National Park Service
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Final Environmental Impact Statement

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Elk and Vegetation Management Plan

Rocky Mountain National Park • Colorado

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Rocky Mountain
National Park Colorado

Summary

This Final Elk and Vegetation Management Plan/Environmental Impact Statement (plan/EIS) analyzes five alternatives to manage elk and vegetation within Rocky Mountain National Park in Colorado. The purpose of this plan/EIS is to guide management actions in Rocky Mountain National Park to reduce the impacts of elk on vegetation and restore, to the extent possible, the natural range of variability in the elk population and affected plant and animal communities.

Alternative 1 would continue to manage elk and the vegetative resources associated with elk as they are currently managed. No specific management actions would be taken to address the large population size and high densities of elk or the resultant adverse vegetative conditions and trends in aspen and willow communities on the winter elk range.

All action alternatives (Alternatives 2 through 5) would incorporate adaptive management and monitoring to determine the level and intensity of management actions including elk population reductions, fencing, herding, and aversive conditioning. Population numbers would be estimated annually and the number of animals to be removed would be determined based on the most current population estimates. If the elk population is within the defined portion of the range of natural variation and vegetation management objectives are being met, no lethal reduction activities would take place.

Alternative 2 would use NPS staff and authorized agents of the National Park Service in the park to remove elk using lethal means to reach a population target range at the lower end of the natural range of variation, between 1,200 and 1,700 elk (200 to 400 park subpopulation; 1,000 to 1,300 town subpopulation). Reduction targets would be aggressive removing 200 to 700 elk in the first four years to quickly reduce the size of the population, followed by less intensive yearly reductions of 25 to 150 elk each year for 16 years. Use of redistribution techniques and limited aspen fencing would also be required to meet vegetation objectives. Given appropriate interagency cooperation, redistribution techniques could include adaptive use of wolves as a management tool.

Alternative 3, the preferred alternative, would rely on gradual lethal reduction of elk over time by NPS staff and authorized agents of the National Park Service to achieve a high target elk population at the high end of the natural range of variation, between 1,600 and 2,100 animals (600 to 800 park subpopulation; 1,000 to 1,300 town subpopulation). Inside the park, up to 200 elk would be removed annually over 20 years. Fertility control agents could be implemented as an adaptive management tool to control the population size if an effective, logistically feasible agent becomes available. The higher elk population target under this alternative would require additional measures, including aspen and montane riparian willow fences on both the primary summer and winter ranges and redistribution techniques, to meet vegetation objectives. Given appropriate interagency cooperation, redistribution techniques could include adaptive use of wolves as a management tool.

Alternative 4 would use fertility control agents on elk inside the park to achieve a target elk population at the higher end of the natural range of variation (1,600 to 2,100: 600 to 800 park subpopulation; 1,000 to 1,300 town subpopulation). Lethal reduction of 80 to150 elk each year by NPS staff and authorized agents of the National Park Service would supplement fertility control. The higher elk population target under this alternative would require additional measures, including aspen fences on the primary winter

and summer ranges and montane riparian willow fences on the primary winter range and redistribution techniques, to meet vegetation objectives.

Alternative 5 would release a limited number of gray wolves in Rocky Mountain National Park to be intensively managed and allowed to increase to a maximum of 14 in a phased approach. Lethal reduction activities by NPS staff and authorized agents of the National Park Service would reduce the elk population to the higher end of the natural range of variation, 1,600 to 2,100 animals, in the first four years. Up to 100 elk would be lethally removed annually over the next 16 years to meet population targets. Later in the plan, the target elk population would be allowed to fluctuate within the natural range of variation between 1,200 to 2,100 elk, depending on wolves' effectiveness in redistributing elk. Wolf activity would be the primary redistribution tool. Wolves would be intensively monitored and their movements and activities restricted to the park. A limited amount of aspen fencing may also be required to meet vegetation objectives.

The potential environmental consequences of the actions are evaluated for each alternative, including impacts on natural resources, cultural resources, visitor use and experience, public health and safety, socioeconomic resources, and park operations.

