National Park Service
U.S. Department of the Interior

Rocky Mountain National Park
Colorado

Rocky Mountain National Park

Exotic Plant Management Plan Environmental Assessment

November 2018

Exotic Plant Management Plan
Rocky Mountain National Park
Environmental Assessment

SUMMARY

Rocky Mountain National Park (RMNP or park) is proposing to adopt a framework to manage exotic plant species in the park. The park is currently managing invasive exotic plant infestations in accordance with the 2003 Invasive Exotic Plant Management Plan and Environmental Assessment (2003 plan). However, the number of invasive exotic plant species in the park is growing, and the distribution and acreage of invasive exotic plants is expanding. This is happening despite efforts to control these occurrences.

This Environmental Assessment (EA) evaluates two alternatives: a no action alternative and a preferred alternative. Under Alternative A (the no action alternative), the park would continue to manage exotic plants under the 2003 plan. Under Alternative B (the preferred alternative), the park would develop a decision-making framework that would incorporate the best available science, expert knowledge, site assessments, and monitoring to determine the extent of exotic species infestations, determine if management is necessary, prioritize management, and determine the most effective control methods.

This EA has been prepared in compliance with the National Environmental Policy Act (NEPA) to provide the decision-making framework that 1) analyzes a reasonable range of alternatives to meet the objectives of the proposal, 2) evaluates potential issues and impacts on resources and values, and 3) identifies mitigation measures to lessen the degree or extent of these impacts.

Resource topics analyzed in detail were vegetation, including special status species; terrestrial wildlife, including special status species; fish and special status aquatic species; wilderness; and visitor use and experience. All other resource topics were dismissed because the proposed project would have little or no impact on those resources. Public scoping was conducted in accordance with NEPA.

The National Park Service is also using this EA to coordinate public review of a draft programmatic agreement (PA) (developed with the Colorado State Historic Preservation Office in accordance with the implementing regulations for Section 106 of the National Historic Preservation Act. The draft PA can be found in Appendix A. The PA provides the process the park will follow to meet the requirements of Section 106 for exotic plant management plan activities when the effects of the undertaking are not fully known. Comments regarding the PA can be submitted along with comments on the EA.

Public Comment

If you wish to comment on this EA, you may post comments online at: http://parkplanning.nps.gov/romo or mail or hand deliver comments to: Superintendent, Rocky Mountain National Park, Estes Park, Colorado 80517. This EA will be on public review for a minimum of 30 days.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. Comments will not be accepted by fax, email, or in any other way than those specified above. Bulk comments in any format (hard copy or electronic) submitted on behalf of others will not be accepted.

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INTRODUCTION

Rocky Mountain National Park (RMNP or park) was established in 1915 (Figure 1). The purpose of the 265,795-acre park according to the Foundation Document for Rocky Mountain National Park (NPS 2013a) "is to preserve the high-elevation ecosystems and wilderness character of the southern Rocky Mountains within its borders and to provide the freest recreational use of and access to the park's scenic beauties, wildlife, natural features and processes, and cultural objects." The National Park Service (NPS) administers the historic, natural, and scenic values that contribute to the public's enjoyment of the park.

NPS Management Policies (2006a) state that "Exotic species will not be allowed to displace native species if displacement can be prevented," and "In general, new exotics will not be introduced to parks." In addition, Executive Order 13112 (EO 13112), signed in 1999 and amended December 2016, provides guidance for the management of invasive species and ensures that "federal agency activities concerning invasive species are coordinated, complementary, cost-efficient, and effective." EO 13112 was updated in 2016, and now directs agencies to "prevent the introduction, establishment, and spread of invasive species," to "monitor invasive species accurately and reliably," and to "provide for the restoration of native species, ecosystems, and other assets that have been impacted by invasive species." NPS Management Policies (2006) further state that, "Programs to manage exotic species will be designed to avoid causing significant damage to native species, natural ecological communities, natural ecological processes, cultural resources, and human health and safety."

Invasive exotic plants are capable of spreading rapidly, outcompeting native plants, and drastically altering ecosystem conditions and processes, even in wilderness areas. The number of invasive exotic plant species in the park is growing, and the distribution and acreage of invasive exotic plants is expanding (NPS 2015c). This is happening despite efforts to control these occurrences. The park is currently managing invasive exotic plant infestations in accordance with the 2003 Invasive Exotic Plant Management Plan and Environmental Assessment (2003 plan; NPS 2003). While the 2003 plan provides a mechanism for addressing some invasive exotic plant infestations within the park, it does not allow managers the flexibility to deal with new species infestations, does not contain a framework to allow new control methods, prevents the eradication of some exotic species, and does not contain a structured framework to incorporate new science and information into the decision-making and management process.

The park proposes a framework to manage exotic plant species in the park. Park Natural Resource Managers would develop a decision-making framework that would incorporate the best available science, expert knowledge, site assessments, and monitoring to determine the extent of exotic species infestations, determine if management is necessary, prioritize management, and determine the most effective control methods. Exotic plants would be managed using principles of adaptive integrated pest management including monitoring of exotic plant populations, monitoring of the effectiveness of exotic plant management actions, and using monitoring data to drive changes in management actions. Park Natural Resource Managers would have the flexibility to manage the exotic plant species listed in the 2003 plan, species listed on the Colorado noxious weed lists, and any additional exotic species that become

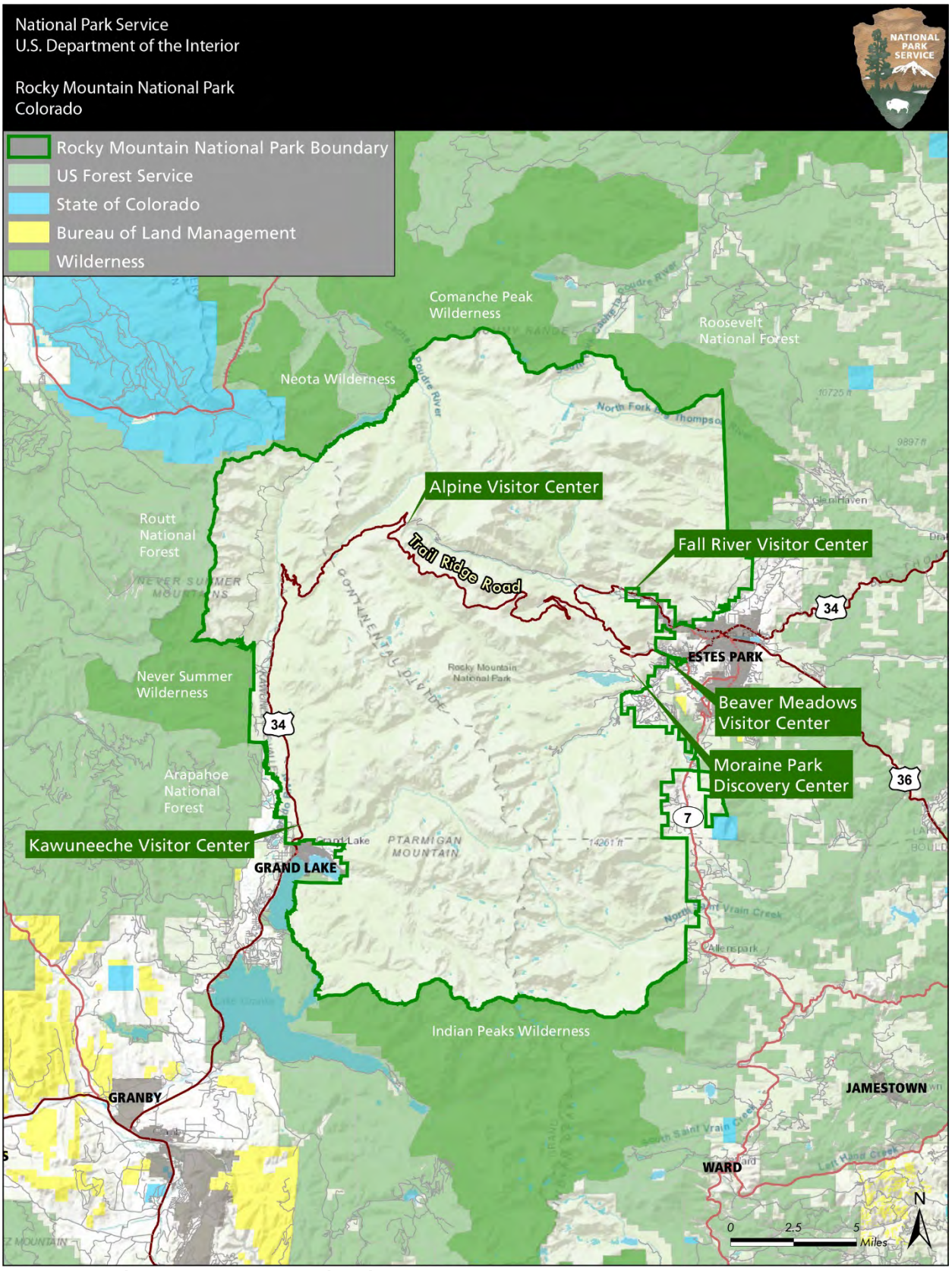

Figure 1. Rocky Mountain National Park

an issue in the park in the future. Park staff would have the flexibility to use a full range of integrated pest management tools, including manual control, mechanical control, responsible herbicide application, cultural practices, early detection, and monitoring the effectiveness of management strategies that are consistent with NPS policy and specifically Director's Order #77-7: Integrated Pest Management.

Purpose and Need

The purpose of the proposed framework is to protect and restore native species, ecosystems, and the visitor experience from the detrimental effects of exotic plant invasion, and to protect cultural resources.

An updated Exotic Plant Management Plan is needed because the park is experiencing an increase in the number and extent of exotic plant invasions, which threaten to displace native plant communities, disrupt fire cycles, alter wildlife habitat, impede ecosystem functions, and adversely affect the visitor experience. The management tools available in the 2003 plan have been ineffective in controlling invasive exotic plant infestations in the face of new species invasions, a warming climate, changing fire regimes, and ongoing nitrogen deposition, which continue to aggravate the spread of exotic plants. The 2003 plan is insufficient because it limits herbicide use to only 15 species of exotic plants; contains acreage thresholds that prevent eradication of newly established infestations and smaller existing infestations; does not contain a framework for addressing exotic species newly discovered in the park; and lacks the flexibility to use the best available techniques to manage exotic plants, including new techniques that may become available in the future. A new management plan is needed to expand the range of methods available to control and, if possible, eradicate exotic plant infestations and prevent their spread.

Issues and Impact Topics Retained for Further Analysis

Based on internal and external scoping, the following impact topics were identified for further analysis in this EA:

- Vegetation, including Special Status Species
- Terrestrial Wildlife, including Special Status Species
- Fish and Special Status Aquatic Species
- Wilderness
- Visitor Use and Experience

Impact Topics Dismissed from Further Analysis

The NPS dismissed impact topics from further analysis in this EA for those resources where there would be no effects, or the effects would be slight. Impact topics that were dismissed from further analysis are described below, along with a brief explanation of the reasons for dismissal.

Air Quality

Use of prescribed fire under both alternatives could affect air quality. Prescribed fire could be used at elevations below 9,500 feet and in areas previously consulted on and identified in the Fire Management Plan and EA (NPS 2012). Prescribed fire is a cultural treatment sometimes used to control invasive exotic plants and would result in temporarily adding smoke and particulates to the air during such operations. Air quality impacts from prescribed fires would be localized and would last for only a few days. Fire would not be used on a large scale due to potential adverse impacts on resources, including air quality. Fire would be used only when it poses the least threat to resources. Currently, the park uses prescribed fire primarily for fuel reduction and rarely uses it for control of invasive exotic vegetation. In the early 2000s, a pilot project was initiated using propane wands and prescribed fire to control yellow sweetclover along Trail Ridge Road; however, this effort was not cost or time effective and was not continued. Because impacts on air quality would be localized and temporary, and because impacts from prescribed fire were analyzed in a previous EA, air quality was dismissed from detailed analysis in this EA.

Archeological Resources

Types of archeological resources in the park include open camps, artifact assemblages including stone tools and stone tool production sites, stacked stone features such as hunting blinds, ceremonial sites, and aboriginal wooden features (e.g. wickiups). Archeological resources may also be considered ethnographic resources. Ethnographic resources include objects, landscapes, plants and animals, and sites or structures important to a people's sense of purpose or way of life. Surveys have recorded more than 1,000 archeological resources in the park. Noteworthy archeological surveys conducted in the park include the Systemwide Archeological Inventory Program (Brunswig 2005; Butler 2005) and trail surveys (Briggs and Chance 2017; Briggs 2015; Larmore and Briggs 2015). Archeological resources have been documented in all ecological zones of the park.

Ground-disturbing invasive exotic plant management activities such as manual, mechanical, and cultural control have the potential to cause direct and indirect effects on archeological resources. Ground-disturbing activities have the potential to cause direct long-term impacts on surface and subsurface artifacts and features by altering the spatial organization and physical integrity of archeological deposits. The impacts on archeological deposits would vary based on the depth of shoveling or the root structure of the invasive exotic plant being removed. Direct impacts would be localized to treatment areas. Due to the generally unknown subsurface qualities of archeological resources, it is not possible to quantify or assess the severity of potential impacts. Invasive plant management may cause indirect impacts on archeological resources by increasing their susceptibility to erosion and illicit artifact collection. Indirect impacts from exposure and erosion would last only until surface vegetation is reestablished. These potential impacts would be the same under both alternatives.

Heat from prescribed fire treatments has the potential to destroy or damage the physical characteristics of archeological materials. Fire effects on stone and wood materials include spalling and fracturing. Archeological deposits with perishable materials could be chemically altered, calcified, or destroyed. Any prehistoric or historic wood, ceramic, glass, or other materials would be altered or destroyed. Impacts would be the same under both alternatives.

To minimize the potential negative impacts on archeological resources described above, any exotic plant management undertaking the park determines would have potential to cause an adverse effect on cultural resources listed in or eligible for listing in the National Register of Historic Places (i.e., "historic properties") would be redesigned to avoid the historic property or would not occur within the boundary of the historic property. A qualified Archeologist meeting Secretary of the Interior's Professional Qualification Standards would aid in planning avoidance of known artifacts and features that contribute to the eligibility of historic properties and would assist in planning minimization of ground disturbance from manual, mechanical, and cultural treatment activities conducted within the boundaries of historic properties. Impacts would be avoided and minimized by implementing the measures described in the *Mitigation/Conservation Measures* (Appendix B), such as briefing work crews about the need to protect and preserve inadvertent archeological discoveries and instructing them regarding the illegality of collecting artifacts. If previously unknown archeological resources are discovered during any ground-disturbing undertaking, all work in the immediate vicinity of the discovery would halt until the resources are identified and documented, and an appropriate mitigation strategy is developed.

Under both alternatives, the park's Section 106 Coordinator would evaluate the effects of exotic plant management actions with the potential to cause effects on historic properties pursuant to Section 106 of the National Historic Preservation Act (NHPA) using the park-specific 2018 EPMP (Exotic Plant Management Plan) PA between the NPS and Colorado State Historic Preservation Officer (SHPO) regarding exotic plant management in the park (Appendix A). No adverse effects are anticipated when the park adheres to the 2018 EPMP PA, Section 106 of the NHPA, and the resource protection measures defined in Appendix B *Mitigation/Conservation Measures*. Because effects would be the same under both alternatives and because no adverse effects are anticipated with the use of mitigation measures, archeological resources were dismissed as an impact topic in this EA.

Historic Structures, Buildings, Districts, and Cultural Landscapes

The park contains hundreds of buildings and structures associated with the historical settlement and development of the park. The more than 350 miles of hiking trails in the park are considered historic structures. Historic structures are found primarily in six historic districts: Holzwarth, Fall River Entrance, Utility Area, William Allen White Cabins, Moraine Park Campground, and Timber Creek Campground. Two cultural landscapes have been documented in the park: Moraine Park Museum/Discovery Center and Amphitheater Cultural Landscape, located in Moraine Park; and the McGraw Ranch Cultural Landscape, located near Lumpy Ridge. The natural and constructed landscape and historical objects, plants, animals, and structures may also be considered ethnographic resources because they have special importance to a people's sense of purpose or way of life.

Direct effects on historic structures and buildings would not occur because buildings and features would be avoided during manual, mechanical, and cultural control operations. Because constructed features of historic structures, buildings, and historic districts have been previously identified and are easily visible to crews, invasive exotic plant management activities would avoid built environment historic properties and there would be no direct effects on constructed cultural resources. Park Staff would not conduct prescribed fire treatments in proximity to historic structures when there is any risk for direct negative impacts. Indirect effects on setting

from loss of vegetation and destabilized soils around buildings and structures would typically be temporary until surface vegetation is reestablished. It is unlikely invasive exotic plant removal would result in negative impacts on any characteristics that qualify a historic district or cultural landscape for listing in the NRHP. Exotic species removal would have a long-term beneficial indirect impact on historic properties by restoring native species to an area and restoring the setting during the period of significance.

As described for archeological resources, the park's Section 106 Coordinator would evaluate the effects of exotic plant management actions with the potential to cause effects on historic properties using the 2018 EPMP PA (Appendix A) under both alternatives. No adverse effects are anticipated when the park adheres to the 2018 EPMP PA, Section 106 of the NHPA, and the resource protection measures defined in Appendix B. Because effects would be the same under both alternatives, and because no adverse effects are anticipated with the use of mitigation measures, historic structures, buildings, districts, and cultural landscapes were dismissed as impact topics in this EA.

Soundscapes

Exotic plant control activities may result in a slight increase in unnatural sounds. Activities generating noise would include using gasoline-powered string trimmers or mowers, trucks, or utility task vehicles (UTV), and the presence of large groups of volunteers and/or park employees. Mechanical equipment would mostly be used within the 5% of the park that is not wilderness. Occasionally, string trimmers may be used in designated or recommended wilderness if determined to be the minimum tool needed to accomplish the work. The use of mechanized equipment would be of short duration lasting only a few daylight hours. The slight noise increases associated with exotic plant control activities would not result in measurable additional noise in the park; therefore, soundscapes were dismissed as an impact topic in this EA. Impacts on the wilderness soundscape are discussed in the *Wilderness* section.

Water Quality

There would be no aquatic application of herbicides, and herbicides that leach into or persist in water would not be used; therefore, water quality was dismissed as an impact topic in this EA. Potential indirect impacts from herbicides on fish and aquatic organisms are addressed in the *Fish and Special Status Aquatic Species* section.

Indian Trust Resources

No Indian trust resources are in the park; therefore, Indian trust resources was dismissed as an impact topic in this EA.

Environmental Justice

Grand Lake, Estes Park, and other communities near the park contain both minority and low-income populations; however, environmental justice was dismissed as an impact topic in this EA because no actions in the alternatives would have disproportionately high health or environmental effects on these populations or communities.

ALTERNATIVES

Alternative A – Continue with Current Management of Invasive Exotic Plants (No Action)

The park would continue current management of invasive exotic plant species using the provisions of the 2003 plan. Methods to inventory and monitor invasive exotic plants; prioritize invasive exotic plants to be controlled; identify control techniques most appropriate for each species; monitor effectiveness of control efforts; prevent new infestations; inform the public about park efforts to control invasive exotic plants; and work with adjacent landowners and local, county, state, and federal agencies would continue as described in the 2003 plan. No additional species would be managed beyond the 35 invasive exotic plant species identified in the 2003 plan, even if additional invasive exotic plants become a threat to park resources. Herbicide use would be limited to the 15 species identified for herbicide use in the 2003 plan and would only be used when the number of invasive exotic plants in a given population exceed thresholds identified in the 2003 plan.

Alternative B – Adaptive Integrated Pest Management (Proposed Action and Preferred Alternative)

The park would adopt a parkwide adaptive integrated pest management decision-making framework that incorporates the best available science, expert knowledge, site assessment, and monitoring. This information would be used to determine the extent of exotic species infestations, prioritize treatments, and determine the most effective treatment methods and other management actions. Management actions would be prioritized based on the level of threat to park resources, the size and extent of species infestations, and the park's ability to control those infestations. Park Natural Resource Managers would use a structured decision-making process to assist in setting invasive exotic plant management priorities (Figure 2) and assist in determining control methods for invasive exotic plants (Figure 3). Park Staff would have the flexibility to manage invasive exotic plant species listed in the 2003 plan, species listed on the Colorado noxious weed list, and any additional invasive exotic plant species that become a threat to park resources in the future. The tools used to control invasive exotic plants could include manual removal, mechanical control, and herbicide application. These control methods could be used separately or in combination with one another, depending upon which species are targeted for management. Components of the proposed action are described below.

Inventory

The park would increase inventory and documentation of invasive exotic plant species occurrence and distributions, with a focus on early detection that would allow the park to better prioritize treatments in the future. Comprehensive inventories and early detection would allow the park to better execute rapid response strategies, which prevent new invasive exotic plant species from becoming established in the park or from spreading to new areas within the park.

Exotic Plant Management Plan Environmental Assessment

Rocky Mountain National Park

Structured Decision-Making Process to Assist in Setting Invasive Exotic Plant Management Priorities

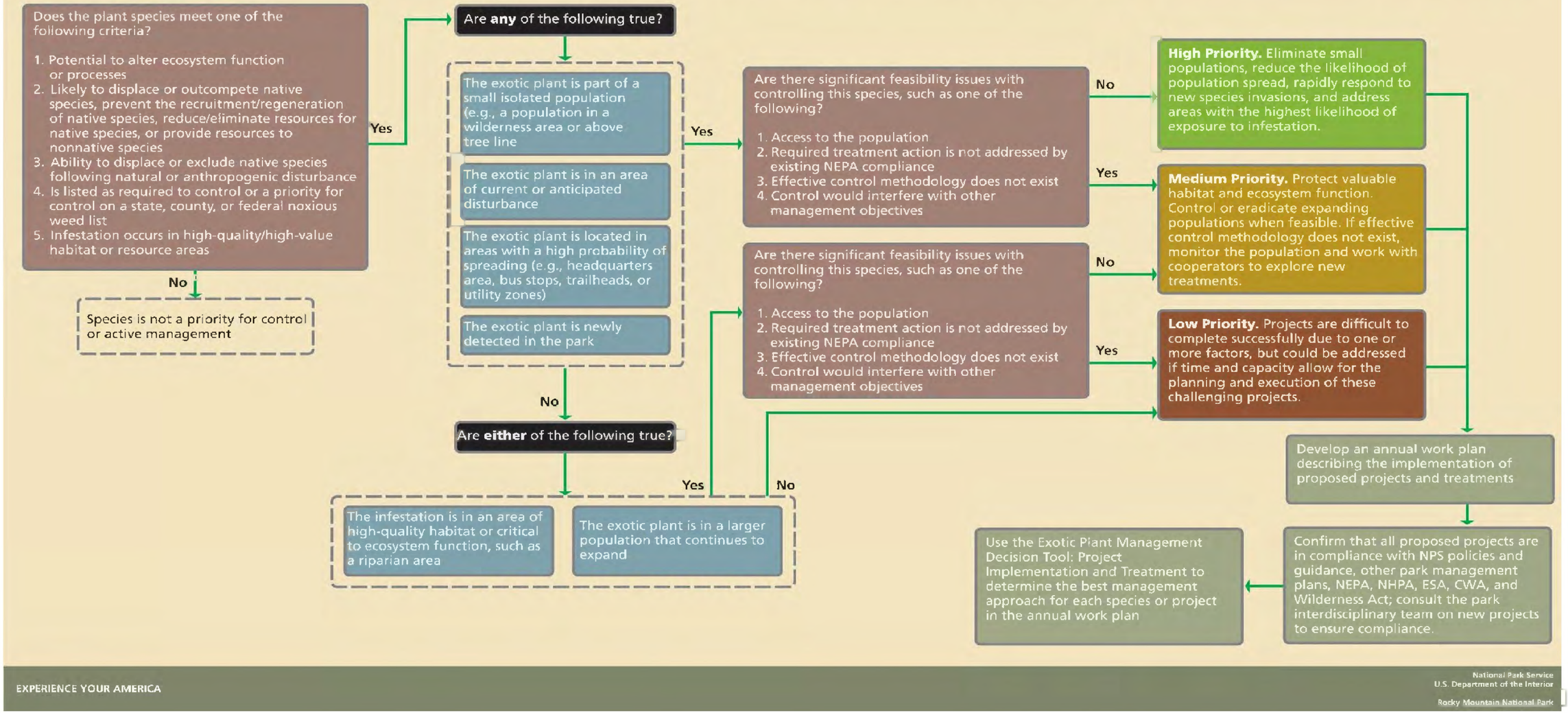

Figure 2. Structured decision-making process for setting invasive exotic plant management priorities.

