecosystems, and that parks can contribute to the conservation of regional biodiversity (NPS 2006a). Conversely, many parks cannot meet their natural resource preservation goals without the assistance and collaboration of neighboring landowners and resources to achieve ecosystem stability and other resource management objectives. Therefore, section 4.1.4 of the NPS *Management Policies 2006* states that the agency will pursue cooperative conservation with other agencies, Indian tribes, other traditionally associated people, and private land owners in accordance with Executive Order 13352 (Facilitation of Cooperative Conservation).

Section 4.4.2, Management of Native Plants and Animals. Section 4.4.2 of NPS *Management Policies 2006* provides guidance for management of plant and animal species, stating that natural processes will be relied upon whenever possible to maintain native plant and animal species and the natural fluctuations of their populations of these species but that the NPS may intervene to manage individual wildlife or their populations (NPS 2006a).

In addition, this section identifies conditions that could exist in parks that would necessitate intervention, including circumstances when there are unnaturally high or low concentrations of wildlife populations as a result of human influences, such as loss of seasonal habitat, the extirpation of predators, or the creation of highly productive habitat through agriculture or urban landscapes (NPS 2006a).

Section 4.4.2 also provides guidance on population monitoring requirements stating that the NPS "will assess the results of managing plant and animal populations by conducting follow-up monitoring or other studies to determine the impacts of the management methods on non-targeted and targeted components of the ecosystem" (NPS 2006a).

Section 4.4.2.1, NPS Actions that Remove Plants and Animals. In this section, the NPS *Management Policies 2006* provides further guidance for NPS actions that involve removal of animals. This section explains that the NPS may directly reduce an animal population by using several population management techniques, either separately or together, such as relocation, public hunting on lands outside the park, habitat management, predator restoration, reproductive intervention, and destruction of animals by NPS personnel or their authorized agents (NPS 2006a).

Whenever the NPS removes, manages, or allows others to remove animals for an authorized purpose, the NPS will seek to ensure that such removals will not cause unacceptable impacts to native resources, natural processes, or other park resources. This section also requires that, whenever the NPS identifies the need for reducing the size of a park animal population, the agency will use scientifically valid resource information and will document this information in the appropriate park management plan (NPS 2006a).

In addition, the NPS will manage such removals to prevent them from interfering broadly with:

- Natural habitats, natural abundances, and natural distributions of native species and natural processes;
- Rare, threatened, and endangered plant or animal species, or their critical habitats;
- Scientific study, interpretation, environmental education, appreciation of wildlife, or other public benefits;
- Opportunities to restore depressed populations of native species; and

- Breeding or spawning grounds of native species (NPS 2006a).

Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision Making and Handbook

NPS Director's Order 12 and its accompanying handbook (NPS 2001a) lay the groundwork for how the National Park Service complies with NEPA. Director's Order 12 and the handbook set forth a planning process for incorporating scientific and technical information and for establishing an administrative record for NPS projects.

Director's Order 12 requires that impacts to park resources be analyzed in terms of their context, duration, and intensity. It is crucial for the public and decision makers to understand the implications of those impacts in the short and long term, cumulatively, and within context, based on an understanding and interpretation by resource professionals and specialists. Director's Order 12 also requires that an analysis of impairment to park resources and values be made as part of the NEPA document.

NPS-77: Natural Resources Management Guideline

The Natural Resource Reference Manual 77 provides guidance for NPS employees responsible for managing, conserving, and protecting the natural resources found in National Park Service units (NPS 2004b).

Director's Order 41: Wilderness Preservation and Management (1999a)

Director's Order 41 guides the NPS efforts in meeting the letter and spirit of the *Wilderness Act of 1964*. This Director's Order establishes specific instructions and requirements concerning the management of all National Park Service wilderness areas, and is accompanied by a reference manual (Reference Manual 41). The reference manual includes applicable policies and director's orders; an assessment of the critical issues in wilderness preservation and management with instructions on how these issues will be managed; minimum content requirements for wilderness management plans; and other information that will help field managers and staff meet their responsibilities (NPS 1999a).

2002 Director's Guidance Memorandum on CWD ("Chronic Wasting Disease Memo," July 26, 2002)

On July 26, 2002, the Director of the NPS issued a memorandum regarding the NPS response to CWD of deer and elk. This memorandum established policy for managing elk or deer that exhibit signs of CWD and for proposed translocation of deer or elk. Under this memorandum, deer or elk cannot be translocated from areas where CWD-positive cervids have been detected or from areas where documentation is inadequate to confirm the absence of the disease. Although it is not possible to confirm the total absence of the disease, the memorandum requires testing to detect the disease (with 99% confidence) if it is present in 1% or greater of a deer or elk population before animals can be translocated (NPS 2002a).

Deer or elk cannot be translocated from areas where CWD-positive cervids have been detected or from areas where documentation is inadequate to confirm the absence of the disease.

Wilderness Management Program

The park does not currently have a Wilderness Stewardship Plan. The NPS does conduct a minimum tool analysis in accordance with the *Wilderness Act of 1964* for all activities that could affect the wilderness resource and character at the park. This process is discussed further in the next section.

Other Legislation, Compliance, and Policy

National Environmental Policy Act of 1969, as Amended

NEPA section 102(2)(c) requires that an EIS be prepared for proposed major federal actions that may significantly affect the quality of the human environment.

Endangered Species Act of 1973, as Amended

Section 7 of the *Endangered Species Act* requires that all federal agencies, in consultation with the Secretary of the Interior, shall insure that proposed federal actions will not likely jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of designated critical habitat.

Wilderness Act of 1964

President Lyndon B. Johnson signed the *Wilderness Act* (16 USC §§1131-1136) on September 3, 1964, establishing the National Wilderness Preservation System. The *Wilderness Act* states that "In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness (16 USC §1131[a])." Although there is great similarity between the NPS *Organic Act* and the *Wilderness Act*, Congress applied the *Wilderness Act* to the NPS to strengthen its protective capabilities.

Per the *Wilderness Act*, the park's managers must apply the 'minimum requirement' concept to all management activities that affect the wilderness resource and character at the park. Minimum requirement is a documented process the NPS uses to determine the appropriateness of all actions affecting wilderness. This concept is intended to minimize impacts on wilderness values and resources. Managers may authorize (using a documented process) the generally prohibited activities or uses listed in section 4(c) of the *Wilderness Act* if deemed necessary to meet the minimum requirements for the administration of the area as wilderness and where those methods are determined to be the 'minimum tool' for the project.

Clean Water Act of 1972, as Amended

The *Clean Water Act* is a comprehensive statute aimed at restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. This act requires the establishment of state water quality standards for surface waters, as well as federal water quality standards, and the development of guidelines to identify and evaluate the extent of nonpoint source pollution. The act requires biennial reports on water quality from the states, and the establishment of total maximum daily loads in surface waters where pollutants exceed state standards. Because impacts to jurisdictional wetlands that may be present in the South Unit are not anticipated, and because it has been determined that the Little Missouri River is not a navigable water, requirements under section 404 of the *Clean Water Act* do not apply.

Title 43, Code of Federal Regulations

Title 43 of the CFR, part 24, describes the four major systems of Federal lands administered by the Department of the Interior. Section 24.4 (f) states that "Units of the National Park System contain natural, recreation, historic, and cultural values of national significance as designated by Executive and Congressional action." In describing appropriate activities, it states that "[a]s a general rule, consumptive resource utilization is prohibited." In addition, section 24.4 (i) instructs all Federal agencies of the Department of the Interior, among other things, to "[p]repare fish and wildlife management plans in

cooperation with State fish and wildlife agencies and other Federal (non-Interior) agencies where appropriate." It also directs agencies to "[c]onsult with the States and comply with State permit requirements … except in instances where the Secretary of the Interior determines that such compliance would prevent him from carrying out his statutory responsibilities."

National Historic Preservation Act of 1966, as Amended

Section 106 of the *National Historic Preservation Act* requires federal agencies to consider the effects of their undertakings on properties listed on, or potentially eligible for listing on, the National Register of Historic Places. All actions affecting a park's cultural resources must comply with this legislation.

Title 36, Code of Federal Regulations (1992)

Title 36 provides the regulations "for the proper use, management, government, and protection of persons, property, and natural and cultural resources within areas under the jurisdiction of the NPS" (36 CFR 1.1(a)).

Relationship to Planning Documents for Theodore Roosevelt National Park

The following sections describe planning documents in place at Theodore Roosevelt National Park. These documents have been reviewed and considered as they relate to elk management so that the plan/EIS is consistent with previously established goals and objectives for the park.

General Management Plan, Theodore Roosevelt National Park (NPS 1987)

A general management plan is developed to describe long-term management objectives for a park. The general management plan for Theodore Roosevelt National Park lists a number of objectives related to elk management. These include:

- Protect, preserve, and manage the natural environment to ensure ecosystem integrity while providing for visitor enjoyment and safety;
- Restore and maintain, to the extent feasible, the endemic plants and animals and ecological processes of the Little Missouri badlands to a condition symbolic of the scene during Theodore Roosevelt's association with the area;
- Allow natural processes to continue with a minimum of human disturbance; and
- Implement necessary management activities, such as invasive plant control, prescribed burning, wildlife habitat enhancement…to preserve the "natural process."

Resource Management Plan, Theodore Roosevelt National Park (1994)

The purpose of the resource management plan for Theodore Roosevelt National Park is to provide a flexible, amendable action and working plan for the identification, restoration, and protection of the park's resources (NPS 1994). Goals and objectives identified in the resource management plan that relate to elk management are summarized as follows:

- Restoring and/or maintaining, to the extent feasible, the physical and biological resources and processes which interact to form the park's ecosystems;
- Managing the park as a natural badlands ecosystem, influenced by human activities over time, allowing natural processes to continue;
- Considering the effects of management activities on the natural and cultural resources of the park and managing those activities to prevent adverse impacts;

- Managing all the park's natural resources in accordance with all applicable laws, NPS guidelines, and individual comprehensive management plans for preservation and interpretation; and
- Managing the park's resources associated with Theodore Roosevelt and his life in the badlands.

A specific section in the resource management plan provides guidance for managing ungulates in general and elk specifically. For example, the plan notes that the "park will utilize completed research studies and other available information to manage native ungulates in the park including continuing with population monitoring and developing reduction actions as needed." Other guidance in this section includes:

- Developing a management plan addressing population management, species interactions, possible threats to park ungulates, and possible threats to the park from ungulates; and
- Working with the NDGF and USFS to address elk management activities outside the park on adjacent private and USFS lands, including depredation problems, increasing recreational activities, and supporting multiple use concepts on surrounding public lands.

Fire Management Plan (THRO 2008)

The fire management plan for Theodore Roosevelt National Park outlines five objectives:

- Protect life, private property, and park resources from the effects of unwanted fire;
- Reduce the incidence and extent of human-caused fires;
- Use wildland fire where appropriate as a tool to meet resource objectives;
- Use prescribed fire to meet management objectives; and
- Prevent the adverse impact from fire suppression (THRO 2008).

To support these objectives, the park was divided into 23 fire management units, including 15 in the South Unit. The annual burn acreage limit for any wildland fire type in the South Unit is 4,000 acres, which was established to ensure adequate forage for bison and elk during the winter season. The plan recognizes the importance of both wildland and prescribed fire in ecosystem management, both of which are used to restore fuel loads and plant community structure and composition to ranges of natural variability comparable to pre-European settlement. Prescribed fires are also used to minimize the occurrence of unnaturally intense fires by reducing hazard fuels.

Northern Great Plains Exotic Plant Management Plan (2005)

The National Park Service has developed an exotic plant management plan to control exotic (non-native) plants at 13 parks located in the Northern Great Plains area, including Theodore Roosevelt National Park. The intent of this plan is to manage exotic plants to reduce their negative effects on native plant communities and other natural and cultural resources within these parks (NPS 2005). The plan dictates the use of integrated pest management, a decision-making process that supports the NPS mission by coordinating knowledge of pest biology, the environment, and available technology to prevent unacceptable levels of pest damage, using environmentally sound, cost-effective management strategies that pose the least possible risk to people, park resources, and the environment. This process helps resource specialists determine whether treatment of an exotic plant is necessary and appropriate, where treatment should be administered, when treatment should be applied, and what strategies should be used for immediate and long-term results (NPS 2005).

Options for resource managers include cultural treatments (such as irrigation and seeding to promote native plants), manual/mechanical treatments (such as hand pulling, cutting, haying), biological treatments (using natural enemies such as insects and microorganisms), chemical treatments (applying pesticides), and prescribed fire. Resource specialists will use a standard decision-making process

developed for this plan to identify exotic plants; determine exotic plant management priorities; identify and evaluate the efficacy and environmental effects of the proposed treatment; consider alternative treatments having less impacts; justify why a treatment was selected; and confirm compliance with applicable policies and regulations. Resource specialists will also be able to use the results of this analysis to explain to the public how each of these factors was considered in selecting treatment methods (NPS 2005).

Loss Control Management Safety and Environmental Health Program (NPS 2002b)

This program provides overall guidance for integrating health and safety considerations in all park management and planning activities. Program activities include accident investigations and reporting; training; motor vehicle and motorized equipment operation; inspection; environmental and occupational safety, health, and industrial hygiene; fire prevention and protection; plans of action for emergencies; public safety programs; and contractor standards.

Interpretive Prospectus (1990)

The primary goal of this plan is to provide a framework for a total visitor experience at Theodore Roosevelt National Park through interpretation by the National Park Service, concessioner activities, and cooperating association personnel (NPS 1990). While this plan does not specifically address elk management, it does discuss some goals that have been considered in the development of this plan/EIS, including: helping visitors understand that park resources do not end at the park boundaries; increasing the understanding of the animals of the Little Missouri River badlands; and promoting the importance of protecting the scenery and values of the Badlands ecosystem that Theodore Roosevelt experienced (NPS 1990).

Other Federal Agency Plans, Policies, and Actions

Land and Resource Management Plan for the Dakota Prairie Grasslands - Northern Region (USFS 2002)

The Land and Resource Management Plan for the Dakota Prairie Grasslands offers guidance for all resource management activities on the Dakota Prairie Grasslands. It identifies management standards and guidelines, and describes resource management practices, levels of resource use and protection, and the availability and suitability of lands for resource management. This plan includes several guidelines and objectives pertaining to managing resources to complement native species and their habitat needs while balancing management of other resources and uses, including livestock grazing.

The Land and Resource Management Plan for the Dakota Prairie Grasslands, which includes the Little Missouri National Grassland, guides on-the-ground natural resource management to ensure sustainable ecosystems and to provide multiple benefits, including forage for livestock and wildlife habitat. This plan does not include any policies or management actions specific to elk, and big game is only mentioned as a resource that is present within the grasslands; however, general objectives and guidelines

The Land and Resource Management Plan for the Dakota Prairie Grasslands guides on-the-ground natural resource management to ensure sustainable ecosystems and to provide multiple benefits, including forage for livestock and wildlife habitat. This plan does not include any policies or management actions specific to elk.

that would apply to elk management are described, including supporting native wildlife populations, reducing hazards to big game, allowing big game movement throughout the year, and managing for native vegetation abundance and diversity to provide foraging habitat for big game.

State of North Dakota Statutes and Guidelines

Hunting

Hunting is the primary tool used by the NDGF to manage game populations. Two elk hunting units are located adjacent to the park, units E3 and E4 (see map 3). Each year, the elk hunting season and the number of licenses available are established by the state through proclamations issued by the governor. In addition to once-in-a-lifetime licenses available to North Dakota residents through a lottery system, one license may also be available to residents and non-residents through a raffle (as per North Dakota Century Code 20.1-08-04.6). Landowner preference and depredation permits are also available to landowners in elk hunting units E3 and E4 (as per North Dakota Century Code 20.1-03-11.7 and 20.1-08-04.6). Each year, NDGF gives area landowners the opportunity to meet and discuss proposed hunting seasons. North Dakota Game and Fish exercises flexibility in terms of how big game is managed. Depending on population objectives, NDGF may increase the number of licenses issued or extend hunting seasons when population numbers are increasing. Once game populations are reduced, fewer licenses may be issued in following years and/or hunting seasons may be scaled back. Further information on elk hunting seasons, available licenses, and success is discussed in the "Land Management Adjacent to the Park" and "Elk Population" sections of chapter 3.

Hunting is the primary tool used by the NDGF to manage game populations.

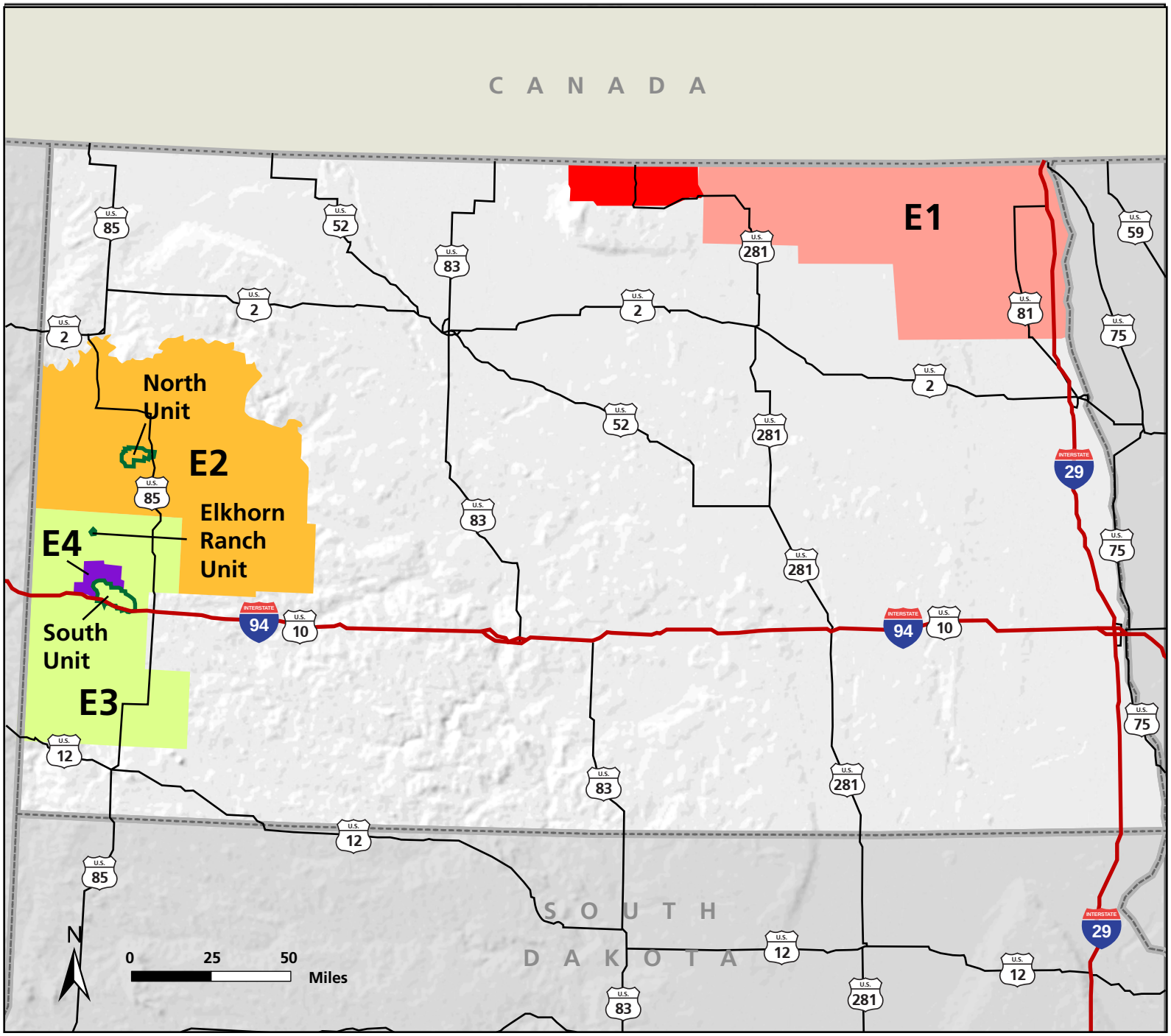
Disposal of CWD Positive Carcasses

Although the state of North Dakota does not have specific policies for the disposal of carcasses from ungulates that are CWD positive, they do have guidelines for the disposal of dead or diseased livestock, as well as the disposal of large animal carcasses generated during an emergency. These guidelines are published by the North Dakota Department of Health, Division of Waste Management (North Dakota Department of Health 2002, 2007), and generally indicate dead or diseased carcasses could be disposed of at permitted landfills. Further communication with the state has also indicated that disposal of CWD positive carcasses in approved landfills would be recommended, and that this protocol has been developed in accordance with direction in the National Animal Health Emergency Management System Guidelines published by the U.S. Department of Agriculture regarding transmissible spongiform encephalopathy diseases (Keller 2008; USDA 2005).

Although the state of North Dakota does not have specific policies for the disposal of carcasses from ungulates that are CWD positive, they do have guidelines for the disposal of dead or diseased livestock and large animal carcasses.

Theodore Roosevelt National Park
North Dakota

National Park Service
U.S. Department of the Interior



Elk Hunting Units

- E1
- E2
- E3
- E4
- No Hunting Allowed

- Park Boundary
- Interstate
- State Highways

Map 3:
Statewide Elk Management

Note: Unit E5, established in 2008, includes the entire state outside of the four elk units and the Turtle Mountains area known as Deer Unit 1.

Billings County Land Use Plan (Undated)

This comprehensive land use plan establishes the Billings County environmental planning and review process; discusses the legal framework for the plan; identifies the customs and cultures of the county; addresses community stability; and provides the organization, structure, and responsibilities related to implementation of the plan. The intent of the environmental planning and review process is to promote the stated purposes and philosophy of NEPA as they relate to Billings County. Specific goals, policies, and objectives for this process are outlined in the plan, and in general, it promotes cooperative relationships with federal agencies in planning processes that have the potential to affect the physical and socioeconomic resources of Billings County (Billings County, undated).

In the description of the custom and culture of tourism and recreation in Billings County, the land use plan recognizes elk as a big game species that attracts people to the area. The plan also considers National Park Service elk management as an area of concern and discusses the crop and hay damage that has resulted from elk migration between the park and surrounding lands (Billings County, undated). While a committee on wildlife and endangered species was established to deal with such issues, the plan itself does not provide specific guidance on elk management.