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United States Department of the Interior • National Park Service • Rocky Mountain National Park

EXECUTIVE SUMMARY

This Final Elk and Vegetation Management Plan/Environmental Impact Statement (plan/EIS) analyzes a range of alternatives and management actions for elk and vegetation within Rocky Mountain National Park in Colorado. The analysis includes the elk population that primarily winters in the eastern part of the park and in the Estes Valley and primarily summers in the Kawuneeche Valley and alpine areas of the park and the vegetation resources on the elk's primary winter and summer ranges inside the park. This plan/EIS assesses the impacts that could result from continuation of the current management framework (alternative 1) or implementation of the four action alternatives.

Development of this plan/EIS involved the cooperation of multiple agencies at various levels of participation. The National Park Service is the lead agency and is responsible for all aspects of developing the plan and environmental impact statement, including selection of a preferred alternative and preparing a record of decision. This plan will be implemented by the National Park Service inside Rocky Mountain National Park. Cooperating agencies include the Town of Estes Park, the Estes Valley Recreation and Parks District, Colorado Division of Wildlife, Grand County, Larimer County, Town of Grand Lake, U.S. Bureau of Reclamation, and the U.S. Forest Service.

PURPOSE OF AND NEED FOR ACTION

This section explains what the plan/EIS would accomplish and why action is necessary at this time. Summaries of both the purpose and the need appear here, with more detailed information available in the "Background" section of this document.

The National Park Service is obligated by law and policy to maintain and restore, to the extent possible, the natural conditions and processes in park units. The Rocky Mountain National Park / Estes Valley elk population is larger, less migratory, and more concentrated than it would be under natural conditions. Elk heavily use the habitats in aspen and montane riparian willow communities, which support high levels of biodiversity; as a result, these communities may be declining in areas on the elk range where elk concentrate. The high concentrations of elk and levels of herbivory have degraded the vegetation in communities that support large numbers of bird, butterfly, and plant species in comparison to other habitat types in the park and in the Rocky Mountains (Connor 1993, Mueggler 1985, Simonson et al. 2001, Turchi et al. 1994).

NPS management policies (NPS 2006b) direct managers to strive to maintain the components and processes of naturally evolving park ecosystems. These policies also recognize that if biological or physical processes were altered in the past by human activities, they may need to be actively managed to restore them to a natural condition or to maintain the closest possible approximation of the natural condition. Natural conditions are defined as the condition of resources that would occur in the absence of human dominance over the landscape. Natural conditions occur when the components and processes of the natural system are intact. Natural change is recognized as an integral part of the functioning of natural systems; that is, resource conditions are not static, but fluctuate in response to natural processes, such as weather

conditions. Recognizing such fluctuations, this document bases its descriptions and analysis on the natural range of variation in resource conditions. A key element in determining the need for action was the comparison between existing conditions and the estimates for the natural range of variation that would be expected under natural conditions.

Elk are a natural component of the Rocky Mountain National Park ecosystem and are expected to affect native vegetation communities that occur in the park. The natural range of variation for elk populations and associated vegetation conditions in the park were estimated based on research and ecosystem modeling specific to Rocky Mountain National Park, as well as related research and experiences in other locations.

Under natural conditions, the elk population size and distribution would be controlled by a number of factors, including predators such as wolves and grizzly bears, hunting by American Indians, and the presence of competitors such as bison. Ecosystem modeling predicted that the elk population under natural conditions, given the current amount of available habitat, would fluctuate between 1,200 and 2,100 elk (Coughenour 2002) with 200 to 800 in the subpopulation that winters inside the park and 1,000 to 1,300 in the subpopulation that winters outside the park. These subpopulations are referred to as the park and town subpopulations, respectively, throughout the text. With an intact predator base, elk would be less sedentary and more wary, resulting in lower concentrations of elk on the elk range. With elk less concentrated and less sedentary, montane riparian willow and aspen would be more abundant with increased stand size and complexity; that is, stands would have a variety of age classes and stems of differing sizes. Under natural conditions with suitable levels of montane riparian willow habitat available, beaver would be more abundant on the elk range and as a result, water levels on the primary elk winter and summer ranges would be higher, further encouraging the establishment and growth of willows. These natural conditions represent the overall desired future condition for elk and vegetation on the elk range, as presented in detail in the “Alternatives” chapter, and are what the National Park Service strives to achieve.