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Exotic Plant Management Plan Environmental Assessment

Rocky Mountain National Park

Structured Decision-Making Process to Assist in Determining Invasive Exotic Plant Control Methods

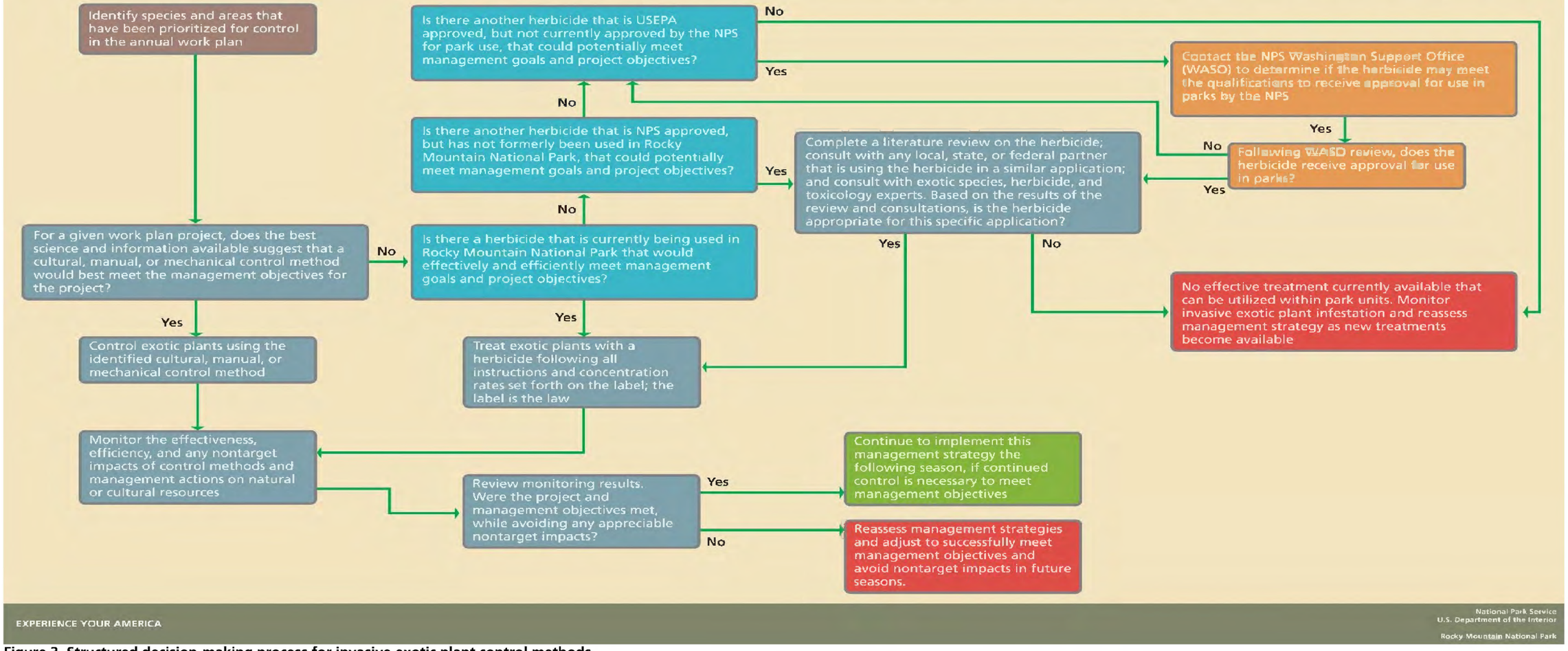

Figure 3. Structured decision-making process for invasive exotic plant control methods.

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Park Natural Resource Managers would conduct desktop analysis and on-site field surveys prior to treatment to determine the presence and proximity of natural resources that may be at risk from invasive exotic plant treatments, including aquatic resources and special status species. Park Natural Resource Managers would consult park plant databases, as well as soil and vegetation GIS layers, to identify known and likely locations of rare plants. If surveys are warranted, surveys would be conducted when plants are expected to be flowering or have aerial stems or catkins to determine the presence or absence of sensitive species in the park prior to treatment.

On-site surveys would involve one or two park staff hiking trails and walking meadows in a grid pattern to find new infestations and document their extent by collecting observational data. These activities would occur on most park trails and meadows across the entire elevational range of the park. Trails and meadows would be inventoried from May through October. When funding and resources are available, a full inventory would be completed over a 2-year period and ideally would be repeated every 5 years. In most years, fewer surveys would occur and a full park inventory would be completed over a longer timeframe.

Process for Determining Invasive Exotic Plant Management Priorities

Park Natural Resource Staff would evaluate each invasive exotic plant species based on criteria described in Figure 1 to determine management priorities. Based on the outcome of the process outlined in Figure 2, each species and project site would be ranked as high, medium, or low priority for management. Park Natural Resource Staff would develop an annual work plan describing the implementation of proposed projects and treatments for management of invasive exotic plants. If an exotic plant species population is determined to be a management priority using this framework, the desired outcome of managing that species would be delineated in the annual work plan. For example, if a population of invasive reed canary grass (*Phalaris arundinacea*) is identified as a priority for control, the desired outcome, or desired future condition of the project site, would be described in the work plan. That outcome within the first 12 months might be a 50% reduction in the population size, or a 30% reduction in population density. The long-term desired outcome might be a reduction of the population by 90% and a restoration of native flora. Clearly defining the desired future condition of, or simply the goals for, the project site, allows managers to know if those goals are being met. If management actions are not successful in achieving the desired future condition identified for the site, park managers can then change their approach to better achieve success. Once exotic species populations have been prioritized for management, individual projects are identified, and desired future conditions are determined for the project sites, park managers would then determine the exotic plant control methods to be implemented.

Process for Determining Invasive Exotic Plant Control Methods

The specific management method for each invasive exotic plant species would be determined using the structured decision-making process outlined in Figure 3. The management method or methods for each species would be determined based on the best scientific information available. Prior to using a herbicide that has not previously been used in the park, Park Natural Resource Managers would complete a literature review and consult with local, state, and federal

entities that are using the herbicide and consult with other experts to determine if the herbicide is appropriate for use for a specific application in the park. Prior to using a herbicide that is not currently approved for use by the NPS, Park Natural Resource Managers would consult with the NPS Intermountain Regional Office and Washington Support Office, as needed, to determine if the herbicide meets the qualifications to receive approval for use in parks by the NPS. Park Natural Resource Managers would develop an annual work plan describing the implementation of proposed projects and treatments for management of invasive exotic plants. Following the implementation of the projects listed in the annual work plan, Park staff would monitor the effectiveness of control methods and reassess management strategies annually, or as appropriate, based on the results of monitoring.

Monitoring

Park Natural Resource Managers would manage invasive exotic plants using principles of adaptive integrated pest management. Park staff would monitor sites where invasive exotic plants have been controlled to determine if the management objectives have been met or if additional methods should be used to help achieve objectives. If a management tool is used that is new to the park (e.g., the use of a herbicide that is approved by the NPS that has not been used in the park previously), a pilot monitoring study would be implemented to determine the effectiveness of the new tool. The proposed action would also include monitoring impacts of management actions on nontarget native species to ensure that if unanticipated nontarget effects occur, they are known and able to be remedied. Monitoring data would be used, along with the best available science, to implement management actions and to inform changes to those actions.

Monitoring would also be implemented for larger infestations of invasive exotic plants, which generally occur at elevations from over 7,000 to more than 9,500 feet, even if the infestation is not targeted for immediate control. Monitoring of larger infestations allows park staff to understand the rate of spread and the threat to park resources. This information would then serve to inform the prioritization of exotic plant infestations. Monitoring would typically involve a team of two park staff and would occur from May through October using observational data collection methods such as photographs, line transects, plots, and mapping using a global positioning system (GPS) unit. Inventory and monitoring data would be stored in a database and formatted for effective analysis.

Invasive Exotic Plant Management Tools

The park would have the flexibility to use a full range of exotic plant management tools–including manual control, mechanical control, responsible herbicide application, cultural practices (including fire and native habitat restoration), early detection, and monitoring the effectiveness of management strategies that are in compliance with NPS Policies and guidance, other park management plans, NEPA, NHPA, Endangered Species Act, Clean Water Act, and Wilderness Act. Over time, the park anticipates the elevational range for treatments would increase as warming, nitrogen deposition, or other factors expand the range of exotic plants to include higher elevations.

Exotic plant management techniques would generally be the same under Alternative B as under the no action alternative (see *Actions Common to Both Alternatives*). Park Natural Resource Managers would have the flexibility to use herbicides on additional invasive exotic plants in the park when other control methods are not effective. Herbicide application would be conducted by park staff or contractors, or other responsible parties knowledgeable in safe application of herbicides. A crew of 5 to 10 people would use backpack sprayers along roadsides and in some meadows. Limited use of UTVs with wand or other types of sprayers could also occur. UTV use would occur both on- and off-trail. UTVs would not be used in archeologically sensitive areas. Any UTV use in the Wilderness portion of the park would require specific Wilderness Minimum Requirements Analysis approval. Vehicles and UTVs would be kept out of streams and swales, except for occasionally crossing a stream to get to a site. Vehicles and UTVs would not be used within 100 feet of a stream if the stream is within a wetland. Herbicides would not be used in standing water such as ponds or stagnant wetlands or flowing water and applicators would ensure that no drift gets into waterways or lakes. Additional application methods may be used in the future as technology improves. Park Natural Resource Managers would only allow use of herbicides that have been through both the Environmental Protection Agency (EPA) and NPS approval processes for the target species and that are approved to be sprayed near water or close to waterways. The smallest amount of herbicide necessary for effective treatment would be used. Spot treatments would be most commonly used in lieu of broadcast treatment. Broadcast treatment would only be considered for the most severe infestations where a near monoculture of invasive exotic plants is present. Park staff would use herbicides that target specific species or functional groups, as opposed to broad-spectrum herbicides, when these herbicides are available and effective. Broad-spectrum herbicides would only be used when no specific herbicides would successfully meet management objectives. This approach would reduce impacts on nontarget plant species. Treatments generally would occur from May through October at elevations from over 7,000 to more than 9,500 feet.

A second exception would be that the requirement to set exotic plant population thresholds prior to the use of herbicides would be eliminated. For example, under the 2003 plan, the invasive species cheatgrass (*Bromus tectorum*), would have to reach a population that covered greater than 100 square meters prior to using herbicide for control. Another example is the requirement for leafy spurge to cover greater than 10 square feet in any one location prior to using herbicide to control the infestation. Allowing invasive exotic plant populations to reach a certain size prior to using herbicide to control the population is counterproductive to successful exotic plant management. Exotic plant species are most easily managed and eradicated when their population size is very small. Alternative B would eliminate this threshold requirement and allow plant populations to be treated with effective and approved methods before reaching a predetermined population size, thus increasing the likelihood of successfully controlling the targeted exotic plant population.

Actions Common to Both Alternatives

Invasive Exotic Plant Management

The following exotic plant management techniques could be used under both alternatives.

Depending on the type of action, the level of ground disturbance, and the potential for effects on nontarget species and resources, additional consultation and compliance may be required for specific activities.

Manual Control

Manual control would involve clipping, hand pulling, and severing roots. This technique generally would occur at the lower elevations of the park from May to October and at elevations from over 7,000 to more than 9,500 feet.

Mechanical Control

Mechanical control could involve mowing with gas-powered push mowers or using gas-powered string trimmers. Mowing requires one or two park staff and generally would occur in roadside meadows at elevations from over 7,000 to more than 9,500 feet. String trimmers would generally be used in teams of two to eight park staff and would be used to spot treat infestations at elevations from over 7,000 to more than 10,500 feet. In the future, mechanical control may be needed at higher elevations as invasive exotic species expand their elevational range in the park. Mechanical treatments would occur May through October.

Cultural Practices

Cultural practices create an environment where exotic species have greater difficulty invading a site and can include native habitat restoration and prescribed fire. Native habitat restoration activities would generally occur from April through October at elevations from over 7,000 to more than 10,500 feet. The restoration practices used would include activities that prevent the growth of invasive exotic species, including the establishment of native vegetation communities where exotic species may otherwise spread. Whenever possible, native seed collected from within the park would be spread by staff, volunteers, or contractors and raked into the soil surface. After seeding, the restoration site would be mulched using wood chips, also spread by hand. Crews and volunteers would also plant native seedlings grown from seed or propagated from other plant material collected within the park. Minor digging would be necessary when planting grasses, forbs, shrubs, and trees. Raking the soil surface would also be necessary when seeding to establish native vegetation cover. Most plants from the park's nursery stock are usually in 1-inch cones or quart-sized plots, which would determine the size of hole needed for each plant. In certain cases, topsoil and erosion control would be necessary to favor the establishment of native plantings. While the park would use native topsoil whenever possible, weed free topsoil may be brought in from approved sources and spread by crews with rakes or spread by small equipment such as a skid steer (usually only on the roadside). Erosion control typically is only needed on steeper slopes and would involve installing erosion barriers, such as wattles, or installing some type of matting to prevent soil movement and soil loss.

Prescribed fire could be used at elevations below 9,500 feet and in areas previously consulted on and identified in the Fire Management Plan (NPS 2012). The Fire Management Plan identifies treatment areas included in the Long-Term Fuels Treatment Plan (NPS 2012, Figure 4, p. 54) where prescribed fire, manual treatments (work completed using hand tools including

chainsaws), and mechanical treatments (work completed using machinery) may be implemented to reduce hazardous fuels or create or maintain desired landscapes or other site-specific objectives. The Long-Term Fuels Treatment Plan identifies approved areas where fuels treatments may occur over the life of the Fire Management Plan, estimated at about 20 years starting in 2012 (NPS 2012). Currently, the park uses prescribed fire primarily for fuel reduction; it is rarely used for control of invasive exotic vegetation.

Biological Control

Biological control is a method of managing pests, such as invasive exotic plants, by introducing a predator or parasite. Biological control is not currently being considered as an immediate or primary technique for invasive exotic plant management in the park and is not considered in this document. In the future, biological controls may be used once they have been successfully tested in other areas and in coordination with neighboring and collaborating agencies or entities such as Larimer and Boulder Counties, U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service, and universities. Additional review under NEPA would be needed if biological controls were proposed in the future.

Wetlands, Surface Waters, and Water Influence Zones

Herbicides would not be used in standing or flowing water, and applicators would ensure that no drift gets into waterways or lakes based on site-specific assessments. Herbicide application near waters would follow herbicide-specific buffers (see Appendix E, Table 2). Water influence zones, where vegetation plays a major role in sustaining the long-term integrity of aquatic systems, would be identified to reduce risk of unwanted exposure to toxins by nontarget species. Water influence zone sizes would vary based on the specific characteristics of each treatment site. A general recommended minimum buffer is 25 feet from the top of each streambank. For this plan, the water influence zone, is defined as 100 feet from the top of each streambank, or a distance equal to the mean height of mature dominant late seral upland vegetation, whichever is greater. Water influence zone size may be increased based on the specific characteristics of each treatment site, including slope, soil characteristics, and potential for runoff or water contamination. Some herbicides may have greater or smaller recommended distances for application from surface water, including up to surface water edges. All herbicides would be applied in accordance with the label.

Additional Actions Common to Both Alternatives

Under both alternatives, Park Natural Resource Managers would continue current efforts to prevent introduction of invasive exotic plants to the park. These efforts include using weed-free hay, inspecting construction vehicles entering the park for invasive exotic plant seed, and washing vehicles before they enter a construction zone. The park's best management practices for use of herbicides would be followed (Appendix C). The park also would continue current education and outreach efforts to park visitors and the community as described in the 2003 plan.

Alternatives Comparison

Table 1. Alternatives comparison.

Action	Alternative A (No Action)	Alternative B (Proposed Action)
Inventory	Invasive exotic plant surveys would be conducted every year by park staff and volunteers, focusing on road shoulders and hiking trails in the park. Wilderness areas would be surveyed if time allows. Rangers would be trained to identify invasive exotic plants and report them.	In addition to the inventory actions in the no action alternative, the park would increase inventory and documentation of invasive exotic plant species occurrence and distributions, with a focus on early detection that would allow the park to better prioritize treatments in the future.
Process for Determining Invasive Exotic Plant Management Priorities	Park staff would prioritize invasive exotic plants to be controlled based on the management strategies contained in a risk assessment (Rutledge and McLendon 1996) and management zones (NPS 1976). Park Natural Resource Managers would assign species an urgency score of high, medium, or low based on their ecological impact and relative ease of control. Additional details are available in the 2003 plan.	Park Natural Resource Managers would evaluate each invasive exotic plant species infestation based on criteria described in Figure 2 to determine management priorities. Using the decision process in Figure 2, Park staff would prioritize treatments from high to low priority based on aggressiveness of exotic species and habitat value.
Process for Determining Invasive Exotic Plant Control Methods	Control techniques would be evaluated based on cost and effectiveness and nontarget effects. Herbicides would be applied as a last resort; the effectiveness of mechanical, cultural, biological, and other methods would be evaluated before synthetic herbicide control is proposed. Use of herbicides would be limited as described below under Integrated Pest Management. Additional detail is available in the 2003 plan.	The specific control method for each invasive exotic plant species would be determined using the structured decision-making process outlined in Figure 3. The control method, or combination of methods, for each species would be determined based on the best scientific information available.
Monitoring	Park staff would continue to monitor areas where invasive exotic plants have been removed.	In addition to the monitoring actions in the no action alternative, Park staff would manage invasive exotic plants using principles of adaptive integrated pest management including monitoring invasive exotic plant populations and monitoring the effectiveness of invasive exotic plant management actions. The proposed action would include monitoring impacts of management actions on nontarget native species, as well as broader scale monitoring of the rate of spread of exotic plant infestations.
Invasive Exotic Plant Management	Park staff would use Integrated Pest Management (IPM) tools including manual control, mechanical control, responsible herbicide application, cultural practices, and biological control. Use of herbicides would be limited to 15 invasive exotic plant species identified in the 2003 plan: ● Canada thistle (*Cirsium arvense*) ● Cheatgrass (*Bromus tectorum*) ● common St. Johnswort (*Hypericum perforatum*) ● Dalmatian toadflax (*Linaria dalmatica*) ● diffuse knapweed (*Centauera diffusa*)	Park Natural Resource Managers would have the flexibility to use a full range of exotic plant management tools including manual control, mechanical control, responsible herbicide application, cultural practices, early detection, and monitoring the effectiveness of management strategies. Implementation of each management technique would be the same as under the no action alternative, with the exception of herbicide application. Using the decision process in Figure 3, Park staff would have the flexibility to use herbicides on additional invasive exotic plants in the park when other control methods are widely known to not be

Action	Alternative A (No Action)	Alternative B (Proposed Action)
	● field bindweed (*Convolvulus arvensis*) ● houndstongue (*Cynoglossum officianale*) ● leafy spurge (*Euphorbia esula*) ● oxeye daisy (*Chrysanthemum leucanthemum*) ● orange hawkweed (*Hieracium aurantiacum*) ● quackgrass (*Agropyron repens*) ● smooth brome (*Bromus inermis*) ● spotted knapweed (*Centaurea maculosa*) ● sulfur cinquefoil (*Potentilla recta*) ● yellow toadflax (*Linaria vulgaris*) Herbicide use would only be implemented on these species when the number of plants in one location exceeds thresholds established in the 2003 plan.	effective or have been proven to not be effective in the park. In addition, Alternative B would not have plant population thresholds for herbicide application. In addition to the 15 invasive exotic plant species listed for the no action alternative, the park anticipates that herbicides would be used to treat myrtle spurge (*Euphorbia myrsinites*) and yellow starthistle (*Centaurea solstitialis*) from Colorado Noxious Weed List A; bouncingbet (*Saponaria officinalis*), bull thistle (*Cirsium vulgare*), Russian knapweed (*Acroptilon repens*), scentless chamomile (*Matricaria perforata*), and musk thistle (*Carduus nutans*) from Colorado Noxious Weed List B; common burdock (*Arctium minus*) and common mullein (*Verbascum thapsus*) from Colorado Noxious Weed List C; baby's breath (*Gypsophila paniculata*) and hoary alyssum (*Berteroa incana*), both on the Colorado Noxious Weed Watch List; and reed canary grass. Other species on the Colorado Noxious Weed List not yet known to occur in the park also would be considered for herbicide or other treatment methods, as well as species that appear on the Colorado Noxious Weed List in the future, on any surrounding state's noxious weed lists, or any other invasive exotic plant species known to present ecological or human health hazards.
Additional Actions Common to Both Alternatives	Park staff would: ● continue current efforts to prevent introduction of invasive exotic plants to the park, and ● continue current education and outreach efforts to park visitors and the community as described in the 2003 plan.	Same as the no action alternative.

Alternatives Considered and Dismissed

The following alternatives were considered for project implementation, but were dismissed from further analysis, as described below.

No Management of Invasive Exotic Plants

Without management or control, invasive exotic plants would continue to harm the park's natural resources, displacing native vegetation and wildlife. This alternative was rejected because it would not meet the purpose and need for the project, would not meet the park's

enabling legislation to protect natural resources, and would not comply with the NPS Organic Act (1916) or the federal Noxious Weed Act (1974).

Modify the 2003 Plan

The park considered modifying the 2003 plan. Ideas considered included eliminating the arbitrary plant population thresholds in the 2003 plan and modifying the plan to address species that become listed as noxious weeds by the state of Colorado. This alternative was dismissed because it would not allow the park to address invasive exotic plant infestations as effectively as the proposed action, and because it would not meet the purpose and need of the EA. This alternative would not meet the purpose and need of the EA because modifying the 2003 plan would not allow the park to address species that became a threat to park resources if those species were not listed on the Colorado noxious weeds list or the park list. It is likely the park could be the first place in Colorado to document the occurrence of a new invasive exotic plant that would not be described on any of these lists. To manage exotic plants effectively, the park needs the flexibility to address newly discovered invasive exotic plants.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the affected environment (existing setting or baseline conditions) and analyzes the potential environmental consequences (impacts or effects) that would occur as a result of implementing the no action or preferred alternative. Cumulative effects are analyzed for each resource topic carried forward.

Vegetation, including Special Status Species

Affected Environment

General Vegetation Types

Approximately 1,000 vascular plant species are known in the park. The large number of species is largely the result of the wide range in elevation in the park, from 7,800 feet to more than 14,000 feet above sea level. The climate of the park and surrounding areas is controlled by the north-south orientation of the Rocky Mountains and their abrupt changes in elevation. Weather from the west tends to leave its moisture on the western slopes of the mountains, creating drier and warmer conditions on the eastern slopes, which also contributes to the variety of plant life in the park (NPS 2006b). Major vegetation types in the park range from ponderosa pine (*Pinus ponderosa*) woodlands and shrub/grasslands at lower elevations, to lodgepole pine (*Pinus contorta*) forests and Engelmann spruce (*Picea engelmannii*)/subalpine fir (*Abies lasiocarpa*) forests at gradually higher elevations, to alpine tundra at more than 11,500 feet (NPS 2003). Aquatic and riparian areas occur along the 147 lakes and 450 miles of streams scattered throughout the park and contain some of the greatest diversity of habitat for flora and fauna in the park (NPS 2006b).