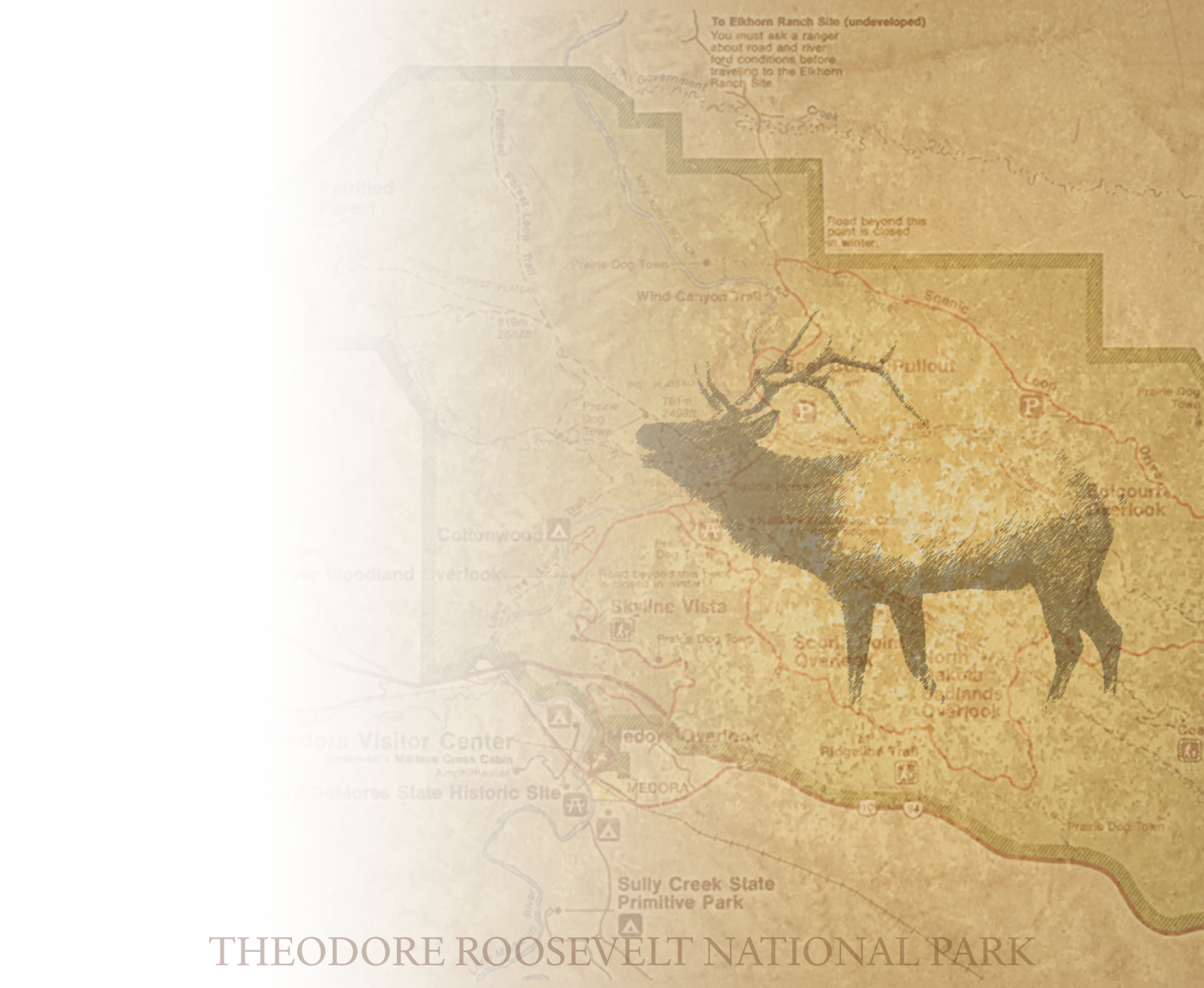
Billings County Comprehensive Plan (Undated)

This plan provides a background on the demographics, economy, and future growth in Billings County. It outlines goals, policies, and objectives for the county to help guide a stable economy and population base that allows citizens to continue their livelihoods. Goals and objectives identified in the plan include, among others, 1) protecting and guiding development of non-urban areas to maintain the integrity and compatibility of land uses, promote and maintain a stable agricultural economy, and strengthen and diversify the county's economic base; and 2) conserving and developing natural resources to promote responsible development of the county's natural resources; and to promote and maintain a stable oil and gas industry (Billings County 2007).

Specific policies outlined to achieve these goals and objectives include, but are not limited to:

- Cooperating and coordinating with federal, state, and local land management agencies and districts to ensure proper and consistent uses of the land and other resources;
- Supporting sustainable agricultural practices; recognizing and preserving agricultural land as a resource for the use and benefit of current and future generations;
- Encouraging and facilitating improved communications with federal and state land management agencies to ensure productive and sustainable uses of agricultural resources;
- Creating an environment amenable to economic investment;
- Promoting tourism and recreational opportunities;
- Preserving and protecting aesthetic values of the county's environment;
- Promoting positive social and economic uses of the environment;
- Encouraging ecologically sound land and soil management practices; and
- Promoting and encouraging the multiple uses of natural resources in the county (Billings County 2007).

ALTERNATIVES



CHAPTER 2: ALTERNATIVES

INTRODUCTION

This "Alternatives" chapter describes the various actions that could be implemented for current and future elk management in the South Unit at Theodore Roosevelt National Park (the park), including the "no action" alternative. Regulations implementing NEPA (40 CFR 1502.14) require consideration of the no action alternative, which in this document is the continuation of the current elk management program, as well as a range of reasonable alternatives. An agency must then analyze the impacts the alternatives could have on the human environment, which the regulations define as the natural and physical environment and the relationship of people with that environment (40 CFR 1508.14).

This "Alternatives" chapter describes the various actions that could be implemented for current and future elk management in the South Unit at Theodore Roosevelt National Park, including the "no action" alternative.

The interdisciplinary planning team developed the action alternatives (i.e., alternatives B through F) discussed in this chapter, taking into consideration feedback from the public and the science team (see "Chapter 5: Consultation and Coordination" and attachment 1). Action alternatives selected for detailed analysis must meet, to a large degree, the management objectives and also the purpose of and need for action as expressed in "Chapter 1: Purpose of and Need for Action."

This chapter provides an overview of the alternatives in table form. Next, the alternatives, including actions common to all alternatives, are described in detail, including estimated costs. All costs are reported in 2007 dollars and do not account for inflation over the life of this plan. There is also a discussion of adaptive management and how this would be applied to the action alternatives. The remainder of the chapter addresses how alternatives meet objectives, alternatives that were considered but eliminated from detailed analysis, and consistency with the purposes of NEPA.

OVERVIEW OF ALTERNATIVES

As required by the National Environmental Policy Act, the alternatives described in this chapter represent a full spectrum of options for managing elk within the South Unit of Theodore Roosevelt National Park. As a result of the alternatives development process, five action alternatives were selected for detailed analysis. Table 2 shows a summary of actions proposed under each alternative.

TABLE 2. SUMMARY OF ALTERNATIVE ELEMENTS

Element	Alternative A: No Action (Continue Existing Elk Management Program)	Alternative B: Direct Reduction with Firearms	Alternative C: Roundup and Euthanasia	Alternative D: Testing and Translocation	Alternative E: Hunting Outside the Park	Alternative F: Fertility Control (Maintenance Only)
Management Tools						
Initial Reduction	Not applicable; the park does not conduct elk population reduction activities.	• Qualified federal employees and authorized agents remove elk with firearms to reach initial population goal. • Teams used for direct reduction activities. • Others needed for associated activities (carcass handling, CWD testing, shipping, etc.).	• Helicopters help drive elk to the handling facility. • Ship live elk to commercial facility for euthanasia, CWD testing, and processing. • If no facility is available, euthanasia conducted by qualified federal employees and authorized agents at the park handling facility.	• Helicopters help drive elk to the handling facility • CWD testing conducted prior to translocation • Elk translocated to willing recipients only. • All applicable state and federal permits required to implement this alternative would be obtained.	• Working with landowners and the state, disperse elk to available land adjacent to the South Unit. • Manipulate fence as necessary to facilitate dispersal. • Focus on dispersing to state regulated Elk Hunting Units around the South Unit. • Coordinate with state actions used to remove elk outside park.	Not applicable; fertility control dismissed from further consideration for initial reduction as described later in this chapter.
Maintenance	Not applicable; the park does not currently conduct any elk population maintenance activities.	Same as initial reduction but scope of effort greatly reduced.	Same as initial reduction but scope of effort greatly reduced.	Same as initial reduction but scope of effort greatly reduced.	Same as initial reduction but scope of effort greatly reduced.	Currently, a fertility control agent is not available that meets NPS criteria; however, an agent could become available during the life of this plan. This alternative would require: • Roundup and administration of fertility control agent at handling facility. • Treatment of 90% of female elk annually. • Marking treated females and recapturing for subsequent treatments.
Numbers of Elk to be Removed[1]						
Elk Population Goal Selected by Interdisciplinary Team	Not applicable	100 to 400 elk	100 to 400 elk	100 to 400 elk	100 to 400 elk	100 to 400 elk
Initial Reduction – Number of Elk to be Removed	Not applicable.	**Assuming a** hypothetical **scenario where the elk population is 1,000 and the target after initial reduction is 200 elk,** approximately 1,358 elk removed over 5 years (accounting for annual population growth).	**Assuming a hypothetical** scenario **where the elk population is 1,000 and the target after initial reduction is 200 elk,** approximately 800 elk removed in the first year of the plan.	**Assuming a** hypothetical **scenario where the elk population is 1,000 and the target after initial reduction is 100 elk:** CWD testing - 368 elk. Initial reduction - at least 668 (accounting for annual population growth) to reach a population size of 100 elk (exact numbers will depend on demand from willing recipients)	**Assuming a hypothetical scenario where the elk population is 1,000 and the target after initial reduction is 200 elk,** approximately 1,358 elk removed over 5 years to reach population size of 200 elk (accounting for annual population growth).	Not applicable.

TABLE 2. SUMMARY OF ALTERNATIVE ELEMENTS

Element	Alternative A: No Action (Continue Existing Elk Management Program)	Alternative B: Direct Reduction with Firearms	Alternative C: Roundup and Euthanasia	Alternative D: Testing and Translocation	Alternative E: Hunting Outside the Park	Alternative F: Fertility Control (Maintenance Only)
Maintenance Activities – Number of Elk to be Removed/Treated	Not applicable.	**Assuming hypothetical scenario of 200 elk after initial reduction**, approximately 20 to 24 female elk removed annually during maintenance activities. Results in removal of 200 to 240 total elk from year 6 to 15.	**Assuming hypothetical scenario of 200 elk after initial reduction**, approximately 600 to 800 elk in three or four removals conducted each time the population would increase to approximately 400 elk during the life of the plan.	**Assuming hypothetical scenario of 100 elk after initial reduction,** when the population reaches 400 elk again, approximately 300 elk would be tested for CWD. Approximately 75 elk translocated in one event thereafter (will ultimately depend on duration of initial response, availability of willing recipients, and number of maintenance actions taken during the life of the plan).	**Assuming hypothetical scenario of 200 elk after initial reduction,** approximately 400 to 600 elk in two or three removals conducted each time the population would increase to approximately 400 elk during the life of this plan.	**Assuming hypothetical scenario of approximately 215 elk after initial reduction,** would require treating 69 female elk per year. Depending on alternative used for initial reduction, could result in treating approximately 690 to 996 female elk.
Total Elk Removed/Treated	Not applicable.	Approximately 1,558 to 1,598.	Approximately 1,400 to 1,600.	At least 1,411.	Approximately 1,758 to 1,958.	Approximately 690 to 996 female elk treated (depending on alternative used for initial reduction).
Timing of Management Actions						
Initial Reduction	Not applicable.	Fall phase: • Work with the state to determine the appropriate time for management actions. • Elk movement data used to determine where actions are taken. • Generally timed with state hunting season outside park. Winter phase • Work with the state to determine the appropriate time for management actions. • Elk movement data used to determine where actions are taken.	Same as alternative B.	CWD Testing Phase: • Work with the state to determine the appropriate time for management actions. • Generally conducted in the fall, timed with state hunting season outside the park. • Elk movement data used to determine where actions are taken. Translocation phases: • Depends on demand from willing recipients. • Elk movement data used to determine where actions are taken.	Working closely with the state to determine the appropriate time, disperse elk outside the park, but generally expected to occur after the end of the state hunting season in December.	Working with the state to determine the appropriate time for management actions, it is generally assumed that the fertility control agent would be administered in early winter to reduce heat stress and to treat females when the greatest numbers of elk are in the park.
Maintenance Activities	Not applicable.	Same as initial reduction.	Same as initial reduction.	Same as initial reduction.	Same as initial reduction.	Agent administered annually at any time of the year.
Other						
Research and Monitoring	As funding allows: • Annual surveys for population estimates. • Movement / distribution studies. • Population dynamics. • Vegetation monitoring.	Same as alternative A.	Same as alternative A.	Same as alternative A.	Same as alternative A.	Same as alternative A, plus: • Post-calving observations of treated elk to determine if reproduction had occurred.

TABLE 2. SUMMARY OF ALTERNATIVE ELEMENTS

Element	Alternative A: No Action (Continue Existing Elk Management Program)	Alternative B: Direct Reduction with Firearms	Alternative C: Roundup and Euthanasia	Alternative D: Testing and Translocation	Alternative E: Hunting Outside the Park	Alternative F: Fertility Control (Maintenance Only)
CWD Testing	Testing conducted as part of targeted and opportunistic surveillance.	Same as alternative A, plus: • Test all carcasses removed during initial reduction and maintenance.	Same as alternative B.	Same as alternative B, plus: • Prior to initial reduction, CWD testing to detect (with 99% confidence) the disease if present at 1% or greater prevalence. For a hypothetical population of 1,000 elk, this equals approximately 368 • Could be required prior to maintenance phases as well (depending on duration of initial reduction).	Same as alternative B.	Same as alternative A.
Carcass Handling, Disposal, and Distribution of Meat	Meat would be donated to non-profit organizations, food banks, and zoos, as permitted by regulation. If necessary, CWD-positive carcasses would be landfilled per state standard operating procedures (see "State of North Dakota Statutes and Guidelines" section of chapter 1).	Same as alternative A, plus: • A maximum of 30 CWD-negative carcasses left on the ground to decay.	Same as alternative A.	Same as alternative A.	Same as alternative A.	Same as alternative A.
Public Outreach	Continue current level and frequency of outreach, including educational and interpretive programs.	Increased educational and interpretive programs related to elk management, including more outreach.	Same as alternative B.	Same as alternative B.	Same as alternative B, plus: • Additional efforts to obtain landowner support.	Same as alternative B.
Enhance Public Hunting Outside the Park	Coordinate with state to add hunting seasons and/or increase the number of animals that can be taken outside the park.	Same as alternative A, plus: • Fall phase could increase elk available for hunting outside the park.	Same as alternative B.	Same as alternative B.	Same as alternative A, plus: • Direct dispersal of animals within the state to increase hunting opportunities.	Same as alternative A.

[1]Numbers of elk to be removed are reported for comparison purposes only, and are based on an assumed population of approximately 1,000 elk prior to initial reduction, and an assumed population growth rate of 25%, as explained later in this chapter.

ELEMENTS COMMON TO ALL ALTERNATIVES

Several activities related to elk management in the South Unit would be considered common to all alternatives, including the no-action alternative (alternative A) and the five action alternatives (alternatives B through F). Implementation of any action described below is subject to available funding.

1. **Research and Monitoring:** Elk population estimates, in addition to research on population dynamics and movement/distribution of elk, would be conducted.

   The park would continue to visit permanent range transects to collect data as part of the monitoring plan. Because limited data exists on seral stage conditions in the South Unit (see "Desired Conditions" section of chapter 1), researchers would initially collect data to establish a baseline, and would then monitor changes in species composition over time to determine trends in grazing effects.

2. **CWD Testing:** Targeted and opportunistic surveillance for CWD in elk would continue. Targeted surveillance, as defined by the NPS, would include lethal removal of deer or elk that exhibit clinical signs consistent with CWD for testing. The NPS defines opportunistic surveillance as taking diagnostic samples for CWD testing from elk found dead, such as road kill, or animals lethally removed from the park for other purposes (e.g., research, population management).

   Alternative D requires CWD testing to document the highly likely absence of the disease within the elk population prior to implementation. Currently, the only feasible option available requires sampling after the animal has died (post-mortem). Although live tests for CWD in elk are in their experimental phase (a study has been initiated at Rocky Mountain National Park), they are very new and it is unknown how sensitive they are in determining whether or not CWD is present. At this time, they are not a viable option for use in demonstrating the presence or absence of the disease in a cervid population (Powers 2008). If that should change, the NPS would evaluate whether or not the live test is appropriate for use at the park. Additional information on CWD and NPS actions related to the disease are described in appendix C.

3. **Disposal of CWD-positive Carcasses:** Although not an issue at this time, should an elk carcass test positive for CWD, it would be landfilled at approved facilities per state guidelines under all alternatives (see the "State of North Dakota Statutes and Guidelines" section of Chapter 1).

4. **Disposal of CWD-negative Carcasses:** To the extent feasible, meat from elk carcasses would be donated to non-profit organizations, such as the North Dakota Community Association (on behalf of Sportsmen Against Hunger), tribes, or zoos. All donations of meat for human consumption would be conducted in accordance with requirements of the NPS Office of Public Health related to CWD (NPS 2006b). This would include adopting the NPS Public Health guidelines pertaining to the donation of meat from areas outside 60 miles of a known CWD case (i.e., waiting for test results before donating, receiving informed consent from recipients). Although carcasses would be tested for CWD before they would be donated, it is important to note that the CWD tests are not sensitive enough to be thought of as a "food safety test" (i.e., a negative result does not guarantee that the animal does not have CWD) (NPS 2006b). Should future testing detect CWD in animals within 60 miles of the park, a different set of recommendations from the NPS Office of Public Health guidelines would be applied.

5. **Enhancing Hunting Opportunities Outside the Park:** The park would continue to work with NDGF on enhancing elk hunting opportunities outside the park. For alternative A (no action), this would focus on state actions such as adding elk hunting seasons or increasing the number of animals that can be taken, possibly to coincide with times of year elk are known to move outside the park (see the "Elk Movement and Distribution in and Around the South Unit" section of

chapter 3). All action alternatives would include these options, as well as NPS conducting management activities timed with the state hunting season outside park boundaries as practicable. This would help create short-term hunting opportunities outside of the South Unit by dispersing elk. In addition, alternative E includes dispersing large numbers of elk outside the park which would enhance hunting opportunities in the units surrounding the South Unit.

ALTERNATIVE A: NO ACTION (CONTINUE EXISTING ELK MANAGEMENT PROGRAM)

The Council on Environmental Quality requires that the alternatives analysis in an EIS "include the alternative of no action" [40 CFR 1502.14(d)]. The no action alternative "sets a baseline of existing impact continued into the future against which to compare impacts of action alternatives" (Director's Order 12, section 2.7). The no action alternative would be a continuation of existing management practices and assumes no new management actions would be implemented beyond those available when the elk management planning process started.

The no action alternative would be a continuation of existing management practices and assumes no new management actions would be implemented beyond those available when the elk management planning process started.

Under the no action alternative, options for the management of the elk population in the South Unit of the park would be limited. The park does not have an existing elk management plan and none of the park's current planning documents call for specific actions related to management of the elk population. The resource management plan for the park states that the "park will utilize completed research studies and other available information to manage native ungulates in the park including continuing with population monitoring and developing reduction actions as needed" (NPS 1994). Although the park conducted translocations for population reduction in accordance with this direction twice before (1993 and 2000), this practice was stopped due to the 2002 Director's Guidance Memorandum on CWD (NPS 2002a). This policy states that live elk cannot be removed from the park unless testing has been conducted to detect the disease with 99 percent confidence if it is present in 1 percent or more of the elk herd (NPS 2002a). For an elk population of approximately 1,000, this would require testing approximately 368. Currently, as noted in other locations in this document, testing elk for CWD requires killing the animals. Large scale lethal removals for testing were not anticipated by and are not authorized in the park's existing planning documents. Because other potential elk management methods have not been fully evaluated in other plans, and because of the change in NPS policy, the park is therefore left without tools to effectively manage the elk population.

The park would continue vegetation monitoring in elk use areas of the South Unit, as well as monitoring of the elk population. Data collected would help develop information related to baseline seral stage conditions as well as trends in seral conditions. Opportunistic and targeted surveillance for CWD would continue. The current level and frequency of public outreach would be maintained. Educational and interpretive measures would continue to inform the public about elk ecology and their potential impacts on park resources. No park closures or restrictions related to elk management actions would be needed under alternative A.

Implementation Costs

The estimated cost of implementing alternative A, based on input from the interdisciplinary team, is shown in table 3. Although some expenses would not necessarily be incurred annually, and some expenses could change year to year, average annual costs for elk management activities have been

developed by dividing the total cost by the life of the plan (assumed to be 15 years for the purposes of these calculations). These costs would primarily be for research and monitoring related to elk population surveys; studies on elk population movements and distribution; elk population dynamics; vegetation conditions in elk use areas; and opportunistic and targeted CWD surveillance. None of these costs include NPS staff time because the associated activities would be conducted as part of normal duties.

The ultimate cost of implementing alternative A would depend on the available funding for research and monitoring activities and the number of elk tested for CWD as a result of opportunistic and targeted surveillance. A specific number of elk to be tested for CWD in a given year cannot be predicted under alternative A, because opportunistic and targeted surveillance are based on testing elk found dead or that appear to exhibit clinical signs of CWD, respectively.

The labor costs associated with conducting these CWD surveillance efforts would also vary depending on where the carcass or elk to be sampled are located in the South Unit. Because opportunistic surveillance is only conducted when elk are found dead from other causes, it is assumed that these carcasses would be located during other day-to-day activities, and there would be no additional labor costs. However, targeted surveillance for CWD would require an NPS staff member to actively locate, remove, and retrieve the clinically suspect elk in the field, which could take four to five hours depending on where the elk is found. Assuming the individual tasked to locate the elk earns approximately $30 per hour, labor costs for locating an animal for targeted CWD surveillance could be as much as $150 per elk. The cost associated with actual CWD testing would range between $35 and $50 per elk to cover laboratory fees and collection costs.