The purpose of this plan/EIS is to guide management actions in Rocky Mountain National Park to achieve these desired conditions by reducing the impacts of elk on vegetation and by restoring, to the extent possible, the natural range of variability in the elk population and affected plant communities. A successful plan would realize these purposes while providing continued elk viewing opportunities for visitors.

Although the overall desired elk population size and distribution could be achieved within the 20-year life of this plan, achieving the desired future conditions for aspen and montane riparian willow on the elk range would take longer. However, strides would be made toward reaching that overall goal.

Several features of the elk population are considered to be outside the natural range of variation, such as its density in some parts of the park (particularly in the core winter range), its overall size, and its behavior (Monello et al. 2005). The absence of an intact predator base is a key reason the elk population size, density and behavior is considered to be outside the natural range of variation. The gray wolf, which was extirpated from the Rocky Mountain National Park area before the park was established, represented a key component in the food chain and in defining the natural condition. Ecosystem simulation modeling indicates that fewer elk would likely be present if wolves lived in the Rocky Mountain National Park area (Coughenour 2002). Empirical evidence from areas with intact wolf populations, such as Yellowstone and Banff National Parks, indicates that elk would be more wary and less sedentary, resulting in lower densities. Grizzly bears, which were native to the park but also extirpated, would also probably contribute to reducing elk numbers; research shows that wolves more effectively limit elk populations in the presence of multiple predators (Gasaway et al. 1992 and Orians et al. 1997, cited in Monello et al.

2005). Other factors that likely contributed to a lower elk population under natural conditions are the effects of American Indian hunters and the presence of bison (reviewed in Monello et al. 2005). The prohibition of hunting inside the park and the town of Estes Park while adjacent areas outside the park are open to hunting has created a "sanctuary" that has contributed to the high elk concentrations and more sedentary behavior.

Elk are gregarious animals, meaning that they tend to form groups with other elk, unlike other wildlife species that are intolerant of high densities. Because elk can congregate in high densities, especially during the winter, an overabundant or over-concentrated population could have a large and detrimental effect on vegetation conditions, in particular aspen and montane riparian willow communities in the core winter range, and on the wildlife that depend on these areas as habitat (Monello et al. 2005). Such effects are becoming increasingly evident in the park.

The elk population reached a high point between 1997 and 2001, with annual estimates ranging from about 2,800 to 3,500 (Lubow et al. 2002). Since 2002, winter estimates in the park and Estes Valley area outside the park have declined, ranging from about 1,700 to 2,200. The dynamic nature of wildlife populations makes population estimates of a wide-ranging, mobile species such as elk variable. Because of these uncertainties, elk population size estimates in the research and in this document use ranges rather than exact numbers. However, the general ranges of population estimates reflect important trends relevant to the analyses of elk population effects on resources.

The elk population includes three subpopulations that exhibit different population dynamics and migration patters (Larkins 1997, Lubow et al. 2002): 1) Moraine Park / Beaver Meadows (referred to as Moraine Park), 2) Horseshoe Park, and 3) the Town of Estes Park. The Moraine Park and Horseshoe Park subpopulations exhibit the same population dynamics and will be collectively referred to here as the park subpopulation. The Town of Estes Park population exhibits different dynamics and is referred to as the town subpopulation.

The elk in the park subpopulation are estimated to be at the food-limited carrying capacity (Coughenour 2002, Singer et al. 2002). The food-limited carrying capacity is the average maximum number of elk that the primary winter range forage base can support (also referred to as ecological carrying capacity). Assuming existing habitat and continuation of weather patterns that occurred in the second half of the 20th century, the park subpopulation is expected to continue to fluctuate between 800 and 1,100 animals (Coughenour 2002). The town subpopulation is variously estimated to be at or below carrying capacity, based on different researchers' results (Coughenour 2002, Lubow et al. 2002). Population estimates for the town subpopulation from 2001 to 2005 have ranged between about 1,000 and 1,400 elk in the Estes Valley area.

If the elk population is at or within the carrying capacity of its habitat, it does not necessarily mean that the elk-to-habitat relationship is balanced or within the natural range of variation. Factors affected by humans such as elk distribution over time and area, a missing predator (i.e., gray wolf), and a refuge effect (i.e., no hunting in the park and in much of the Estes Valley) can have a large influence on habitat conditions even though the ecological carrying capacity may be adequate to support the elk population. Ecosystem simulation modeling indicates that with wolves present, the elk population was 15% to 40% below the food-limited carrying capacity (Coughenour 2002).