Invasive Exotic Species

At least 42 invasive exotic plant species are known to occur in the park, which is an increase from the 35 known to occur in 2003. Invasive exotic species are of particular concern due to their ability to displace native vegetation and their potential to adversely affect the long-term health of the native ecosystem (NPS 2003). Exotic species have invaded the park because of human activities such as mining, logging, and livestock grazing prior to the establishment of the park. Since the park was established, construction, increased visitation, a warming climate, changing fire regimes, and ongoing nitrogen deposition have further contributed to the establishment and spread of exotic plants. The largest concentrations of invasive exotic plants occur around developed areas in the lower elevations of the park. However, exotic species such as yellow toadflax, spotted knapweed, and curly dock (*Rumex crispus*) have been found above tree line along Trail Ridge Road (NPS 2003). Previously, high altitude was thought to be a natural barrier to invasive exotic species. Aquatic and riparian areas throughout the park are particularly susceptible to exotic plant infestation because of the high visitation rates and sensitivity of these communities to environmental stresses. Visitation contributes to invasive

exotic plant infestations because visitors often inadvertently carry in seeds of exotic invasive plants in their socks or on their shoes.

Special Status Species

Special status plant species include plant species listed as threatened, endangered, or candidate under the Endangered Species Act (ESA) and species considered imperiled or vulnerable by the Colorado Natural Heritage Program (CNHP). No federally listed plant species are known to occur in the park; however, two species – Ute ladies'-tresses orchid (*Spiranthes diluvialis*) and Colorado butterfly plant (*Gaura neomexicana* spp. *coloradensis*) – occur in riparian habitats downstream of the park in lower elevation areas. The Colorado butterfly plant has been proposed for removal from the list of endangered and threatened species by the USFWS on June 6, 2018 (85 FR 26623). Other special status plant species listed as imperiled or vulnerable by the State of Colorado and the CNHP are known or suspected to occur in the park. These species are found in a wide range of plant communities from the high peaks and tundra, to cliff sides, to subalpine forests, to riparian areas. A complete list of special status species in the park is presented in Appendix D.

Environmental Consequences

Alternative A – Continue with Current Management of Invasive Exotic Plants (No Action)

Manual and Mechanical Control

Controlling invasive exotic plants through hand pulling and using hand tools to uproot plants and remove root structures of rhizomatous species would cause ground disturbance. Rhizomatous root systems for several invasive species such as toadflaxes and Canada thistle can be widespread, and roots of some species such as bindweed can grow to many feet below the ground surface. In addition, some loss of native plants could occur in the immediate vicinity of an invasive exotic plant that is dug from the ground. This may lead to adverse impacts on vegetation through soil disturbance and trampling of native vegetation. Similarly, mowing or using a string trimmer would cause adverse impacts on native vegetation growing among the invasive exotic species by cutting them. Only individual plants or small populations of native species within the treatment area might be adversely affected and these impacts would persist for about one growing season. For some invasive exotic plants that reproduce by seed and through rhizomes (e.g., Canada thistle, leafy spurge, field bindweed, and yellow toadflax), especially in areas with hard soils or rocky substrates, manual and mechanical control of large well-established patches would be marginally effective and could actually promote the spread of the invasive exotic plant. Cutting seed heads and cutting plants just below ground level could have negative effects on adjacent native species from trampling. Trampling effects would persist for less than one growing season.

Cultural Practices

Cultural practices are expected to have beneficial effects on native vegetation, including special status species, because restoring disturbed areas to natural conditions prevents soil erosion and enhances native plant communities. Management activities associated with cultural practices

could result in adverse impacts from the presence of park staff in native habitat and inadvertent trampling damage to vegetation that would last less than one year.

If prescribed fire is used, it could reduce populations of certain invasive exotic plants (e.g., smooth brome, sweetclover, and timothy) and stimulate growth of native plants. However, the ground disturbance caused by fire could also lead to infestations of other invasive exotic plants, such as red top, diffuse and spotted knapweed, and yellow and dalmatian toadflax, to the detriment of native plant communities. Appropriate control techniques would be implemented to eradicate or control invasive exotic plants that begin to invade or spread following a fire. Prescribed fire would be avoided in some areas if this practice would enhance the spread of invasive exotic plants. The effect of fire on native vegetation is dependent on the intensity and location of the fire. Appendix B on page 120 of the 2003 plan identifies the invasive exotic plants that can be effectively controlled using prescribed fire. In the past, the park has primarily used prescribed fire for fuel reduction rather than control of invasive exotic plants. Because of the strict set of weather-related conditions that need to be met to conduct a prescribed burn, the use of prescribed fire for control of exotic invasive species would be infrequent.

Herbicide Application

As previously described, treatment of invasive exotic plant species with herbicides under the no action alternative would be limited to applying synthetic herbicide on 15 nonnative species and would only be implemented on these species when the number of plants in one location exceeds thresholds established in the 2003 plan. Not being able to treat certain invasive exotic species until their populations exceed certain thresholds could result in negative impacts on native vegetation, which would be replaced or crowded by invasive exotic species. Herbicide treatment under the no action alternative could potentially have adverse impacts on vegetation through impacts on native vegetation caused by off-target herbicide application or drift. Impacts on nontarget vegetation would include individual plants or groups of plants being killed by herbicides. Native vegetation would naturally revegetate and cover the area within a few growing seasons, especially if competing nonnative invasive species have been successfully eliminated. Applying herbicides by hand or wicking/wiping methods would facilitate accurate and precise treatments that would minimize inadvertent impacts on native vegetation. In addition, applying herbicides in compliance with the labels (e.g., by applying proper concentrations, avoiding use in windy conditions, or following restrictions for use near water) would reduce impacts on native vegetation from drift, runoff, or spills.

Effects on Special Status Species

Not being able to treat invasive exotic species until their populations exceed certain thresholds could result in negative impacts on special status species, which could be displaced or crowded by invasive exotic species. Incidental impacts would be avoided because potential habitat for special status plant species would be surveyed before using herbicides, and rare plants would be avoided during spraying as described in Appendix B *Mitigation/Conservation Measures* and Appendix C *Best Management Practices*. Effects on downstream populations of two federally listed threatened species, Ute ladies'-tresses orchid and Colorado butterfly plant, are unlikely because herbicides would be used in accordance with the manufacturer's label, including restrictions on use near water; and the park's water bodies experience dilution as they converge and as precipitation events occur throughout the summer. The tendency of herbicides to degrade in water and when exposed to sunlight further reduces the risk of exposure. Herbicide

would not likely reach downstream habitats outside the park in concentrations high enough to harm those habitats because of dilution and rapid degradation of herbicides in the water. The benefit to the park's plant communities from controlling invasive exotic species and restoring native vegetation communities and habitat outweighs the small risk of exposure.

Conclusion

Overall, the limited herbicide treatments available under the no action alternative would limit the ability of resource managers to control invasive exotic plant species, allowing them to spread further throughout the park. This would negatively impact native vegetation through displacement of native plant habitats. As previously described, the number of invasive exotic plant species in the park is growing, and the distribution and acreage of invasive exotic plants is expanding. This is happening despite efforts to control these occurrences using the methods described in the 2003 plan. Without the flexibility to address new plant species infestations and use of a framework that allows new control methods, it is anticipated that the number of infested acres would increase despite the use of other IPM techniques to control invasive exotic species. Under the no action alternative, it is likely that biological diversity would be negatively impacted in the park. Over longer time periods, such as decades or longer, entire native plant communities could be replaced by invasive exotic plants, resulting in substantial loss of biodiversity. Loss of native plant communities and biodiversity from increased prevalence of invasive exotic species would be an important negative impact on park resources, such as wildlife habitat, and would detract from the park's purpose to preserve the park's high-elevation ecosystems. These effects would occur mostly at elevations below 9,000 feet but would also likely extend to higher elevations over time. These adverse effects would last indefinitely until the invasive exotic plant infestations have been removed and restored to native plant species.

Cumulative Effects – Past, present, and reasonably foreseeable future actions that have impacted or could impact vegetation include elk and vegetation management; fire management; and road, facility, and trail construction and maintenance. Elk and vegetation management and fire management have generally had beneficial effects on native vegetation, including elk redistribution and vegetation restoration. These actions have resulted in benefits by protecting the integrity of native vegetation communities in the park. Road, facility, and trail construction have likely had adverse effects over the long term from vegetation loss, damage, and trampling and changed community composition by creating disturbances that allow invasive exotic plant species to become established. Overall, the impacts from past, present, and reasonably foreseeable future actions would be beneficial.

As previously described, the no action alternative would contribute adverse effects on vegetation, including special status species, because invasive exotic plant populations would continue to increase in number and size, resulting in additional adverse effects from loss of diversity in native plant communities. Thus, when the effects of the no action alternative are combined with the effects of other past, present, and reasonably foreseeable future actions, the total cumulative impacts on vegetation, including special status species, would be beneficial, with an adverse incremental contribution from the no action alternative.

Alternative B – Adaptive Integrated Pest Management (Proposed Action and Preferred Alternative)

Manual and Mechanical Control and Cultural Practices

Under Alternative B, impacts from manual, mechanical, and cultural control methods would be the same as previously described for the no action alternative. It is expected that the frequency of ground disturbance under Alternative B would be less than under the no action alternative, as rhizomatous perennial invasive vegetation would be more likely to be treated with herbicides instead of digging up the root mass associated with each plant.

Herbicide Application

The impacts of herbicide treatment methods on native vegetation under Alternative B would be similar to those described for the no action alternative, except that the park would have the flexibility to use herbicides on additional invasive exotic plants in the park and there would be no population thresholds for herbicide application, which would allow more effective control of invasive exotic plants by treating new infestations before they reach a threshold level. As described under the no action alternative, adverse impacts on native vegetation could result from off-target herbicide application drift. Additional impacts on native vegetation could result from UTV use off-trail; however, UTV use is expected to be limited, and UTVs would be kept out of streams, swales, and wetlands, except for occasionally crossing a stream to get to a site. Because the park would have the flexibility to use herbicides on additional invasive exotic plants and no population thresholds would be required, Alternative B could result in more frequent use of herbicides in the short term and, thus, additional impacts on native vegetation. These effects would be temporary and native vegetation affected by herbicide drift would recolonize or recover within a few growing seasons, especially if competing invasive exotic plants have been successfully removed. Trampling by UTVs would recover within one growing season.

Effects on Special Status Species

Direct effects on special status plant species from manual and mechanical control, cultural practices, and herbicide application would be the same as described for the no action alternative. Alternative B would benefit native vegetation, including special status species over the long term because allowing plant populations to be treated with effective and approved methods before reaching a predetermined population size increases the likelihood of successfully controlling the targeted invasive exotic plant population, which would reduce competition with special status species.

Conclusion

Allowing an adaptive integrated pest management approach to managing invasive vegetation would benefit native plant communities by enabling a rapid response to invasive exotic plant species using IPM tools. This rapid response would treat infestations at the smallest possible size and allow park staff to respond to new-to-the-park invasive exotic plant species in a proactive manner. An important difference between Alternative B and the no action alternative is that Alternative B would allow the eradication of highly invasive exotic plant species, while the no action alternative would not because many species would not be treated until populations reached certain threshold. By allowing use of additional herbicides and including an adaptive

integrated pest management component, Alternative B would better preserve ecological diversity compared with the no action alternative. In areas with particularly dense infestations of invasive plants, eliminating or reducing the density of invasive exotic plants would allow native vegetation to flourish. Using the most effective treatment based on the process identified in Figure 3 could lead to lower herbicide use over the long term as populations of invasive exotic plants are eliminated or brought under control. The increase in preventive measures would reduce the need for invasive vegetation treatments. Overall, maintaining native plant communities in a healthy dynamic condition would favor native plants over invasive exotic plants (McLendon and Redente 1994; McLendon 1996), resulting in long-term benefits to native vegetation. This is an important benefit because the park's mission includes preserving the park's high-elevation ecosystems. These benefits would persist indefinitely, as long as Alternative B continues to be implemented by the park.

Cumulative Effects – The impacts of past, present, and reasonably foreseeable future actions under Alternative B would be the same as those described under the no action alternative. Implementation of Alternative B could have small adverse impacts on native vegetation from off-target herbicide use and incidental damage to native plants, similar to the no action alternative. However, Alternative B would have a beneficial overall effect because it is anticipated that invasive exotic plants would decrease as a full range of exotic plant management tools (including expanded use of herbicides) are implemented, and native vegetation would be restored. Thus, when the effects of Alternative B are combined with other past, present, and reasonably foreseeable future actions, the total cumulative impacts on vegetation, including special status species, would continue to be beneficial. Alternative B would contribute a relatively large beneficial effect on the impacts that are already occurring over several seasons as exotic plant infestations are reduced in size.

Terrestrial Wildlife, including Special Status Species

Affected Environment

Wildlife found in the park includes 52 mammal species, 276 bird species, 4 amphibian species, 2 reptile species, and 11 fish species. The distribution of wildlife species within the park varies by season, elevation, and types of habitats.

Mammals

Large herbivores occurring in the park include elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), bighorn sheep (*Ovis canadensis*), and moose (*Alces alces*). Elk are common throughout the park. Population estimates in the park and nearby Estes Valley peaked between 1997 and 2001, with annual estimates ranging from about 2,800 to 3,500 animals. The elk population in the park and Estes Valley migrates seasonally between high-elevation summer ranges and low-elevation winter ranges. Summer range includes subalpine and alpine areas in the park and is used primarily during June, July, and August. In September, a portion of the elk herd migrates to winter range in the Estes Valley on the east side of the park and adjacent areas outside the park, as well as areas farther east. Elk typically return to summer range in May (Zeigenfuss et al. 2011). Approximately 350 bighorn sheep live in the park and surrounding areas. Mule deer occupy many types of habitats in the park, including lodgepole pine and other

forest types, forest edges, shrublands, and grasslands. Moose occupy a large range and forage in a variety of habitats in the park. They prefer a mosaic of second growth forest, openings, swamps, lakes, and wetlands. Numerous other small mammal species occur in a wide variety of habitats in the park.

Birds

The park provides habitat for a variety of bird species including Neotropical migrant songbirds, raptors, and waterfowl. Of the 276 bird species known to occur in the park, 26 are year-round inhabitants while the rest are seasonally present in the park. The diversity of songbirds in the park is greatest in aspen, riparian willow, and ponderosa pine habitat (Turchi et al. 1995).

Amphibians and Reptiles

Four species of amphibians – boreal toad (*Anaxyrus boreas boreas*), boreal chorus frog (*Pseudacris maculata*), wood frog (*Lithobates sylvatica*), and tiger salamander (*Ambystoma tigrinum*) – are known to occur in the park. The boreal toad is state listed as endangered in Colorado. Chorus frogs and tiger salamanders occur in wet or riparian habitats. The only two known reptiles in the park are the western terrestrial garter snake (*Thamnophis elegans*), which occurs in riparian habitat, and the plateau fence lizard (*Sceloporus tristichus*).

Special Status Species

Special status wildlife species include species listed as threatened or endangered, species proposed for listing, and candidates for listing under the ESA; species listed as threatened, endangered, or of special concern by the state of Colorado; species considered imperiled or vulnerable by the CNHP; and bald and golden eagles, which are protected under the Bald and Golden Eagle Protection Act. Federally listed terrestrial wildlife species with the potential to occur in the park are listed in Table 2.

Table 2. Threatened, endangered, and candidate/proposed species with the potential to occur in the park.

Species Common and Scientific Name	Status[1]	Potential to Occur	Rationale for Exclusion[2]	Habitat Description and Range in Colorado
MAMMALS				
Canada lynx *Lynx canadensis*	T, CH	Yes	IALS	Canada lynx occur in boreal forest types and adjacent habitats with a high density of snowshoe hares. In the southern Rocky Mountains, Canada lynx occur within subalpine and upper montane forest zones, usually above 8,000 feet in elevation. Lynx use riparian areas during the fall. Potential lynx habitat is present throughout the park (Figure 4) and lynx have been detected in the park. No critical habitat has been designated in the park (USFWS 2017a).
Preble's meadow jumping mouse *Zapus hudsonius preblei*	T	No	ELE	Preble's meadow jumping mouse occurs in shrubby riparian and wet meadow habitat at elevations below 7,600 feet. The analysis area occurs outside of the known elevation range for the species. No critical habitat for this species has been identified in the park.

Species Common and Scientific Name	Status[1]	Potential to Occur	Rationale for Exclusion[2]	Habitat Description and Range in Colorado
North American wolverine *Gulo gulo luscus*	P	Yes	Included	Wolverines inhabit alpine and arctic tundra and boreal and coniferous mountain forests, especially large wilderness areas and areas with snow on the ground in winter. Wolverines may disperse through atypical habitat. Habitat for the wolverine is located within the park, but there are currently no known populations or individuals in Colorado (USFWS 2017b).
BIRDS				
Mexican spotted owl *Strix lucida occidentalis*	T	Yes	Included	The Mexican spotted owl inhabits coniferous mixed woodlands in isolated mountain ranges and canyonlands of the southwestern U.S. (USFWS 2012). No Mexican spotted owls have been documented in the park; however, nesting habitat is present on slopes with mixed conifer forests and steep canyons with streams and mixed conifer forests (Blakesley 2009). Habitat is concentrated on the eastern border of the park and near Grand Lake on the western border of the park (Figure 5). No critical habitat for this species has been identified in the park.
Yellow-billed cuckoo *Coccyzus americanus*	T	No	ELE	In the western U.S., this species breeds in large blocks of riparian habitats, particularly woodlands with cottonwoods and willows. The park is above the elevation range for the cuckoo and does not provide suitable habitat (Hughes 1999; NatureServe 2017).

[1] **Status Codes**: **T**=federally listed threatened; **P**=federally proposed for listing; and **CH**=designated critical habitat.
[2] **Exclusion Rationale Codes**: **IALS** = Inter=Agency Lynx Screens used, **ODR**=outside known distributional range of the species; **HAB**=no habitat present in the park; and **ELE**=outside of elevation range of species.

As indicated in Table 2, the Canada lynx, North American wolverine, and Mexican spotted owl are the only federally listed terrestrial species with the potential to occur in the park. While not listed or proposed for listing, the southern white-tailed ptarmigan (*Lagopus leucura altipetens*) is under review for listing under the ESA and is known to occur in the park.

In addition to the federally listed species above, 49 special status wildlife species, including 2 amphibians, 2 reptiles, 41 birds, 3 mammals, and 5 terrestrial invertebrates, are known or have the potential to occur in the park either occasionally or year-round. A complete list of special status species, including wildlife, potentially occurring in the park is in Appendix D. Aquatic special status species, such as the greenback cutthroat trout (*Oncorhynchus clarki stomias*) and Colorado River cutthroat trout (*Oncorhynchus clarki pleuriticus*), are addressed in the *Fish and Special Status Aquatic Species* section.

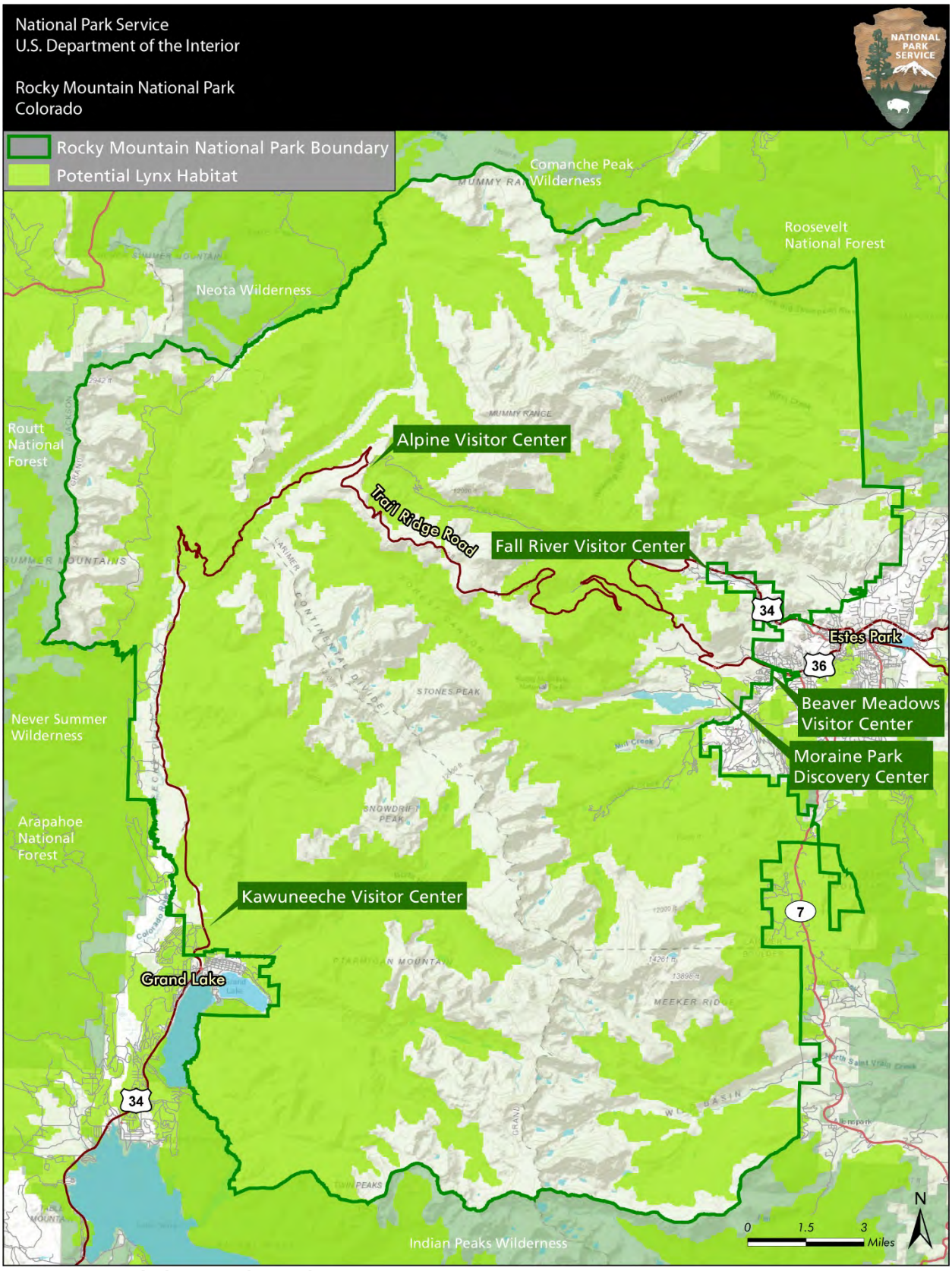

Figure 4. Lynx habitat in the park.