Approximately $25 of the total cost would be for laboratory tests, which would be conducted by the NPS Biological Resource Management Division. The remainder of the cost (approximately $10 to $25) would be the labor costs associated with physical collection of a sample from the carcass. However, these labor costs would probably be lower, assuming staff could be trained in proper sample collection and handling, and the cost for taking samples would be covered by existing labor costs associated with preparing the carcass for disposal.

TABLE 3. COST ESTIMATE ALTERNATIVE A

Action	Assumptions	Cost for the 15-Year Planning Period	Average Annual Cost
Aerial surveys for annual population estimates	Approximately $5,000 per annual survey for aircraft time. A second survey would be conducted in years 5, 10, and 15 of this plan/EIS for a total of 18 surveys.	$90,000	$6,000
Other elk research (e.g., movement studies)[1]	Thirty (30) elk would be tracked during movement studies; costs include approximately $15,000 per year to refurbish radio collars; $700 per animal per year for capture efforts; $1,000 per year for pregnancy screening; and approximately $3,000 per year for incidental expenses.	$600,000	$40,000
Vegetation monitoring	Vegetation monitoring would be conducted using contract services (USFS or other experts)	$150,000	$10,000
Total		**$840,000**	**$56,000**

ELEMENTS COMMON TO ALL ACTION ALTERNATIVES

There are several elements common to just the action alternatives (alternatives B through F). These include the following:

1. **Estimates of Elk Population Size / Growth**: To allow the reader to compare the relative scope of the action alternatives, each of the detailed descriptions in the following sections provides an estimate of the total number of elk to be removed or treated over the life of the plan. To prepare this estimate, assumptions have been made about the size of the elk population prior to initial reduction, as well as the subsequent growth of the elk population after a management action is taken, as follows:

    - For comparison purposes only, a hypothetical population of 1,000 elk is assumed to be present in the South Unit prior to initial reduction.
    - The annual elk population growth rate used in this plan/EIS is assumed to be 25% based on the potential rate of increase reported in a recent reconstruction of the elk population growth from 1985 to 2006 (Sargeant and Oehler 2007). It is important to note that the model authors cautioned against using this growth rate for long-term management of the elk population. This was reiterated by the science team, explaining in their recommendations that use of this model cannot be expected to predict future population growth with equal accuracy because of variation in data used to construct the model; changes in environmental influences (e.g., higher elk densities); and the effects on population growth by random changes in demographic characteristics (Sargeant and Oehler 2007; see appendix D of attachment 1). It was used because the model represents the best estimate available to calculate the numbers of elk that would remain in the South Unit after implementation of an action alternative. Because the model accurately reconstructed population growth at relatively low numbers of elk, as would be present after implementation of one of the action alternatives, applying the growth rate facilitates comparisons regarding the scope and frequency of management actions under each of the alternatives.

      This growth rate would not be appropriate to determine a potential elk population size in the absence of active management under the no action alternative. Because there would be no removal of elk other than that which occurs through hunting, limited predation, and natural mortality, it is expected that the impairment of grassland vegetation and elk habitat would eventually cause the population growth rate to slow and ultimately result in a large reduction in the elk population (as described in chapter 1).
    - Ultimately, aerial surveys would be conducted in January to estimate minimum elk population size and provide input on the number of elk to be removed the following fall/winter. As explained by the science team, the park uses correction factors when estimating the elk population size because a proportion are not seen during such surveys. However, because correction factors are estimates and proportions of elk seen during surveys are random variables, overestimates and underestimates of population size are inevitable. As a result, the science team recommended that management actions be taken based on minimum number of elk seen, not corrected estimates, which would reduce the risk that uncertainty in elk population estimates could lead to greater-than-desired reductions (see “Population Objectives and Population Estimates” section of attachment 1 for more details regarding the implications of this issue).
    - The initial reduction would be equal to the number of elk over the minimum elk population. Any mortality related to hunting outside the park would be accounted for in the initial removal. For example, if the population estimate based on early winter aerial

surveys concludes there are 1,000 elk, and it is determined that 75 elk are taken during hunting season, then the initial reduction would require the removal of 825 elk to reach a minimum population level of 100. A similar process would be used to determine the number of elk that need to be removed during maintenance actions.

2. **Initial Reduction and Maintenance Aspects of Elk Management**: Alternatives B–E consist of management actions that could be used for both initial reduction and maintenance of the elk population to meet stated objectives. Actions would only be taken when certain thresholds are met (see the "Threshold for Taking Action" section in Chapter 1). The duration and frequency of initial reduction and maintenance activities is described for alternatives B–E and may ultimately change depending on the method implemented, the effectiveness of that method, and/or the number of elk to be removed/treated. Alternative F is discussed similarly; however, the fertility control proposed under this alternative would only be applied as a maintenance option if an agent is developed that meets specific criteria (see the "Alternative F" discussion, as well as the "Alternatives Eliminated from Further Consideration" section for background on why fertility control is only viable as a maintenance option).

3. **Temporal/Geographic Distribution of Management Actions**: The NPS would work with the state to determine the appropriate time for management actions, but it is anticipated that some activities would be timed during the fall, during the state hunting season outside the park boundaries, to facilitate increased hunting opportunities outside of the South Unit. As feasible, additional elk management actions would likely be taken in the winter months to help minimize impacts to public safety and visitor use. Information related to numbers of elk taken during state-sponsored hunts outside park boundaries would be used in calculating the numbers of elk to be removed during NPS management actions within the park. This would ultimately decrease the number of animals that would be removed from the South Unit for elk management.

   In addition, elk movement data would be used to determine which geographic locations are most appropriate for management actions. For example, the NPS may target elk in areas where they do not cross the boundary (refer to chapter 3, map 6) to remove elk that tend to remain in the park year-round. This would increase the potential for elk that cross the boundary to be taken during state-sponsored public hunts outside park boundaries.

4. **Sex Ratio**: Sex ratios have been altered by the disproportionate removal of male elk outside the park during hunting season. As a result, female elk would be targeted for removal. However, to ensure the herd does not become biased towards males, the NPS would develop individual strategies for maintaining appropriate sex ratios under each action alternative, based on actual elk population sizes estimated through annual surveys.

5. **Humane Management Actions**: In accordance with the American Society of Mammalogists guidance (ASM n.d.), efforts would be made to ensure management actions are conducted as humanely as possible to minimize elk suffering. If elk are seriously injured during implementation of non-lethal management activities, American Veterinary Medical Association guidelines for euthanasia (AVMA 2007) would be followed.

6. **CWD Testing**: In addition to conducting opportunistic and/or targeted surveillance, all elk lethally removed as part of an action alternative would be tested for CWD. Parties who are responsible for identification (assigning unique identification to each carcass from the point of the kill) and tracking of all CWD samples until final carcass disposition (distribution, donation, landfilling) would be clearly identified.

   Under alternatives B and C, elk removed by direct reduction with firearms (alternative B) and/or roundup/euthanasia (alternative C) would be tested for CWD. Agents working within the park, including skilled volunteers, would not be allowed to keep the carcasses after CWD samples are

taken. Carcasses would be shipped to processors and held, or stored in refrigeration trucks, until test results could be obtained. Carcasses would be butchered and packaged in lots coinciding with a unique identifier assigned to each carcass when the CWD samples were taken. If any samples are found to be CWD positive, those corresponding lots would be disposed of appropriately. If stored in a refrigeration truck, carcasses would be separated and, if samples were found to be CWD positive, those corresponding carcasses would be disposed of appropriately. CWD negative lots and carcasses would be available for distribution or donation.

Under alternative D, testing would be used to comply with the 2002 Director's Guidance Memorandum on CWD (NPS 2002a). Prior to translocations, this policy requires the park to test a statistically significant number of elk to be 99% sure that, if present at 1% or greater prevalence, the disease would be detected. For a population of 1,000 elk (hypothetical population size prior to initial reduction), this would require approximately 368 be sampled (NPS 2006c). The NPS contributions to this sample set would be supplemented with test results from samples taken by the state outside the park in the surrounding hunting units (a total of 36 in 2006 [NDGF 2006]). If CWD is not found, subsequent management actions (such as translocation) would be conducted for 3 years before testing would again be required.

Under alternative E, the NPS would cooperate with NDGF to ensure all animals removed outside the park are screened for CWD.

If live tests sensitive enough to determine presence or absence of CWD in individual animals or populations are available in the future, the park would use such a test to the extent practicable prior to decision-making regarding management actions.

7. **Helicopter/Firearms Use**: Helicopter and firearms use would comply with all relevant regulations, policies, and plans (see the "Employee and Visitor Health and Safety" section in chapter 4), and would be consistent with the interagency helicopter operations guide (IAMC 2006). Only qualified personnel would participate in helicopter operations.
8. **Minimizing Disturbances to Public**: To the extent feasible, efforts would be made to minimize safety concerns and disturbances to the public, such as scheduling elk management activities during periods of lower visitor use (e.g., fall or winter months). However, the NPS would determine if specific areas of the park would need to be closed during elk management activities. The public would be appropriately notified of these closures.
9. **Education/Interpretation:** The park would provide educational and interpretive information to the public about elk ecology, potential impacts from elk on other park resources, and success of elk management actions in achieving the desired condition.

Under alternative B, direct reduction actions with firearms would be used to lethally remove elk from the park by qualified federal employees and authorized agents.

ALTERNATIVE B: DIRECT REDUCTION WITH FIREARMS

Under alternative B, direct reduction actions with firearms would be used to lethally remove elk from the park. The methods described below would be used for both initial reduction and maintenance phases. Direct reduction would be managed by the NPS and carried out by qualified federal employees and authorized agents. Authorized agents include, but are not limited to, other agency and tribal personnel, contractors, or skilled volunteers.

Personnel engaged in direct reduction of elk for this plan would have the appropriate skills and proficiencies in the use of firearms and protecting

public safety. These personnel would have experience in the use of firearms for the removal of wildlife. For the purposes of this plan, a contractor would be a fully insured business entity, nonprofit group, or other entity engaged in wildlife management activities that include direct reduction with firearms. The contractor would possess all necessary permits. Skilled volunteers would include individuals identified through an NPS-developed system. Before assisting with removal actions with firearms, individuals would need to meet a number of requirements including a demonstrated level of firearm proficiency established by the park. Other skilled volunteers would need to demonstrate appropriate proficiency depending on their proposed involvement. Those skilled volunteers that qualify for participation would become part of a pool of available personnel that may supplement elk management teams. In addition, all skilled volunteers would be directly supervised in the field by NPS personnel during any elk management actions (see the discussion in the "Methods" section for this alternative). Authorized agents under direct NPS supervision would assist in conducting efficient, humane removal of animals to meet resource management objectives.

Authorized agents would be proficient in using firearms to remove wildlife. Contractors would possess necessary permits; skilled volunteers would be identified through an NPS system.

Compliance with all relevant NPS directives related to firearms use in parks, as well as federal firearm laws administered by the Bureau of Alcohol, Tobacco, and Firearms would be required. The park would develop specific guidelines for firearms use.

Methods

Teams, as necessary, would be involved with direct reduction activities, including the field activities directly related to reduction efforts (shooting, field dressing, data collection, CWD testing, carcass handling/transport) and subsequent management actions (carcass handling after removal from the field, data collection, shipping).

Teams could work simultaneously in different areas of the park. Each team members' role would be identified during a pre-reduction meeting and could include any of the actions noted above. Direct reduction teams would generally access an area on foot or horseback. The teams would locate groups of elk to facilitate reduction activities, although elk located opportunistically would also be considered for removal.

Team members, including skilled volunteers, would be designated to shoot elk as directed by the NPS and would assist with spotting and handling the carcasses (field dressing). Only non-lead bullets would be used. Although their use is not anticipated, firearm noise suppressors would also be considered at the discretion of the park. Every effort would be made to make the shootings as humane as possible. Elk injured during the operation would be put down as quickly as possible to minimize suffering. Qualified team members would be responsible for taking CWD samples and assisting in removing carcasses. Pending CWD test results (approximately 2-week waiting period), a maximum of 30 carcasses would be left in the field annually and their locations would be marked using GPS. Some CWD negative carcasses would be left because of the difficulty to retrieve them given terrain, weather, etc. Other CWD negative carcasses would be allowed to decay, providing carrion for scavengers and helping to mimic natural conditions. Should any samples from these carcasses test positive for CWD, park staff would retrieve the carcasses to the extent possible and dispose of them appropriately (see "State of North Dakota Statutes and Guidelines" in chapter 1).

Carcasses not left in the field would be transported to the handling facility in the park (see map 2 in chapter 1), where the remaining personnel would be available for subsequent management activities. These would include loading carcasses into refrigeration trucks for temporary storage while CWD

samples are processed; collecting data; and shipping carcasses to processors for distribution or donations (if CWD negative). As initial reduction activities could span weeks or months, carcasses could also be transferred to a meat locker for storage until test results are complete.

Timing

Working with the state to determine the appropriate time for management actions, this alternative would generally have two phases: a fall phase, timed with the state hunting season outside the park boundaries, and a winter phase. Elk movement data would be reviewed during the fall phase to determine if it is appropriate to implement management actions in areas where they are known to cross the park boundary (see map 6 in chapter 3). The fall phase could cause elk to disperse and increase opportunities for elk removal outside the park during the fall hunting season. The winter phase would be conducted primarily within the interior parts of the park, generally after the close of the state hunting season in December. There are fewer visitors during the fall and winter, so the effects of limited park closures or restrictions that may be required during direct reduction activities would be minimized. Information related to numbers of elk taken during state-sponsored hunts outside park boundaries would be used in calculating the numbers of elk to be removed during NPS management actions within the park. All direct reduction with firearms would occur during daylight hours.

Numbers of Elk Removed

Under this alternative, the NPS would seek to reduce the elk population via direct reduction with firearms and conduct annual maintenance actions thereafter with the intended effect of minimizing the overall number of elk removed during the life of the plan/EIS. The following discussion presents a hypothetical scenario that is intended for comparative purposes only. The actual numbers of elk to be removed during both initial reduction and maintenance would be determined based on elk population estimates from annual surveys conducted throughout the life of this plan.

The actual numbers of elk to be removed during both initial reduction and maintenance would be determined based on elk population estimates from annual surveys conducted throughout the life of this plan.

Initial Reduction

Based on a hypothetical scenario where the elk population in the South Unit is 1,000 animals before initial reduction, and the target elk population size is 200, initial reduction would take 5 years at a target removal rate of 250 to 300 elk per year. For the purposes of the calculations below, and because direct reduction is likely to disperse elk, making it more difficult to locate them for removal, it was assumed 275 could be removed each year over the course of several months during fall and winter. However, if logistics permit, the NPS could try to remove more elk via direct reduction in any given initial reduction to reduce the duration of the management action. Based on surveys conducted by the NPS in 2001 and 2004 to 2006, as well as a population model developed for Theodore Roosevelt National Park (see the "Elk Population and Growth at Theodore Roosevelt National Park" section in chapter 3), annual growth in this plan/EIS was assumed to be 25%. Factoring in this growth between management actions, approximately 1,358 elk would have to be removed during initial reduction. Annual surveys would be conducted in the park to estimate the actual number of animals to be removed during initial reduction. In addition, the number of elk removed during state-sponsored hunts around the park would be factored into the actual numbers of elk that need to be removed in the park.

Year One – Removing 275 elk during the first year of initial reduction activities would reduce the population in the South Unit of the park to approximately 725 elk.

Year Two – Assuming a 25% population growth, the elk population would be approximately 906 individuals at the beginning of year two. Removing 275 elk would reduce the population to approximately 631 elk at the end of year two.

Year Three – Applying a 25% population growth rate, the population of elk in the South Unit would be approximately 789 at the beginning of year three. Removing 275 elk would reduce the population to approximately 514 elk in year three.

Year Four – Assuming the same 25% population growth, the elk population would be approximately 642 at the beginning of year four. Removing 275 elk would result in a population of 367 elk at the end of year four.

Year Five – Assuming a population growth of 25%, approximately 458 elk would be present in the South Unit of the park at the beginning of year five. Approximately 258 elk would need to be removed by the end of year five to reach the population target of 200.

Several factors could influence the number of years to reach the initial elk population target. As the elk population decreases through successful reduction efforts, animals might become adapted to direct reduction activities and become more wary, increasing the effort necessary to reach the removal numbers in any given year. Existing reproduction and mortality rates might differ from the estimate used in this projection. If reproduction rates are higher and mortality lower than estimated, the population growth would be greater than 25% and more elk would need to be removed, potentially increasing the time to reach the initial population goal. The converse would be true if reproduction rates were lower and mortality rates higher than estimated, resulting in fewer elk needing to be removed, and efforts could take less time.

Maintenance

Maintenance of the population would involve the same direct reduction methods as those described above. Under this alternative, maintenance actions would be implemented annually, focusing on the removal of adult female elk. The science team (see Scenario F discussion in appendix D of attachment 1) concluded that if approximately 25% of adult female elk were removed annually (approximately 10 to 12% of the population based on sex ratios; see chapter 3 for further discussion of sex ratios), the park would observe a temporary increase in elk populations in the short-term, followed by a long-term, gradual decline that would maintain the population around 200 elk. Based on the hypothetical scenario where initial reduction takes 5 years to reduce the elk population to 200 animals and subsequent removals of 20 to 24 female elk would be necessary annually, it is assumed that the park would remove 200 to 240 elk for maintenance between years 6 and 15. Annual population estimates and the number of elk removed outside the park would be used to refine the number of elk to be removed by the NPS to stabilize the population.

Implementation Costs

The estimated cost of implementing alternative B, developed based on input from the interdisciplinary team and research conducted by the National Park Service consultant is shown in table 4. Although some expenses would not necessarily be incurred annually, and some expenses could change year to year, the average annual costs for elk management activities have been developed by dividing the total cost by the life of the plan (assumed to be 15 years for the purposes of these calculations). None of these costs include NPS staff time because the associated activities would be conducted as part of normal duties.

The costs associated with alternative B would include the costs identified for alternative A (research and monitoring), plus costs from direct reduction activities with firearms. For this alternative, it is assumed qualified federal employees or authorized agents would conduct the lethal removal activities and process the elk, collect biological data, prepare meat for transfer to a local food bank (as appropriate), or arrange

for disposal of deer carcasses (if needed). Opportunistic and targeted surveillance for CWD would continue, and the costs of CWD sampling would be based on the same assumptions as described for alternative A. Although the number of elk that would be tested under opportunistic or targeted surveillance cannot be estimated, it is assumed that this would be the same under any of the alternatives, and therefore, this would not be an extra cost to the NPS. However, the NPS would also test all carcasses removed lethally for CWD under this alternative. The sampling and testing costs would be the same as described for alternative A, except that all labor costs associated with locating, handling, and sampling a carcass would be included in the labor costs associated with removing the elk and preparing them for distribution, donation, or disposal. As a result, costs for CWD testing of elk removed lethally would include only the $25 laboratory test.

The estimated cost of implementing alternative B (see table 4) was calculated based on the hypothetical scenario described under the "Number of Elk to Be Removed" section. Actual costs could vary depending on the actual numbers of elk to be removed, which would be determined based on population estimates from annual surveys. The ultimate cost of implementing alternative B would depend on the extent to which NPS staff and authorized agents would be involved in direct reduction activities; the number of elk to be removed and how; and the available funding for research and monitoring activities. It is assumed that additional education/interpretation activities would be conducted within existing budgets and using current staff, so no additional costs are listed for these activities. In addition, the costs of this alternative could be further influenced by whether or not skilled volunteers are used as authorized agents.

TABLE 4. COST ESTIMATE ALTERNATIVE B

Action	Assumptions	Cost for the 15-Year Planning Period	Average Annual Cost
Aerial surveys for annual population estimates	Same as alternative A	$90,000	$6,000
Other elk research (e.g., movement studies)	Same as alternative A	$600,000	$40,000
Vegetation monitoring	Same as alternative A	$150,000	$10,000
Direct reduction with firearms	*Initial Reduction:* Years 1–5: 1,358 total elk removed ($500 per elk) *Maintenance:* Years 6–15: approximately 20 to 24 female elk removed annually for 10 years ($550 per elk[1])	$779,000–$799,000	$51,933–$53,266
Refrigeration Truck	A one-time expense.	$75,000	$5,000
CWD Testing	All elk removed (approximately 1,558 to 1,598) would be tested for CWD ($25 per elk)	$38,950–$39,950	$2,596–$2,663
Total		**$1,732,950–$1,753,950**	**$115,530–$116,929**

[1]Cost increase after year five is due to additional time needed to locate elk at a lower density.

ALTERNATIVE C: ROUNDUP AND EUTHANASIA

Under alternative C, roundup and euthanasia would be used for both the initial reduction and maintenance phases. Roundups would be conducted and elk would be herded to the park's capture and handling facility (see map 2 in chapter 1). From there, live elk would be transported to a commercial processing facility, where they would be euthanized, tested for CWD, and processed for distribution, donation, or disposal, as appropriate. If this is not an available option, elk would be euthanized at the park handling facility by qualified NPS employees and authorized agents skilled in specific euthanasia techniques. Carcasses would be tested for CWD, and processed for distribution, donation, or disposal, as discussed in the following section.

Under alternative C elk would be herded to the park's capture and handling facility, transported to a commercial processing facility, and processed for distribution.

Methods

A helicopter, pilot, and one certified crew member acting as a spotter would be used to round up and drive elk to the park's handling facility in the South Unit (see map 2 in chapter 1).

The park would first attempt to transport live elk from the handling facility to a commercial facility within the state (assuming a willing recipient). The commercial facility would be responsible for euthanasia, processing, and distributing (donating) or disposing of the meat once CWD test results are obtained, as described previously. Trained NPS personnel would be available to take samples during the euthanasia process. Under this scenario, elk would be held at the park's handling facility until a full truckload had been captured and loaded, at which point they would be transported to the commercial facility. CWD testing/tracking and distribution of carcasses would be conducted in accordance with NPS directives and specific guidance provided by the park (e.g., CWD sampling, tracking, etc.). If samples are found to be CWD positive, those corresponding carcasses would be disposed of per state guidelines (see "State of North Dakota Statutes and Guidelines" section in chapter 1. CWD negative lots and carcasses would be available for distribution or donation.