Elk densities are variable in the park, with high (76 to 170 elk/mile^2) to very high (171 to 285 elk/mile^2) concentrations on about 7% of the primary winter range, centered in Moraine Park / Beaver Meadows (Singer et al. 2002). The remainder of the primary winter range generally has

moderate (26 to 75 elk/mile^2 on 11% of the primary winter range) to low (less than 26 elk/mile^2 on 82% of the primary winter range) densities (Singer et al. 2002). Although elk use lower-density areas of the primary winter range to rest or as they move between areas, most of their foraging time is highly concentrated on a small percentage of the primary winter range. Elk densities on core winter range areas greater than 260 elk/mile^2 are the highest concentrations ever documented for a free-ranging population in the Rocky Mountains (Monello et al. 2005, Singer et al. 2002). Evidence from various research conducted in the park indicates that the high densities of elk in specific areas on the core winter range are as significant as the total population size in terms of causing adverse impacts on vegetation.

Increased concentrations of elk could potentially increase the risk of spreading chronic wasting disease in the elk population. Chronic wasting disease is a transmissible spongioform encephalopathy that primarily occurs in free ranging deer and elk in northeastern Colorado and southeastern Wyoming (Miller et al. 2000). Elk and deer in the park have tested positive for this disease. Based on modeling predictions, chronic wasting disease has the potential to severely affect deer populations (Miller et al. 2000, Gross and Miller 2001).

The elk population, over the years, has also become less migratory, with 10% to 15% of the elk remaining on the primary winter range during the summer. Under natural conditions, all of the elk in the population would seasonally migrate from the primary winter range to the primary summer range. These non-migratory elk can severely inhibit the growth of plants as high levels of herbivory are taking place during the growing season (Augustine and McNaughton 1998).

Changes in migration patterns have also resulted in increasing numbers of elk that spend the entire year on what traditionally was only winter range in both the park and town areas. Over the years, more elk are calving near areas where the public recreates in the Estes Valley, which increases the risk of human-elk conflicts. In addition, increased concentrations of elk in developed areas inside and outside the park also increase the potential for human-elk conflict as elk become more habituated and less fearful of humans. This may result in increased safety risks and property damage.

Research consistently indicates that a continuation of the high elk densities in Rocky Mountain National Park would result in the complete loss of aspen trees or, at best, existence in a shrub-like state on core winter range areas (W. L. Baker et al. 1997, Olmsted 1997, Suzuki et al. 1999, Coughenour 2002, Weisberg and Coughenour 2003). Elk browsing currently stunts the growth or kills all young aspen trees (i.e., less than 8 feet in height, also called suckers or shoots) on the core elk winter range and in some parts of the Kawuneeche Valley (W. L. Baker et al. 1997; Olmsted 1979, 1997). Accordingly, aspen regeneration is suppressed, resulting in overmature, deteriorating aspen stands with no small or mid-size trees. These stands will likely be permanently lost if the current level of elk herbivory continues, although it is difficult to predict when this would happen.

Elk are severely inhibiting the ability of montane riparian willow to reproduce, as few willow plants on the primary winter range produce seed, and seedling survival is almost non-existent (Cooper et al. 2003). Elk are also suppressing the growth of willow plants, so that few plants can attain a height greater than the herbaceous layer, which is the layer of non-woody plants such as grasses, forbs, and herbs (Peinetti et al. 2002, Zeigenfuss et al. 2002). Willow is the dominant woody shrub on almost all wet meadow or riparian areas in Rocky Mountain National Park. It is an important food source for elk (Hobbs et al. 1981, Singer et al. 2002) and provides wildlife habitat for a large number of bird, butterfly, and plant species (Connor 1993, Simonson et al. 2001). Elk herbivory has contributed to a transition of tall willow areas to short willow areas over the last 60 years in Moraine Park and Horseshoe Park (Peinetti et al. 2002, Zeigenfuss et al. 2002, B. W. Baker et al. 2005). Declines in montane riparian willow over the last 50 to 60 years are attributed to various

factors, but the current condition and trend of montane riparian willow communities is primarily due to the effects of elk.