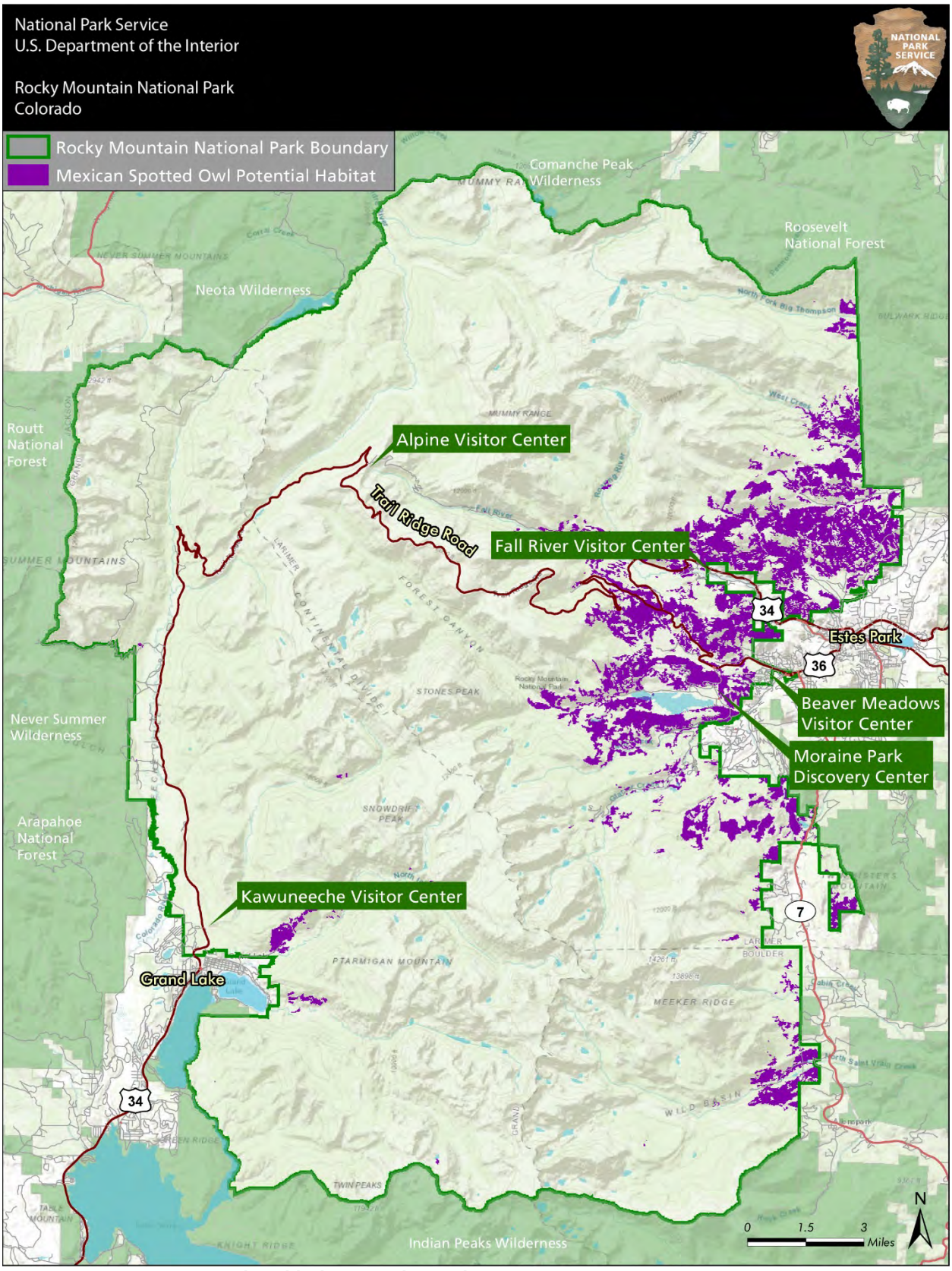

Figure 5. Mexican spotted owl habitat in the park.

Environmental Consequences

Alternative A – Continue with Current Management of Invasive Exotic Plants (No Action)

Manual and Mechanical Control

General impacts on wildlife would include disturbance from human activity and noise. This is especially likely if mechanical or manual controls are implemented. Noise from machinery and human presence could affect the behavior of terrestrial wildlife, such as large herbivores and birds, causing individual animals to avoid the area or change their movements. Most species, such as birds and most mammals, are highly mobile and are likely to avoid project activities during implementation and may be temporarily displaced from foraging habitat. Many species of small mammals are nocturnal and are unlikely to be affected by increased human activity or noise resulting from mechanical or manual controls. Amphibians and reptiles in the park occur mostly in riparian and wetland habitats but could be temporarily displaced by increased human activity or noise in these habitats. Any impact on wildlife movements would be seasonal, limited to times when weed crews are present and control activities are occurring. Minimal disruptions are anticipated as work in any one area would encompass less than a week and less than 10 hours each day. Impacts on terrestrial wildlife habitat from mechanical and manual control would be small because these actions would be small, localized, and selective.

Herbicide Application

Herbicide spot treatments targeted to nonnative vegetation would benefit native vegetation overall by reducing competition with invasive plants. Impacts from broadcast application of herbicides are not expected because broadcast application would only be used under the most severe circumstances, such as on monocultures of invasive exotic plants, and if other controls are not effective. Most wildlife, especially large herbivores, avoid areas with severe infestations of exotic plants and would be less likely to occur in these areas in general. Spot herbicide applications on small populations of invasive exotic plants are not expected to result in negative impacts on habitat for large herbivores, birds, or amphibians and reptiles because these actions would be small, localized, and selective, and would benefit wildlife habitat overall by reducing the prevalence of invasive exotic plants.

Effects on Special Status Species

Impacts on special status wildlife species from project activities would generally be the same as described above for general wildlife. Project activities would have no impact on snow cover, would not take place in lynx or wolverine habitat during denning season, and would not result in permanent loss of vegetation cover and, thus, would not result in the loss of habitat for lynx or wolverine or their prey. Work would be avoided in potential Mexican spotted owl (MSO) nesting habitat and the adjacent area to buffer impacts of noise-producing equipment for application during the critical breeding and nesting timeframe from March 1 through August 31. If this timeframe cannot be avoided, surveys for MSO in these treatment areas would take place and treatment may proceed if no MSOs are present. If wolverines or MSOs or evidence of their presence are observed during project activities, work in the area would cease until surveys are conducted to verify presence and potential denning or nesting areas. If confirmed, work would be avoided during the critical breeding and nesting timeframes. The park would consult with the

USFWS before proceeding with treatments and, in future years, surveys would occur prior to work.

Boreal toads and other amphibians reproduce in wetland and riparian habitats and could potentially be vulnerable to impacts from herbicide use in these habitats during breeding periods. Currently used mitigation/conservation measures (Appendix B) would include ceasing work and conducting surveys if boreal toads are observed. If boreal toad breeding is confirmed in an area, treatments would be postponed until after the breeding season and surveys would occur before work in future years.

Conclusion

As previously described in the *Vegetation* section, it is likely that control of some invasive exotic plant species would not be successful under the no action alternative, leading to an increase in the number and size of invasive exotic plant populations and a decrease in the diversity of native plant populations. Many invasive exotic plants, such as spotted knapweed and leafy spurge, are unpalatable or toxic to wildlife, and their presence would likely reduce wildlife use in the infested area. For example, elk and deer use would likely avoid areas heavily infested with exotic plant species. Grass production can drop by as much as 90% with the expansion of invasive exotic plants (Harris and Cranston 1988). This in turn reduces native forage and cover for wildlife. Small mammals and nesting birds could also be adversely affected by loss of native plants, which provide foraging and breeding habitat. Studies demonstrate that invasive exotic plants cause reduced abundance of and diversity of birds, reptiles, small mammals, and insects (Huenke 1996). Over longer time periods, such as decades or longer, entire native plant communities could be replaced by invasive exotic plants, resulting in substantial loss of habitat for wildlife. Loss of wildlife habitat would be an important negative impact on park resources and would detract from the park's purpose, which includes protecting high-elevation ecosystems and wildlife. These negative effects would likely last indefinitely until the invasive exotic plant infestations have been removed and restored to native habitat.

Cumulative Effects – Past, present, and reasonably foreseeable future actions that have impacted or could impact terrestrial wildlife and special status species include elk and vegetation management; fire management; seasonal closures; wildlife protection through law enforcement actions; and road, facility, and trail construction and maintenance. Elk and vegetation management, seasonal closures, law enforcement, and fire management have generally had beneficial effects on wildlife overall by improving wildlife habitat and reducing visitor impacts, such as keeping visitors out of sensitive wildlife areas during breeding, calving, and nesting seasons to prevent changes to wildlife behavior during these times. Road, facility, and trail construction have likely had adverse effects over the long term by increasing habitat fragmentation. Overall, cumulative impacts from past, present, and reasonably foreseeable future actions are beneficial. As previously described, the no action alternative would contribute adverse effects on terrestrial wildlife because invasive exotic plant populations would continue to increase in number and size, resulting in decreased biodiversity and habitat quality for wildlife. Thus, when the effects of the no action alternative are combined with the effects of other past, present, and reasonably foreseeable future actions, the total cumulative impacts on terrestrial wildlife, including special status species, would be beneficial, with an adverse incremental contribution from the no action alternative.

Alternative B – Adaptive Integrated Pest Management (Proposed Action and Preferred Alternative)

Manual and Mechanical Control, Cultural Practices, and Herbicide Application

Impacts on terrestrial wildlife such as mammals, birds, amphibians and reptiles, and special status wildlife species would generally be the same as described under the no action alternative, with the exception that a potentially greater variety of herbicides would be used to treat a greater number of invasive exotic plant species. As described for the no action alternative, the herbicides proposed for use would generally be applied in spot treatments to individual plants or small populations and would not have discernable impacts on wildlife. Any new herbicides proposed for use would be thoroughly evaluated for safety and effectiveness using the process described in Figure 3, including potential effects on wildlife. Potential for terrestrial wildlife to be exposed to herbicides would be reduced by avoiding work near nests of bald and golden eagles or peregrine falcons during the breeding and nesting season from March through July or avoiding work in sensitive wildlife habitat during lambing, calving, or denning periods as described in Appendix B *Mitigation/Conservation Measures*. Potential effects on habitat for large herbivores, birds, and amphibians and reptiles would be reduced by using spot herbicide applications on small populations of invasive exotic plants. Spot treatments would not result in negative impacts on habitat because these actions would be small, localized, and selective, and would benefit wildlife habitat overall by reducing the prevalence of invasive exotic plants.

Effects on Special Status Species

As described for the no action alternative, removal of invasive exotic plants and restoration of native vegetation would likely result in long-term improvement of lynx, wolverine, and Mexican spotted owl habitat, including habitat for prey species. The park submitted a biological assessment (BA) to the USFWS to document potential impacts and proposed mitigation/conservation measures to protect federally listed threatened, endangered, and candidate species (Appendix E) on June 8, 2018. The BA found that the preferred alternative would have no effect on lynx; may affect, but is not likely to adversely affect, the Mexican spotted owl; and would not jeopardize the continued existence of the wolverine. The USFWS concurred with this determination in a letter dated September 17, 2018.

Conclusion

As previously described, invasive exotic plants can displace the native plant communities that populations or individuals of terrestrial wildlife and special status species depend upon for habitat. Alternative B would benefit native vegetation over the long term because allowing plant populations to be treated with effective and approved methods before reaching a predetermined population size increases the likelihood of successfully controlling the targeted invasive exotic plant population. Effectively controlling and reducing infestations of invasive exotic plants would improve wildlife habitat in the park over the long term and would better preserve ecological diversity compared with the no action alternative. This would be an important benefit for wildlife in the park and would support the park's purpose, which includes preserving high-elevation ecosystems and wildlife. These benefits would persist as long as Alternative B continues to be implemented.

Cumulative Effects – The overall impacts of past, present, and reasonably foreseeable future actions on wildlife, including special status terrestrial species, would be beneficial as described in the no action alternative. As previously described, Alternative B also would contribute beneficial effects on terrestrial wildlife. Thus, when the effects of Alternative B are combined with these other past, present, and reasonably foreseeable future actions, the total cumulative impacts on terrestrial wildlife and special status species would continue to be beneficial. Alternative B would contribute a relatively large beneficial effect to the impacts that are already occurring.

Fish and Special Status Aquatic Species

Affected Environment

Native trout species that occur in the park are the federally listed threatened greenback cutthroat trout and the Colorado River cutthroat trout, a state species of concern. Cutthroat trout are found in cold, clear, gravelly headwater streams and mountain lakes. Until recently, the greenback cutthroat trout was thought to be geographically and genetically separated from the Colorado River cutthroat trout by the Continental Divide (Dare et al. 2011). The greenback subspecies was believed to occupy the mountain and foothill areas of the Arkansas and South Platte River basins (Dare et al. 2011). In recent years, this distribution has been called into question based on the discovery of genetic markers for greenback cutthroat trout in rivers believed to be exclusively Colorado River cutthroat trout lineage areas, and vice versa. The term "green-lineage" refers to an undescribed cutthroat trout genetic lineage. "Blue-lineage" describes the more common Colorado River cutthroat trout. Green-lineage throughout its range and blue-lineage Colorado cutthroat trout east of the Continental Divide are both currently considered under the umbrella of the ESA-listed greenback cutthroat trout by the USFWS. Populations of both lineages are known within the park (Figure 6).

Exotic trout species that occur in the park are brown trout (*Salmo trutta*), eastern brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*), and Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*). These exotic fish species were stocked in lakes and streams in the park for recreational fishing until the 1960s. Other native fish species found in the park include western longnose sucker (*Catostomus catostomus griseus*), western white sucker (*C. commersoni suckii*), and mottled sculpin (*Cottus bairdi*).

Aquatic habitats in the park provide habitat for numerous aquatic invertebrates, including one mollusk considered vulnerable or imperiled by the CNHP; and one insect species, the Arapahoe snowfly (*Capnia arapahoe*), which is a candidate for listing as threatened or endangered under the ESA. Although not known to occur in the park, the Arapahoe snowfly is known to inhabit 21 first-order tributaries with steep slopes in Larimer, Boulder, and Jefferson Counties in Colorado (Fairchild et al. 2017). Known occupied streams have pebble, cobble, or bedrock substrates that support a hyporheic zone for the young during the warm months (Young et al. 2016). Limited species occurrence data and modeling indicate Arapahoe snowfly habitat occurs at elevations from 5,575 to 6,900 feet. Suitable Arapahoe snowfly habitat in the park is shown in Figure 7.

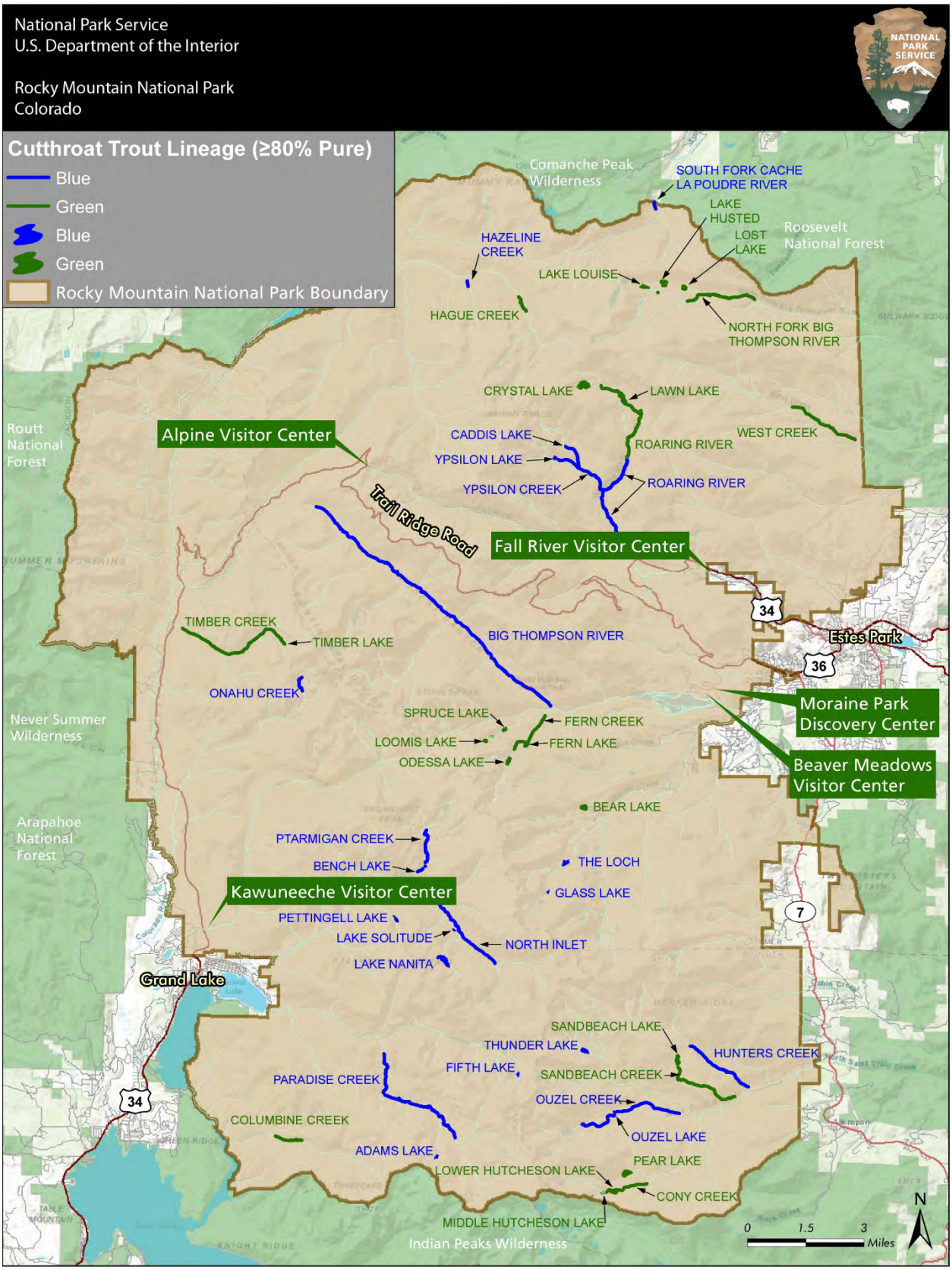

Figure 6. Green- and blue-lineage cutthroat populations in the park.

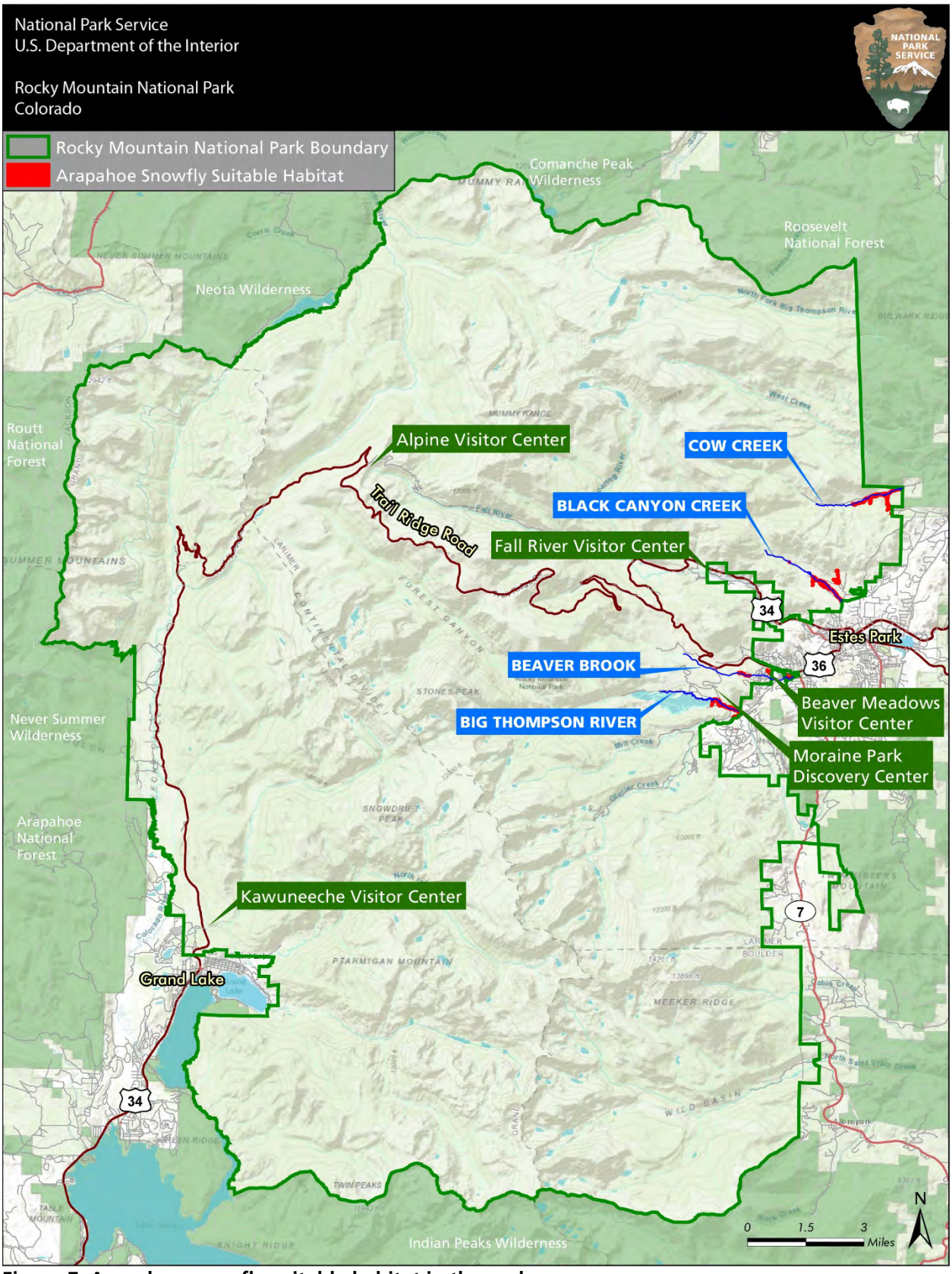

Figure 7. Arapahoe snowfly suitable habitat in the park.

Environmental Consequences

Alternative A – Continue with Current Management of Invasive Exotic Plants (No Action)

Manual and Mechanical Control and Cultural Practices

Manual, mechanical, and cultural control would continue unchanged, following the methods described in the 2003 plan, and would not be expected to affect fish or special status aquatic species because these activities would be limited in extent and would not occur in fish or aquatic species habitat.

Herbicide Application

Potential direct and indirect effects on fish and special status aquatic species include exposure to herbicides that may be toxic for fish or for aquatic invertebrates. There are two primary paths for herbicides to enter surface waters. First is direct application of herbicide during treatment and second is indirect application by aerial drift, precipitation runoff, or by transport of soil containing herbicide into water resources. Herbicide use would follow label instructions, which include protecting waters by not using herbicides in standing or flowing water. In addition, applicators would ensure that no airborne drift gets into waterways or lakes. Only herbicides that are practically nontoxic to fish and other aquatic organisms would be used within the water influence zone, as defined above. Additionally, no spraying would occur near greenback cutthroat trout streams or lakes during peak spawning and reproductive periods (May 15 through August 31), and spraying in terrestrial Arapahoe snowfly habitat would take place in the summer months when they are not active.

Although mitigation/conservation measures would be in place, the potential for indirect exposure of cutthroat trout to herbicides would exist from aerial drift, runoff, or soil transport. The impacts of herbicides currently used in the park on fish and other aquatic organisms were evaluated in the EA for the 2003 plan (NPS 2003). As described in the 2003 plan, the park's water bodies experience dilution as they converge and as precipitation events occur throughout the summer. The propensity of herbicides to degrade in water and when exposed to sunlight further reduces the risk of exposure. Dilution and rapid degradation of herbicides would eliminate the risk of a harmful amount of herbicide reaching cutthroat trout or other fish species. The EPA's levels of concern (LOCs) are criteria used by the EPA to indicate potential risk to nontarget organisms. The criteria indicate whether a herbicide, when used as directed, has the potential to cause adverse effects on nontarget organisms (EPA 2017). Because of dilution, there are no plausible scenarios in which any of the herbicides currently used, applied according to the manufacturer's directions, would exceed the LOC.