If a processing facility is not identified, euthanasia would be conducted by qualified park staff or authorized agents at the capture and handling facility within the South Unit. The capture and handling facility in the South Unit would be modified to allow for the containment of blood and other waste. Under this scenario, elk would be euthanized using methods approved by the AVMA. CWD samples and other data would be collected by trained NPS personnel or authorized agents. Some handling related mortality could be expected under this method due to stress on the elk; to be as humane as possible, the park would attempt to reach a goal of no more than 5% handling mortality. As necessary, the park would reevaluate handling methods if associated mortality becomes an issue. Carcasses would be stored in refrigeration trucks located at the handling facility until CWD test results are obtained. If necessary, carcasses would be moved temporarily to a meat locker facility for the CWD test holding period. CWD negative carcasses would be donated to the extent practicable, while those that are CWD positive would be landfilled per state guidelines (see the "State of North Dakota Statutes and Guidelines" section of Chapter 1).

Approximately 25 to 30 qualified park staff members or authorized agents would be needed to assist with the logistics of the roundup (i.e., direct animals through appropriate chutes at the handling facility, ensure safety procedures are implemented); assist in loading live elk into transport trucks or carcasses into refrigeration trucks; euthanize elk and collect CWD samples; and handle requests from the news media.

Elk would be identified for euthanasia based on objectives for population sex and age ratios. Elk to be euthanized would be kept in separate pens from those to be released back into the park. Based on the previous roundups conducted at the park, 150 elk could be herded through the chute per day; however, these animals could not be euthanized the same day due to the time involved. If it is necessary to keep live animals overnight, NPS staff would be responsible for ensuring the welfare of captured animals.

Timing

Working with the state to determine the appropriate time for management actions, roundups under this alternative would generally be carried out in fall and winter. During the fall phase, elk movement data would be reviewed to determine if it is appropriate to roundup animals in areas where elk are known to cross the park boundary (see map 6 in chapter 3). The fall phase may encourage elk to disperse, and therefore help increase opportunities for elk removal outside the park during the fall hunting season, while also driving the necessary number of elk to the handling facility in the South Unit. The winter phase would be conducted primarily within the interior parts of the park and generally after the close of the state hunting season in December. There are fewer visitors during the fall and winter, so the effects of limited park closures or restrictions that may be required during direct reduction activities would be minimized. Information related to numbers of elk taken during state-sponsored hunts outside park boundaries would be used in calculating the numbers of elk to be removed during NPS management actions within the park. Roundups would be conducted during daylight hours.

Number of Elk Removed

This section presents a hypothetical scenario that is intended for comparative purposes only. The actual numbers of elk to be removed during both initial reduction and maintenance would be determined based on elk population estimates from annual surveys to be conducted throughout the life of this plan. If logistics permit, the NPS could try to roundup and euthanize more elk per day than discussed below to reduce the duration of the management action.

Initial Reduction

Based on a hypothetical scenario where the elk population in the South Unit is 1,000 animals before initial reduction, and the target elk population size is 200, the park could accomplish initial reduction within one year. Given past experience, the park would attempt to safety herd 150 elk through the park handling facility in a day. For the purposes of these calculations, it is assumed the NPS would seek to euthanize 50 elk in one day (at the park handling facility or the commercial facility). Therefore, it is assumed it would take 22 total days for the roundups and to euthanize approximately 800 elk and reach the population target (six days for rounding up elk and 16 days for euthanasia). Annual population estimates and the number of elk removed outside the park would be used to refine the number of elk to be removed by the NPS within the park.

Maintenance

Maintenance of the population would involve the roundup and euthanasia methods described above. Maintenance actions would be implemented when the population in the South Unit exceeds 400 elk. Based on the hypothetical scenario where initial reduction takes 1 year to reduce the elk population to 200 animals, and assuming a population growth rate of 25%, this threshold would be reached within 3 to 4 years after initial reduction. Given experience from past roundup efforts at the park, 150 elk can be rounded up in a single day. Assuming 50 elk would be euthanized per day, the removal of the approximately 200 elk required to reach the target population could be achieved within a year (less than two days to conduct the roundups and four days to euthanize the elk). Given these assumptions, the park would conduct three or four removals for maintenance during the life of this plan (assumed to be 15 years for the purposes of these calculations), resulting in the removal of 600 to 800 elk during maintenance activities. Annual population estimates and the number of elk removed outside the park would be used to refine the number of elk removed by the NPS.

Implementation Costs

The estimated cost of implementing alternative C is shown in table 5 and is based on input from the interdisciplinary team and research conducted by the National Park Service consultant. Although some expenses would not necessarily be incurred annually, and some expenses could change year to year, the average annual costs for elk management activities have been developed by dividing the total cost by the life of the plan (assumed to be 15 years for the purposes of these calculations). None of these costs include NPS staff time because the associated activities would be conducted as part of normal duties.

The costs associated with alternative C would include the costs identified for alternative A (research and monitoring), as well as expenses associated with roundup and euthanasia. As described for alternative B, opportunistic and targeted surveillance for CWD would continue, and it is assumed that this expense would be the same under any of the alternatives, and therefore, this would not be an extra cost to the National Park Service. Costs associated with the roundup/euthanasia were calculated assuming elk would be shipped live to a commercial facility that would be responsible for euthanizing, processing, and distributing (donating) or disposing of the meat and that these costs would be the responsibility of the National Park Service. Under this alternative, it was also assumed that all carcasses would be CWD negative and the meat from the carcasses could be donated following NPS public health guidelines.

The euthanasia/processing costs identified in table 5 include fees to cover the U.S. Department of Agriculture inspection of the slaughtering and processing of elk, which could be approximately $35 per head. However, the NPS could work with the U.S. Department of Agriculture and commercial facility to waive or reduce such costs so these expenses could actually be lower. CWD testing would be required prior to distributing or donating meat (per NPS public health guidelines), and the costs assume that all sampling would be conducted by the NPS at the commercial facility. This CWD testing would cost approximately $35 to $50 per elk, which includes the labor costs associated with taking the sample as well as the laboratory test, as described for alternative A.

The estimated cost of implementing alternative C (see table 5) was calculated based on the hypothetical scenario described under the “Number of Elk to Be Removed” section. Actual costs could vary depending on the actual numbers of elk to be removed, which would be determined based on population estimates from annual surveys. The ultimate cost of implementing alternative C would depend on the number of elk rounded up and euthanized; and the use of NPS staff versus authorized agents. It is assumed that additional education/interpretation activities would be conducted within existing budgets and using current staff, so no additional costs are listed for these activities.

TABLE 5. COST ESTIMATE ALTERNATIVE C

Action	Assumptions	Cost for the 15-Year Planning Period	Average Annual Cost
Aerial surveys for annual population estimates	Same as alternative A	$90,000	$6,000
Other elk research (e.g., movement studies)	Same as alternative A	$600,000	$40,000
Vegetation monitoring	Same as alternative A	$150,000	$10,000
Roundups	Approximately $75–$150 per elk including helicopter time Initial Reduction: Approximately 800 elk in year one Maintenance: Years 2–15: Approximately 600 to 800 elk in three to four roundups	$105,000–$240,000	$7,000–$16,000
Shipping to commercial facility	Assumes shipping from Medora to a facility in Harvey, ND (approximately 250 miles) at $4 per mile. Approximately 1,400 to 1,600 elk would be shipped during the life of the plan. Assuming 50 elk could be shipped in one truckload, a total of 28 to 32 truckloads would be needed throughout the life of the plan.	$28,000–$32,000	$1,867–$2,133
Euthanasia/Processing	Approximately 1,400 to 1,600 elk would be euthanized and processed during the life of the plan. Commercial facility charges for euthanasia would range between $45 and $50 per head for approximately 1,400 to 1,600 elk. Commercial facility charges would range between $0.35 and $0.49 per pound for processing. Assuming an average elk weighs 600 pounds, this would be approximately $210 to $294 per head. Up to $35 per head may be required for U.S. Department of Agriculture Inspection fees	$406,000–$606,400	$27,067–$40,426
CWD Testing	All elk removed (approximately 1,400 to 1,600) would be tested for CWD ($35 to $50 per elk)	$49,000–$80,000	$3,267–$5,333
Total		**$1,428,000–$1,798,400**	**$95,201–$119,892**

ALTERNATIVE D: TESTING AND TRANSLOCATION

Under alternative D, the NPS would seek to conduct initial reduction and maintenance actions using translocation (roundup and relocation of animals to willing recipients outside the park). All applicable state and federal permits required to implement this alternative would be obtained. This option would involve multiple roundups—at least one for testing a sample number of elk to establish the prevalence of CWD, and subsequent roundups for the actual translocation of animals. However, several circumstances could influence implementation of this option, including the presence of CWD, the availability of willing recipients, and management considerations for the park (see "Potential Adaptive Management Approaches" section later in this chapter).

Under alternative D, the NPS would seek to conduct initial reduction and maintenance actions using translocation (roundup and relocation of animals to willing recipients outside the park).

Methods

The 2002 Director's Guidance Memorandum on CWD (NPS 2002a) allows translocation of elk only after sampling has been conducted that would detect the disease (with 99% confidence) if it were present in 1% or more of the elk population. For a population of 1,000 (hypothetical population size prior to initial reduction) sampling of approximately 368 elk would be required (NPS 2006c). Management actions for the CWD testing phase (roundup, euthanasia, CWD testing, and carcass storage/distribution) prior to initial reduction under alternative D would be similar to those described for alternative C (roundup/euthanasia). Translocation of elk for population maintenance that is proposed more than 3 years after the initial CWD testing would require additional testing. Some handling related mortality could be expected under this method due to stress on the elk; to be as humane as possible, the park would attempt to reach a goal of no more than 5% handling mortality. As necessary, the park would reevaluate handling methods if associated mortality becomes an issue. CWD negative carcasses would be donated to the extent practicable, while those that are CWD positive would be landfilled per state guidelines (see the "State of North Dakota Statutes and Guidelines" section of Chapter 1).

Assuming CWD is not present and willing recipients are available, subsequent roundups for initial reduction by translocation would be conducted. These would be completed as soon as possible after the final test results are received, but no more than 3 years after receiving the results. Elk would only be translocated to willing recipients, which could include tribes, non-profit groups, or other agencies (state and federal). Parties interested in receiving live elk from the park would be responsible for their transport; ensuring the transport occurs in a humane manner; and ensuring compliance with all state and federal laws. An MOU that specifies the conditions of the transfer would be developed between the NPS and the recipient, and would require close coordination with state veterinarians and agricultural boards to ensure all requirements are met. The NPS would ensure that the terms of any such agreement are met and would require assurances that subsequent releases of elk would be conducted humanely; that there would be no immediate commercial gain; and that sufficient land would be available to support the translocated herd. The maintenance phase of this alternative would rely on the same translocation methods as the reduction phase. However, translocations of elk for population maintenance more than 3 years after the initial CWD testing would require additional testing.

Timing

Although the NPS would work with the state to determine the appropriate time for management actions, it is assumed that this alternative would be broken into multiple phases: a fall CWD testing phase, timed with the state hunting season outside the park boundaries, and translocation phases for initial reduction and maintenance. During the fall phase, elk movement data may be used to determine if it is appropriate to conduct the roundup for CWD testing in areas where elk are known to cross the park boundary (see map 6 in chapter 3). The fall CWD testing phase may increase dispersal of elk and create opportunities for elk removal outside the park during the fall hunting season, while also driving the necessary number of elk to the handling facility in the South Unit for CWD testing. The translocation phases would be conducted when willing recipients are identified. The effects of limited park closures or restrictions that may be required during direct reduction activities would be minimized. Roundups would be conducted during daylight hours.

Number of Elk to Be Removed

This section presents a hypothetical scenario that is intended for comparative purposes only. The actual numbers of elk to be removed during both initial reduction and maintenance would be determined based on elk population estimates from annual surveys to be conducted throughout the life of this plan.

For the purposes of the impacts analysis, this alternative would be carried forward assuming the criteria for translocation (i.e., CWD is not detected and willing recipients are available), initial reduction, and maintenance are met, and assuming the scenario outlined below would be implemented. However, if these conditions are not met, initial reduction and/or maintenance could be conducted in accordance with methods direct reduction with firearms or roundup and euthanasia.

The numbers of elk to be removed under these circumstances would also depend on the number of elk that remain after CWD testing or after any are translocated to willing recipients. If logistics permit, the NPS could try to roundup and translocate more elk per year than discussed below to reduce the duration of the management action.

Initial Reduction

As mentioned above, based on a hypothetical population of 1,000 elk, approximately 368 would have to be euthanized for CWD testing prior to translocation. As management actions for the CWD testing phase would be similar to those described for alternative C (roundup and euthanasia), rounding up elk and testing for CWD would be done within the year.

Initial reduction activities would be implemented as soon as possible after receiving the final test results from CWD testing. Assuming initial reduction via translocation begins within the same year, the elk population would be approximately 632 animals at the beginning of initial reduction. Based on surveys conducted by the NPS in 2001 and 2004 to 2006, as well as a population model developed for Theodore Roosevelt National Park (see the on “Elk Population and Growth at Theodore Roosevelt National Park” section in chapter 3), annual growth in this plan/EIS was assumed to be 25%. Based on these assumptions and a hypothetical scenario where the target elk population size is 100, at least 668 elk would have to be removed during three years of initial reduction activities using the following assumptions.

Year One: If a willing recipient requests 300 elk within the first year after CWD testing, they would be rounded up in a day and subsequently translocated when transportation is made available. Approximately 332 elk would remain in the South Unit at the end of year one.

Year Two: The estimated population would be approximately 415 animals (assuming 25% population growth) in year two. If a request for 200 animals is made in year two, approximately 215 elk would remain in the South Unit at the end of year two.

Year Three: Applying the 25% population growth estimate, there would be 268 elk in year three. Assuming there is a willing recipient for elk, the NPS would translocate approximately 168 elk to reach the population level of 100 elk at the end of year three.

Should these requests span more than three years, additional CWD sampling would be required before subsequent translocations could be conducted. Ultimately, the number of years needed to reach the initial population target, as well as the total number of elk to be removed, would depend on the frequency of requests from willing recipients. Annual population estimates and the number of elk removed outside the park would be used to refine the number of elk to be removed by the NPS.

Maintenance

Maintenance of the population would involve the roundup and translocation methods described above. Maintenance actions would be implemented when the elk population in the South Unit exceeds 400. Annual population estimates and the number of elk removed outside the park would be used to refine the number of elk to be translocated by the NPS. Based on the hypothetical scenario where initial reduction takes three years to reduce the elk population to 100 animals, and assuming a population growth rate of 25%, it is estimated this threshold would be reached within six to seven years after the initial population target is reached. For example, if initial reduction is completed by year 3, the year 10 population would be approximately 475 elk. At this point, additional CWD testing of nearly 300 elk would be required prior to subsequent translocations. Given that 150 elk can be rounded up in a single day, this next testing phase could be achieved within one year. This would result in a population of approximately 175 elk in the South Unit in year 10 of the plan/EIS. The NPS would attempt to find willing recipients to translocate 75 elk to reach a population of 100 within the same year. Further translocations for maintenance would depend on demand from willing recipients during the life of this plan (assumed to be 15 years for the purposes of these calculations).

In this scenario, should there be any requests for elk after year 13, CWD testing would be required, and would be proportional to the population size at the time of the request. The NPS would then seek to translocate the number of elk needed to reach the population target (100 elk), but the total number of elk translocated would ultimately depend on requests from willing recipients.

Implementation Costs

The estimated cost of implementing alternative D was calculated assuming translocation is available for both initial reduction and maintenance (see table 6). Although some expenses would not necessarily be incurred annually, and some expenses could change year to year, the average annual costs for elk management activities have been developed by dividing the total cost by the life of the plan (assumed to be 15 years for the purposes of these calculations). None of these costs include NPS staff time because the associated activities would be conducted as part of normal duties.

The estimates are based on input from the interdisciplinary team and research conducted by the NPS consultant. The costs associated with alternative D under would include the costs identified for alternative A (research and monitoring), as well as costs for translocation. As described for alternative B, opportunistic and targeted surveillance for CWD would continue. It is assumed that this expense would be the same under any of the alternatives, and therefore, this would not be an extra cost to the NPS.

In this alternative, because a separate roundup would be conducted for the purposes of CWD testing only, the labor costs associated with this are not covered by other activities. Therefore, table 6 includes labor costs for roundups associated with the CWD testing phase of this alternative, as well as the costs for taking and testing the samples ($35 to $50 per elk). The ultimate cost of implementing alternative D would depend on the number of elk to be tested for CWD; the number of elk rounded up and translocated for initial reduction and/or maintenance; and the use of NPS staff versus authorized agents. It is assumed

that additional education/interpretation activities would be conducted within existing budgets and using current staff, so no additional costs are listed for these activities.

Because some costs associated with translocation, including trucking costs, special marking requirements, and veterinary screening requirements, may vary by recipient, they are not included in table 6. It is important to note that these costs, as well as the cost of all activities related to the roundup (e.g., use of a helicopter, veterinarian time, feed) and translocation (including any roundups required for CWD testing and the costs of that testing) would be the responsibility of the recipient. The only costs to the NPS would be staff time associated with the roundup.

The estimated cost of implementing alternative D (see table 6) was calculated based on the hypothetical scenario described under the "Number of Elk to Be Removed" section. Actual costs could vary depending on the actual numbers of elk to be removed, which would be determined based on population estimates from annual surveys.

TABLE 6. COST ESTIMATE ALTERNATIVE D

Action	Assumptions	Cost for the 15-Year Planning Period	Average Annual Cost
Aerial surveys for annual population estimates	Same as alternative A	$90,000	$6,000
Other elk research (e.g., movement studies)	Same as alternative A	$600,000	$40,000
Vegetation monitoring	Same as alternative A	$150,000	$10,000
Roundups[1]	Approximately $75–$150 per elk, including helicopter time *Initial Reduction:* Year 1: roundup of approximately 368 elk for initial CWD testing and translocation of approximately 300 elk Years 2 and 3: roundups for translocating approximately 368 elk total *Maintenance:* Year 10: roundup of approximately 300 elk for CWD testing and translocation of approximately 75 elk	$105,825–$211,650	$7,055–$14,110
CWD testing[1]	Costs for taking and testing samples from approximately 368 elk in year 1 and 300 elk in year 10 ($35 to $50 per elk)	$23,300–$33,400	$1,553–$2,227
Refrigeration Truck	One-time expense needed to store carcasses after CWD testing.	$75,000	$5,000
Total		**$1,044,125–$1,160,050**	**$69,608–$77,337**

[1]These costs would be the responsibility of the entity that receives the elk.

ALTERNATIVE E: HUNTING OUTSIDE THE PARK

Under alternative E, the NPS would look to enhance elk hunting opportunities outside the park, working cooperatively with NDGF, as well as the USFS and adjacent landowners, to implement actions outside the park to reduce and maintain the elk population.

Under alternative E, NPS would work cooperatively with NDGF, the USFS, and adjacent landowners to disperse elk outside the park to increase hunting opportunities.

Methods

The park would seek support from the state of North Dakota and work cooperatively with NDGF to identify supporting landowners to ensure adequate area is available to fully implement this alternative. If support is obtained, the NPS would disperse elk beyond the boundary of the park; although not necessarily anticipated, dispersal could involve using a helicopter. NPS employees may manipulate the fence to facilitate dispersal as necessary. Once elk are dispersed, the NPS would work with the NDGF to enhance hunting opportunities to reduce and maintain the elk population. The NPS would cooperate with NDGF to ensure all animals removed outside the park are screened for CWD.

Timing

The NPS would work with the state to determine the appropriate time for management actions, but it is generally assumed that this alternative would be initiated after the close of the state elk hunting season in December.

Number of Elk to Be Removed

This discussion presents a hypothetical scenario that is intended for comparative purposes only. The actual numbers of elk to be removed during both initial reduction and maintenance would be determined based on elk population estimates from annual surveys to be conducted throughout the life of this plan. If logistics permit, the NPS could try to disperse more elk and create more hunting opportunities per year than discussed below to reduce the duration of the management action.

Initial Reduction

Based on a hypothetical scenario where the elk population in the South Unit is 1,000 animals before initial reduction, and the target elk population size is 200, initial reduction would take 5 years at a target removal rate of 250 to 300 elk per year (for the purposes of calculations below, it was assumed 275 animals could be removed per year).

Based on surveys conducted by the NPS in 2001 and 2004 to 2006, as well as a population model developed for Theodore Roosevelt National Park (see chapter 1), annual growth in this plan/EIS was assumed to be 25%. Based on the hypothetical scenario where initial reduction takes 5 years to reduce the elk population to 200 animals, and factoring in this growth between management actions, approximately 1,358 elk would have to be removed during initial reduction. Population estimates conducted annually would be used to refine the actual number of elk in the park removed during initial reduction activities. In addition, the number of elk removed during the state-regulated hunting season would be factored into the actual numbers of elk that need to be removed.

Year One – By removing 275 elk during the first year of initial reduction activities, the elk population in the South Unit of the park would be approximately 725.

Year Two – Assuming a 25% population growth, the elk population would be approximately 906 at the beginning of year two. Removing 275 animals would result in a population of approximately 631 elk at the end of year two.

Year Three – Assuming the same 25% population growth rate, the population of elk in the South Unit would be approximately 789 at the beginning of year three. Removing 275 elk would result in a population of 514 elk at the end of year three.

Year Four – Assuming the same 25% population growth rate, the elk population would be approximately 642 at the beginning of year four. Removing 275 elk would result in a population of 367 elk at the end of year four.

Year Five – Assuming the same 25% population growth rate, approximately 458 elk would be present in the South Unit of the park at the beginning of year five. Approximately 258 elk would be removed by the end of year five to reach the population target of 200.

Several factors could influence the number of years to reach the initial elk population target. As the elk population decreased through successful reduction efforts, animals might become adapted to directed dispersal s and become more wary, increasing the effort necessary to reach the removal numbers in any year. Existing reproduction and mortality rates might differ from the estimate used in this projection. If reproduction rates were higher and mortality lower than estimated, the population growth would be greater than 25%, and more elk would need to be removed, potentially increasing the time to reach the initial population goal. The converse would be true if reproduction rates were lower and mortality rates higher than estimated, resulting in fewer elk to be removed, and efforts could take less time.