Another factor contributing to the decline in montane riparian willow on the elk range is a decrease in surface water, which is believed to be a consequence of reduced beaver activity. Beaver are a critical component of the primary winter range in the park. Under natural conditions, they would be present in higher numbers; currently very few beaver are found on the elk primary winter range. In 1939 and 1940, it was estimated that more than 300 beavers occupied Moraine Park (Packard 1947). Since then, beaver on the primary winter range have declined by more than 90%, with a resultant decline of surface water in the area by nearly 70%, which has led to a decline in montane riparian willow (Packard 1947, Peinetti et al. 2002, Zeigenfuss et al. 2002). The lack of beaver is accelerating montane riparian willow declines by inhibiting the development of appropriate sites for willow seedling establishment and limiting recharge of the shallow aquifers in Moraine Park and Horseshoe Park (Cooper et al. 2003). Recovery of beaver on the primary winter range is unlikely, as suitable habitat for beaver is currently lacking there due to the poor condition of the montane riparian willow communities (B.W. Baker et al. 2005).

Elk consumption at extremely high rates may result in the alteration of herbaceous plant communities on the elk range. Annual herbaceous consumption rates in montane riparian willow and upland shrub communities on the primary winter range have occurred at a high level, on average 55% to 60%, respectively. The majority of offtake in willow and upland areas occurred during the summer and winter periods, respectively (Singer et al. 2002). Herbaceous plants in willow communities may be particularly vulnerable because the majority of grazing occurs during the growing season (Augustine and McNaughton 1998).

Objectives

Objectives are specific statements of purpose that describe what should be accomplished, to a large degree, for the plan to be considered a success. Development of the objectives was done with legal and regulatory mandates in mind and with an awareness of the complexity of relationships between the numerous species, ecosystems, and ecological processes that future management actions would affect. The objectives for the Rocky Mountain National Park elk and vegetation management plan are to

1. Restore and/or maintain the elk population to what would be expected under natural conditions to the extent possible.

    Maintain a free-roaming elk population.

    Decrease the level of habituation to humans exhibited by elk.

    Restore the elk population size to a level allowing it to fluctuate within the natural range of variation, between 1,200 and 2,100 elk with 200 to 800 wintering inside the park and 1,000 to 1,300 outside the park.

    Redistribute elk to disperse high densities of elk.

2. Restore and/or maintain the natural range of variation in vegetation conditions on the elk range, to the extent possible.

    Prevent loss of aspen clones within high elk use areas.

    Restore and maintain sustainable montane riparian willow.

Increase montane riparian willow cover within suitable willow habitat on the primary winter range.

Maintain or improve the condition of riparian and upland willow on the primary summer range.

Reduce the level of elk grazing on herbaceous vegetation.

3. Opportunistically collect information to understand chronic wasting disease prevalence in the park within the framework of the alternative.
4. Ensure that strategies and objectives of this plan/EIS do not conflict with those of chronic wasting disease management.
5. Continue to provide elk viewing opportunities.
6. Recognize the natural, social, cultural, and economic significance of the elk population.

IMPACT TOPICS ANALYZED

Individual impact topics, or subject resources, were analyzed in this environmental impact statement to determine the potential effects that would occur as a result of implementation of any one, or a combination of, the alternatives presented in this elk and vegetation management plan. The impact topics and the rationale for fully evaluating the particular topic are presented below.

Elk population: Retained as one of the primary resources to be managed by this plan.

Endangered or threatened species and critical habitats: Retained because actions taken by the plan could have effects on several listed species and on compliance with the Endangered Species Act.

Soils: Retained because of the impacts that existing elk populations have on soils in areas where elk congregate in high densities.

Natural soundscape: Retained because it could be affected by several of the potential management tools that could be used to manage the elk population. These include, but are not limited to, shooting and the use of vehicles and aircraft.

Vegetation: Retained as one of the primary resources to be managed by this plan. This impact topic will include analyses of effects on wetland vegetation.

Water resources: Retained because of the relationships between vegetation (especially willow), water resources, wetlands, and elk in the park's winter range. Wetland issues associated with hydrology will be addressed in this section.

Wetlands: Although this topic was retained because much preferred elk habitat is in riparian willow wetlands in the eastern portion of the park and the Kawuneeche Valley, wetlands were not addressed as a stand-alone impact topic. The hydrologic and vegetative wetland components and issues are fully evaluated in the "Water Resources" and "Vegetation" sections, respectively.