As previously described, while no observations of Arapahoe snowfly have been documented in the park, suitable habitat is present within streams and drainages on the eastern park boundary. The no action alternative would not result in discernable effects on the Arapahoe snowfly or other aquatic invertebrates. As previously described for cutthroat trout, implementation of mitigation/conservation measures such as water influence zones would reduce the risk of exposure to herbicides through runoff and drift. The propensity of herbicides to degrade in water and when exposed to sunlight, and the potential for dilution of water bodies, further reduces the risk of exposure.

Conclusion

As previously described in the *Vegetation, including Special Status Species* section, it is anticipated that if the no action alternative is implemented, the number of infested acres would increase despite the use of other techniques to control invasive exotic species. It is likely that biological diversity would be adversely impacted in the park, including in riparian plant communities adjacent to fish and aquatic invertebrate habitat or directly providing habitat for the Arapahoe snowfly. Riparian vegetation such as trees, shrubs, grasses, and forbs provides shade, which moderates water temperatures and is a source of woody cover when limbs and trees fall into the stream. Roots of riparian vegetation help stabilize stream banks, reducing siltation and maintaining water quality. Riparian plants also provide habitat for stoneflies, including the Arapahoe snowfly, and for terrestrial insects that may serve as food for cutthroat trout. An increase in invasive exotic species under the no action alternative would adversely affect fish and special status aquatic species by displacing native riparian vegetation. Although negative impacts on fish and special status aquatic species from the loss of biodiversity in riparian plant communities would be small, any loss of biodiversity would be important because aquatic communities make up a relatively small portion of the park, provide habitat for a disproportionate number of species, and are relatively fragile and vulnerable to disturbance. These effects would occur wherever invasive exotic plants are prevalent, and would continue indefinitely.

Cumulative Effects – Past, present, and reasonably foreseeable future actions that have impacted or could impact fish and special status aquatic species include elk and vegetation management; fire management; and road, facility, and trail construction and maintenance. Elk and vegetation management and fire management have generally had beneficial effects on fish and special status aquatic species overall by improving and restoring riparian habitat. Overall, cumulative impacts from past, present, and reasonably foreseeable future actions are beneficial. As previously described, the no action alternative would contribute adverse effects on fish and special status aquatic species because invasive exotic plant populations would continue to increase in number and size, displacing native riparian vegetation, which provides important benefits for fish and special status aquatic species. Thus, when the effects of the no action alternative are combined with the effects of other past, present, and reasonably foreseeable future actions, the total cumulative impacts would be beneficial, with an adverse incremental contribution from the no action alternative.

Alternative B – Adaptive Integrated Pest Management (Proposed Action and Preferred Alternative)

Manual and Mechanical Control and Cultural Practices

As described above for the no action alternative, manual, mechanical, and cultural control would not be expected to affect fish and special status aquatic species because these activities would be limited in extent and would not occur in fish or aquatic species habitat.

Herbicide Application

As described above for the no action alternative, potential direct and indirect effects include exposure to herbicides that may be toxic to fish or aquatic invertebrates. Accidental exposure

resulting from direct application of herbicides during treatment or indirect application by aerial drift would be avoided by implementing the measures described in Appendix B *Mitigation/Conservation Measures*, including enforcing a water influence zone around streams, lakes, and ponds. No broadcast application would be used in areas where surface water is present. Only herbicides that are practically nontoxic to fish and other aquatic organisms would be used within the water influence zone when application near surface water is necessary. Likewise, herbicides that do not persist in soils and water, but degrade rapidly in water and sunlight, would be preferred to those that do not degrade rapidly.

As previously described for the no action alternative, there are no plausible scenarios under Alternative B in which any herbicides considered, including the most toxic, applied according to the manufacturer's directions would result in adverse effects. Although new herbicides, not currently used under the 2003 plan, would be approved for use, these herbicides would be thoroughly evaluated for safety and effectiveness using the process described in Figure 3, including safety for use near aquatic habitats. As described in Appendix B *Mitigation/Conservation Measures*, most herbicides would not be used within the water zone of influence; and the park's water bodies experience dilution as they converge and as precipitation events occur throughout the summer.

The park submitted a BA to the USFWS to document potential impacts and proposed mitigation measures to protect federally listed threatened, endangered, and candidate species (Appendix E) on June 8, 2018. The BA found that the preferred alternative may affect, but is not likely to adversely affect, the greenback cutthroat trout and Arapahoe snowfly. The USFWS concurred with this determination in a letter dated September 17, 2018.

Conclusion

The benefits to the park's fish and special status aquatic species from controlling invasive exotic species and restoring native vegetation communities and habitat outweigh the slight risk of herbicide exposure. The elimination of invasive exotic plant species and reestablishment of native plants would result in beneficial effects on riparian habitat, which supports fish and special status aquatic species. This would be an important benefit because aquatic communities make up a relatively small portion of the park, provide habitat for a disproportionate number of species, and are relatively fragile and vulnerable to disturbance. These benefits would occur over the long term and would persist as long as populations of invasive exotic plant species are controlled and prevented from increasing.

Cumulative Effects – The impacts of past, present, and reasonably foreseeable future actions on fish and special status aquatic species would be beneficial as described in the no action alternative. As previously described, Alternative B also would contribute beneficial effects on fish and special status aquatic species. Thus, when the effects of Alternative B are combined with these other past, present, and reasonably foreseeable future actions, the total cumulative impacts would continue to be beneficial. Alternative B would contribute a relatively small beneficial effect to the impacts that are already occurring.

Wilderness

Affected Environment

In 1980, 2,959 acres of the Indian Peaks Wilderness was incorporated by the park in a boundary adjustment with the adjacent national forest. In 2009, Congress designated the Rocky Mountain National Park Wilderness Area, covering about 249,126 acres. These two wilderness areas combined cover about 252,085 acres, or 95% of the park (Figure 8). In addition, about 62% of the park boundary is adjacent to national forest, of which 70% is designated wilderness. The wilderness areas administered by the U.S. Forest Service adjacent to the park include Indian Peaks (73,291 acres), Comanche Peak (66,791 acres), Never Summer (20,747 acres), and Neota (9,924 acres).

The Wilderness Act directs the NPS to protect and manage wilderness so that it "generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable," and so that it "has outstanding opportunities for solitude, or a primitive and unconfined type of recreation." Director's Order 41: *Wilderness Stewardship* (NPS 2013b) provides accountability, consistency, and continuity in the NPS wilderness stewardship program and guides NPS efforts in meeting the letter and spirit of the Wilderness Act (16 United States Code 1133(b)). The Wilderness Act directs that "each agency administering any area designated as wilderness shall be responsible for preserving [its] wilderness character." The five qualities of wilderness character are (1) untrammeled, (2) undeveloped, (3) natural, (4) offers outstanding opportunities for solitude or primitive and unconfined recreation, and (5) other features of scientific, educational, scenic, or historical value.

One of the stated purposes of the park is to preserve the high-elevation ecosystems and wilderness character of the southern Rocky Mountains within its borders. Maintaining wilderness values are key to many visitors' experiences and to park management. In addition to the natural features of the wilderness, such as animals, plants, waters, and geologic features, the park contains intangible qualities of wilderness such as natural quiet, solitude, space, light, night sky, and scenery. Both tangible and intangible resources are equally important in wilderness management decisions affecting park resources. The wilderness areas are free of most manmade noises from machinery and motor vehicles and light pollution in the night sky. Activities causing excessive or unnecessary unnatural sounds in and adjacent to the park are monitored, and actions are taken to prevent or minimize unnatural sounds that adversely affect park resources or values or visitors' enjoyment of them (NPS 1994).

The Backcountry/Wilderness Management Plan for Rocky Mountain National Park (NPS 2001) defines wilderness management policies and actions at the park. The plan identifies the park's wilderness vision, long-range management goals, intermediate objectives, and actions and options to meet those objectives. The wilderness management plan is also used as a working guide for staff who manage the wilderness resource. All backcountry/wilderness areas of the park are assigned to one of four management classes based on five criteria: type and amount of use, accessibility and challenge, opportunity for solitude, acceptable resource conditions, and management use. These classes range from Management Class 1, the most pristine and undeveloped areas, to Management Class 4, which includes formal trail corridors and other high use areas.

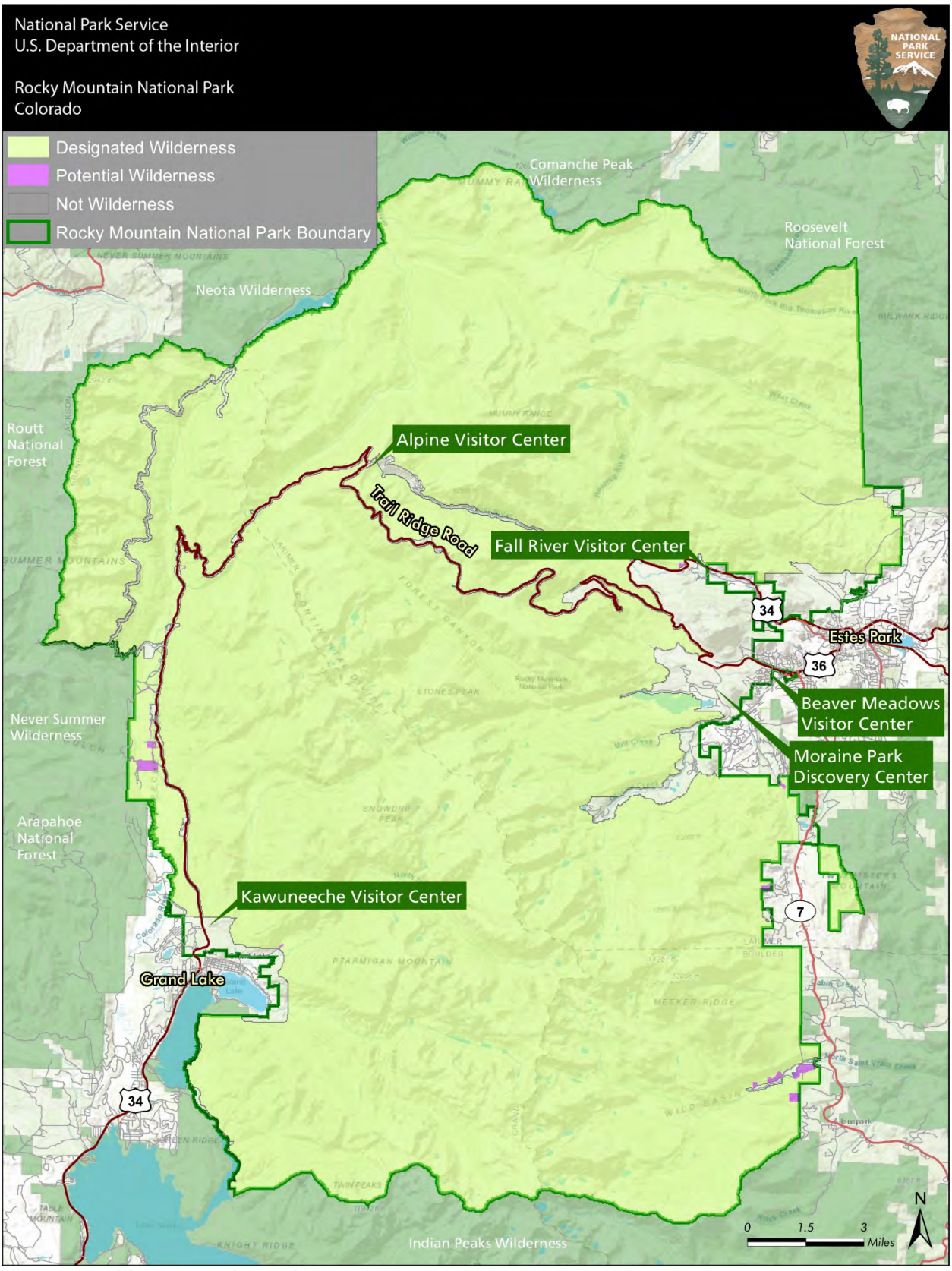

Figure 8. Wilderness in the park.

Environmental Consequences

Alternative A – Continue with Current Management of Invasive Exotic Plants (No Action)

Manual and Mechanical Control and Herbicide Application

All methods that include crews for survey or treatment, including manual and mechanical control and herbicide treatment, may disrupt the wilderness quality of *opportunities for solitude* from the presence of a small field crew in wilderness. Similarly, mechanized equipment (e.g., string trimmers) could temporarily diminish the wilderness experience for park visitors, primarily due to noise. The use of mechanized equipment to treat or remove invasive vegetation would also directly impact the *undeveloped* and *natural* qualities of wilderness character. Use of field crews and mechanized equipment would generally be limited to a few hours or days at any one location and would cease after crews left the area. The use of management activities generally prohibited by the Wilderness Act, such as the use of motorized and mechanized vehicles and equipment and monitoring installations, would be limited to the minimum required to preserve wilderness character.

Cultural Practices

Cultural practices have the potential to both benefit and adversely impact wilderness character in the park. Management activities associated with cultural practices, including the presence of small crews in native habitat and the potential for closures in specific areas, could disrupt *opportunities for solitude*. However, restoring disturbed areas to natural conditions prevents soil erosion and enhances native plant communities, which preserves and improves the *natural* quality of wilderness character over the long term. Prescribed fire could be used to maintain healthy native plant communities in some habitat types in wilderness. As described in the *Vegetation, including Special Status Species* section, fire can cause some invasive exotic plant species to spread while reducing the population of others. Prescribed fires would be avoided in some areas of the park if prescribed fire would enhance invasive exotic plants. Appropriate control techniques would be implemented to eradicate or control invasive exotic plants that begin to invade or spread following a fire, which could further impact wilderness character in the park. Prescribed fire would have a negative impact on the *natural* and *untrammeled* qualities of wilderness character in localized areas of the park for few hours or days as prescribed fires burn but would have a long-term benefit on the natural quality of wilderness when plant and animal communities and the ecological balance are restored. Benefits would persist for years or decades after the prescribed fire.

Conclusion

As previously described, the limited herbicide treatments available under the no action alternative would limit the ability of resource managers to control invasive exotic plant species, allowing them to spread further throughout the park. Ultimately, allowing invasive exotic plant species to spread further throughout wilderness in the park would diminish the *natural* quality of wilderness over time. This would be a serious threat to the *natural* quality of wilderness in the park over time. These impacts would continue indefinitely, until populations of invasive exotic plants were controlled.

Overall, exotic plant management activities would benefit the *natural* quality of wilderness by restoring and protecting native plant communities from the negative effects of invasive exotic plants. Exotic plant management activities would also negatively affect the *untrammeled* quality of wilderness by manipulating and imposing human controls on vegetation communities. The park prepared a programmatic wilderness Minimum Requirements Decision Guide (MRDG) that analyzes the proposed activities in this EA that are generally prohibited under the Wilderness Act or that are otherwise likely to impact overall wilderness character. The MRDG process would be used to identify, analyze, and select management actions while avoiding and minimizing impacts on wilderness character. The park's annual work plan would include a tiered wilderness minimum requirement analysis for the specific actions proposed each year, if necessary. Overall, manual, mechanical, and cultural control methods would affect only a very small portion of wilderness in the park, because infestations of invasive, exotic plants are not currently widespread in wilderness in the park.

Cumulative Effects – Past, present, and reasonably foreseeable future actions that have impacted wilderness include elk and vegetation management; fire management (including prescribed and wildland fires); and road, facility, and trail construction and maintenance. These actions have caused adverse impacts such as human activity and increased noise and would result in decreased opportunities for solitude or primitive types of recreation. Impacts on wilderness character from these activities are generally localized and temporary. Overall, cumulative impacts from past, present, and reasonably foreseeable future actions are beneficial. For example, beneficial impacts on the *natural* quality of wilderness character have resulted from protecting the integrity of native vegetation communities in the park through past and present elk and vegetation management efforts, including fencing, elk redistribution, and vegetation restoration. Protecting the integrity of native vegetation communities can also improve the wilderness experience for park visitors. As previously described, the no action alternative would contribute adverse effects on wilderness character in specific areas of the park primarily due to the presence of crews and the noise associated with mechanical control and occasional use of herbicides. In addition, the no action alternative may not be effective at controlling some aggressive invasive exotic plants, which would diminish the *natural* quality of wilderness over time. Thus, when the effects of the no action alternative are combined with the effects of other past, present, and reasonably foreseeable future actions, the total cumulative impacts would be adverse, with an adverse incremental contribution from the no action alternative.

Alternative B – Adaptive Integrated Pest Management (Proposed Action and Preferred Alternative)

Manual and Mechanical Control and Cultural Practices

As described for the no action alternative, crews for survey and treatment would have direct effects on wilderness character. Treatment of invasive exotic plants within wilderness would have impacts on the *untrammeled*, *natural*, and *undeveloped* qualities of wilderness, as well as *opportunities for solitude*. As described for the no action alternative, use of field crews and mechanized equipment would generally be limited to a few hours or days at any one location and would cease after crews left the area.

Herbicide Application

The impacts of herbicide treatment methods on native vegetation under Alternative B would be similar to those described for the no action alternative, except that the park would have the flexibility to use herbicides on additional invasive exotic plants in the park and there would be no population thresholds for herbicide application. The expanded use of herbicides may result in additional temporary adverse impacts on the *untrammeled* and potentially *undeveloped* qualities of wilderness character in localized areas of the park during initial implementation of Alternative B. Over the long term, herbicide use under Alternative B is expected to benefit the *untrammeled*, *natural*, and *undeveloped* qualities of wilderness, as well as *opportunities for solitude* because the increased effectiveness of herbicides to control invasive exotic plant species would reduce the repeated disturbance to wilderness visitors by reducing the number of staff and volunteer hours spent removing vegetation by hand.

Conclusion

An adaptive integrated pest management approach to managing invasive vegetation would result in beneficial impacts on wilderness character by enabling a rapid response to infestations of new-to-the-park invasive exotic plant species using IPM methods. This rapid response would control infestations at the smallest possible size. Under Alternative B, educational, preventive, and collaborative actions would benefit *natural* and *untrammeled* qualities of wilderness character by reducing the need for invasive vegetation treatments.

Exotic plant management activities would balance the restoration of the *natural* quality of wilderness with the impacts of this management activity on the *untrammeled* quality of wilderness. As described for the no action alternative, Park staff prepared a programmatic wilderness MRDG that analyzes the proposed activities in this EA that are generally prohibited under the Wilderness Act or that are otherwise likely to impact overall wilderness character. The MRDG process would be used to identify, analyze, and select management actions while avoiding and minimizing impacts on wilderness character. The park's annual work plan would include a tiered wilderness minimum requirement analysis for the specific actions proposed each year, if necessary.

Overall, managing invasive exotic vegetation in wilderness would have beneficial impacts on wilderness character by improving naturalness, scientific and educational values, and the experiential aspect of wilderness recreation by maintaining, promoting, and protecting ecosystem health. These benefits would be important because the potential degradation of wilderness qualities described under the no action alternative would be avoided. Beneficial effects on wilderness would persist indefinitely as long as Alternative B is implemented.

Cumulative Effects – The overall impacts of past, present, and reasonably foreseeable future actions on wilderness character would be beneficial as described in the no action alternative. As previously described, Alternative B also would contribute beneficial effects on wilderness character over the long term by reducing the abundance of exotic plants in the park. Thus, when the effects of Alternative B are combined with these other past, present, and reasonably foreseeable future actions, the total cumulative impacts on wilderness quality would continue to be beneficial. Alternative B would contribute a relatively large beneficial effect to the impacts that are already occurring.

Visitor Use and Experience

Affected Environment

The park's wide range of elevations and habitats offer a variety of opportunities for visitors. Common summer activities in the park include viewing scenery, wildlife viewing/bird watching, hiking, front country and backcountry camping, technical rock climbing and bouldering, fishing, and photography. Visitors also drive Trail Ridge Road, which reaches elevations of 12,183 feet and is the highest continuous paved road in the U.S. Although most visitors come in the summer, snowshoers and cross-country skiers also visit the park in the winter. More than 350 miles of trails offer opportunities to hikers and backpackers, and many trails are available to horseback riders. Trails within the park accommodate a range of user levels, from front country trails with minimal inclines to high alpine backcountry trails with steep rocky terrain.

The park is easily accessible from the Denver metropolitan area, about 65 miles to the southeast. Although visitation fluctuates from year to year, visitor numbers have hovered around 3 million annually since 1994 (NPS 2017). Visitation dropped in 2013, which could be attributed to damage from flooding (3,229,617 in 2012 compared with 2,991,141 in 2013). The park received more than 4,155,900 visitors in 2015, which was a 21% increase over 2014. All months in 2015 set visitation records except for February and April. The park set an attendance record again in 2016 with 4,526,335 visitors, an increase of more than 8% over 2015 (NPS 2017). Park visitation from 2014 to 2016 is shown in Figure 9.

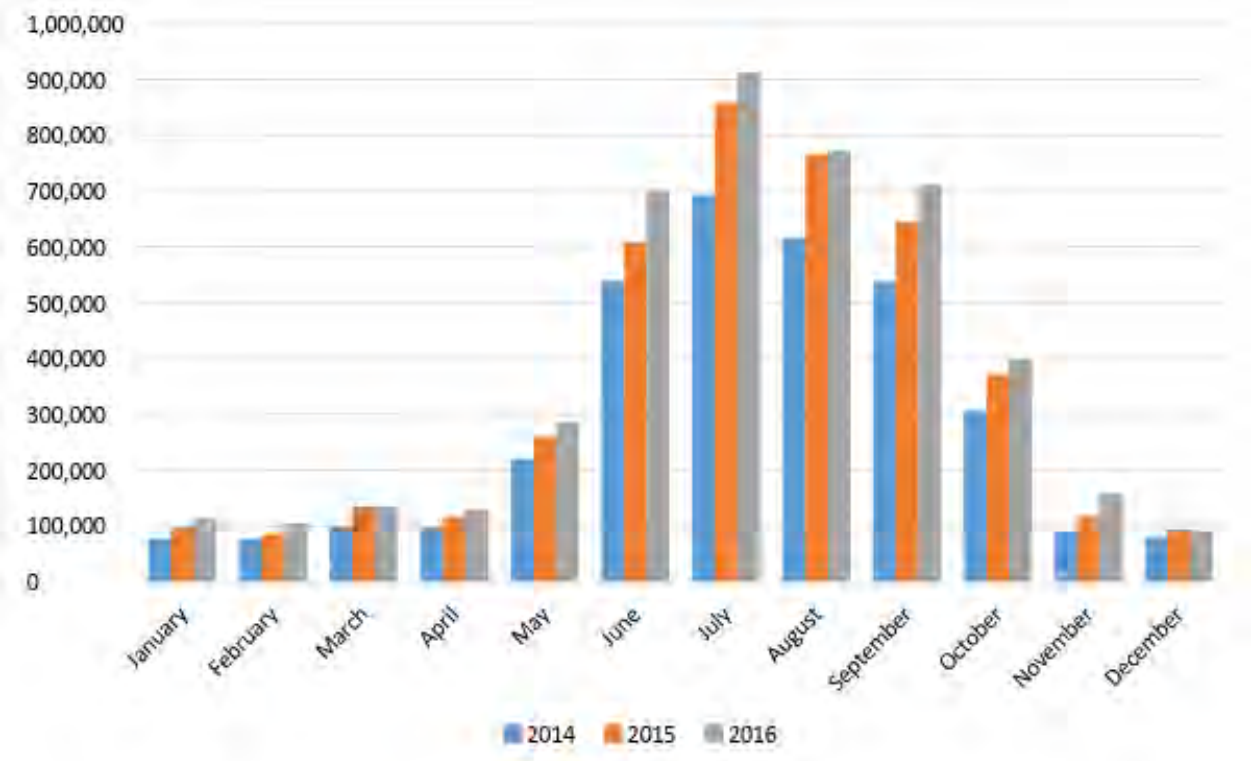

Figure 9. Total monthly park visitation, 2014-2016.