Maintenance

Maintenance of the population would involve the methods described above for initial reduction by directed dispersal coordinated with state actions. Maintenance actions would be implemented when the elk population in the South Unit exceeds 400. Based on the hypothetical scenario where initial reduction takes 5 years to reduce the elk population to 200 animals, and assuming a population growth rate of 25%, it is assumed this threshold would be reached within 3 to 4 years after the initial reduction target population level (200 elk) is reached.

Given that initial reduction would take 5 years under the assumptions described previously, and subsequent maintenance would be needed every 3 to 4 years after an action year, it is assumed that the park would conduct two or three removals for maintenance during the life of this plan (assumed to be 15 years for the purposes of these calculations). Under this alternative, this would result in the removal of 400 to 600 elk during maintenance activities over the life of the plan.

Implementation Costs

The estimated cost of implementing alternative E is shown in table 7 and is based on input from the interdisciplinary team and research conducted by the National Park Service consultant. The costs associated with alternative E would include the costs identified for alternative A (research and monitoring), as well as costs for directed dispersal. As described for alternative B, opportunistic and

targeted surveillance for CWD would continue. It is assumed that this expense would be the same under any of the alternatives, and therefore, this would not be an extra cost to the NPS. Although some expenses would not necessarily be incurred annually, and some expenses could change year to year, the average annual costs for elk management activities have been developed by dividing the total cost by the life of the plan (assumed to be 15 years for the purposes of these calculations). None of these costs include NPS staff time because the associated activities would be conducted as part of normal duties.

The estimated cost of implementing alternative E (see table 7) was calculated based on the hypothetical scenario described under the "Number of Elk to Be Removed" section. Actual costs could vary depending on the actual numbers of elk to be removed, which would be determined based on population estimates from annual surveys. The ultimate cost of implementing alternative E would depend on the number of elk dispersed outside the park, potential cost sharing with NDGF, and the method used for dispersal.

Although not anticipated, the estimate assumes a "worst case scenario" in which helicopters would be needed for all dispersals. It is assumed that additional education/interpretation activities would be conducted within existing budgets and using current staff, so no additional costs are listed for these activities.

TABLE 7. COST ESTIMATE ALTERNATIVE E

Action	Assumptions	Cost for the 15-Year Planning Period	Average Annual Cost
Aerial surveys for annual population estimates	Same as alternative A	$90,000	$6,000
Other elk research (e.g., movement studies)	Same as alternative A	$600,000	$40,000
Vegetation monitoring	Same as alternative A	$150,000	$10,000
Directed dispersal[1]	Costs for helicopter operations related to driving elk beyond the park boundary in years 1–5, and twice or three times between years 6 and 15. Assumes three days of helicopter time for each operation at approximately $17,000 per operation.	$1,256,400–$1,290,460	$119,000–$136,000
Fence alterations	Assumes 1,000 linear feet of fence would need alteration at $6.90/foot for materials during/after each management action.	$48,300–$55,200	$3,220–$3,680
Total		$2,144,700–$2,186,660	$142,980–$145,710

[1]Although not anticipated, the cost estimate assumes a "worst case scenario" in which helicopters are used for all dispersals.

ALTERNATIVE F: FERTILITY CONTROL (MAINTENANCE ONLY)

Alternative F, which involves the use of chemical (non-surgical) fertility control, is analyzed solely for maintenance of the elk population after initial reduction. Please see the "Alternatives Eliminated from Further Consideration" section of chapter 2 for the reasons why this alternative is not appropriate for

The park would not use this alternative unless future scientific studies prove fertility control agents that meet NPS criteria to be effective and efficient means of elk population control.

initial reduction activities. At this time, non-surgical fertility control has had mixed success in managing wildlife populations; however, ongoing research in other NPS units has indicated that use of such an agent for elk population maintenance at Theodore Roosevelt National Park could be feasible during the life of this plan. Ultimately, the park would not use this alternative unless future scientific studies prove fertility control agents that meet NPS criteria (spelled out later in this section) to be effective and efficient means of elk population control and the preferred and adaptive management efforts fail to maintain the elk population within the target range. In addition, implementation of this alternative would likely require additional coordination with NDGF.

Because this option is unlikely to result in adequate initial reduction elk population within the lifetime of the plan, it is proposed here only for use as a population maintenance tool. For the purposes of this alternative and the environmental analysis, it is assumed that a fertility control agent is available for maintenance, following initial reduction efforts by other means (see alternatives B–E above).

Methods

This alternative would focus on treating female elk with chemical fertility control agents to maintain the target elk population size. This option would reduce the number of calves born each year and ideally would slow birth rate to match death rate from natural causes and hunting outside the park, stabilizing the population size. Two basic categories of fertility control technology would be considered under this alternative: immunocontraceptives (vaccines) and non-immunological methods (pharmaceuticals). The two primary fertility control vaccines used in elk include porcine zona pellucida (PZP) and gonadotropin releasing hormone (GnRH). The non-immunological agents considered for use include GnRH agonists (an agent that combines with a receptor on a cell to produce a physiologic reaction) and contragestives (an agent that terminates pregnancy). Each of these agents is described in detail in appendix E, which provides an overview of reproductive control technologies for elk management, including methods available but not recommended for use.

Under this option, the park would initiate a fertility control program for elk population maintenance using either an agent approved for use in free-ranging elk or approved for off-label veterinary use. Any fertility control agent would be applied using treatments recommended by the prescribing veterinarian. The park would monitor the status of ongoing fertility control research. If advances in technology could benefit elk management in the park, then the future choice of a fertility control agent could change. The final choice would be determined by availability, cost, efficacy, duration, and safety at the time the action was implemented. An agent considered for use would need to meet the criteria outlined below. No fertility control agents are currently available that meet these criteria; however, it is possible that such an agent could be developed during the lifetime of this plan, and therefore, it has been considered for detailed analysis. For the purposes of this discussion and environmental impact analysis, it is assumed that a fertility control agent that meets these criteria would be available.

- **Effective with a single treatment:** The agent would effectively control fertility for the specific duration with a single dose, and would not require a booster. A single dose treatment would minimize the handling/darting needed to treat large numbers of elk. This would minimize the dangers and stress for the animals and people involved, as well as the associated costs.
- **At least 85% effective:** Considering the variability in biological response and the difficulty and expense of applying chemical contraceptives to a free-roaming wildlife population, the lowest acceptable level of effectiveness would be 85%.

- **Multi-year effectiveness:** Given the expense of treating animals, a chemical agent would need to be effective (at least 85%) for three to five years.
- **Appropriate approvals and certifications:** Ideally, the agent would have regulatory approval for use in elk. Alternatively, the agent could be a drug approved for use in other ungulate species but available for use in elk. Finally, an agent could be used experimentally if the responsible regulatory agency (U.S. Food and Drug Administration (FDA) or Environmental Protection Agency (EPA)), approved an investigational new animal drug exemption or experimental use permit, respectively. This exemption requires specialized authorizations under a drug research project. All agents would need to be certified as safe for use in elk by the prescribing veterinarian.
- **Withdrawal period:** Any fertility control agent used must have a zero day withdrawal period to allow consumption of the meat if the animal is killed by a hunter immediately after being treated.
- **Safe for treated animals:** The agent would have no long-term effects on treated elk other than effective fertility control. This would include the absence of toxic, short-term reactions or debilitating long-term effects that would increase morbidity or mortality in the population. The agent would not result in any genetic mutations that would be passed on to subsequent generations of elk if the fertility control was not successful, nor would it affect pregnant animals or their fetus.
- **No substantial behavioral effects:** The fertility control agent would not result in substantial behavioral effects, such as changes in breeding behavior (e.g., continued cycling of females, which can extend the breeding season or rut). It is the park's goal to avoid substantial changes to elk reproductive activities that would adversely affect wildlife behavior, visitor experience, and/or the health and safety of the public.
- **Safe for non-target animals:** Elk carcasses serve as a food source for other animals in the park. A fertility control agent should have no adverse effects (toxicity, changes in fertility, genetic mutations, etc.) on non-target animals that consume elk. The long-term effects of fertility control agents on non-target animals are unknown at this time. Based on an adaptive management approach, if additional information becomes available indicating that an agent has adverse effects on non-target animals, the use of the agent would stop or be modified to eliminate risks.

The park could consider fertility control agents developed during the lifetime of this plan based on certain criteria: effective with a single treatment, at least 85% effective, multi-year effectiveness, appropriate approvals and certifications, zero day withdrawal period, safe for treated animals, no substantial behavioral effects, safe for non-target animals.

Application Procedures

Fertility control agents would be administered within park boundaries by certified NPS staff or authorized agents according to Director's Order 77-4: *Use of Pharmaceuticals for Wildlife*. Best management practices for applying fertility control agents, as described in Director's Order 77-4, coupled with staff training would reduce safety risks associated with treating large numbers of animals.

While some fertility control agents may be remotely applied in the field, roundups using helicopters would be used in most applications to direct elk to the handling facility (see map 2 in chapter 1) for treatment. Male elk, which are more difficult to round up, would be purposely avoided or encouraged to separate from cow or cow/calf herds.

Subsequent to the roundup, all animals would be treated on the same day. Using this method, staff and/or contractors would move the animals through chutes, administer the fertility control agent, mark them with ear tags, and release them.

Based on past research (see appendix E) annual roundups would be conducted to treat 90% of female elk. Any marked elk that are not herded to the handling facility would be recaptured and treated in the field. Tracking and capturing previously treated elk would require a substantial amount of time to locate the animal so it could be temporarily restrained and treated. One method developed to deliver treatments without the physical capture or handling of elk is a remote dart application (biobullet) delivered with a dart-type gun. With this method, the biobullets are not recovered. Factors for consideration with this method include the maximum distance to the animal that allows the needed penetration for delivery, consistency in dosage delivery, and accurate documentation of which elk have been treated. Furthermore, the current behavioral state of elk at the park (extremely wild) precludes delivery of an agent from the ground.

Helicopters and net guns would be the primary capture method used to try and trap previously marked elk not rounded up for annual treatment. If possible, the elk would be recovered and sedated (as needed), tags updated, the control agent administered, and released. Locating these elk could prove very difficult given their typically elusive nature at the park, and the fact they would only have ear tags and not GPS collars. Some handling related mortality could be expected under this method due to stress on the elk; to be as humane as possible, the park would attempt to reach a goal of no more than 5% handling mortality. As necessary, the park would reevaluate handling methods if associated mortality becomes an issue. The application of annual treatments can be time consuming and expensive, and human and animal safety precautions must be addressed (see the “Training” section that follows).

Training

Regardless of the technique implemented, qualified NPS employees or authorized agents trained in the administration of reproductive controls would perform these activities. Training would include safety measures, particularly related to administering the treatment, to protect both visitors and NPS employees. NPS employees or authorized agents would be qualified to handle live elk in order to prevent disease transmission or any harm to the animal or the employee.

Monitoring

The ability to achieve target levels of infertility in the elk population would require knowledge of the fertility status of individual elk that had been treated (Hobbs et al. 2000). To monitor treated animals, post-calving observations of treated elk would be conducted to determine if there had been successful reproduction.

Timing

Fertility control agents currently being evaluated may be deliverable at any time of the year (Powers 2008). Working with the state to determine the appropriate time for management actions, it is generally assumed that the fertility control agent would be administered in early winter to reduce heat stress and to treat females when the greatest number of elk are in the park (see “Summary of Existing Research/Modeling” in chapter 1, and “Elk Population” section of chapter 3 for more information on seasonal movements of elk at the park). The treatment of female elk would be conducted during the off-peak visitor hours (early morning and evening) and weekdays to the extent possible. Elk movement data

may be used to determine if it is appropriate to conduct the roundup for administering the agents in areas where elk are known to cross the park boundary (see map 6 in chapter 3). Every effort would be made to minimize the time elk are concentrated in the handling facility to reduce stress.

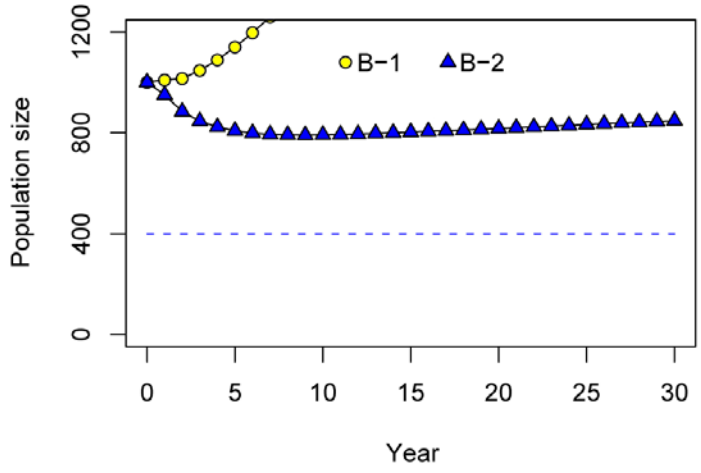
Number of Elk to Be Treated (Maintenance Only)

This discussion presents a hypothetical scenario that is intended for comparative purposes only. The actual numbers of elk to be treated during maintenance would be determined based on elk population estimates from annual surveys to be conducted throughout the life of this plan. As logistics permit, the NPS would try to roundup and/or treat as many elk as possible in one day to reduce the duration of the management action.

To effectively reduce population size, treatment with a reproductive control agent must decrease the reproductive rate to less than the mortality rate. Research at the park has shown at least a 96% survival rate (4% mortality rate) for female elk (see details in the "Elk Population" section in chapter 3).

Fertility control agents generally decrease population levels slowly. Although research on the number of elk that must be treated with fertility control agents for effective control of population growth are not available, data are available for free-ranging deer populations (Hobbs et al. 2000; Rudolph et al. 2000). According to the research, it would be necessary to treat at least 90% of females annually to halt population growth. After several years of application at this rate of treatment, as deaths exceed births, a small (e.g., 5%) reduction in the population could be expected (Hobbs et al. 2000). This research also indicates deer population size would remain relatively constant if 90% of the initial females are treated with a long-term fertility control agent, and subsequently, 90% of all fawns are treated annually. Using a hypothetical population of 1,000 elk, models run by the science team for this project showed this to be the case at the park as well, and eventually showed a small annual increase in the elk population (see figure 1; see appendix D of attachment 1 for more information).

FIGURE 1. POPULATION SIZE WITH FERTILITY CONTROL



Source: Oehler et al. 2007

Note: B-1 represents elk population sizes if 75% of females are treated annually; B-2 represents elk population sizes if 90% of female elk are treated annually.

Based on data collected during the roundup conducted in 2000 (see the "Elk Population" section in chapter 3), approximately 55% of the elk population in the South Unit consists of females. Age ratio observations from 1993 and 2000 (see the "Elk Population" section in chapter 3) indicated that approximately 65% of antlerless elk were females of breeding age. Assuming a hypothetical scenario in which the park would allow the elk population to reach an estimated 215 elk after initial reduction (to allow for some margin of error), it is estimated there would be approximately 118 female elk prior to the first fertility control treatment, 77 which would be of breeding age. Ninety percent of these female elk, or 69 of them, would require fertility control treatment annually after initial reduction. Depending on the alternative used for initial reduction (alternative B–E), and based on the associated assumptions, initial reduction could last 1 to 5 years. As a result, approximately 690 to 996 elk could be treated during the life of this plan. Note that these estimations do not take into account recruitment, immigration of animals into the population, or the fact that calves eventually become breeders. Annual population estimates and the number of elk removed outside the park would also be used to refine the number of elk to be treated by the NPS. In addition, although NPS criteria include multi-year effectiveness, this estimate assumes annual treatment would be required as a worst case scenario.

Implementation Costs

The estimated cost of implementing alternative F (see table 8) was calculated assuming fertility control would be implemented after initial reduction, which, depending on the alternative selected, could last 1-5 years. Although these expenses would not necessarily be incurred annually from the beginning of the plan, and some expenses could change year to year, the average annual costs for maintenance of the elk population using fertility control have been developed by dividing the total cost by the life of the plan (assumed to be 15 years for the purposes of these calculations). None of these costs include NPS staff time because the associated activities would be conducted as part of normal duties. It is important to note that costs of alternative F would be in addition to the costs of the initial reduction phase of the other alternative used.

The estimates are based on input from the interdisciplinary team and research conducted by the NPS consultant. The costs associated with alternative F under would include the costs identified for alternative A (research and monitoring), as well as costs for fertility control as a maintenance tool, including roundups, physically administering fertility control agents, and monitoring success. As described for alternative B, opportunistic and targeted surveillance for CWD would continue. It is assumed that this expense would be the same under any of the alternatives, and therefore, this would not be an extra cost to the NPS.

The estimated cost of implementing alternative F (see table 8) was calculated based on the hypothetical scenario described under the "Number of Elk to Be Treated (Maintenance Only)" section. Actual costs could vary depending on the actual numbers of elk to be treated, which would be determined based on population estimates from annual surveys. The ultimate cost of implementing alternative F would depend on the alternative chose for initial reduction; the number of elk treated with fertility control agents; the effectiveness of the fertility control agent; and the use of NPS staff versus authorized agents. It is assumed that additional education/interpretation activities would be conducted within existing budgets and using current staff, so no additional costs are listed for these activities.

TABLE 8. COST ESTIMATE ALTERNATIVE F –FERTILITY CONTROL (MAINTENANCE ONLY)

Action	Assumptions	Cost for the 15-Year Planning Period	Average Annual Cost
Aerial surveys for annual population estimates	Same as alternative A	$90,000	$6,000
Other elk research (e.g., movement studies)	Same as alternative A	$600,000	$40,000
Vegetation monitoring	Same as alternative A	$150,000	$10,000
Reproductive control for maintenance	*Roundups for administering fertility control:* Approximately $75–$150 per elk including helicopter time Assuming 690 to 996 female elk must be rounded up to be treated after initial reduction *Fertility control agent:* Assumes one dose of fertility control agent costs $160 and 690 to 996 female elk are treated after initial reduction	*Roundups:* $51,750–$149,400 *Fertility control agent:* $110,400–$159,360	*Roundups:* $3,450 - $9,960 *Fertility control agent:* $7,360–$10,624
Monitoring of elk population for reproduction	Assumes three days of staff time per year beginning in year 2 to 6, depending on duration of initial reduction	$10,000–$13,000	$667–$867
Total		**$1,012,150–$1,161,760**	**$67,477–$77,451**

POTENTIAL ADAPTIVE MANAGEMENT APPROACHES

Successful management of natural systems is a challenging and complicated undertaking. Adaptive management—learning by doing—is based on the assumption that current resources and scientific knowledge is limited and a certain level of uncertainty exists. Nevertheless, an adaptive management approach attempts to apply available resources and knowledge and adjusts management techniques as new information is revealed. Holling (1978) first described the principle of adaptive management as requiring management decisions and policies to be viewed as hypotheses subject to change—as sources of continuous, experimental learning.

The Department of the Interior requires its bureaus ". . . use adaptive management to fully comply" with the Council on Environmental Quality's guidance that requires "a monitoring and enforcement program to be adopted . . . where applicable, for any mitigation" required in NEPA planning processes (516 DM 1.3 D(7); 40 CFR 1505.2). In addition, the Department of the Interior has recently outlined the adaptive management approach in a technical guide developed to provide guidance to all department bureaus and agencies (Williams et al. 2007).

The adaptive management process has six steps. These include: assessing the problem; designing management actions; implementing those actions; monitoring the effects of the actions; evaluating the monitoring data; and adjusting future actions based on that data. This process works well when integrated with the NEPA process. As with adaptive management, the primary goal of NEPA is informed decision-

making through understanding the impacts of a proposed federal action. The NEPA process can provide an adaptive management framework, define thresholds, outline actions, and assess their potential impacts, thereby allowing for the implementation of subsequent actions described in the adaptive management component of the plan. This approach allows resource managers more flexibility for achieving the desired condition stated in the plan, and can reduce or limit future environmental review requirements.

As described above, the adaptive management approach can be divided into the following basic steps: assessment, design, implementation, monitoring, evaluation, and adjustment or continuation (Nyberg 1998). Ideally, the resulting management of an ecosystem will improve as more information is gathered, analyzed, and incorporated into the process. Adaptive management requires setting quantitative objectives, exploring alternative management strategies, monitoring progress, and evaluating performance in terms of risks and benefits (Goodman and Sojda 2004). The applicability and success of decisions depends on the frequency and precision of monitoring (Williams 1997).

Adaptive management incorporates scientific experimental methods in the management process while remaining flexible to adjust to changes in the natural world, as well as the policies that govern it. The goal is to give policy makers a better framework for applying scientific principles to complex environmental decisions (Wall 2004).

All of the action alternatives (B–F) described in this chapter incorporate adaptive management approaches to meet the objectives of the plan. Each alternative includes a management action followed by a period of monitoring to evaluate the results of the action. By using an adaptive management approach, managers will be able to change the timing or intensity of management treatments to better meet the goals of the plan as new information is obtained. The adaptive management approach and its integration into the action alternatives are more fully described below.

Using the Adaptive Management Process

Adaptive management requires an examination of a hypothesis to be tested. For this plan, adaptive management starts with the hypothesis that elk population size is the primary factor that would limit grasslands in elk use areas from reflecting a “lightly grazed system.” Monitoring under this plan would test for changes in both the elk population as well as shifts in grassland vegetation patterns in elk use areas (see “Actions Common to All Action Alternatives Section” and appendix B for more details). If a difference is evident, then elk management actions may need to be altered. If not, data would be examined to identify the most important variable(s) affecting grassland conditions. These could include drought, fire, and other wildlife, in addition to elk population size. Figure 2 illustrates an adaptive management approach.

Under this plan the following six steps would constitute the adaptive management approach. Alternatives described in the plan are used as an example in each of these steps for illustrative purposes.

1. *Monitor the baseline data* — Existing conditions would be recorded and monitored to establish a baseline for future comparison.

2. *Apply the management action* — Elk would be managed using an action alternative described in this document; for example, alternative B would involve direct reduction with firearms during initial reduction and maintenance.

3. *Monitor the effectiveness of each management action* — Monitoring would determine whether the management actions were achieving the desired outcome. For example, are direct reductions with firearms in elk use areas resulting in vegetation conditions reflective of or trending towards a lightly grazed system? Or, is direct reduction with firearms efficient and cost effective for reaching the desired population size within a reasonable time frame?