Wildlife: Retained for the potential of the plan to affect other species of wildlife and their habitats.

Wilderness: Retained because of the potential for management actions to affect designated and recommended wilderness in the park.

Socioeconomics: Retained because elk viewing contributes substantially to the Estes Park economy. Changes in the elk herd's size, location, or behavior could affect these factors.

Park operations: Retained because the implementation of management actions in association with this plan would require changes in how the park is operated.

Public health and safety: Retained because of concerns associated with elements of the alternatives such use of firearms, and the consumption of elk meat.

Visitor use and experience: Retained because elk are integral to the expectations and activities of visitors to the park. The actions implemented by the plan could affect how visitors would use and experience the park.

PURPOSE AND SIGNIFICANCE OF ROCKY MOUNTAIN NATIONAL PARK

National park system units are established by Congress to fulfill specific purposes, based on the unit's unique and "significant" resources. A unit's purpose, as established by Congress, is the foundation on which later management decisions are based to conserve resources while providing "for the enjoyment of future generations."

Establishment

Congress established Rocky Mountain National Park on January 26, 1915. The enabling legislation states:

> said area is dedicated and set apart as a public park for the benefit and enjoyment of people of the United States…with regulations being primarily aimed at the freest use of the said park for recreation purposes by the public and for the preservation of the natural conditions and scenic beauties thereof. (38 Stat. 798)

Significance of Rocky Mountain National Park

The significance of Rocky Mountain National Park and its broad mission goals are derived from its enabling legislation and are summarized in the park's strategic plan (NPS 2005j).

As stated in excerpts from the park's 2005-2008 strategic plan (NPS 2005j) that are relevant to the management of elk and vegetation, Rocky Mountain National Park is significant because

> Rocky Mountain National Park provides exceptional accessibility to a wild landscape with dramatic scenery, opportunities for solitude and tranquility, wildlife viewing, and a variety of recreational opportunities.
>
> The fragile alpine tundra encompasses one third of the park and is one of the main scenic and scientific features for which the park was established. This is one of the largest examples of alpine tundra ecosystems preserved in the national park system in the lower 48 states.
>
> The park, which straddles the Continental Divide, preserves some of the finest examples of physiographic, biologic, and scenic features of the Southern Rocky Mountains. The park contains the headwaters of several river systems, including the Colorado River. Geologic processes, including glaciation, have resulted in varied and dramatic landscape. Elevations span from 7,630 feet to 14,259 feet atop Longs Peak, a landmark feature.

> The park's varied elevations encompass diverse ecosystems where wilderness qualities dominate. Varied plant and animal communities and a variety of ecological processes prevail.

In October 1976, Rocky Mountain National Park was recognized as an International Biosphere Reserve. This recognition highlights the significance of the park's natural ecosystems, which represent the Rocky Mountain Biogeographic Province. As an element of the Biosphere Reserve, Rocky Mountain National Park is part of a network of protected samples of the world's major ecosystem types, devoted to conservation of nature and genetic material and to scientific research in service of man.

During the winter months, visitors can enjoy the spectacular landscape while snowshoeing or cross-country skiing. Summer activities at the park include hiking, camping, climbing, fishing, horseback riding, bird watching, and mountaineering. Wildlife viewing is an important activity at the park during all seasons, with the large population of resident elk drawing many visitors.

ALTERNATIVES

This environmental impact statement evaluates five alternatives that could be implemented to manage elk and vegetation in Rocky Mountain National Park. All actions defined in the alternatives would be carried out within the boundaries of the park. The four action alternatives involve the following elements in common:

1. **Population numbers**. All action alternatives are designed to maintain a viable elk population within the natural range of variation as determined from park specific research and ecosystem simulation modeling. Each action alternative would maintain the population between 1,200 and 2,100 elk with 200 to 800 wintering inside the park and 1,000 to 1,300 outside the park; however, they vary in defining where within this range the population would fluctuate, such as the high or low end. The alternatives also vary in the time it would take to achieve the population target.
2. **Vegetation management**. Once aspen and montane riparian willow on the elk range are adequately protected from elk herbivory, vegetation restoration methods would be employed as needed to facilitate faster regeneration of aspen and willow. These methods include prescribed fire, mechanical thinning of vegetation and debris, planting willow cuttings, and reintroduction of beaver if natural recolonization is not occurring.
3. **Adaptive management**. The action alternatives would incorporate the principle of adaptive management using monitoring and evaluation to determine if management actions were achieving objectives and adjusting actions accordingly.
4. **Monitoring and data collection**. The action alternatives would incorporate a monitoring and evaluation program. The monitoring program would consist of collecting data, summarizing data into useful information, and interpreting the data to advance manager's understanding and knowledge for improved decision-making. The National Park Service or contractors would collect monitoring data regarding elk population size, composition, and distribution; vegetative structure, regeneration, and cover; beaver populations; natural wolf recolonization; and visitor response to management actions. In addition to other federal contracting requirements, for the purposes of implementing this plan, a contractor is a fully-insured business entity, nonprofit group, or other government agency engaged in wildlife management activities that include trapping, immobilization and lethal removal, chemical euthanasia, and monitoring. The contractor must possess all necessary permits.

5. **Humane treatment**. All action alternatives involve the direct management of individual animals, ranging from remote delivery of control agents to live capture and lethal removal. These management activities would be conducted in a manner that minimizes stress, pain, and suffering.
6. **Distribution of carcasses**. To the extent possible the National Park Service would donate carcasses and/or meat from elk in which chronic wasting disease is not detected and that were not killed using sedative agents or euthanasia drugs through an organized program to eligible recipients, including members of tribes, based on informed consent and pursuant to applicable public health guidelines. The National Park Service would identify interested organizations, agencies, and /or tribes with whom to partner in a meat donation program in order to defer the high cost of processing and packaging the meat. All adult elk carcasses would be tested for chronic wasting disease. All other carcasses would be disposed of in accordance with federal and state policies.
7. **Wilderness**. All action alternatives would involve management activities in designated or recommended wilderness areas within the park. As such, in accordance with the Wilderness Act and NPS policies, the National Park Service is required to complete a minimum requirement and minimum tool analysis before taking management actions.
8. **Research Study**. Within the framework of an action alternative, the National Park Service would opportunistically conduct a study to evaluate procedures for testing for chronic wasting disease in live elk and the effectiveness of a multi-year fertility control agent in wild, free-ranging elk.
9. **Education**. The National Park Service would establish a long-term public education program to inform the public about the selected alternative and results.

The following alternatives are proposed for managing elk and vegetation in Rocky Mountain National Park:

Alternative 1

This alternative would continue the existing management framework. Under this alternative, no new management actions would be applied. This alternative assumes that the existing management decisions, without any new criteria or factors, would continue. Since NPS lethal reduction was discontinued in 1968, there has been no active management of elk within the park. The elk population size in the park under this alternative would be regulated primarily by forage availability and weather conditions, and outside the park it would continue to be additionally regulated by hunter harvests. Under this alternative, ecosystem modeling predicts that the elk population would continue to fluctuate within 2,200 and 3,100 animals. The population size could rise above or drop below this range due to variables such as weather, emigration, or immigration of elk either permanently or temporarily. In addition, elk would continue to concentrate at high densities in localized areas of the elk range and would continue to be less migratory. No formal vegetation resource management program in the park to address elk-caused effects on vegetative cover, and dominant plant species composition on the elk range would be developed.

Alternative 2

This alternative would involve the lethal removal (culling) of elk by NPS staff and authorized agents of the National Park Service (see Appendix H for further discussion of culling and authorized agents) to reach and maintain an elk population size at the lower end of the natural range of variation (1,200 to 1,700 total elk: 200 to 400 park subpopulation; 1,000 to 1,300 town subpopulation). In the first four years of the plan, between 200 and 700 elk would be lethally removed annually inside the park to bring the population to the target size. To maintain the target

population range, 25 to 150 elk would be removed annually over the remaining 16 years of the plan. To reduce elk densities on the elk range, redistribution of the population would occur using herding (for directed movement of a group of elk), aversive conditioning (to locally distribute elk and result in avoidance of areas), and unsuppressed (noisy) weapons. Given appropriate interagency cooperation, adaptive management could also include wolves as a redistribution tool. Aspen stands (up to 160 acres) on the elk range would be fenced to exclude elk herbivory. These temporary fences would be installed adaptively, based on vegetation response to elk management actions as indicated through the monitoring program. Suitable willow habitat on the elk range would not require protection using fences because of the lower target elk population and the use of redistribution methods to disperse high concentrations of elk.