Most visitor use is concentrated in front country areas, along roads, and along trails. The most common visitor activities in the park include viewing scenery, driving Trail Ridge Road, wildlife viewing/bird watching, and day hiking (NPS 2011a, 2011b). The most commonly visited sites in the park during the summer, when invasive exotic plant control activities are most likely to occur, are Trail Ridge Road, the Alpine Visitor Center, and Bear Lake. Old Fall River Road, Sprague Lake, and the other visitor centers in the park are also popular destinations. About 75% of summer visitors drive Trail Ridge Road and about 57% of summer visitors go day hiking (NPS 2011a).

Heavy visitor use can damage native vegetation and facilitate invasion by invasive exotic plants. Recreational use can spread seeds of invasive exotic plants, which can be transported into the park on visitors' shoes, socks, or tire treads. Because invasive exotic plants are often introduced to the park by human activity, infestations are most often found in areas frequented by visitors, such as front country areas, parking areas, along roads, and along trails.

Environmental Consequences

Alternative A – Continue with Current Management of Invasive Exotic Plants (No Action)

Manual and Mechanical Control

Use of crews for survey or treatment of invasive exotic plants may have direct effects on the overall visitor experience from the presence of crews (resulting in both noise and visual impacts) and from closures associated with treatment and revegetation. Controlling invasive exotic plants through manual and mechanical control would cause ground disturbance and may be visually unappealing to park visitors for a few weeks or months until vegetation regrows in these areas. In addition, there would be temporary noise impacts associated with the use of mechanized equipment, persisting only a few hours or days at a time. Invasive exotic plant management activities would occur primarily during the summer months when weeds are actively growing and park visitation is at its highest. Although weed control work would take place only in localized areas of the park, most work would occur in front country areas, along roads, and along trails where visitors are more likely to be present. Nevertheless, the impacts described above would impact only a small percentage of park visitors because the work would only persist a few days or hours at a time.

Cultural Practices

Similar to manual and mechanical control, revegetation work would affect visitor experience from the visual intrusion of personnel and equipment and associated noise. Until replanted vegetation fills in the disturbed area, bare ground or mulch would be visible, which would be a visual intrusion in an otherwise natural landscape. Revegetation areas are usually closed to visitors by fencing and signing until the area is considered recovered, which typically takes several growing seasons. No roads or trails are expected to be closed due to revegetation efforts. Ultimately, revegetated communities would benefit the visitor experience over the long term by restoring native plant communities.

Use of prescribed fire for exotic plant management is expected to result in minimal negative impacts on visitor experience. Immediately following the burn, there would be blackened

ground and vegetation and little ground cover. Some visitors would perceive this as a negative visual impact. Usually native grasses and forbs would return within 1 year. Smoke may impede a scenic vista for a short time, but smoke dispersal is considered in any burn plan. Specific burn plans are written for each prescribed fire, and prescribed fires are not conducted if conditions are not favorable for smoke dispersion.

Herbicide Application

Application of selected herbicides on targeted individual plants has potential to directly affect visitor use and experience. The presence of crews applying herbicides would have impacts as described above under *Manual and Mechanical Control*. Areas treated with herbicides could be closed temporarily to visitor use and, therefore, would adversely affect visitor experience in localized areas for a few hours at a time. Impacts related to chemical treatment are expected to be minimal because herbicide use would be limited to the application of synthetic herbicide on 15 species and would only be implemented on these species when the number of plants in one location exceeds thresholds established in the 2003 plan.

Conclusion

Management of exotic plants helps contribute to one of the main NPS goals, "to manage park resources in such a manner by such means as will leave them unimpaired for the enjoyment of future generations" (NPS 2006a). However, as previously described in the *Vegetation, including Special Status Species* section, it is likely that control of some invasive exotic plant species would not be successful under the no action alternative, allowing them to spread further throughout the park and diminish the quality of the visitor experience over the long term. As previously described, wildlife viewing is one of the major attractions of the park, and invasive exotic plants are often unpalatable and rarely are of benefit to wildlife. Loss of native plant communities could result in decreased opportunities for visitors to observe wildlife, enjoy scenic views, and view native wildflowers. These impacts are difficult to quantify and would detract from the park's purpose to provide recreational use of and access to the park's scenic beauties, wildlife, natural features, and processes. Impacts would persist indefinitely until native plant communities and wildlife habitat are restored.

Cumulative Effects – Past, present, and reasonably foreseeable future actions that have impacted visitor use and experience include elk and vegetation management; fire management; and road, facility, and trail construction and maintenance. These actions have caused and would continue to cause adverse impacts including increased noise, decreased visibility from smoke, traffic delays from construction, and temporary area closures. These actions also preserve and improve wildlife habitat, opportunities to watch wildlife, and visitor facilities that attract visitors to the park and gateway communities. Overall, effects from past, present, and reasonably foreseeable future actions would have beneficial effects on visitor use and experience. As previously described, the no action alternative would contribute adverse effects on visitor use and experience. Thus, when the effects of the no action alternative are combined with the effects of other past, present, and reasonably foreseeable future actions, the total cumulative impacts would be beneficial, with an adverse incremental contribution from the no action alternative.

Alternative B – Adaptive Integrated Pest Management (Proposed Action and Preferred Alternative)

Manual and Mechanical Control and Cultural Practices

The impacts of using manual, mechanical, and cultural control methods under Alternative B would be same as those described for the no action alternative. Use of crews for survey and treatment would have direct effects on visitor use and experience from the presence of crews (resulting in both noise and visual impacts) and closures associated with treatment and revegetation. However, restoring disturbed areas to natural conditions (specifically through cultural practices) would prevent soil erosion and enhance native plant communities, which could improve visitor use and experience over the long term.

Herbicide Application

The expanded use of chemical herbicides under Alternative B may result in additional localized adverse impacts on visitor use during initial implementation of this EA from increased presence of crews and closures associated with treatment. Measures to reduce impacts on visitor use and experience would be implemented as described in Appendix B *Mitigation/Conservation Measures*. These measures would include notifying the public and identifying areas where herbicide application is warranted, including providing this information on the park's website and posting signs. Signs would contain the treatment date, target invasive exotic plants, name of herbicide applied, restricted entry period if any, and a park contact name and number for any questions. These measures would allow the visitors with concerns about herbicide exposure to avoid the area during and immediately after use of herbicides.

Conclusion

As previously described, control of invasive exotic plant populations is expected to be more effective under Alternative B than under the no action alternative. Effective control of invasive vegetation would have long-term beneficial impacts on visitor use and experience in the park by maintaining, promoting, and protecting ecosystem health. Maintaining ecosystem health by managing invasive exotic plants would enhance visitor experience by improving and preserving opportunities for visitors to observe wildlife, enjoy scenic views, and view native wildflowers while ensuring that future generations can enjoy these activities. These benefits are difficult to quantify and would persist as long as effective management of exotic plant species continues to be implemented.

Cumulative Effects – The overall impacts of past, present, and reasonably foreseeable future actions on visitor use and experience would be beneficial as described for the no action alterative. As previously described, Alternative B also would contribute beneficial effects on visitor use and experience by increasing the likelihood of successfully controlling exotic plant populations, which would preserve and enhance the visitor experience. Thus, when the effects of Alternative B are combined with these other past, present, and reasonably foreseeable future actions, the total cumulative impacts on visitor use and experience would continue to be beneficial. Alternative B would contribute a small beneficial effect to the impacts that are already occurring.

CONSULTATION AND COORDINATION

The following American Indian tribes, agencies, and organizations were contacted and were invited to participate in the planning process:

American Indian Consultation

- Arapaho Tribe of the Wind River Reservation, Wyoming
- Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana
- Cheyenne and Arapaho Tribes, Oklahoma
- Comanche Nation, Oklahoma
- Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana
- Shoshone Tribe of the Wind River Reservation, Wyoming
- Southern Ute Indian Tribe of the Southern Ute Reservation, Colorado
- Ute Indian Tribe of the Uintah & Ouray Reservation, Utah
- Ute Mountain Tribe of the Ute Mountain Reservation, Colorado, New Mexico, and Utah
- White Mesa Ute

Bureau of Reclamation
Colorado Department of Public Health and Environment
Colorado State Historic Preservation Office
Federal Emergency Management Agency
U.S. Army Corps of Engineers, Regulatory Program
U.S. Department of Agriculture Natural Resource Conservation Service
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Geological Survey

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APPENDICES

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Appendix A: Draft Programmatic Agreement

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PROGRAMMATIC AGREEMENT

AMONG

THE NATIONAL PARK SERVICE AT ROCKY MOUNTAIN NATIONAL PARK AND THE COLORADO STATE HISTORIC PRESERVATION OFFICER REGARDING EXOTIC PLANT MANAGEMENT IN ROCKY MOUNTAIN NATIONAL PARK

WHEREAS, Rocky Mountain National Park (ROMO or Park), located in Larimer, Boulder, and Grand Counties, Colorado, intends to implement an Invasive Plant Management Plan (Plan) to protect ROMO's natural and cultural resources from the impacts of nonnative invasive plants; and

WHEREAS, the NPS has prepared an Environmental Assessment in compliance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts of the Plan on the natural and human environment; and

WHEREAS, the Plan provides the framework to implement decisions to mitigate against the continued spread of nonnative invasive plant species and treat existing infestations through adaptive management; and

WHEREAS, implementation of the Plan will result in undertakings that have the potential to affect historic properties; and

WHEREAS, Section 106 and its implementing regulations 36 CFR Part 800 as amended requires federal agencies to take into account the effect of an undertaking on historic properties as defined by 36 CFR 800.16(1)(1); and

WHEREAS, the NPS intends to coordinate its compliance with Section 106 of the National Historic Preservation Act (NHPA) (54 U.S.C. 306108) with the applicable requirements of the National Environmental Policy Act (NEPA) (42 U.S.C. 4321-4347) pursuant to 40 CFR 1500-1508; and

WHEREAS, the NPS intends to apply this Programmatic Agreement (PA) regardless of whether the No Action or Action Alternative is selected as result of the NEPA process; and

WHEREAS, the National Park Service (NPS) has defined the undertaking's area of potential effect (APE) as comprising all current lands administered by the NPS within the boundary of ROMO, which is 265,795.20 gross area acres; and

WHEREAS, the NPS has determined that the effects on historic properties cannot be fully evaluated prior to the approval of the undertaking, and has developed this PA to establish a process for complying with Section 106 of the NHPA in accordance with 36 CFR Part 800.14(b); and

WHEREAS, this PA supplements the 2008 *Programmatic Agreement Among the National Park Service, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers for Compliance with Section 106 of the National Historic Preservation Act* (2008 Nationwide PA); and

WHEREAS, the NPS has consulted with the Arapaho Tribe of the Wind River Reservation, Wyoming; Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation, Montana; Cheyenne and Arapaho Tribes, Oklahoma; Comanche Nation, Oklahoma; Northern Cheyenne Tribe of the Northern Cheyenne Indian Reservation, Montana; Shoshone Tribe of the Wind River Reservation, Wyoming; Southern Ute Indian Tribe of the Southern Ute Reservation, Colorado; Ute Indian Tribe of the Uintah and Ouray Reservation, Utah; and Ute Mountain Tribe of the Ute Mountain Reservation, Colorado, New Mexico, and Utah participated and each have been invited to sign this PA as concurring parties; and

WHEREAS, the NPS has consulted Grand Lake Area Historical Society; Larimer, Grand, and Boulder Counties, and the Town of Estes and each have been invited to sign this PA as concurring parties; and

WHEREAS, the NPS has consulted with the Colorado State Historic Preservation Officer (SHPO) pursuant to 36 CFR 800.14(b); and

WHEREAS, in accordance with 36 CFR Part 800.6(a)(1), the NPS has notified the Advisory Council on Historic Preservation (ACHP) of the development of a PA, and the ACHP has chosen not to participate in the consultation pursuant to 36 CFR Part 800.6(a)(1)(iii); and

NOW, THEREFORE, the NPS and SHPO agree that the Invasive Plant Management Plan and subsequent projects shall be implemented in accordance with the following stipulations in order to take into account the effect of the undertaking on historic properties.

STIPULATIONS

I. PROFESSIONAL QUALIFICATIONS AND STANDARDS

A. All work performed under this PA will be performed or supervised by qualified individuals and/or teams that meet the *Secretary of the Interior's Historic Preservation Professional Qualification Standards* (Appendix 2).

B. Any inventory, documentation or treatment of potential or known historic properties pursuant to implementation of this PA shall conform to the provisions of the *Secretary of the Interior's Standards and Guidelines for Identification, Documentation, and Treatment of Historic Properties*, and NPS Director's Order 28 (Cultural Resources).

C. The 2008 Nationwide PA requires that the Superintendents of all NPS units have a designated Section 106 Coordinator and CRM Team with the qualifications and training needed to effectively carry out the responsibilities of the positions. The CRM Team provides expertise and technical advice to the Superintendent and ROMO Section 106 Coordinator for the purposes of Section 106 compliance.

II. PROJECT PLANNING AND IDENTIFICATION OF HISTORIC PROPERTIES

A. ROMO will identify proposed invasive plant management activities to be conducted within a one year period of time with an annual work plan, early enough in the planning process so that notifications can be made to concurring parties and signatories to comment on the work plan and to allow for their identification of culturally significant resources.

B. The Section 106 Coordinator will prepare a cultural resources assessment for review and approval by ROMO's Cultural Resource Management (CRM) Team. One assessment will be prepared for all anticipated undertakings under the plan for the upcoming year.

The Cultural Resources Assessment will:

1. Evaluate whether invasive plant management activities have the potential to cause direct, indirect and cumulative effects on historic properties and whether the activity(ies) qualify for streamlined review (defined in section IV.B of this PA and Appendix 1).If the activity(ies) do not meet the criteria for Streamlined Review, the undertaking must be accomplished through the Standard Review Process outlined in Section V of this PA;

2. Define the APE, taking into account direct, indirect and cumulative effects on historic properties;

3. Identify potential historic properties within the APE by consulting with the ROMO Section 106 Coordinator and members of the CRM team to identify the location and significance of cultural resources within the APE. If cultural resources within the APE have not yet been documented or evaluated for eligibility for listing on the National Register of Historic Places, the CRM team will determine whether archeological surveys are needed by considering the following:

    i. The results of the file and literature search and whether adequate survey has already occurred and/or there is no potential for historic properties (i.e., previous disturbance or developed area);
    ii. Whether the proposed invasive plant management activity is ground disturbing and has the potential to affect historic properties;
    iii. Whether identified or potential historic properties within the APE can be avoided through measures; and
    iv. Whether the undertaking would qualify for streamlined review (defined in Section IV.B of this PA and Appendix 1);
    v. Comments received during the consultation process (Stipulation III, below).

4. Assess potential effects on historic properties from the undertaking by applying the Criteria of Adverse Effect set forth in 36 CFR 800.5(a)(1); when surveys are needed, the Park will provide consulting Indian Tribes a copy of the draft report and cultural resource site forms for review. The Park will consider Indian Tribal input on site eligibility and project effects;

5. If the ROMO Section 106 Coordinator determines no historic properties are within the APE, or the proposed undertaking would results in a determination of "no historic properties affected" or "no adverse effect," no further consultation is required, and the ROMO Section 106 Coordinator will document the following:

    i. Consultation conducted with the public and with Indian Tribes and/or descendants as defined by Park affiliation studies needed to identify the presence or absence of sites of cultural or religious interest;
    ii. Any proposed protection measures of archeological sites to follow 36 CFR Part 68.
    iii. An annual report of all undertakings reviewed using the Stramlined Review process.

C. Public access to the cultural resources assessment or other archeological reporting and documentation will remain confidential to the extent that they meet the definitions set forth at Section 304 of the National Historic Preservation Act, Section 9 of the Archeological Resource Protection Act, Executive Order 13007 Indian Sacred Sites, and similar legislation.

III. CONSULTATION FOR IMPLEMENTATION ACTIVITIES

A. Public Comment

For invasive plant management activities that do not qualify for the streamlined review process as set forth in Section IV of this PA, ROMO will consult with interested parties and members of the public interested in Park cultural resources and in NPS actions that might affect those resources as part of the standard review process. The ROMO Superintendent will notify interested parties each year of undertakings that require standard review, to include areas proposed for activities under the Plan, and to solicit comment regarding potential effects to historic properties.

B. Tribal Consultation

The Federal government has a unique legal relationship with Indian Tribes set forth in the Constitution of the United States, treaties, statutes, and court decisions. This relationship is further informed and guided by Executive Orders and NPS agency management policies, which underscore the important relationship that traditionally associated Indian Tribes have with Park lands and resources. The NPS is aware that historic properties of religious and cultural significance to Indian Tribes and groups are located on ancestral lands now encompassed by ROMO and that "Indian Tribes…possess special expertise in assessing the eligibility of historic properties that may possess religious and cultural significance to them," (36 CFR 800.4 (c)(1)). These qualifications are inherent to Indian Tribes and constitute qualifications independent of the Secretary of the Interior's Qualification Standards.

Consultations with Indian Tribes will be conducted in a sensitive manner, respectful of tribal sovereignty, and recognizing the government-to-government relationship between the NPS and Indian Tribes. The NPS and Indian Tribes and groups will continue to collaborate on resources management and historic preservation activities. The NPS has already determined that historic properties with religious and cultural significance to traditionally associated Indian Tribes and groups are within the APE. The NPS will continue to consult with traditionally associated Indian Tribes and groups on all activities throughout the implementation of the Plan.

The ROMO Superintendent will serve as the designated representative in government-to-government consultations with Federally recognized and traditionally associated Indian Tribes. The Section 106 Coordinator will provide day-to-day staff support for consultation with Indian Tribes and groups and serve as liaisons in communicating tribal concerns, suggestions, and recommendations to Park staff, staff in other NPS offices, and others involved in the implementation of the Plan.

Each year, ROMO will notify consulting Indian Tribes in writing and with associated map locations about areas proposed for activities under the Plan. Indian Tribes will be provided advanced notice of activities and will be provided 30 days to reply to the NPS verbally or in writing about any concerns.

C. SHPO Consultation

Consultation with the SHPO on projects reviewed under the Standard Review Process will occur in accordance with the procedures set forth in Section V of this PA. Consultation with SHPO on activities that meet the criteria for streamlined review and implementation of this PA will occur annually in accordance with Sections IV and VIII of this PA.

D. Consultation with Local Governments and Applicants for Federal Assistance, Licenses, Permits, and Other Approvals

Where appropriate, the Superintendent shall actively seek the views and comments of local governments and certified local governments. Those seeking Federal assistance, licenses, permits, or other approvals are entitled to participate as a consulting party as defined in 36 CFR 800.2(c)(4) and will be consulted with, as applicable.

IV. STREAMLINED REVIEW PROCESS

Where the ROMO Section 106 coordinator, in coordination with the CRM Team, determines the following criteria are met for a proposed undertaking, no further consultation is required. If the CRM Team cannot come to agreement on whether the plan activities qualify for the streamlined review process, the ROMO Section 106 Coordinator may initiate consultation under the Standard Review Process as outlined in Section V or consult directly with SHPO as an independent arbiter. Only activities that meet the criteria for streamlined review under this PA will be addressed in this manner.

If no concerns are expressed from the Tribes within 30 days, then ROMO staff may proceed with implementation of proposed Plan activities treatments, taking into consideration other interested parties, protection measures, standard operating procedures, and best management practices needed to protect historic properties in collaboration with the ROMO Section 106 coordinator.

A. Criteria for Using the Streamlined Review Process

1. The proposed Plan activity must be eligible for streamlined review listed in Section IV.B of this PA.

2. A cultural resources assessment (per Section III.B. of this PA) must have been prepared by the Section 106 Coordinator and approved by the CRM Team.

3. Proposed Plan activities meet criteria for no, low, or moderate levels of ground disturbance (see Appendix 1 for definition of ground disturbance levels).

4. Provided that the undertaking is eligible for being streamlined under Section IV.B of this PA, identified historic properties and any prehistoric or historic site, district, building, structure or object, including traditional cultural property, that do not have a consensus determination of eligibility and are located within the activity APE (per Section II.B.2, above) will be treated as historic properties and subject to avoidance measures and/or best management practices.

5. The ROMO Section 106 Coordinator, in coordination with the CRM Team, must have reviewed the activity and certified that the effects of the proposed activity on historic

properties will **not be adverse** based on criteria in 36 CFR Part 800.5, including consideration of direct, indirect, and cumulative effects. The Effect Finding must be "No Historic Properties Affected" or "No Adverse Effect".

6. ROMO will undertake formal survey efforts of streamlined activity project areas subject to the availability of appropriated funds. ROMO will ensure that any survey undertaken conforms to the Secretary of the Interior's Standards for Identification and Documentation of historic properties.

B. Undertakings Eligible for Streamlined Review (Appendix 1)

The streamlined review process is intended for use on the following activities as well as similar undertakings that are the same in scope, scale, and impact:

1. Mechanical, Manual Treatments, and Cultural Treatments with No Ground Disturbance. These activities would occur above the ground surface and would not impact native soils, and therefore would not be subject to cultural resource survey identification efforts beyond those efforts undertaken for the cultural resource assessment:
    - Herbicide spot treatment of individual plants;
    - Hand cutting or clipping flower heads or other above ground plant parts;
    - Mechanical and manual hand tools that cut vegetation above ground; and
    - Native seed dispersal, mulching and watering.

2. Mechanical, Manual, and Cultural Treatments with Low Potential for Ground Disturbance. The streamlined review process is intended to be used for activities with the potential to cause limited ground disturbance directly adjacent to small plants and their root systems:
    - Hand pulling or severing roots;
    - Tarping with staples or nails;
    - Revegetation;
    - Willow cuttings planting; and
    - Caging of planted trees.

3. Mechanical, Manual, and Cultural Treatments with Moderate Potential for Ground Disturbance. The streamlined review process is intended to be used for activities with the potential to cause moderate disturbance to soils around the root systems of moderately sized tap-rooted plants:
    - Hand pulling or severing roots of weeds greater than a depth of 6 inches but less than 12 inches;
    - Revegetation (e.g., salvaging and replanting of small aspen, conifers, and shrubs and minor digging to plant nursery stock up to a depth of 12 inches);
    - Installing erosion control wattles or silt fence which are buried up to 6 inches in the ground and secured with stakes that may go up to 12 inches deep; and
    - Use of UTV for activities such as herbicide spraying.

4. Revegetation. Revegetation may be streamlined in areas that have been determined eligible or assumed as eligible for listing in the National Register as a cultural or ethnographic landscape, and provided ground disturbance levels fall within the categories

of No, Low, and Moderate Potential (Appendix 1). The streamlined review process is intended to be used for:

- Planting native plant species and placement of straw bales and wattles to improve erosion control;
- Establishing native vegetation by seeding, raking, mulching, and watering to provide wildlife habitat, prevent invasion of exotic plants, and reduce erosion issues;
- Removing native plants from Park locations and then replanting them in another location to promote native plant growth, provided both the locations that the plants are being removed from and the location they are being located to have been subject to complete review per the stipulations of this PA;
- Replacement of invasive or exotic landscape plantings with similar or compatible non-invasive plants to a cultural or ethnographic landscape that is in keeping with the Secretary of Interior's Standards for Historic Preservation; and
- Mulching, which would include application of organic weed-free hay, bark, or wood chips, or other such ground cover over invasive plants, or to support the growth of native plants.