4. *Monitor for effects of management actions on other resources* — Resources in the park would be monitored during and after management actions to determine whether or not there have been any unacceptable effects on herbaceous grassland plants.

5. *If monitoring indicates the goal of a lightly grazed system is not at an acceptable level, reconsider the management actions* — For example, under alternative C, if monitoring shows the desired effect is not being met, this could result in additional roundups and removal to achieve a population of 100 elk. Similarly, if an action was found to have unintended effects on elk or other components of the environment, modifications would be considered. For example, under alternative F, if the reproductive control agent was causing unacceptable behavioral changes in elk, the agent would be changed.

6. *If the management action is effective, and elk use areas are reflective of a lightly grazed system, consider modifying the intensity of the action* — For example, if maintaining the population under alternative B results in conditions similar to those found today (with a population assumed to be 1,000), the number of elk removed during maintenance could be reduced and still have the same effect.

Applying the Adaptive Management Approach to the Action Alternatives

The action alternatives have been developed considering the potential use of the following adaptive management approaches. Implementation of any adaptive management approach would rely on best available science when necessary.

Alternative C Implementation

As described previously, if a processing facility is not identified, euthanasia would be conducted by qualified park staff or authorized agents at the capture and handling facility within the South Unit. The capture and handling facility would be modified to allow for the containment of blood and other waste.

Alternative D Implementation

Alternative D would involve CWD testing and translocation of elk for initial reduction and maintenance; however, as shown in figures 3 and 4, there are several circumstances under which changes to the selected action may be needed (e.g., presence of CWD, availability of willing recipients).

If CWD is detected, or if willing recipients are not available to take the required number of elk for initial reduction or maintenance activities within 3 years of CWD testing, translocation would be precluded from further use. Park staff would evaluate the circumstances and tools available and determine an appropriate path forward. If translocations are precluded for use during initial reduction, the park would explore options for using direct reduction with firearms (as described for alternative B), roundup/euthanasia (as described for alternative C), or hunting outside the park (alternative E) as shown in figure 3.

In an instance where CWD is not detected, but willing recipients are not available for translocations associated with initial reduction, it would not preclude the NPS from considering translocations for maintenance, as long as the appropriate conditions are met. However, translocations of elk for population maintenance more than 3 years after the initial CWD testing would require additional testing.

If translocations are precluded for use during maintenance, the park would explore options for using fertility control (as described for alternative F), direct reduction with firearms (as described for alternative B), roundup/euthanasia (as described for alternative C), or hunting outside the park (alternative E) as shown in figure 4. However, fertility control could also be precluded from use for maintenance by the availability of a fertility control agent that meets NPS criteria, and if available, also by the effectiveness of that agent in controlling the growth of the elk population.

FIGURE 2. AN ILLUSTRATION OF THE ADAPTIVE MANAGEMENT APPROACH FOR THE ACTION ALTERNATIVES

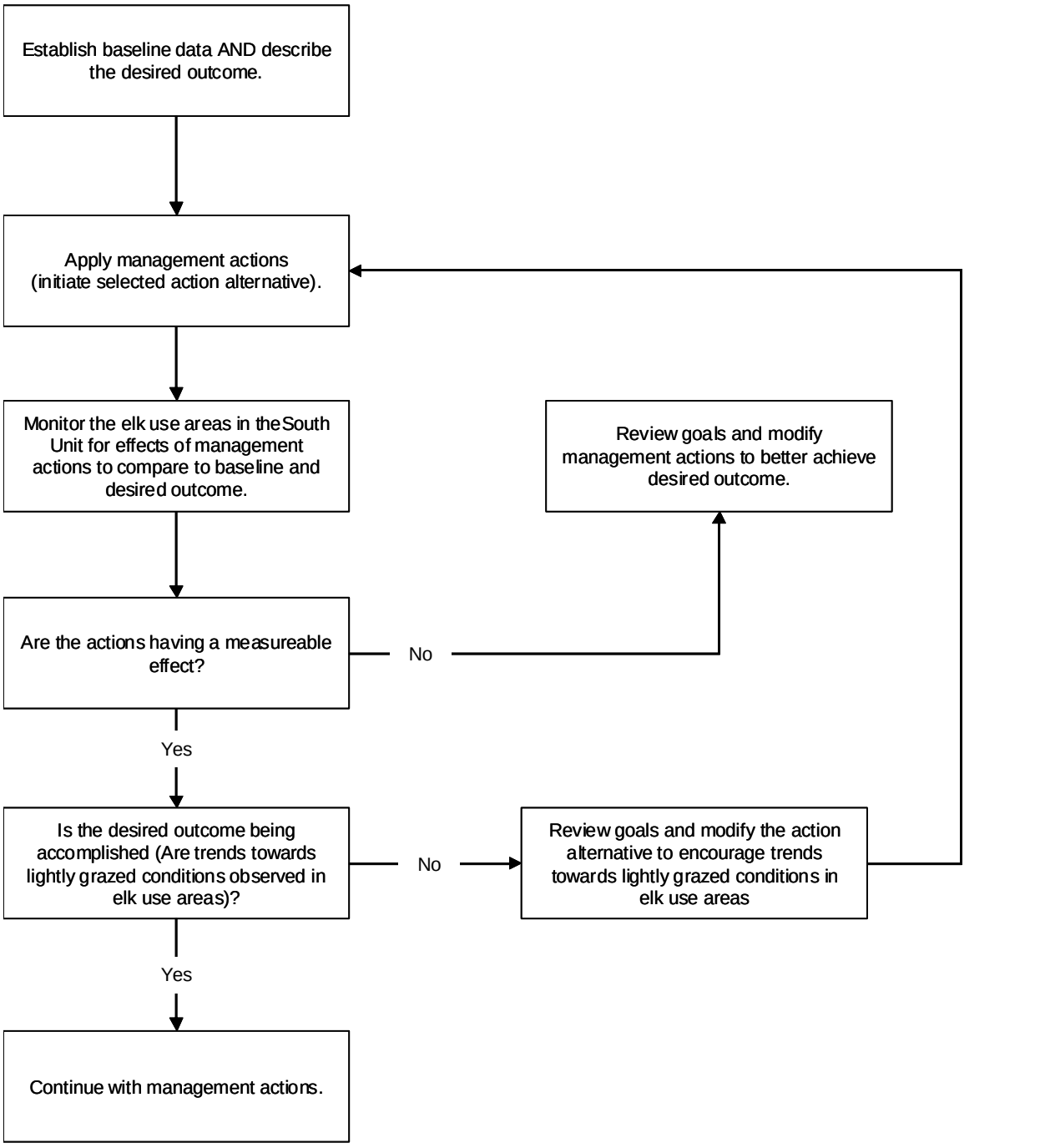


FIGURE 3. ALTERNATIVE D INITIAL REDUCTION FLOW DIAGRAM

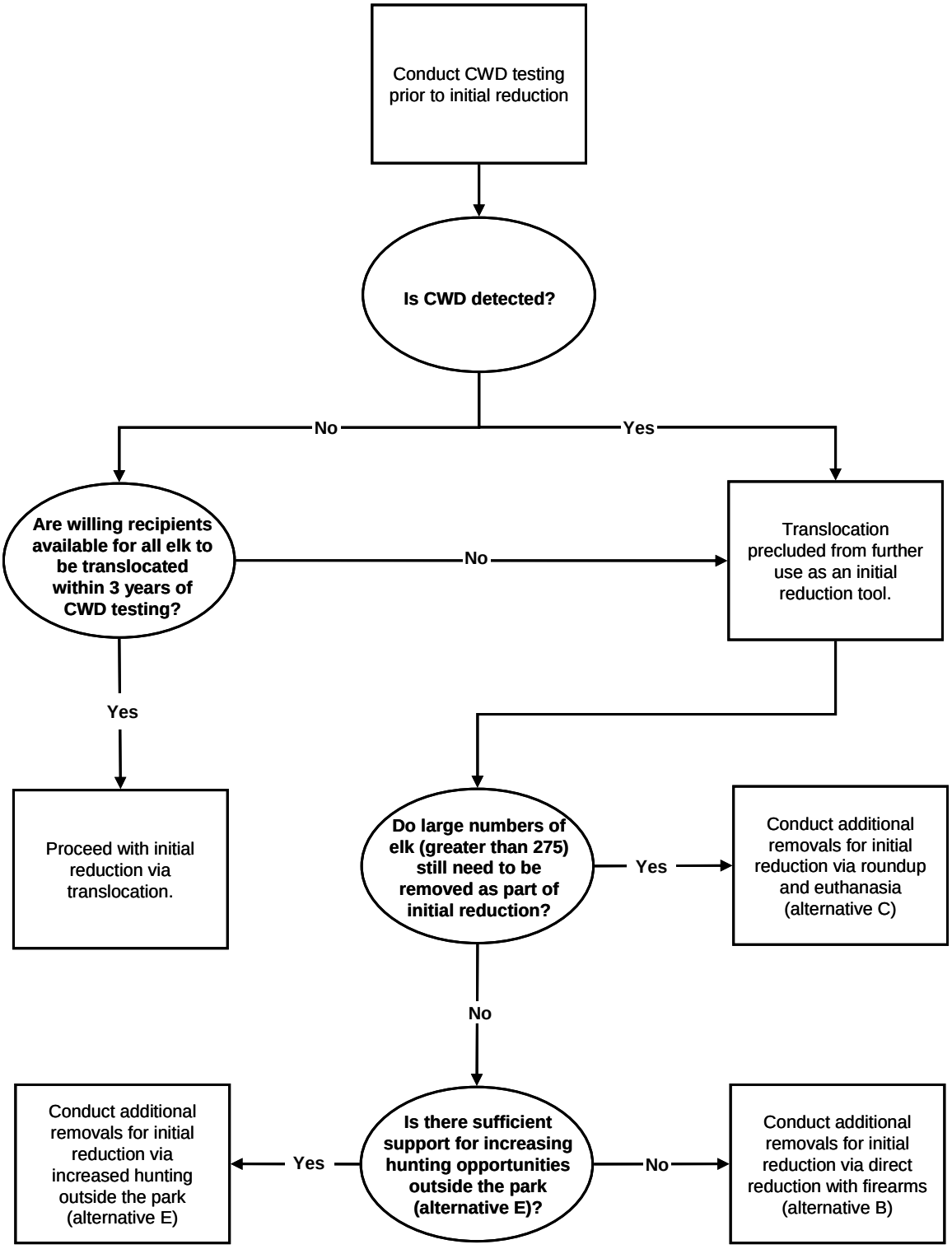
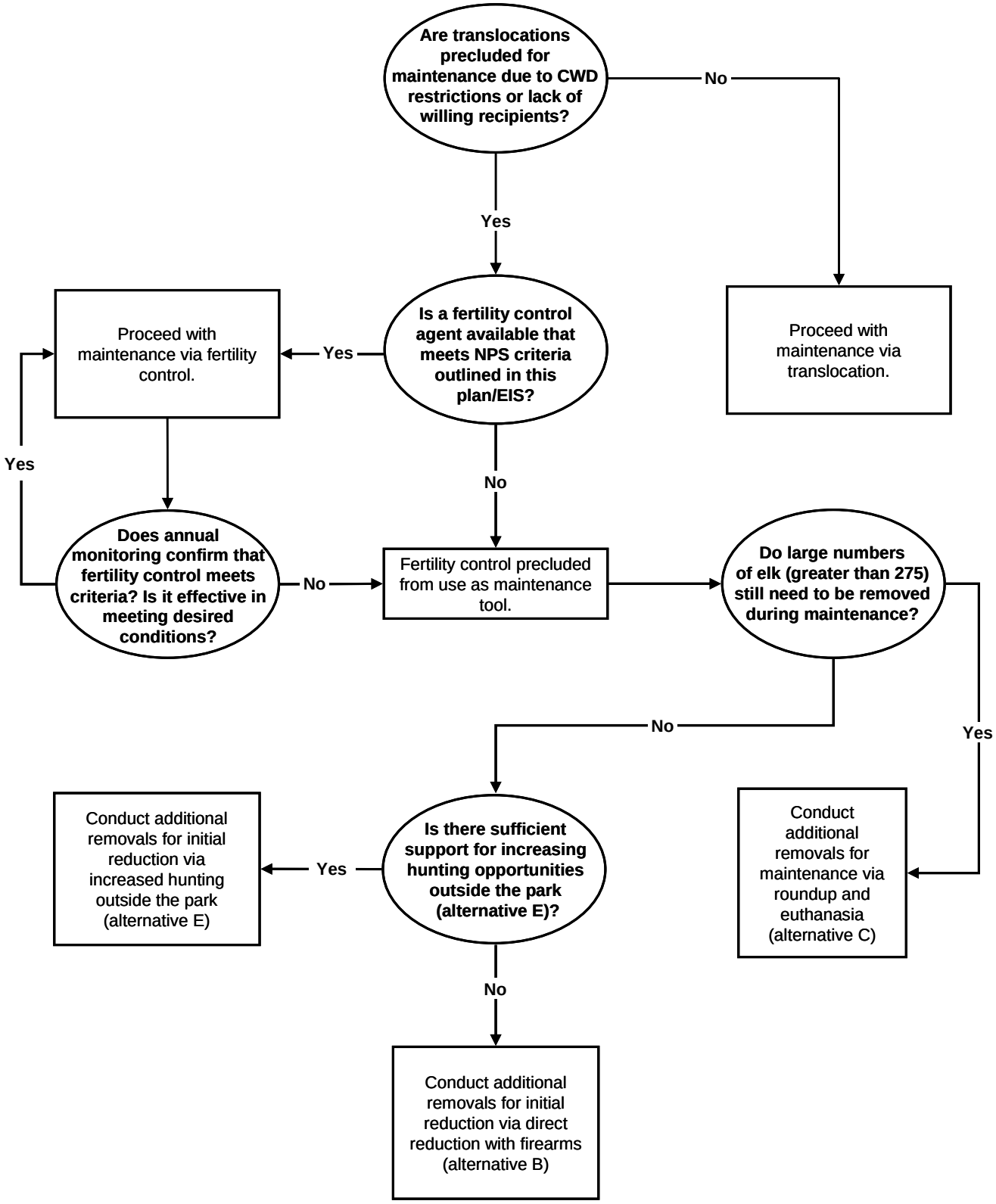


FIGURE 4. ALTERNATIVE D MAINTENANCE FLOW DIAGRAM



There is limited information regarding the safety, efficacy, and feasibility of applying fertility control agents in large, free-roaming populations. As science catches up to the need for management, additional agents could be developed and tested for reproductive control on free-ranging elk. The park could review the science at that time to determine if other agents are appropriate for use. The size, scale, and location of the application would depend on the specifications and efficacy of the agent.

Alternative E Implementation

Under alternative E, the NPS would seek to increase hunting opportunities outside the park boundaries by dispersing elk in coordination with state actions during both initial reduction and maintenance. If sufficient landowner support cannot be obtained for this, the NPS could round up and translocate elk, similar to the methods described in alternative D but with a preference for in-state translocations.

Alternative F Implementation

As stated previously, the park would not use this alternative unless future scientific studies prove fertility control agents that meet NPS criteria to be effective and efficient means of elk population control and the preferred and adaptive management efforts fail to maintain elk population within the target range. If implemented, monitoring would be required to determine the effectiveness of the fertility control agent as a maintenance tool. If after the second year of maintenance activities it appears unlikely that the park's elk population would be sufficiently maintained at target goals, other maintenance actions could be considered (alternatives B–E).

Elk Population Goal

Based on past management experience in the park, managing elk and other ungulates at levels established using the science-based forage allocation model (Westfall et al. 1993) is assumed to result in conditions reflecting light grazing pressure in elk use areas.

To confirm this, once the baseline seral stage is characterized for the South Unit, vegetation data collected in areas of high elk use (determined based on movement data) would be compared to areas of low and no elk use (also determined by movement data) to evaluate if trends in vegetation conditions reflect a lightly grazed system analogous to late seral stages (see appendix B). Recognizing that there is no single universal approach to assessing ecological condition through seral stage classification and evaluating trends, the science team suggested the Needle-and-Thread / Threadleaf Sedge Herbaceous Vegetation plant association in high and low elk use areas, established based on elk location data, could be monitored because this association is characterized by major species that respond differentially to drought, fire, and grazing by large ungulates (see appendix E of attachment 1).

Particular vegetation species—needle-and-thread, western wheatgrass, and blue grama (*Bouteloua gracilis*) —that differ in their respective ability to tolerate or avoid grazing would be monitored in this association. Grazing tolerance consists of mechanisms that facilitate regrowth following grazing. Grazing avoidance includes plant characteristics that reduce the probability and severity of grazing, such as low growth form, spines or hairs on the plant, or secondary chemical compounds that reduce palatability. Grazing resistant plants tend to increase in abundance and frequency under heavy grazing pressure (increasers) while plants that lack such characteristics tend to decrease (decreasers) (see appendix B). Shifts in the relative contribution of increaser/decreaser species within a plant association can be used as an assessment of grazing pressure of a particular site. Furthermore, comparisons of current composition to historic climax conditions are also valuable in assessing the ecological condition of a site (USDA-NRCS 2003).

Data would be collected over a 10-year period to account for drought conditions that may result in delayed responses in vegetation, as well as changes in use by other ungulates. Using best available science, the park would adjust its elk management actions in one of several ways:

- If there is an identifiable trend toward lightly grazed conditions attributable to elk use in areas previously displaying high grazing pressure, then no change in elk population management would be necessary.
- If there is an identifiable trend toward highly or moderately grazed conditions attributable to elk use in areas previously displaying light grazing pressure, then the elk population level would be adjusted.
- If conditions in areas displaying high or moderate grazing pressure do not change (i.e., are not trending towards a lightly grazed system), then the elk population level would be adjusted.
- If there is no change in conditions for areas displaying high or moderate grazing with the elk population fluctuating between 100 and 200 animals, then other factors affecting grassland ecosystems would be further explored while maintaining the elk population within this range.
- If conditions similar to those found today (with a population assumed to be 1,000) continue, the number of elk removed during maintenance could be reduced and a larger population could be maintained.

Plot Locations for Vegetation Monitoring

Once the elk population is reduced, parts of the park once considered low, moderate, or high elk use areas, based on elk movement data, could change. The results of movement studies could be used to help determine new areas of high and low elk use, and as a result, vegetation monitoring plots could be shifted.

Establishing Quantitative Vegetation Goals

As the monitoring data are collected and analyzed to characterize the seral stage of plant communities (see appendix B), quantitative desired conditions for vegetation could be established. Monitoring would then shift from characterizing the existing seral stage to ensuring these goals are being met. Ultimately, if desired conditions for vegetation are not being met, the park would revisit the elk population goal using best available science (similar to that described above), and/or other factors that affect seral stage of grassland ecosystems.

Forage Allocation Model Update

Information obtained from the analysis of diet data collected in recent years (see "Summary of Research/Modeling" section in chapter 1) could be used to update the forage allocation model. However, it is unknown whether or not that update would cause a change to the population goal identified using the existing model.

HOW ALTERNATIVES MEET OBJECTIVES

As stated in the "Purpose of and Need for Action," all action alternatives selected for analysis must meet all objectives to a large degree. The action alternatives must also address the stated purpose of taking action and resolve the need for action; therefore, the alternatives were individually assessed in light of how well they would meet the objectives of this plan and environmental impact statement, which are stated in chapter 1 of this document. Alternatives that did not meet the objectives were not analyzed further (see the "Alternatives Eliminated from Further Consideration" section in this chapter).

Table 9 compares how each of the alternatives described in this chapter would meet the plan objectives. Table 10 summarizes the effects of each alternative on each impact topic as described in "Chapter 4: Environmental Consequences."

TABLE 9. SUMMARY OF HOW ALTERNATIVES MEET PROJECT OBJECTIVES

Objective	Alternative A: No Action (Continue Existing Elk Management Program)	Alternative B: Direct Reduction with Firearms	Alternative C: Roundup and Euthanasia	Alternative D: Testing and Translocation	Alternative E: Hunting Outside the Park	Alternative F: Fertility Control (Maintenance Only)
Prevent major adverse impacts to physical and biological components of the park and surrounding environments.	Does not meet objective: this alternative does not provide the park with a means to prevent sustained heavy use by the elk population, which could cause impairment of grassland vegetation and the associated habitat it provides.	Fully meets objective: reduces elk population to levels that have historically showed viability, while maintaining lightly grazed conditions and reducing impacts on adjacent lands.	Fully meets objective: same as alternative B	Fully meets objective: same as alternative B	Fully meets objective: same as alternative B	Currently does not meet objective: requires another alternative for initial reduction, and presently, fertility control agents that meet NPS criteria for population control are not available. If an agent becomes available that meets NPS criteria, it would still require another alternative for initial reduction, but would fully meet the objective as described for alternative B.
Develop and implement actions consistent with the guidance and bounds set by the NPS Management Policies 2006.	Does not meet objective: park lacks an approved elk management plan that would prevent impairment, resource degradation, or the need for restoration from sustained heavy use by elk; promote natural conditions; allow for cooperation with others when managing resources; or use scientifically valid information to guide decisions on population management	Fully meets objective: an approved elk management plan would be in place that prevents impairment, resource degradation, or the need for restoration from sustained heavy use by elk; promotes natural conditions; allows for cooperation with others when managing resources; and uses scientifically valid information to guide decisions on population management	Fully meets objective: same as alternative B	Fully meets objective: same as alternative B	Fully meets objective: same as alternative B	Currently does not meet objective: requires another alternative for initial reduction, and presently, fertility control agents that meet NPS criteria for population control are not available. If an agent becomes available that meets NPS criteria, it would still require another alternative for initial reduction, but would fully meet the objective as described for alternative B.
Establish indicators to guide management of elk.	Partially meets objective: forage allocation model for ungulates in the South Unit provides the basis for population objectives, but no approved plan that allows for implementation of elk management techniques.	Fully meets objective: an approved plan that allows for management of the elk population using indicators such as population size (based on the forage allocation model) and vegetation condition (based on seral stage).	Fully meets objective: same as alternative B	Fully meets objective: same as alternative B	Fully meets objective: same as alternative B	Currently does not meet objective: requires another alternative for initial reduction, and presently, fertility control agents that meet NPS criteria for population control are not available. If an agent becomes available that meets NPS criteria, it would still require another alternative for initial reduction, but would fully meet the objective as described for alternative B.