Alternative 3

This alternative, the preferred alternative, would involve the gradual lethal removal of elk by NPS staff and authorized agents of the National Park Service to reach and maintain an elk population size at the higher end of the natural range of variation (1,600 to 2,100 total elk: 600 to 800 park subpopulation; 1,000 to 1,300 town subpopulation). Inside the park, up to 200 elk would be removed annually over 20 years. Fertility control would be considered as an adaptive management tool if an agent that is logistically feasible to implement and is safe and effective becomes available. Aspen stands (up to 160 acres) on the elk range would be fenced to exclude elk herbivory. Because this alternative would result in a target population at the high end of the natural range, up to 440 acres of suitable willow habitat could be fenced in the high elk-use areas of the primary summer and winter ranges. These temporary fences would be installed adaptively, based on vegetation response to elk management actions as indicated through the monitoring program. To reduce elk densities on the elk range outside of fenced areas, redistribution of the population would occur using herding, aversive conditioning, and unsuppressed (noisy) weapons. Given appropriate interagency cooperation, adaptive management could also include wolves as a redistribution tool.

Alternative 4

This alternative involves the use of a single-year, multi-year, or life-time fertility control agent on elk inside the park to achieve a target elk population at the higher end of the natural range of variation (1,600 to 2,100 total elk: 600 to 800 park subpopulation; 1,000 to 1,300 town subpopulation). Using a single-year agent logistically up to 400 elk could be treated annually during the first four years of the plan and 200 for each of the remaining 16 years. Lethal reduction methods to supplement the fertility control actions would also be needed due to logistical constraints on using fertility control agents to reduce the population size to within management objectives (i.e., not enough elk could be treated efficiently). In addition to a single-year fertility control agent, 80 to 150 elk would be lethally removed each year. Aspen stands (up to 160 acres) on the elk range would be fenced to exclude elk herbivory. Because this alternative would result in a target population at the high end of the natural range, up to 260 acres of suitable willow habitat could be fenced in the high elk-use areas of the primary winter range inside the park. These temporary fences would be installed adaptively, based on vegetation response to elk management actions as indicated through the monitoring program. To reduce elk densities on the elk range outside of fenced areas, redistribution of the population would occur using herding, aversive conditioning, and unsuppressed (noisy) weapons.

Alternative 5

This alternative would involve lethal reduction of elk in combination with the release and intensive management of a limited number of gray wolves within Rocky Mountain National Park in a phased approach to achieve an elk population that would fluctuate within the natural range of

variation between 1,200 to 2,100 total elk (200 to 800 park subpopulation; 1,000 to 1,300 town subpopulation). In the first four years of the plan, NPS staff and authorized agents of the National Park Service would reduce the elk population by lethal reduction to bring the population within the high end of the natural range of variation (1,600 to 2,100: 600 to 800 park subpopulation; 1,000 to 1,300 town subpopulation) by removing 50 to 500 elk annually. Up to 100 elk could be lethally removed over the remaining 16 years to meet that target population range. At the same time, two pairs of wolves would be released and allowed to gradually increase to a maximum of 14 over the life of the plan. The number of wolves would be increased after determining through monitoring that the National Park Service could effectively manage the size and activities of the wolf population inside the park and that wolves would contribute to accomplishing the plan's management objectives. Due to the presence of wolves and the high level of redistribution of elk expected under this alternative, temporary fences to protect aspen (up to 160 acres) would be installed adaptively based on vegetation response, as indicated through the monitoring program; suitable willow habitat on the elk range would not require protection using fences.

Environmentally Preferred Alternative

The environmentally preferred alternative is the alternative that will promote the National Environmental Policy Act, as expressed in Section 101 of the act. The environmentally preferred alternative is Alternative 5. This best protects the biological and physical environment by effectively reducing the densities and abundance of the elk population to levels that would allow for recovery of vegetation on the elk range most reflective of natural conditions.

ENVIRONMENTAL CONSEQUENCES

Impacts of the five alternatives were assessed and are presented in chapter 4 of the plan/EIS and are summarized in Table 2-3 in Chapter 2.

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