5. Installation of temporary signs, plaques, or wayside exhibits. This would include temporary signs, plaques, or waysides needed to inform the public about closure areas and treatment areas, provided that the signs can be driven into the ground without the need for digging post holes, and are not installed within the boundary of any archeological site or sensitive areas identified through tribal consultation where such signage would not be culturally appropriate.

6. If ethnobotanical resources are identified during Tribal consultation and an undertaking may cause potential impacts to vegetation contributing to cultural landscapes and districts, contributing vegetation would be identified, flagged, and monitoring during all streamlined activities.

V. STANDARD REVIEW PROCESS

All undertakings that do not qualify for streamlined review as described in Section IV above, will be reviewed in accordance with 36 CFR Part 800. The following are categories of Plan activities that are **NOT** eligible for streamlined review under this PA and must go through the Standard Review Process:

A. Mechanical/Manual Treatments and revegetation activities with a High Potential for Ground Disturbance such as excavations with heavy equipment or shovels greater than 12 inches in depth to remove invasive plants (Appendix 1).

B. Prescribed fire would be addressed as part of *Rocky Mountain National Park 2012 Wildland Fire Management Plan* and the 2008 Nationwide PA.

VI. INADVERTENT DISCOVERIES OR UNANTICIPATED EFFECTS

A. For situations when historic properties may be discovered or unanticipated effects on historic properties are found during implementation of any activity associated with the Plan, all invasive plant control activities in the area of the discovery or unanticipated effects will stop and the area secured from further disturbance.

B. An archeologist or cultural resource specialist who meets the Secretary of the Interior's Qualification Standards will document and evaluate the discovery for NRHP significance.

C. If archaeological materials are discovered as a result of any activity or undertaking, the discovery will be protected, all ground disturbing activities will cease within 30 meters (100 ft) of the discovery, and activity will cease in the area until the discovery is assessed and documented. If the Section 106 coordinator determines that the discovery is an isolate and determines it is not eligible for NRHP listing, it will be documented and the activity will proceed with no further consultation. For all other discoveries, ROMO will either assume the materials eligible for NRHP listing pursuant to 36 CFR § 800.13(c) or consult with Indian Tribes and SHPO regarding eligibility and effect. ROMO will notify the SHPO and Tribes by phone within 48 hours of the discovery.

D. The ROMO Superintendent, in consultation with the ROMO Section 106 Coordinator and appropriate CRM Team members, will make reasonable efforts to avoid, minimize or mitigate adverse effects on those historic properties in consultation with the SHPO and the respective Indian Tribes.

VII. NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT (NAGPRA)

ROMO shall ensure that any American Indian burials or American Indian human remains, funerary objects, sacred objects and objects of cultural patrimony discovered during implementation of any activity under the Plan, or part of any activity associated with the Plan are treated with appropriate respect and according to Federal law, including, but not limited to, NAGPRA and its implementing regulations, 36 CFR Part 10. Actions described herein do not constitute compliance with provisions of NAGPRA.

If objections are raised by any American Indian Tribe regarding treatment of human remains or cultural items as defined under NAGPRA, the objection shall be resolved in accordance with NAGPRA.

VIII. ANNUAL REPORTING

An annual report of all undertakings reviewed using the Streamlined Review process under this PA will be prepared by the ROMO Section 106 Coordinator and provided to the SHPO and concurring parties. The annual report will be submitted for the preceding year by or before March 1 of the following year.

IX. DISPUTE RESOLUTION

Should any concurring party or signatory to this PA object at any time to any actions proposed or the manner in which the terms of this PA are implemented, the NPS shall consult with such party to resolve the objection. If the NPS determines that such objection cannot be resolved, the NPS will:

A. Forward all documentation relevant to the dispute, including the NPS's proposed resolution, to the ACHP. The ACHP shall provide the NPS with its advice on the resolution of the objection within 30 days of receiving adequate documentation. Prior to reaching a final decision on the dispute, the NPS shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP, signatories [and concurring parties], and provide them with a copy of this written response. The NPS will then proceed according to its final decision.

B. If the ACHP does not provide its advice regarding the dispute within the 30 day time period, the NPS may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the NPS shall prepare a written response that takes into account any timely comments regarding the dispute from the signatories [and concurring parties] to this PA, and provide them and the ACHP with a copy of such written response.

C. The NPS's responsibility to carry out all other actions subject to the terms of this PA that are not the subject of the dispute remain unchanged.

X. AMENDMENTS

This PA may be amended when such an amendment is agreed to in writing by all signatories. The amendment will be effective on the date a copy signed by all of the signatories is filed with the ACHP. Five (5) years after the date of executing this PA, and every five (5) years thereafter for the duration of the PA, ROMO shall consult with SHPO to review the sufficiency of this PA and consider amendments of its terms, as appropriate.

XI. TERMINATION

If any signatory to this PA determines that its terms will not or cannot be carried out, that party shall immediately consult with the other signatories to attempt to develop an amendment per Stipulation X, above. If within 30 days (or another time period agreed to by all signatories) an amendment cannot be reached, any signatory may terminate this PA upon written notification to the other signatories.

Once the PA is terminated, and prior to work continuing on the undertaking, the NPS must either (a) execute a new PA pursuant to 36 CFR Part 800.14(b) or (b) request, take into account, and respond to the comments of the ACHP under 36 CFR Part 800.7. The NPS shall notify the signatories as to the course of action it will pursue.

XII. ANTI-DEFICIENCY ACT

The NPS's obligations under this PA are subject to the availability of appropriated funds, and the stipulations of this PA are subject to the provisions of the Anti-Deficiency Act. The NPS shall make reasonable and good faith efforts to secure the necessary funds to implement this PA in its entirety. If compliance with the Anti-Deficiency Act alters or impairs the NPS's ability to implement the stipulations of this agreement, the NPS shall consult in accordance with the amendment and termination procedures found at Stipulations X and XI of this PA.

XIII. DURATION

The NPS and signatories to this PA will conduct a periodic review every 5 years to reconsider the terms of this PA. Reconsideration may include the continuation or revision of this PA by amendment.

This PA will expire in 10 years from the date of its execution. Prior to such time, the NPS and signatories may consult to reconsider the terms of the PA and renew, amend, or terminate it.

EXECUTION of this PA by the NPS and SHPO, and implementation of its terms evidence that the NPS has taken into account the effects of this undertaking on historic properties and afforded the ACHP an opportunity to comment.

SIGNATORIES:

National Park Service

_____ Date _____
Darla Sidles, Superintendent, Rocky Mountain National Park

Colorado State Historic Preservation Officer

_____ Date _____
Steve Turner, State Historic Preservation Officer

APPENDIX 1

Ground Disturbance Category Definitions and Associated Methods and Tools for Each Category

Category of Disturbance	Potential depth of disturbance below ground surface	Extent of disturbance	Associated Tools or Methods
NO GROUND DISTURBANCE	None	No ground disturbance. Treatments limited to those that occur above ground surface and do no impact native soils.	• Herbicide (cut stump/foliar/pre-emergent treatment); Herbicide treatments are generally spot treatments of individual plants using backpack sprayer rather than a broadcast treatment of a large area. • Hand cutting or clipping of flower heads, or other above ground plant parts. • Mechanical and manual hand tools that cut vegetation above ground (including push mowers, weed whackers, weed whips, brush cutters, loppers, chainsaws, and hand pruners); and • Native seed dispersal, mulching and watering

Example 1. Clipping and bagging of flowers heads of musk thistle or mullein to prevent seed dispersal of these invasive plants.

Example 2. Foliar spray. Canada thistle is a perennial plant with rhizomotous root system that must be treated by spraying leaves with herbicides.

LOW	Less than 6 inches	Ground disturbance is limited to areas directly adjacent to small individual tap-rooted plants. Disturbance would typically be less than 1-foot in diameter per individual plant with the exception of revegetation activities. Disturbance is typically limited to duff but may extend up to 6 inches below ground surface. Soils disturbed are typically in contact with root systems.	• Hand pulling or severing roots of weeds with shallow root systems using shovel, McLeod, Pulaski, if within 6" below ground surface in small or sparse infestations; in larger dense populations alternative methods such as herbicide treatment would be used to protect cultural and natural resources. • Tarping with staples or nails • Revegetation (e.g., seed planting, raking, and minor digging to plant nursery stock to a depth of up to 6"); nursery stock is generally in 1-inch diameter containers, but may sometimes be quart sized pots. • Willow cuttings (up to 2" diameter) driven into ground up to 24" deep • Caging of planted trees which may require driving up to 2 t-posts into ground up to 24".
Example 1. Removal of musk thistle plants in which a shovel must be driven into the ground at an angle to sever the root crown about 2-4" below the ground surface. Example 2. Caging of a planted aspen tree with fencing and 2 t-posts to prevent deer and elk from browsing on the young tree. Example 3. Planting native grasses in 1" diameter containers around a campground comfort station to decrease erosion around the structure.			

Category of Disturbance	Potential depth of disturbance below ground surface	Extent of disturbance	Associated Methods and Tools
MODERATE	6 - 12 inches	Ground disturbance is limited to soils around the root systems of individual moderately sized tap-rooted plants. Disturbance would typically be less than 2 feet in diameter, and limited to duff, top soil, and intact A horizon soils that are already disturbed from the rootball of the plants being removed. The 2 ft diameter would not apply to revegetation activities.	• Hand pulling or severing roots of weeds greater than a depth of 6" but less than 12"; in larger dense populations, alternative methods such as herbicide treatment would be used to protect both cultural and natural resources. • Use of shovels, McLeods, and Pulaskis. • Revegetation (e.g., salvaging and replanting of small aspen, conifers, and shrubs and minor digging to plant nursery stock up to a depth of 12"); nursery stock is generally in 1" diameter containers, but may sometimes be in quart or gallon sized pots. • Installing erosion control wattles or silt fence which are buried up to 6" in the ground and secured with stakes that may go up to 12" deep. • Use of UTV for activities such as herbicide spraying.
Example 1. Installing erosion control wattles where soils are loose after removing a dense patch of mullein on a hill slope. Example 2. Removal of mullein by hand pulling which may cause soil disturbance up to 6-8" which would not exceed the depth of root growth. Example 3. Planting of quart size and gallon size shrubs such as fringe sage to establish vegetation to encourage visitors to stay on trail.			

HIGH	Greater than 12 inches	Ground disturbance is associated with exotic plant control that exceeds moderate disturbance. Certain restoration activities would also exceed moderate disturbance.	• Hand pulling, grubbing, digging, or severing roots of weeds greater than a depth of 12". • Revegetation (e.g., salvaging and planting of large nursery stock or salvaged plant material) • Prescribed fire (would comply with Fire Management Plan) • Soil management?
Example 1. Major revegetation project including addition of topsoil incorporated to a depth of greater than 12" for successful replanting of large aspen trees.			

APPENDIX 2

Secretary of the Interior's Historic Preservation Professional Qualification Standards

The following requirements are those used by the National Park Service, and have been previously published in the Code of Federal Regulations, 36 CFR Part 61. The qualifications define minimum education and experience required to perform identification, evaluation, registration, and treatment activities. In some cases, additional areas or levels of expertise may be needed, depending on the complexity of the task and the nature of the historic properties involved. In the following definitions, a year of full-time professional experience need not consist of a continuous year of full-time work but may be made up of discontinuous periods of full-time or part-time work adding up to the equivalent of a year of full-time experience. More information about applying the standards, closely related fields to each discipline, and documenting professional experience is available at https://www.nps.gov/history/local-law/gis/html/quals.html.

The PA recognizes that "Indian Tribes…possess special expertise in assessing the eligibility of historic properties that may possess religious and cultural significance to them," (36 CFR 800.4 (c)(1)). These qualifications are inherent to Indian Tribes and constitute qualifications independent of the Secretary of the Interior's Qualification Standards.

STANDARD FOR ARCHEOLOGIST

Prehistoric: The applicant, employee, consultant, or advisor will have a graduate degree in Anthropology with a specialization in Prehistoric Archeology, or a graduate degree in Archeology with a specialization in Prehistoric Archeology, or a graduate degree in a closely related field, PLUS a minimum of two and one-half (2 1/2) years of full-time professional experience in applying the theories, methods, and practices of Archeology that enables professional judgments to be made about the identification, evaluation, documentation, registration, or treatment of prehistoric archeological properties in the United States and its Territories (at least six months of experience must have been acquired in the performance of field and analytical activities under the supervision of a professional prehistoric archeologist, and one year of experience in the study of the archeological resources of the prehistoric period must have been at a supervisory level); AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation.

Historical: The applicant, employee, consultant, or advisor will have a graduate degree in Anthropology with a specialization in Historical Archeology, or a graduate degree in Archeology with a specialization in Historical Archeology, or a graduate degree in a closely related field (see Academic Background for Archeology), PLUS a minimum of two and one-half (2 1/2) years of full-time professional experience applying the theories, methods, and practices of Archeology that enables professional judgments to be made about the identification, evaluation, documentation, registration, or treatment of historic archeological properties in the United States and its Territories (at least six months of experience must have been acquired in the performance of field and analytical activities under the supervision of a professional Historical Archeologist, and one year of experience in the study of the archeological resources of the historic period must have been at a supervisory level); AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation

STANDARD FOR HISTORIAN

The applicant, employee, consultant, or advisor will have a graduate degree in History or a closely related field of study, PLUS a minimum of two (2) years of full-time professional experience applying the theories, methods, and practices of History that enables professional judgments to be made about the identification, evaluation, documentation, registration, or treatment of historic properties in the United States and its Territories; AND

products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation; OR...

An undergraduate degree in History or a closely related field of study, PLUS a minimum of four (4) years of full-time professional experience applying the theories, methods, and practices of History that enables professional judgements to be made about the identification, evaluation, documentation, registration, or treatment of historic properties in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation

STANDARD FOR ARCHITECTURAL HISTORIAN

The applicant, employee, consultant, or advisor will have a graduate degree in Architectural History or a closely related field of study, PLUS a minimum of two (2) years of full-time professional experience applying the theories, methods, and practices of Architectural History that enables professional judgments to be made about the identification, evaluation, documentation, registration, or treatment of historic properties in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation; OR...

An undergraduate degree in Architectural History or a closely related field of study, PLUS a minimum of four (4) years of full-time professional experience applying the theories, methods, and practices of Architectural History that enables professional judgments to be made about the identification, evaluation, documentation, registration, or treatment of historic properties in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation

STANDARD FOR HISTORICAL ARCHITECT

The applicant, employee, consultant, or advisor will have a State Government-recognized license to practice Architecture, PLUS a minimum of two (2) years of full-time professional experience applying the theories, methods, and practices of Architecture that enables professional judgments to be made about the evaluation, documentation, or treatment of historic structures in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation; OR...

A Masters of Architecture degree with demonstrable course work in Architectural Preservation, Architectural History, Historic Preservation, Historic Preservation Planning, or a closely related field, PLUS a minimum of two (2) years of full-time professional experience applying the theories, methods, and practices of Historic Architecture that enables professional judgments to be made about the evaluation, documentation, or treatment of historic structures in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation; OR...

A Bachelors of Architecture degree with at least one year of graduate study in Architectural Preservation, Architectural History, Historic Preservation, Historic Preservation Planning, or a closely related field, PLUS a minimum of two (2) years of full-time professional experience applying the theories, methods and practices of Historic Architecture that enables professional judgments to be made about the evaluation, documentation, or treatment of historic structures in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation

STANDARD FOR HISTORICAL LANDSCAPE ARCHITECT

The applicant, employee, consultant, or advisor will have a State Government-recognized license to practice Landscape Architecture, PLUS a minimum of two (2) years full-time professional experience applying the theories, methods, and practices of Landscape Architecture that enables professional judgments to be made about the identification, evaluation, documentation, registration, or treatment of historic properties in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation; OR...

A Masters degree in Landscape Architecture with demonstrable course work in the principles, theories, concepts, methods, and techniques of preserving cultural landscapes, PLUS a minimum or two (2) years of full-time professional experience applying the theories, methods, and practices of Landscape Architecture that enables professional judgments to be made about the identification, evaluation, documentation, registration, or treatment of historic properties in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation; OR...

A four-year or five-year Bachelors degree in Landscape Architecture, PLUS a minimum of three (3) years of full-time professional experience applying the theories, methods, and practices of Landscape Architecture that enables professional judgments to be made about the identification, evaluation, documentation, registration, or treatment of historic properties in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation

STANDARD FOR HISTORIC PRESERVATION PLANNER

The applicant, employee, consultant, or advisor will have a State Government-recognized certification or license in Land-use Planning, PLUS, minimum of two (2) years of full-time professional experience applying the theories, methods, and practices of Historic Preservation Planning that enables professional judgments to be made about the identification, evaluation, documentation, registration, protection, or treatment of historic and archeological properties in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation; OR...

A graduate degree in Planning with demonstrable course work in Historic Preservation, or a graduate degree in a closely related field of study with demonstrable course work in Historic Preservation, PLUS a minimum of two (2) years of full-time professional experience applying the theories, methods, and practices of Historic Preservation Planning that enables professional judgments to be made about the identification, evaluation, documentation, registration, protection, or treatment of historic and archeological properties in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation; OR...

An undergraduate degree in Planning with demonstrable course work in Historic Preservation or an undergraduate degree in a closely related field of study with demonstrable course work in Historic Preservation, PLUS a minimum of four (4) years of full-time professional experience applying the theories, methods, and practices of Historic Preservation Planning that enables professional judgments to be made about the identification, evaluation, documentation, registration, protection, or treatment of historic and archeological properties in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation.

STANDARD FOR HISTORIC PRESERVATIONIST

The applicant, employee, consultant, or advisor will have a graduate degree in Historic Preservation or a closely

related field of study (see Academic Background for the Historic Preservation discipline), PLUS a minimum of two (2) years of full-time professional experience applying the theories, methods, and practices of Historic Preservation that enables professional judgments to be made about the identification, evaluation, documentation, registration, or treatment of historic and prehistoric properties in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation; OR...

An undergraduate degree in Historic Preservation or a closely related field of study, PLUS a minimum of four (4) years of full-time professional experience applying the theories, methods, and practices of Historic Preservation that enables professional judgments to be made about the identification, evaluation, documentation, registration, or treatment of historic and prehistoric properties in the United States and its Territories; AND products and activities that demonstrate the successful application of acquired proficiencies in the discipline to the practice of historic preservation

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Appendix B: Mitigation/Conservation Measures

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Appendix B.

Mitigation/Conservation Measures

The following conservation measures will be implemented to protect federally listed species, as well as general park resources, and park staff and visitors. Conservation measures for reducing disturbance and impact, and for the application of herbicide are listed, followed by measures specific to Canada lynx, wolverine, Mexican spotted owl, cutthroat trout, and Arapahoe snowfly. A synopsis of label contents pertaining to the application of each herbicide currently used or proposed is presented in Table 2 of the Biological Assessment.

General Protection Measures

- Work will not be conducted near active nests of bald and golden eagles or peregrine falcons during the breeding and nesting season from March through July. Work will also avoid take relating to any bird protected by the Migratory Bird Treaty Act. Park staff will consult with the park's wildlife technician, GIS specialist, or staff ecologist for known raptor and songbird nest locations.

- The park will ensure that all herbicide applicators can identify federally listed plant and animal species in the area.

- Treatment will be avoided in sensitive wildlife habitat during lambing, calving, or denning periods. This generally occurs between May 1 to mid-June for low-elevation areas and from May 1 to August 31 for high-elevation areas.

- Park Natural Resource Management staff will assess all herbicide-treated areas for revegetation needs. Vegetation will be reestablished on bare ground to minimize the opportunity for invasive exotic plant reestablishment, unless the patch is small enough that natural revegetation will occur from adjacent undisturbed native vegetation.

Wilderness Protection Measures

- Park Natural Resource Managers will conduct a desktop analysis and on-site field surveys prior to treatment to identify those exotic plant projects proposed to occur in wilderness. Resource Managers will prepare a programmatic Wilderness Minimum Requirement Decision Guide that analyzes the proposed activities in this EA that are generally prohibited under the Wilderness Act or that are otherwise likely to impact overall wilderness character. The park's Exotic Plant Annual Work Plan will include a tiered Wilderness Minimum Requirement Analysis for the specific actions proposed each year if necessary.

- The use of management activities generally prohibited by the Wilderness Act such as the use of motorized and mechanized vehicles and equipment, and monitoring installations will be limited to the minimum required to preserve wilderness character. Exotic plant management activities will balance the restoration of the natural quality of wilderness with the impacts of this management activity on the untrammeled quality of wilderness.

Cultural Resource Protection Measures

As outlined in the 2018 EPMP PA, stipulations for cultural resources include:

- A qualified individual and/or team that meets the Secretary of the Interior's Historic Preservation Professional Qualification Standards will perform or oversee implementation of the 2018 EPMP PA and any inventory, documentation, or treatment of potential or known historic properties shall conform to the provisions of the Secretary of the Interior's Standards and Guidelines for Identification, Documentation, and Treatment of Historic Properties and NPS Director's Order 28 (Cultural Resources).

- Each year, the ROMO Superintendent will notify consulting Tribes in writing and with associated map locations about areas proposed for activities under the Plan. Tribes will be provided advanced notice of activities and will be provided 30 days to reply to the NPS verbally or in writing about any concerns. If no concerns are expressed within 30 days, Park Staff may proceed with implementation of proposed Plan activities, taking into consideration other interested parties, protection measures, standard operating procedures, and best management practices needed to protect historic properties in collaboration with the ROMO Section 106 coordinator.

- The Park's Section 106 Coordinator, in coordination with the Park's CRM Team, will determine if the 2018 EPMP PA streamlined criteria are met for a proposed exotic plant management treatment undertaking. All undertakings that do not qualify for the streamline review as described in the PA will be reviewed in accordance with 36 CFR Part 800.

- For situations when historic properties may be discovered or unanticipated effects on historic properties are found during implementation of any activity associated with the Plan, all invasive plant control activities in the immediate area of the discovery or unanticipated effects will stop and the area will be secured from further disturbance.

- Park staff shall ensure that any American Indian burials or American Indian human remains, funerary objects, sacred objects, and objects of cultural patrimony discovered during implementation of any activity under the Exotic Plant Management Plan or part of any activity associated with the Exotic Plant Management Plan are treated with appropriate respect and according to Federal law, including, but not limited to, NAGPRA and its implementing regulations, 36 CFR Part 10. Actions described herein do not constitute compliance with provisions of NAGPRA.

- Prior to the beginning of the field season the park cultural resource specialist will provide a cultural resource awareness training to field staff to include a basic identification of prehistoric and historic archeological resources that may be encountered.

Health, Safety, and Herbicide Application

- By April 30 of each year, park personnel will identify locations in the park where herbicide application is warranted. This information will be made available to the public on the park's website, through the park's information office, and may be available using other sources. Herbicide treatment will not be done outside of the identified locations except in the cases of early detection and rapid response of newly discovered populations or species. In these rare cases, these sites will be added to the website at least two weeks prior to treatment.

- All sites where herbicides are proposed to be applied will be posted at access points with signs at least two weeks prior to application. Signs will remain in place for at least as long as is required by the herbicide label. Signs will contain the treatment date, target invasive exotic plants, name of herbicide applied, restricted entry period if any, and a park contact name and number for any questions.

- Job hazard analysis will be included for invasive exotic plant work. Park staff will ensure all employees and volunteers are given proper personnel protective equipment (PPE) and safety instructions for all treatment methods.

- NPS personnel applying herbicides will transport only the estimated quantity needed for that day's work or the smallest amount given the container size. NPS personnel applying herbicides will transport concentrate to the treatment site in original containers in a manner that will prevent tipping or spilling, and in a compartment that is isolated from food, clothing, and safety equipment. In most cases, NPS personnel will only bring a dilute batch mix to the site and will not bring any herbicide concentrate to area of treatment.