TABLE 9. SUMMARY OF HOW ALTERNATIVES MEET PROJECT OBJECTIVES

Objective	Alternative A: No Action (Continue Existing Elk Management Program)	Alternative B: Direct Reduction with Firearms	Alternative C: Roundup and Euthanasia	Alternative D: Testing and Translocation	Alternative E: Hunting Outside the Park	Alternative F: Fertility Control (Maintenance Only)
Minimize scope or frequency of manipulating the elk population in the park, while maintaining long-term elk population viability.	Fully meets objective: park staff would not manipulate the elk population at all during the life of this plan, and population is expected to continue to grow.	Partially meets objective: based on the hypothetical scenario in this plan/EIS, actions would occur frequently (annually), but the scope (number of animals removed) of the actions would be minimized after year 5. Most elk (approximately 1,358) would be removed during the first 5 years, but only 20 to 24 would need to be removed in each of the remaining years. Use of skilled volunteers would require intensive oversight that would not meet this objective. Maintains the elk population at levels that have historically showed viability.	Partially meets objective: based on the hypothetical scenario in this plan/EIS, initial reduction would require a large scope (the removal of 800 elk through roundups and euthanasia in the first year), but the frequency of maintenance actions would be minimized (occur every three to four years) and would require a smaller scope (removal of 200 elk during each action). All euthanasia activities conducted by commercial facility, which would minimize the scope of NPS involvement. Maintains the elk population at levels that have historically showed viability.	Partially meets objective: based on the hypothetical scenario in this plan/EIS, requires large scope during initial reduction (removes 1,036 elk during CWD testing, initial reduction and periodic maintenance over three years). However, maintenance actions would only be conducted periodically, which would minimize the frequency of management and would require a smaller scope (approximately 375 elk over the remainder of the plan). Exact scenario depends on NPS identifying willing recipients Maintains the elk population at levels that have historically showed viability.	Partially meets objective: based on the hypothetical scenario in this plan/EIS, would require intensive effort to disperse 1,358 elk and coordinate state actions outside of park (large scope). The frequency of maintenance actions would be minimized (occur every three to four years) and would require dispersal of 200 elk during each action. Exact scenario depends on NPS gaining support. Maintains the elk population at levels that have historically showed viability.	Currently does not meet objective: requires another alternative for initial reduction, and presently, fertility control agents that meet NPS criteria for population control are not available. If an agent becomes available that meets NPS criteria, it would still require another alternative for initial reduction, but would partially meet the objective: maintains the elk population at levels that have historically showed viability. However, **based on the hypothetical scenario in this plan/EIS,** would require coordination with state to implement, frequent (annual) monitoring for effectiveness, and potentially frequent (annual) treatments that would involve roundups to administer fertility control agents to 90% of female elk (approximately 69 elk annually if needed).
Incorporate management flexibility to account for information obtained regarding wildlife disease or other factors influencing elk populations	Does not meet objective: no approved plan that would allow for flexible management of the elk population.	Fully meets objective: an approved plan that would allow for adaptive management based on desired conditions, monitoring of the elk population and vegetation, and efficiency/effectiveness of management.	Fully meets objective: same as alternative B	Fully meets objective: same as alternative B, plus allows for adaptive management if CWD is discovered, or willing recipients are not available.	Fully meets objective: same as alternative B, plus allows for adaptive management if support for dispersals cannot be obtained.	Currently does not meet objective: requires another alternative for initial reduction, and presently, fertility control agents that meet NPS criteria for population control are not available. If an agent becomes available that meets NPS criteria, it would still require another alternative for initial reduction, but would fully meet the objective as described for alternative B.
Provide public outreach opportunities to inform the public of the complexity of managing elk within the park.	Fully meets objective: continue to provide educational and interpretive opportunities related to elk.	Fully meets objective: provide increased educational and interpretive opportunities related to elk.	Fully meets objective: same as alternative B	Fully meets objective: same as alternative B	Fully meets objective: same as alternative B	Currently does not meet objective: requires another alternative for initial reduction, and presently, fertility control agents that meet NPS criteria for population control are not available. If an agent becomes available that meets NPS criteria, it would still require another alternative for initial reduction, but would fully meet the objective as described for alternative B.

TABLE 9. SUMMARY OF HOW ALTERNATIVES MEET PROJECT OBJECTIVES

Objective	Alternative A: No Action (Continue Existing Elk Management Program)	Alternative B: Direct Reduction with Firearms	Alternative C: Roundup and Euthanasia	Alternative D: Testing and Translocation	Alternative E: Hunting Outside the Park	Alternative F: Fertility Control (Maintenance Only)
Coordinate and cooperate with stakeholders, such as other federal agencies, state, and private entities, including sharing data on the elk population and its management.	Partially meets objective: no programmatic approach to elk management within the park that considers these varied interests; share data with the state and work with the state on issues such as increasing hunting opportunities outside the park.	Fully meets objectives: approved management plan developed with public and agency input. Share data with the state and work with the state on issues such as hunting opportunities outside the park.	Fully meets objective: same as alternative B	Fully meets objective: same as alternative B	Fully meets objectives: approved management plan developed with public and agency input that requires direct involvement by the state to implement actions outside the park. Share data with the state and work with the state on issues such as hunting opportunities outside the park.	Currently does not meet objective: requires another alternative for initial reduction, and presently, fertility control agents that meet NPS criteria for population control are not available. If an agent becomes available that meets NPS criteria, it would still require another alternative for initial reduction, but would fully meet the objective as described for alternative B.
To the extent practicable, enhance elk hunting opportunities on the lands surrounding the park.	Fully meets objective: the predicted growth of the elk population would increase movement and expand the number of elk available for hunting outside the park.	Partially meets objectives: management actions conducted in fall to potentially increase dispersal and therefore number of elk outside of park for hunting. However, reduces elk population substantially and thereby long-term elk hunting opportunities.	Partially meets objectives: same as alternative B.	Partially meets objectives: same as alternative B.	Partially meets objective: same as alternative B, although periodically increases elk hunting opportunities during maintenance actions as elk are dispersed outside the park.	Currently does not meet objective: requires another alternative for initial reduction, and presently, fertility control agents that meet NPS criteria for population control are not available. If an agent becomes available that meets NPS criteria, it would still require another alternative for initial reduction, but would fully meet the objective as described for alternative B.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

	Alternative A – No Action (Continue Existing Elk Management Program)	Alternative B – Direct Reduction with Firearms	Alternative C – Roundup and Euthanasia	Alternative D – Testing and Translocation	Alternative E –Hunting Outside of the Park	Alternative F – Fertility Control (Maintenance Only)
Soils, Erosion, and Water Resources						
Impacts of management action	No action taken to reduce the elk population. Actions would include minimal foot traffic from routine research and monitoring that would contribute minimally to the impacts from the larger elk population.	Annual management activities would have long-term, local, negligible impacts associated with routine field activities that could result in temporary impacts such as localized soil compaction and vegetation loss.	Periodic management activities would have long-term, local, minor impacts associated with normal roundup activities that could result in temporary impacts, such as localized soil compaction and vegetation loss as elk are driven across the landscape.	Same as alternative C but impacts would be long-term, local, and negligible to minor as the frequency of roundups would be reduced.	Directed dispersal of elk outside the park to increase hunting opportunities would have impacts similar to alternative C, but impacts would be long-term, local, and negligible to minor as the scope of dispersals are smaller (although more frequent) during initial reduction. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park.	Same as alternative C but impacts would be long-term, local, and negligible as scope of annual roundups are much smaller throughout the life of the plan.
Impacts of elk population reduction	No reduction would occur in the elk population. Heavy sustained grazing would increase soil erosion, decrease soil fertility, and increase sediment (turbidity) in nearby surface waters. Impacts would be long-term, minor to moderate, adverse.	Elk population would be reduced and maintained between 100 and 400 elk. The potential for sustained heavy use, vegetative cover loss, and soil erosion would decrease resulting in the decrease of sediment in surface waters and long-term beneficial impacts.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Vegetation						
Impacts of management action	Vegetation research and annual population surveys would be conducted, resulting in minimal trampling and long-term negligible adverse impacts.	Annual management activities would have long-term, local, negligible impacts associated with routine filed activities that could result in temporary impacts such as trampling of vegetation from foot traffic.	Periodic management activities would have long-term, local, minor impacts associated with normal roundup activities that could result in temporary impacts, such as trampling of vegetation.	Same as alternative C but impacts would be long-term, local, and negligible to minor as the frequency of roundups would be reduced.	Directed dispersal of elk outside the park to increase hunting opportunities would have impacts similar to alternative C, but impacts would be long-term, local, and negligible to minor as the scope of dispersals are smaller (although more frequent) during initial reduction. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park.	Same as alternative C but impacts would be long-term, local, and negligible to minor as scope of annual roundups are much smaller throughout the life of the plan.
Impacts of elk population reduction	No reduction would occur in the elk population. Heavy sustained browsing, grazing, and trampling of vegetation would decrease stability of plant communities, especially grasslands, and cause shifts in or reduce the diversity of native species composition both inside and outside the South Unit. Impacts would be long-term, moderate to major, adverse.	Elk population would be reduced and maintained between 100 and 400 elk. Browsing and grazing pressure, as well as trampling of vegetation, would be reduced both inside and outside the South Unit. With reduced browsing pressure, more elk would stay inside the South Unit reducing browse on adjacent lands. Long-term beneficial impacts would occur both inside and outside of the South Unit.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

	Alternative A – No Action (Continue Existing Elk Management Program)	Alternative B – Direct Reduction with Firearms	Alternative C – Roundup and Euthanasia	Alternative D – Testing and Translocation	Alternative E –Hunting Outside of the Park	Alternative F – Fertility Control (Maintenance Only)
Elk Population						
Impacts of management action	No action taken to reduce the elk population. Actions would include minimal foot traffic from routine research and monitoring that would contribute minimally to the impacts from the elk population.	Annual direct reduction would cause intermittent disturbances, from the use of firearms, presence of people, and removal of carcasses, that could make elk more wary of people and impact elk movements during management actions. Because these actions could be carried out in fall, during the rut, they could affect breeding behavior. As a result, there would be long-term minor to major adverse impacts on elk. Minimal impacts to elk habitat would occur from trampling during management actions, which would occur outside the growing season.	Periodic roundups would be conducted for initial reduction and maintenance. The periodic use of helicopters to roundup elk during management actions would have intermittent, long-term, major impacts on elk movement. Roundups would result in some trampling of vegetation and long-term negligible adverse impacts to elk habitat. These would occur outside the growing season minimizing effects.	Roundup activities for testing and translocation would have similar impacts to alternative C, including long-term major impacts on elk movements from and long-term negligible impacts from trampling of elk habitat. However, the frequency of roundups would be reduced. Routine research and monitoring would contribute minimally to these impacts	Directed dispersal of elk outside the park to increase hunting opportunities would have similar impacts to alternative C, including long-term negligible impacts from trampling and long-term moderate to major impacts on elk movements from helicopter use as the duration of the activity would be less than alternative C. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park.	Roundup activities for fertility control would have similar impacts to alternative C, including long-term negligible impacts from trampling and long-term moderate to major impacts on elk movements from helicopter use as the duration of the activity would be less than alternative C. Impacts would be greatest in the first year and minimized during maintenance.
Impacts of elk population reduction	No reduction would occur in the elk population.	Elk population would be reduced and maintained to between 100 and 400 elk.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Available Forage/Cover	The amount of forage would be reduced and there would be changes in the structural diversity in woodlands that provide hiding, resting and thermal cover for elk.	Trampling and foraging would be reduced, increasing the amount of forage and cover available.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Competition between elk	Increased competition between elk would result in increased energy expenditures, elevated levels of stress, diminished health and reduction in reproductive capacity.	Density-dependent competition would not occur, creating beneficial impacts to overall population health such as reproductive capability, body condition, and other characteristics.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Movement of elk	The number of elk that leave the park, as well as the time of year they leave could change.	The number of elk that leave the park, or move long distances within the park would be expected to decline, as more forage and habitat would be available within the South Unit creating long-term moderate impacts.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Elk/human interactions	The potential for elk/human interaction would increase.	The potential for elk/human interactions would decrease.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Hunting opportunities	Hunting opportunities could increase with increased population.	Hunting opportunities would be expected to decrease over the long-term.	Same as alternative B.	Same as alternative B.	Same as alternative B, although periodic dispersals of elk outside the park to increase hunting opportunities would slightly offset these impacts.	Same as alternative B.
Disease transmission	Transmission and risk of spreading of inter- and intra-species diseases could increase.	Transmission and risk of spreading inter- and intra-species diseases would decrease, creating a beneficial impact.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B.

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Elk Population (continued)						
Overall impact to elk population	Overall impacts to the elk population would be long-term, moderate to major adverse.	Reduction of population would have long-term beneficial impacts, with long-term moderate changes to elk distribution.	Same as alternative B.	Same as alternative B.	Same as alternative B.	Same as alternative B.
Other Wildlife and Wildlife Habitat						
Impacts of **management action**	No action taken to reduce the elk population. Actions would include minimal foot traffic from routine research and monitoring that would have long-term, negligible adverse impacts as a result of displacement from human disturbance.	Annual direct reduction would cause intermittent disturbances, from the use of firearms, presence of people, and removal of carcasses, that would increase energy expenditures and stress of wildlife, possibly in the wintertime when they are more susceptible to mortality, resulting in long-term minor to moderate adverse impacts. Management actions could also result in the trampling of vegetation and displacement of wildlife from noise disturbance that would contribute to these impacts.	Roundups would be conducted using helicopters for initial reduction and periodic maintenance that would result in some trampling of vegetation and displacement of wildlife. These could occur during the winter, when wildlife are more susceptible to mortality, and would have long-term, minor, and adverse impacts on wildlife and wildlife habitat.	Roundup activities for testing and translocation would have similar impacts to alternative C, including long-term, minor, and localized impacts from trampling of vegetation, displacement of wildlife, and increased wildlife energy expenditures.	Directed dispersal of elk outside the park to increase hunting opportunities would have similar impacts to alternative C, including long-term, minor, localized adverse impacts from trampling vegetation, displacement of wildlife, and increased wildlife energy expenditures. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park.	Roundup activities for fertility control would have similar impacts to alternative C, including long-term, minor, localized adverse impacts from trampling vegetation, displacement of wildlife, and increased wildlife energy expenditures.
Impacts of elk population reduction	No reduction **would** occur in the elk population. Sustained heavy use by a growing elk population would result in a reduction of habitat and forage for all wildlife, including other ungulates, which may need to be managed at lower levels to compensate. Impacts would be long-term, negligible to major adverse, depending on the wildlife species (e.g., negligible for those species that use the canopy of woodlands versus major for those that use grasslands) Predators and scavengers that use elk as a food source could benefit from higher populations.	Elk population would be reduced and maintained to between 100 and 400 elk, which would decrease the potential for heavy use by elk and increase the available habitat and forage for other wildlife species, including ungulates, resulting in long-term beneficial impacts. Greatest benefits would be realized by species that depend on ground cover for protection from predation and as a food source. Predators and scavengers would experience long-term, adverse negligible to minor impacts as increased ground cover may make it more difficult to find their prey, and fewer elk (and carrion) would be available.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.

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Special Status Species (Upland Sandpiper, Long-Billed Curlew, Baird's Sparrow, Grasshopper Sparrow, Lark Bunting, Sprague's Pipit, and Chestnut-Collared Longspur (State Sensitive Species)						
Impacts of management action	No action taken to reduce the elk population. Actions would include minimal foot traffic from routine research and monitoring that would have long-term, negligible adverse impacts as a result of displacement from human disturbance.	Annual direct reduction would cause intermittent disturbances, from the use of firearms, presence of people, and removal of carcasses, that could result in the trampling of vegetation and displacement of sensitive species from noise disturbance. However, management actions would be taken in the fall and winter, outside the sensitive portion of these species lives; actions taken in winter would have no impact on these birds as they are typically not present during this time of year. As a result, there would be long-term, negligible adverse impacts from management actions	Roundups would be conducted using helicopters for initial reduction and periodic maintenance that would result in some trampling of vegetation and displacement of special status birds. However, management actions would be taken in the fall and winter, outside the sensitive portion of these species lives; actions taken in winter would have no impact on these birds as they are typically not present during this time of year. As a result, there would be long-term, minor adverse impacts from management actions.	Roundup activities for testing and translocation would have similar impacts to alternative C, including long-term, minor, and localized impacts.	Directed dispersal of elk outside the park to increase hunting opportunities would have similar impacts to alternative C, including long-term, minor, localized adverse impacts. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park.	Roundup activities for fertility control would have similar impacts to alternative C, including long-term, negligible, localized adverse impacts.
Impacts of elk population reduction	Sustained heavy use by a growing elk population would result in a reduction of the grassland habitat used by these species, including a reduction in cover that make them more susceptible to predation. This would have long-term, moderate to major, adverse impacts.	Elk population would be reduced and maintained to between 100 and 400 elk. This would decrease the potential for sustained heavy use by elk and increase the available grassland habitat, including forage and cover, for sensitive species resulting in long-term beneficial impacts.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Wilderness						
Impacts of management action	No action taken to reduce the elk population. Actions would include minimal foot traffic from routine research and monitoring that would not have discernable impacts. Use of fixed-wing during population surveys would have temporary short-term, negligible to major adverse impacts on the solitude of the wilderness areas depending on the distance to the activity.	Management actions, including the use of firearms, would take place in wilderness areas, and would create a noise intrusion on solitude near the management actions. These impacts would dissipate with distance and would decrease as the scope of annual management actions decrease. Impacts would be long-term, negligible to moderate adverse.	Management actions, including use of helicopters for roundups, would take place in wilderness areas. Use of helicopters in the wilderness area would create a noise intrusion on solitude near the management actions, however, these actions would be minimized as they would only originate in the wilderness area for a short period of time. These impacts would dissipate with distance and occur less frequently after initial reduction (during periodic maintenance). Impacts would be long-term, minor adverse.	Roundup activities for testing and translocation would have similar impacts to alternative C, which would be long-term, minor and adverse.	Directed dispersal of elk outside the park to increase hunting opportunities would have similar impacts to alternative C. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park. The whole of the management activity (dispersal and state actions) would result in long-term, moderate, adverse impacts to wilderness.	Roundup activities for fertility control, would have similar impacts to alternative C, including long-term, minor, adverse impacts. Routine research and monitoring would contribute minimally to these impacts.
Impacts of elk population reduction	No reduction would occur in the elk population. Continued growth of the elk population would increase grazing and could cause shifts in grassland communities that would alter the natural character of the wilderness area and have long-term moderate to major adverse impacts.	Elk population would be reduced and maintained to between 100 and 400 individuals. While elk would be removed, they would remain a component of the wilderness ecosystem. A reduced elk population would eliminate sustained heavy use of vegetation that contributes to the character of the wilderness area, resulting in long-term beneficial effects to wilderness.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.

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	Alternative A – No Action (Continue Existing Elk Management Program)	Alternative B – Direct Reduction with Firearms	Alternative C – Roundup and Euthanasia	Alternative D – Testing and Translocation	Alternative E –Hunting Outside of the Park	Alternative F – Fertility Control (Maintenance Only)
Socioeconomics						
Impacts to adjacent lands	The elk population would continue to grow, resulting in increased damage to adjacent agricultural/ grazing lands, including fences, and landscape vegetation as competition for these resources increases. Impacts would be long-term, moderate, adverse.	A gradual reduction in the elk population would have long-term beneficial impacts to adjacent landowners as pressure on their crop and grazing lands would be reduced, increasing their crop yield and profits. Impacts to fencing and landscape vegetation would also be expected to decline as well, providing beneficial effects.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B, although dispersing elk onto adjacent lands to increase hunting opportunities could have long-term, minor to moderate, adverse impacts during periodic management actions from the temporary increase in potential damage to crops, pastures, fencing, and landscaping.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Protection mechanisms and costs	Long-term, minor, adverse impacts would occur from the increased costs to adjacent land owners for protection mechanisms as the elk population increases.	Although some costs would still be experienced by adjacent landowners, the need for protective measures is expected to reduce, reducing the costs and resulting in beneficial effects.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B, although dispersing elk onto adjacent lands to increase hunting opportunities could have long-term, minor to moderate, adverse impacts during periodic management actions from the temporary increase in costs for fencing and other forms of elk control to protect landscaping, crops, and pastures.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Impacts to tourism and recreation	Long-term beneficial effects would occur due to the increased opportunities to see or hunt elk.	Long-term moderate adverse effects would be experienced as the number of elk would be reduced, hunting opportunities would decrease and the amount hunters spend in the surrounding area would decrease. Long-term negligible to minor impacts may occur from changes in park visitation levels.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B, although dispersing elk onto adjacent lands to increase hunting opportunities would slightly offset the effects by periodically increasing elk available for removal outside the park.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Land Management Adjacent to the Park						
Impacts of management action	No management action would be taken that would affect land management adjacent to the park.	Management actions would occur within the park and would not impact adjacent land management.	Management actions would occur within the park and would not impact adjacent land management.	Management actions would occur within the park and would not impact adjacent land management.	Directed dispersal of elk outside the park to increase hunting opportunities would require coordination with state that would involve a substantial amount of oversight and changes to current management options. These changes would result in long-term moderate adverse impacts during period management actions.	Management actions would occur within the park and would not impact adjacent land management.
Impacts of elk population reduction	No reduction would occur in the elk population. An increase in the elk population could cause the state to have to change management options outside the park as well as require the USFS to reduce permitted grazing to address competition for resources. Changes in these agency plans as a result of an increasing elk population would have long-term minor to moderate adverse impacts.	As the browsing pressure in the South unit decreases, the number of elk moving outside of the park is also expected to decrease. Changes in management as a result of a smaller elk population would have long term, negligible to minor, impacts on management of surrounding lands.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, but the presence of female elk treated with fertility control agents could also change management.

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Visitor Use and Experience						
Impacts of management action (including noise)	No action taken to reduce the elk population. Actions would include minimal foot traffic from routine research and monitoring, including an annual population survey by aircraft, that would have long-term, negligible adverse impacts to visitor experience and noise.	Annual management actions would include direct reduction with firearms that would create a substantial noise intrusion on the natural landscape for several weeks or months per year. As a result, there would be long-term, minor to moderate, adverse impacts of short duration. Closures and leaving carcasses in the South Unit would contribute to these impacts.	Management actions would include the use of helicopters for routine roundups that would create a substantial noise intrusion on the natural landscape. These actions would only last a few days and during times of low visitation resulting in minor, long-term, adverse impacts. Closures would have long-term, minor to moderate, adverse impacts for short-periods of time during management actions.	Roundup activities for testing and translocation would have similar impacts to alternative C, which would be long-term, minor and adverse. Closures would have long-term, minor to moderate, adverse impacts for short-periods of time during management actions.	Directed dispersal of elk outside the park to increase hunting opportunities would have similar impacts to alternative C, which would be long-term, minor and adverse. Closures would have long-term, minor to moderate, adverse impacts for short-periods of time during management actions. Increased hunting opportunities are expected to have similar impacts to alternative B, but outside the park.	Long-term minor to Roundup activities for testing and translocation would have similar impacts to alternative C, which would be long-term, minor and adverse. Closures would have long-term, minor to moderate, adverse impacts for short-periods of time during management actions.
Impacts of elk population reduction	No reduction would occur in the elk population. As the elk population continues to increase, the opportunity for visitors to view elk would also increase and benefit the visitors desiring this experience. However, increased elk would also result in increased browse that would increase competition with other species and change the natural setting, such as reducing vegetation, reducing species diversity, and increasing exotic species that would have long-term, minor to moderate adverse impacts on other visitors.	A reduction in the elk population would maintain a lightly grazed system and provide long-term beneficial impacts to visitors seeking this experience. For those visitors wishing to see elk, negligible to minor impacts would occur as elk would still be present, but chances to see them would be reduced.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.
Employee and Visitor Health and Safety						
Impacts of management action	No management actions would be taken to reduce the elk population. Vegetation and population monitoring would continue and would not impact visitor safety. Employees would use aircraft for population survey actions, but would be trained for such use and result in short-term minor adverse impacts.	The use of firearms in the park would increase health and safety risk, but the use of qualified federal employees and authorized agents would minimize this potential. Following all applicable regulations and safety guidelines, impacts to employee safety would be long-term, minor to moderate adverse. Management activities would be conducted during low visitor use times and visitors would be restricted from these areas, resulting in long-term, negligible to minor adverse impacts to visitor health and safety.	Normal roundup activities and driving elk to the handling facility at the South Unit would increase health and safety risk, but the use of qualified federal employees and authorized agents would minimize this potential. Management actions would occur during period of low visitor use and areas where management actions occur would be closed to park visitors. Impacts to employee and visitor health and safety would be long-term, negligible to minor adverse.	Roundup activities for testing and translocation would have similar impacts to alternative C, resulting in long-term, negligible to minor adverse effects.	Directed dispersal of elk outside the park to increase hunting opportunities would have similar impacts to alternative C, resulting in long-term, negligible to minor adverse effects. Increased hunting opportunities are expected to have similar impacts to alternative B, although slightly less intense as it would occur outside the park.	Roundup activities for fertility control would have the same impacts as alternatives C and D, which would be long-term, negligible to minor adverse.
Impacts of elk population reduction	No reduction would occur in the elk population. An increase in the elk population would result in increase in the spread of diseases transmitted from animals to humans and increase the potential for wildlife-vehicle interactions. These would result in long-term minor adverse impacts to health and safety.	A reduction in elk would reduce the potential for wildlife-vehicle interaction, creating long-term beneficial effects.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.

TABLE 10. SUMMARY OF ENVIRONMENTAL CONSEQUENCES

	Alternative A – No Action (Continue Existing Elk Management Program)	Alternative B – Direct Reduction with Firearms	Alternative C – Roundup and Euthanasia	Alternative D – Testing and Translocation	Alternative E –Hunting Outside of the Park	Alternative F – Fertility Control (Maintenance Only)
Park Management and Operations						
Impacts of management action	No action would be taken to reduce the elk population. Vegetation monitoring and population surveys would continue, and existing staff would be sufficient to conduct these activities. Support would continue to be provided by the USGS and USFS. Cost of management = approximately $840,000.	Direct reduction activities would require staff time to accompany qualified federal employees and coordinate logistics. Annual management action would require temporary shifts in priorities in most divisions for weeks or months, resulting in long-term, moderate to major, adverse impacts. Impacts would be greatest if it is necessary to manage a pool of skilled volunteers. These annual impacts would not last as long after the initial reduction. Cost of management = approximately $1.75 million, increasing by $1 million if skilled volunteers are used.	Roundup activities would require staff time to plan and implement the roundups, work in the handling facility, and process the elk. Periodic management actions would require temporary shifts in priorities in most divisions for the short duration of management activities, resulting in long-term, minor to moderate, adverse impacts. These impacts would occur less frequently after the initial reduction. Cost of management = approximately $1.4 million to $1.8 million.	As with alternative C, roundup and translocation activities would require staff time to identify willing recipients, plan and implement the roundups, work in the handling facility, and process the elk, requiring temporary shifts in priorities in most divisions for the short duration of the management activity. This would have long-term, minor to moderate, adverse impacts. These impacts would occur less frequently after the initial reduction. Cost of management = approximately $1.0 million to $1.2 million.	Directed dispersal of elk outside the park to increase hunting opportunities could require park staff to alter fences, and would require they coordinate with surrounding landowners and the state. Management actions would require temporary shifts in priorities in most divisions for the short duration of periodic management activity resulting in long-term, minor to moderate, adverse impacts. Cost of management = approximately $2.2 million to $2.3 million. Costs of state actions would be covered by permit fees.	Roundup and fertility control activities would require staff time to plan and implement the roundups, administer fertility agents, and work in the handling facility. Management actions would require temporary shifts in priorities in most divisions for the short duration of annual management activities resulting in long-term, minor to moderate, adverse impacts. Cost of management = approximately $1.0 million to $1.2 million.
Impacts of elk population reduction	No reduction would occur in the elk population. As the elk population grows, more surveying and management of other resources in the park would need to occur, resulting in adverse, short- and long-term minor to moderate impacts.	Reduction of the elk population to between 100 and 400 individuals would require additional staff commitments and funding, while a smaller population would lessen the responsibility of staff for other management issues such as fence maintenance and ungulate management. This would have a long-term beneficial effect.	Same as alternative B, although the elk population would be reduced within the first year compared to the first five years.	Same as alternative B, although the elk population would be reduced within the first three years compared to the first five years.	Same as alternative B.	Same as alternative B, although initial reduction would have to be accomplished using one of the other alternatives.

ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

A number of additional alternatives addressing elk management within the park were developed based on the results of internal and external scoping, including public and agency scoping. The following section discusses those alternatives considered and why each was eliminated from further study.

Public Hunting within the Park

A management action utilizing unsupervised, licensed sportsmen was considered extensively by senior NPS officials at local, regional, and national levels. This alternative was proposed repeatedly during numerous park-sponsored public scoping meetings and also received strong support from NDGF. It was not carried forward for further analysis because it would essentially be a public hunt, which would be inconsistent with existing laws, policies, regulations, and case law regarding public hunts in units of the National Park System; it would be inconsistent with long-standing basic policy objectives for National Park System units where hunting is not authorized; and the likelihood that the National Park Service would change its long-standing service-wide policies and regulations regarding hunting in parks is remote and speculative.

Throughout the years, the National Park Service has taken differing approaches to wildlife management, but has maintained a strict policy of not allowing hunting in park units of the National Park System where it is not congressionally authorized. In 1970 Congress passed the *General Authorities Act* and in 1978 the "Redwood Amendment," which clarified and reiterated that the single purpose of the NPS *Organic Act* is conservation. While the *Organic Act* gives the Secretary of the Interior the authority to destroy plants or animals for the purposes of preventing detriment to park resources, it does not give the Secretary authority to permit the destruction of animals for recreational purposes. In 1984, after careful consideration of congressional intent with respect to hunting in national parks, the National Park Service promulgated a rule that allows public hunting in national park areas only where "specifically mandated by Federal statutory law" (36 CFR 2.2). The National Park Service re-affirmed this approach in its *Management Policies 2006* (NPS 2006a).

Congress has not authorized hunting in any legislation for Theodore Roosevelt National Park. Therefore, in order to legally allow hunting at the park, the current NPS hunting regulation would have to be changed, or Congress would need to specifically authorize hunting at the park. The National Park Service has a legislative mandate to protect the natural and cultural resources within national parks in order to allow for their enjoyment by future generations. At this time, the agency intends to exhaust all other possible alternatives before it attempts to change its governing laws, regulations, or policies due to concerns that such actions may have negative impacts on the visitors and resources of this and other parks in the National Park System.

Although a managed public hunt is not being evaluated, the NPS has the authority to use authorized agents of the park to carry out management actions. These authorized agents could include the use of skilled public volunteers in elk reduction efforts. These authorized agents would be used to supplement the NPS personnel needed for certain management actions.

Initial Reduction and Maintenance by Certified Volunteer Sharpshooters (North Dakota Game and Fish Alternative)

As part of the agency scoping effort, NDGF developed the following alternative for consideration in the elk management plan/EIS. This alternative would be implemented as a stand alone option or used in combination with certain components of other alternatives under consideration depending on the time frame identified for accomplishing the population reduction. Elk would be removed within the park by Certified Volunteer Sharpshooters using high powered rifles. A CVS would be a North Dakota resident

that has had an approved hunter education course or is deemed legally eligible to obtain the necessary North Dakota licenses or permits to take or possess big game, and would participate in a specialized training course designed by the park and NDGF. Once approved, the CVS would be given a permit to remove an elk from the park.

Carcasses would be removed from the park by the CVS using approved NPS means. The CVS would process the meat and could either keep it or donate it to a food pantry. The removal period would be November through February when park visitation is low and would coincide with state implemented hunting seasons outside the park. Once the initial elk population goal was achieved, additional removal actions using CVS would be conducted as needed to maintain the desired population range.

The NPS and NDGF would establish a number of zones in the park, designed to manage the activities of CVS in any given time period and to spread out and maximize the effectiveness of the removal operation in the park. A specific number of CVS would be allowed into a zone for a set period of time. Each CVS would only have one opportunity in removing an elk during their assigned time period. The number of CVS in any one zone would be closely regulated to avoid conflicts and minimize possible interactions with other park users.

Each CVS would be assigned to a specific zone and all access to that area would be on foot or horseback. There would be rules specifically prohibiting shooting elk while on or adjacent to a roadway thereby eliminating "road hunting" as a concern. A CVS on foot or horseback in the park would not cause any damage to the park, its facilities or the general public and, therefore, there would be no need for a NPS staff member to accompany the CVS. In addition, a daily mandatory check in and check out requirement would be in place. The NPS and NDGF would staff these check stations.

The NPS could charge each approved CVS a fee. The fees would be used to help cover the expenditures the park would incur managing the CVS alternative. The removal of the elk carcass from the park would be the responsibility of the CVS. All edible flesh and the head would be removed. Removing the head would be required so the animal could be tested for CWD. To the extent practicable, the carcass would be removed by packing the animal out on foot or by horseback, or by using non-motorized wheel carts in areas other than specifically designated wilderness areas where wheeled vehicles of any kind are not allowed.

The NPS determined that this alternative, as currently written, meets the definition of a managed public hunt and therefore will not be fully considered for the reasons described under "Public Hunting within the Park". However, to allow for a similar opportunity, the NPS developed an alternative for full consideration that largely incorporates many components of the NDGF alternative and does not violate long standing NPS policy and law. See "Alternative E: Hunting Outside the Park" for more information.

Removal of All Elk in the Park

This alternative was eliminated from further consideration because removal of a native species is contrary to NPS *Management Policies 2006* (NPS 2006a). In addition, this alternative would eliminate an important aspect of the visitor experience in the park. A 2001 survey documented that viewing wildlife was one of the most common visitor activities in the park and that seeing wildlife in natural habitats was one of the most important recreation experiences (NPS 2002c).

Translocate Elk Without Testing for CWD

Translocation of elk has been used twice in the past for management of the elk population in the South Unit of the park. However, the 2002 Director's Guidance Memorandum on CWD (NPS 2002a) now requires parks test enough elk to detect (with 99% confidence) CWD if it is present at 1% or greater prevelance prior to translocating elk or deer. For the park to translocate elk without determining CWD prevalence, a waiver to the 2002 Director's Guidance Memorandum on CWD would be required.

Although the NPS would obtain all necessary state and federal permits to translocate live elk, this alternative has the potential to unknowingly introduce diseased animals into areas where CWD has not yet been detected, increasing the spread of the disease and the potential for it to become established in new areas. Such action would not likely engender public support and it is likely the NPS would be viewed as irresponsible, particularly if CWD was later identified in translocated animals. Therefore, this alternative was dismissed from further consideration.

Move Elk to the North Unit of Theodore Roosevelt National Park without Testing for CWD

Moving elk to the North Unit of the park was eliminated from further consideration because, by so doing, the park would be implementing a temporary solution. The rapid population growth experienced by elk in the South Unit could be expected in the North Unit and could create an additional elk management problem. Existing ungulate management would have to be adapted and elk would have to be managed to maintain desired conditions (lightly grazed conditions in elk use areas). This would not meet the objective of minimizing the scope and frequency of manipulating the elk population at the park. Therefore, this alternative was dismissed from further consideration.

Reintroduction of Natural Elk Predators

Under this scenario, effective natural elk predators, such as grizzly bears or gray wolves, would be reintroduced to the park. However, the size of the South Unit of the park, approximately 72 square miles, is on the low end of, or below, the area needed to sustain grizzly bears or wolves. Female grizzly bears generally require between 50 and 200 square miles; male grizzly bears need between 200 and 500 square miles (USFWS 2007b). A wolf pack, which usually consists of more than seven wolves, generally requires between 50 and 1,000 square miles (USFWS 2007c).

This would also require coordination with the USFWS because both species are listed under the *Endangered Species Act*. Under section 10(j) of the *Endangered Species Act*, "nonessential experimental populations" are allowed under certain conditions. By definition, a "nonessential experimental population" is not crucial to the continued existence of a species and, therefore, "take" associated with their reintroduction (in this case, within Theodore Roosevelt National Park) would not further threaten the survival of the entire species (USFWS 1998). However, the state of North Dakota is not considered part of the reintroduction effort for either wolves or bears. In addition, their reintroduction would not contribute to the species recovery goals, would not contribute to the breeding population, and would be focused on elk management and not the recovery of a listed species, so the potential for reintroduction would be limited. For these reasons, and because the park cannot support viable populations of grizzly bears or wolves (as required by NPS *Management Policies 2006*), the option of reintroducing predators into the park for elk management was eliminated from further analysis.

Fertility Control for Initial Reduction Activities

Fertility control was eliminated as a stand-alone alternative to manage the park's elk population. This option would not effectively reach the target population goals for initial reduction within the lifetime of this plan. Based on modeling, there would be a temporary increase in the elk population size before there would actually be a slow down in population growth. In addition, there are no fertility control agents that could be used in the near future that would meet the criteria established in this plan. However, fertility control used as a maintenance tool after initial reduction was considered reasonable, pending development of an appropriate agent, and is included in alternative F described previously.

Removal of Feral Horses

Removal of feral horses as a tool to help manage elk in the South Unit was eliminated from further consideration because their removal would have limited overall effect on management of the elk population. The park staff established a feral horse population objective in the South Unit of 50 to 90 animals. Removing these animals would remove one of the species that influence vegetation conditions and forage availability in the South Unit, however, the influence on the population, which is assumed to be 1,000 elk, would be minimal.

CONSISTENCY WITH PURPOSES OF THE NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act requires an analysis of how each alternative meets or achieves the purposes of the act, as stated in section 101(b). Each alternative analyzed in a NEPA document must be assessed as to how it meets the following purposes:

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

The Council on Environmental Quality has promulgated regulations for federal agencies' implementation of the National Environmental Policy Act (40 CFR Parts 1500–1508). Section 1500.2 states that federal agencies shall, to the fullest extent possible, interpret and administer the policies, regulations, and public laws of the United States in accordance with the policies set forth in the act (sections 101(b) and 102(1)); therefore, other acts and NPS policies are referenced as applicable in the following discussion.

Alternative A: No Action (Continue Existing Elk Management Program)

Alternative A would meet the purpose of the National Environmental Policy Act to a small degree because the NPS would work with the state to increase elk removal opportunities through state-sponsored hunts outside the park. This would help to attain a wide range of beneficial uses of the environment (purpose 3); however, this alternative would do little to help achieve a balance between population and resource use (purpose 5) as elk population management would be limited to those removed during hunting outside the park. The heavy browsing pressure in elk use areas from high numbers and continued population trends would likely cause changes in the structure, composition, and function of the plant communities in these areas. This would have undesirable consequences and could cause degradation of the environment (purpose 3). This would not ensure healthful, productive, or esthetically pleasing surroundings (purpose 2). As a result, this alternative would not fulfill the responsibilities of each generation as the trustee of the environment for succeeding generations and in preserving important aspects of our national heritage (purposes 1 and 4).

Alternative B: Direct Reduction with Firearms

This alternative would fulfill most of the purposes of NEPA to a moderate or large degree. Once the initial reduction was achieved (within approximately 6 years), and annual maintenance actions implemented to sustain the reduction, this alternative would minimize the potential for impacts from heavy grazing in elk use areas, and would support a lightly-grazed system. As result, this alternative would fulfill the responsibilities of each generation as a trustee of the environment for succeeding generations (purpose 1). Maintaining a lightly-grazed system in the park would also ensure healthful, productive, and esthetically pleasing surroundings (purpose 2). Elk meat could be donated to organizations, food banks, and zoos, which would help achieve a balance between population and resource use (purpose 5). The adaptive management program would help achieve this balance by using monitoring and science-based decision making to determine if management actions need to be revised to meet resource objectives. Actions taken to enhance elk hunting opportunities outside the park would provide for a wide range of uses of the environment with minimal environmental degradation or other undesirable or unintended consequences (purpose 3). However, there is some risk to health and safety associated with using firearms within the park and increased hunting near the park (purpose 3). Overall, alternative B would preserve important historic, cultural, and natural aspects of our national heritage in the long term (purpose 4).

Alternative C: Roundup and Euthanasia

Much like alternative B, this alternative would fulfill most of the purposes of NEPA to a moderate or large degree. This alternative would support a lightly-grazed system by reducing elk numbers within a year and sustaining that reduction through maintenance actions. This would fulfill the responsibilities of each generation as a trustee of the environment for succeeding generations (purpose 1). Maintaining a lightly-grazed system in the park would also ensure healthful, productive, and esthetically pleasing surroundings (purpose 2). As described for alternative B, potential elk meat distribution or donations would help achieve a balance between population and resource use, as would the adaptive management program (purpose 5). Actions taken to enhance elk hunting opportunities outside the park would provide for a wide range of uses of the environment with minimal environmental degradation. However, there are some undesirable consequences and risk of health and safety (purpose 3) associated with the use of helicopters during roundups for euthanasia, handling the elk as they are prepared and loaded for shipping, as well as increased hunting outside the park. Overall, alternative C would preserve important historic, cultural, and natural aspects of our national heritage in the long term (purpose 4).

Alternative D: Testing and Translocation

As with alternatives B and C, this alternative would fulfill most of the purposes of NEPA to a moderate or large degree. This alternative would support a lightly-grazed system by reducing elk numbers and sustaining that reduction through maintenance actions (depending on willing recipients). This would fulfill the responsibilities of each generation as a trustee of the environment for succeeding generations (purpose 1). Maintaining a lightly-grazed system in the park would also ensure healthful, productive, and esthetically pleasing surroundings (purpose 2). As described previously, potential elk meat distribution or donations would help achieve a balance between population and resource use, as would the adaptive management program (purpose 5). Actions taken to enhance elk hunting opportunities outside the park would provide for a wide range of uses of the environment with minimal environmental degradation, risk of health and safety, or unintended/undesirable consequences. Risks to health and safety (purpose 3) associated with this alternative would arise from the use of helicopters to roundup elk for translocations and from handling the elk as they are prepared and loaded for shipping. Overall, alternative D would preserve important historic, cultural, and natural aspects of our national heritage in the long term (purpose 4).

Alternative E: Hunting Outside the Park

This alternative would fulfill the responsibilities of each generation as a trustee of the environment for succeeding generations (purpose 1) to a large degree, reducing elk numbers and sustaining the reduction through maintenance actions. Maintaining a lightly-grazed system in the park would ensure healthful, productive, and esthetically pleasing surroundings (purpose 2). Alternative E includes the use of hunting opportunities outside the park to remove elk, which would help achieve a balance between population and resource use (purpose 5). The adaptive management program described for each alternative would also help achieve this balance. Since alternative E would rely on moving free-ranging elk outside of the park, there is some concern about unintended consequences (purpose 3) related to changes in their movement patterns. Overall, alternative E would preserve natural aspects of our national heritage, but would not necessarily be consistent with the principles of hunting in fair chase, which is an important part of the historic and cultural heritage of the area dating back to Theodore Roosevelt himself (purpose 4).

Alternative F: Fertility Control (Maintenance Only)

As noted in the analysis, alternatives B, C, D, and E include both initial reduction and maintenance phases, whereas alternative F is only envisioned as a maintenance strategy when paired with the initial reduction tools in one of the other alternatives. Because this alternative would not provide for long-term protection of the environment on its own, it must be combined with another alternative to fulfill responsibilities of each generation as trustee of the environment for succeeding generations, and therefore does not meet purpose 1 as well as the other alternatives. However, maintaining an elk population at levels consistent with a lightly-grazed system in the park would ultimately ensure healthful, productive, and esthetically pleasing surroundings (purpose 2). Alternative F involves some concern about unintended consequences (purpose 3), since it would rely on technology that has not yet been proven in free-ranging elk as a maintenance tool (fertility control). Risks to health and safety (purpose 3) associated with the fertility control method would also be a concern under alternative F. Alternative F would not help achieve a balance between population and resource use (purpose 5) as well as the other alternatives; the adaptive management program would contribute slightly to this balance if fertility control proves ineffective. Overall, alternative F would preserve important historic, cultural, and natural aspects of our national heritage in the long term (purpose 4).