Canada Lynx

- All project activities will adhere to all relevant conservation measures outlined in the Lynx Conservation Assessment and Strategy (Interagency Lynx Biology Team (ILBT) 2013).

Wolverine

- If a wolverine or evidence of wolverine is observed, work in the area will cease until surveys are conducted to verify presence and potential denning areas. If confirmed, work will be avoided during the critical breeding and denning timeframe and in future years, surveys will occur prior to work. If surveys detect a wolverine near target treatment areas, the park will consult with the USFWS before proceeding with treatments.

- Herbicide application will specifically avoid spraying carcasses or in the immediate vicinity of carcasses.

Mexican Spotted Owl

- No Mexican spotted owl (MSO) or nesting have been documented in the park but MSO have the potential to expand into the park. The Park is working continuously with USFWS to refine the definition of potential nesting habitat based on observed nesting of MSO in Colorado. Work will be avoided in potential MSO nesting habitat and the adjacent area to buffer impacts of noise producing equipment for application during the critical breeding and nesting timeframe from March 1 through August 31. If this timeframe cannot be avoided, surveys for MSO in theses treatment areas will take place and treatment may proceed if no MSO are present.

- Prior to spraying, maps of potential MSO habitat will be provided to staff and contractors.

- If surveys detect a Mexican spotted owl near target treatment areas, the park will consult with the USFWS before proceeding with treatments. If nests are identified but not active, the park will consult with the USFWS on proposed actions and guidance on whether work can proceed.

Greenback Cutthroat Trout

- Any invasive exotic plant control activities that could impact this species will be avoided. Herbicide use will follow label instructions, which include protecting waters by not using herbicides in standing or flowing water. In addition, applicators will ensure that no airborne drift gets into waterways or lakes.

- Only herbicides that are practically non-toxic to fish and other aquatic organisms will be used within the water influence zone (see Table 2 of the Biological Assessment).

- If fish mortality or distressed and unusual behavior is observed, spraying will cease and the park will consult with USFWS.

- NPS or USFWS wildlife biologists will conduct site reviews during peak spawning and reproduction periods. The most critical time for greenback cutthroat trout is spawning through hatching based on when most offspring are lost in hatchery settings (Bryan Johnson, unpublished data). Greenback cutthroat trout spawn in the spring. The timing of spawning is driven by temperature with onset of spawning occurring once mean daily water temperature remains above 5 degrees C throughout an entire week (Kennedy 2016). In Rocky Mountain National Park the onset of spawning ranges from mid-May to mid-July. Eggs hatch in approximately 1.5 months and timing to hatch was consistent between the earliest and latest spawning sites (Chris Kennedy, unpublished data). Based on these data the critical timeframe to avoid spraying near greenback cutthroat streams or lakes is May 15 – August 31.

Arapahoe Snowfly

- NPS or USFWS wildlife biologists will conduct site reviews before the park conducts invasive exotic plant management activities in areas adjacent to Arapahoe snowfly habitat. Any invasive exotic plant control activities that could impact this species will be avoided.

- To reduce the risk of take, manual, mechanical, and chemical control activities in Arapahoe snowfly suitable habitat will take place only during summer months, when this species is inactive.

- Herbicide use will follow label instructions, which include protecting waters by not using herbicides in standing or flowing water. In addition, applicators will ensure that no airborne drift gets into waterways or lakes.

- Only herbicides that are practically non-toxic to aquatic invertebrates will be used within the water-influence zone in potential Arapahoe snowfly habitat to reduce the risk that nymphs or adults will be exposed to herbicide residue on water, soil, or detritus.

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Appendix C: Best Management Practices

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Appendix C.

Best Management Practices

The following are general guidelines that will be followed during all exotic plant control activities.

Operational Guidelines

- Inventory for exotic invasive species populations will be as accurate as possible to minimize the disturbance footprint that will result from mechanical and manual removal and application of herbicides.

- If cultural practices can be used alone, or in concert with herbicide application or mechanical control, to successfully eradicate or reduce invasive exotic plant infestations, these methods will be explored and implemented.

- The park will ensure that all herbicide applicators can identify federally listed plant and animal species in the area.

- The park will monitor treated areas to determine the effectiveness of the herbicide in accordance with the park document "Vegetation Monitoring: Project Design, Field Methods, Data Analysis, Reporting" (NPS 2014). Monitoring of treated areas may be conducted with other governmental and nongovernmental organizations and academic partners. These partnerships, as well as literature reviews, may aid in the design and implementation of effectiveness monitoring. In many cases, simple photo monitoring or other newer technologies may be sufficient to determine the effectiveness of treatments.

- Equipment washing and disposal of excess herbicides will be done according to label and away from surface water sources.

- To prevent environmental contamination and exposure of nontarget species to toxins, herbicides will be applied in the smallest amount necessary for effective treatment and application will be localized to target species whenever possible.

- To reduce effects on nontarget species, spot treatments that are applied to exotic invasive species individuals or populations will be the most common method of application. Broadcast treatment (uniform application over an entire area) will only be considered for the most severe infestations, such as when a monoculture of invasive exotic plants is present.

- To reduce effects on nontarget species, herbicides that target specific species or functional groups will be used when effective and available. Broad-spectrum herbicides will only be used when no specific herbicides will successfully meet management objectives. This approach may depend on climate conditions, which could change the timing of phenology for certain species.

- Park staff will ensure contractors are state-licensed commercial applicators and require a qualified supervisor to oversee herbicide applications.

- All use of herbicides in the park must have an EPA registration number and must be reviewed and approved by the NPS Pesticide Approval System and designated IPM coordinator from the

Intermountain Region and the park. Annual pesticide use logs will be filled out in the NPS approval system.

- Application methods, equipment, and rates that minimize potential for drift and off-target impacts will be selected while meeting invasive exotic plant objectives. Drift reduction techniques will be used, including appropriate surfactants, course, low-pressure spray of less than 30 pounds per square inch, appropriate nozzle size and type, and keeping spray nozzles close to the ground.

- Park staff will follow all label instructions and additional instructions provided by the regional and park IPM specialists during the NPS pesticide approval review.

- Park staff will monitor weather conditions before and during all herbicide application projects. Herbicides will not be applied when rain appears imminent, except for those herbicides that require moist soil. Herbicides will not be applied when temperature, humidity, or wind conditions specified on the label are exceeded. The application rates specified by the manufacturer will be used unless directed otherwise by a certified applicator or IPM coordinator.

- If herbicides are stored in the park, they will be kept only in facilities designed and constructed in accordance with the provisions of Title 35, Article 10 of the Colorado Pesticide Applicator Act; Part 11 of "Rules and Regulations Pertaining to Administration and Enforcement of the Pesticide Applicator Act." All pesticide storage facilities will be constructed with adequate sump capacity to contain spillage of the entire quantity of pesticide stored.

- All herbicide containers will be disposed of in accordance with state and federal requirements. Containers will be emptied thoroughly, rinsed three times, and punctured to prevent reuse.

Exotic Plant Treatment near Water

- Herbicides will not be applied directly to water.

- All herbicides will be applied in accordance with the label and with consideration of effects on water and aquatic organisms and vegetation. A synopsis of label contents pertaining to the application of each herbicide is presented in the Biological Assessment.

- Only herbicide formulations labeled as practically non-toxic for aquatic species will be used for spraying in riparian ecosystems, wetlands, or water influence zones adjacent to greenback cutthroat trout populations or within Arapahoe snowfly habitat.

- Within riparian and wetland areas, spot treatments will be conducted with a wand or wick applicator based on herbicide labels and recommendations from the NPS Intermountain Region IPM Coordinator.

- Herbicides with the potential to persist in soils, leach into groundwater, or disperse through the ground will not be applied in areas where the water table is high. That may be determined by wells, presence of wetland vegetation, or other methods.

Appendix D: Federally Listed Threatened and Endangered Species; State of Colorado Endangered, Threatened, or Species of Concern; and Colorado Natural Heritage Program Vulnerable or Imperiled Species

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Appendix D
Federally-Listed Threatened and Endangered Species
State of Colorado Endangered, Threatened or Species of Concern
Colorado Natural Heritage Program Vulnerable or Imperiled Species

Table 1. Federally-Listed Threatened and Endangered Species in Larimer County, Colorado.

Common Name	*Species*	Status	Habitat Requirements
BIRDS			
** Least tern	*Sterna antillarum*	Endangered	Riparian habitat on the Platte River in Nebraska
Mexican spotted owl	*Strix occidentalis lucida*	Threatened	Heavily vegetated canyons or forested areas
Southern white-tailed ptarmigan	*Lagopus Leucura altipetens*	Under review	Alpine tundra
** Piping plover	*Charadrius melodus*	Threatened	Broad, sandy beaches, usually on islands
** Whooping crane	*Grus Americana*	Endangered	Riparian habitat on the Platte River in Nebraska
FISH			
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	Threatened	Isolated headwaters of mountain streams
** Pallid sturgeon	*Scaphirhunchus albus*	Threatened	Riparian habitat on the Platte River in Nebraska
MAMMALS			
Canada lynx	*Lynx canadensis*	Threatened	Subalpine and upper montane forests between 8,000 and 12,000 feet
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	Threatened	Stream and riparian habitats along the Colorado Front Range and southeastern Wyoming
North American wolverine	*Gulo Gulo luscus*	Proposed Threatened	Large roadless or isolated areas at higher elevations
PLANTS			
Colorado butterfly plant	*Gaura neomexicana spp. Coloradensis*	Threatened	Moist areas of flood plains in Laramie and Platte counties in Wyoming, and Larimer, Jefferson, and Weld counties in Colorado
North Park Phacelia	*Phacelia formosula*	Endangered	Between 8,000 and 8,300 feet in Jackson County, Colorado
Utes ladies' - tresses	*Spiranthes diluvialis*	Threatened	Below 6,500 feet in moist to wet alluvial meadows, flood plains of perennial streams
**Western prairie fringed orchid	*Platanthera praeclara*	Threatened	Riparian habitat on the Platte River in Nebraska
INSECTS			
Arapahoe snowfly	*Capnia Arapahoe*	Candidate	Known only from first-order tributaries below 6,000 feet in elevation in Larimer, Jefferson, and Boulder counties in Colorado

** Water depletions in the South Platte River basin may affect these downstream species

Appendix D
Federally-Listed Threatened and Endangered Species
State of Colorado Endangered, Threatened or Species of Concern
Colorado Natural Heritage Program Vulnerable or Imperiled Species

Table 2. State of Colorado Endangered, Threatened or Species of Concern, Bald and Golden Eagles (list updated September 2018).

Scientific name	*Common Name*	Status	Habitat Requirements
AMPHIBIANS			
Anaxyrus boreas boreas	Boreal toad	SE	Spruce-fir and alpine meadows between 7,500 and 11,500 feet including lakes, marshes, wetlands or bogs
Rana pipiens	Northern leopard frog	SC	Historic, not known to exist in the park. Usually in permanent waters with grass or other aquatic vegetation in springs, streams, marshes, bogs and pond.
Rana sylvatica	Wood frog	SC	Found in ponds in open grassy areas with willow and aspen and often near spruce forests.
BIRDS			
Aquila chrysaetos	Golden eagle	BGEPA	Found in open mountains and foothills habitats especially near cliffs.
Buteo regalis	Ferruginous hawk	SC	Open grasslands and plains.
Falco peregrinus anatum	American peregrine falcon	SC	Cliffs and ledges near open meadows and grasslands.
Grus canadensis tabida	Greater sandhill crane	SC	Found in fields, marshes, grasslands and bogs.
Haliaeetus leucocephalus	Bald eagle	SC BGEPA	Along rivers and large lakes.
Numenius americanus	Long-billed curlew	SC	High plains, rangelands and mudflats.
FISH			
Oncorhynchus clarki pleuriticus	Colorado River cutthroat trout	SC	Small headwater tributaries, mountain streams and lower elevation rivers.
MAMMALS			
Canis lupus	Gray wolf	SE	Historic, not known exist in the park. Occupy large ranges including meadows, forests and alpine areas.
Corynorhinus townsendii pallescens Unconfirmed but believed to occur in the park	Townsend's big-earedbBat	SC	Uses pine forests and wooded canyons, hibernates and roosts in caves, mines and buildings

Appendix D
Federally-Listed Threatened and Endangered Species
State of Colorado Endangered, Threatened or Species of Concern
Colorado Natural Heritage Program Vulnerable or Imperiled Species

Scientific name	*Common Name*	Status	Habitat Requirements
Lontra Canadensis Colorado River watershed but a few sightings in the Big Thompson River	River otter	ST	Found in lakes, streams and rivers and primarily dens in burrows on banks and can also use roots and brush.
Thomomys talpoides macrotis	Northern pocket gopher	SC	Ranges in elevations to above 12,000 feet. Found in meadows and sagebrush.
MOLLUSKS			
Acroloxus coloradensis	Rocky mountain capshell	SC	High elevation lakes and ponds.

SE State Endangered – Listed as endangered by Colorado Parks and Wildlife.

ST State Threatened – Listed as threatened by Colorado Parks and Wildlife.

SC State Special Concern – Those species or subspecies of native wildlife that have been removed from the state threatened or endangered list within the last five years; are proposed for federal listing (or a federal listing "candidate species") and are not already state listed; have experienced, based on the best available data, a downward trend in numbers or distribution lasting at least five years that may lead to an endangered or threatened status; or are otherwise determined to be vulnerable in Colorado.

Appendix D
Federally-Listed Threatened and Endangered Species
State of Colorado Endangered, Threatened or Species of Concern
Colorado Natural Heritage Program Vulnerable or Imperiled Species

Table 3. Colorado Natural Heritage Program vulnerable or imperiled species occurring in Rocky Mountain National Park (list updated September 2018).

Scientific Name	Common Name	CHNP Status*	Habitat
BIRDS			
Leucosticte australis	Brown-capped rosy-finch	S3S4	Alpine tundra and rock crevices above tree line, primarily in Colorado
INSECTS			
Callophrys mossii	Moss' Elfin	S2S3	Summer resident, rocky outcrops
Colorado luski	Lusk's pinemoth	S1?	Summer resident, forests
Paratrytone snowi	Snow's skipper	S3	Summer resident, high elevation
Pyrgus ruralis	Two-banded skipper	S3	Summer resident, forest clearings, meadows, pastures, streamsides
Stinga morrisoni	Morrison's skipper	S3/S4	Summer resident, grassy openings
MOLLUSKS			
Acroloxus coloradensis	Rocky mountain capshell	S1	High elevation lakes and ponds
PLANTS			
Aletes humilis	Larimer aletes	S2S3	Cliffs, cracks, and soil composed of disintegrated granite. Also ponderosa pine duff.
Artemisia pattersonii	Patterson's wormwood	S3	Open rocky tundra.
Aquilegia saximontana	Dwarf blue columbine	S3	Cliffs, rocky slopes in alpine and subalpine communities
Asplenium septentrionale	Grass-fern	S3S4	Crevices of rocks, around boulders and on cliffs
Botrychium echo	Reflected moonwort	S3	Gravelly soils, rocky hillsides, grassy slopes, and meadows and early successional (<20 y) habitat.
Botrychium furcatum	Unnamed moonwort	S1	Extremely rare and newly discovered species. Only four known occurrences in Colorado.
Botrychium hesperium	Western moonwort	S2	Gravelly hillsides, disturbed granite soil, among gravel and cobbles trail sides through meadows and lodgepole.

Appendix D
Federally-Listed Threatened and Endangered Species
State of Colorado Endangered, Threatened or Species of Concern
Colorado Natural Heritage Program Vulnerable or Imperiled Species

Scientific Name	Common Name	CHNP Status*	Habitat
Botrychium lanceolatum	Lanceleaf moonwort	S3	subalpine woodland, open fields
Botrychium lunaria	Common moonwort	S3	Open to lightly wooded meadows as well as sparsely vegetated scree slopes.
Botrychium minganese	Mingan moonwort	S1	Subalpine woodland, dense forest to open meadow and from summer-dry meadows to permanently saturated fens and seeps
Botrychium pinnatum	Northwestern moonwort	S1	Grassy slopes, stream banks, disturbances.
Carex diandra	Lesser panicled sedge	S1	Subalpine willow fens.
Carex leptalea	Bristly-stalked sedge	S1	Moist shaded fens, canyon forests, and willow stands. Grassy wetlands.
Carex limosa	Mud sedge	S2	Moist shaded fens, canyon forests, and willow stands.
Carex oreocharis	Grassyslope sedge	S1	Dry slopes in granite soils
Carex stenoptila	Riverbank sedge	S2	Dry and rocky montane openings and coniferous forests.
Castilleja puberula	Shortflower paintbrush	S2S3	Rocky tundra and high peaks of the Continental Divide
Chionophila jamesii	Snowlover	S3S4	Moist grassy slopes or flats in rocky or gravelly soil
Cypripedium fasciculatum	Clustered lady's slipper	S3	Subalpine woodland, open to densely shaded lodgepole or sometimes spruce-fir forests
Cystopteris montana	Mountain bladderfern	S1	Subalpine woodland, moist soil in spruce-fir forests
Draba crassa	Thickleaf draba	S3	Alpine scree slopes, high mountain cliffs
Draba fladnizensis	Austrian draba	S2S3	Alpine, scree slopes
Draba grayana	Gray's draba	S2	Alpine, scree slopes
Draba porsildii	Porsild's draba	S1	Alpine, scree slopes
Draba streptobrachia	Alpine tundra draba	S3	Tundra meadows, scree slopes
Dryopteris expansa	Spreading woodfern	S1	Subalpine woodland, moist, dense spruce-fir forests and cliff bases
Equisetum variegatum	Variegated rush	S1	Subalpine woodland, tundra meadows, scree slopes
Eriophorum gracile	Slender cotton-grass	S1	Subalpine woodland, fens, wet meadows and pond edges

Appendix D
Federally-Listed Threatened and Endangered Species
State of Colorado Endangered, Threatened or Species of Concern
Colorado Natural Heritage Program Vulnerable or Imperiled Species

Scientific Name	Common Name	CHNP Status*	Habitat
Goodyera repens	Lesser rattlesnake plantain	S3S4	Shaded forests and along streams.
Juncus vaseyi	Vasey's rush	S1	Mountain wetlands; springy slopes and meadows.
Juncus tweedyi	Narrowpanicle rush	S1	Shallow water along creeks and hot springs. Only one known occurrence in the park.
Lewisia rediviva	Bitterroot	S2	Dry, gravelly, open soils.
Lewisia triphylla	Threeleaf lewisia	S2	Subalpine woodland, moist meadows
Liatris ligulistylis	Rocky mountain gayfeather	S1S2	Wet meadows.
Lilium philadelphicum	Wood lily	S3S4	Moist forests, thickets and wet meadows.
Listera borealis	Northern twayblade	S2	Subalpine woodland, moist spruce-fir forests, mossy seeps
Listera convallarioides	Broadlipped twayblade	S2	Spruce-aspen forests, in grassy areas near water.
Luzula subcapitata	Colorado woodfern	S3	Subalpine woodland, subalpine and alpine willow carrs
Mentzelia/Nuttallia sinuata	Leechleaf blazingstar	S2	Front range to foothills.
Mimulus gemmiparus	Yellow monkeyflower	S1	Subalpine woodland, granite seeps, slopes and alluvium in open sites within spruce-fir and aspen forests
Papaver radicatum ssp *kluanense*	Alpine/rooted poppy	S3S4	Dry alpine tundra meadows, gravelly slopes, talus, scree, and fell-fields.
Parnassia kotzbuei	Kotzbue's grass-of-parnassus	S2	Subalpine and alpine wet, rocky ledges, in streamlets and moss mats.
Penstemon harbourii	Harbour's beardtongue	S3S4	Rocky substrate, loose scree slopes
Polypodium hespirum	Western polypody	S1S2	Cracks and ledges on cliffs; on a variety of noncalcareous substrates, rarely on limestone.
Polypodium saximontanum	Rocky mountain polypody	S3	Cracks and ledges on rocks; often on granitic substrates.
Potentilla ambigens	Silkyleaf potentilla	S2	Grassy or colluvial (loose sediment to gravel) slopes and meadows.
Potentilla rupincola	Rock cinquefoil	S2	Granitic outcrops or gravelly granitic soils with W or N

Appendix D
Federally-Listed Threatened and Endangered Species
State of Colorado Endangered, Threatened or Species of Concern
Colorado Natural Heritage Program Vulnerable or Imperiled Species

Scientific Name	Common Name	CHNP Status*	Habitat
			exposure.
Pyrola picta	Whiteveined wintergreen	S3S4	Cool, moist slopes and ravines, in lodgepole, Douglas-fir, and ponderosa pine forests.
Salix serissima	Autumn willow	S1	Marshes or fens with willow and sedge species.
Sisyrinchium pallidum	Pale blue-eyed-grass	S2	Margins of streams, wet meadows and fens.
Telesonix jamesii	James' telesonix	S2	Subalpine woodland, boulder fields, cliff faces, rocky outcrops in tundra and mixed conifer forests
Tonestus lyallii	Lyall's serpentweed	S1	Meadows, fellfields, talus slopes, rock crevices, open coniferous forests in alpine and subalpine communities.
Viola selkirkii	Selkirk's violet	S1	Cold, moist mountain forests and thickets.

S1 species are critically imperiled in Colorado (5 or fewer known occurrences in the state or 1,000 or fewer individuals)
S2 species are imperiled (6 to 20 known occurrences in the state or 1,000 to 3,0000 individuals)
S3 species are vulnerable (21 to 100 known occurrences in the state or 3,000 to 10,000 individuals).

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Appendix E: Signed Concurrence Letter and Biological Assessment

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Colorado Field Office
P.O. Box 25486, DFC (65412)
Denver, Colorado 80225-0486

IN REPLY REFER TO:
ES/CO: NPS/RMNP
TAILS: 06E24000-2018-I-1176

SEP 17 2018

Ms. Darla Sidles
Superintendent
Rocky Mountain National Park
Estes Park, Colorado 80517

Dear Ms. Sidles:

This responds to your letter and biological assessment received on June 18, 2018, regarding the proposed Exotic Plant Management Plan for Rocky Mountain National Park (Park), Colorado. Additional information was provided in a revised biological assessment, which was sent by email from your office on August 24, 2018. Your letter requested concurrence with your determination that the proposed project may affect, but is not likely to adversely affect the greenback cutthroat trout (*Oncorhynchus clarkii stomias*), Mexican spotted owl (*Strix occidentalis lucida*), and Arapahoe snowfly (*Arsapnia arapahoe*). Your letter requested concurrence with your determination that the proposed project would not affect the Canada lynx *(Lynx canadensis*). Your letter also requested concurrence with your determination that the proposed project would not jeopardized the continued existence of the North American wolverine (*Gulo gulo luscus).* These comments have been prepared under the provisions of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et. seq.).

The proposed action is the implementation of a new Exotic Plant Management Plan to manage for exotic plant species at the Park. The existing 2003 Invasive Exotic Plant Management is considered by the Park to be insufficient as it limits herbicide use to only 15 species of exotic plants; contains acreage thresholds that prevent eradication of newly established infestations and smaller existing infestations; does not contain a framework for addressing exotic species newly discovered in the Park; and lacks the flexibility to use the best available techniques to manage exotic plants, including new techniques that may become available in the future. The new management plan is needed to expand the range of methods available to control and, if possible, eradicate exotic plant infestations and prevent their spread.

This plan would adopt a park-wide adaptive management decision-making framework that incorporates the best available science, expert knowledge, site assessment, and monitoring. This

framework will be used to determine the extent of exotic species infestations, prioritize treatments, and determine the most effective treatment methods and other management actions. The Park will have the flexibility to manage invasive exotic plant species listed in the 2003 plan, species listed on the Colorado noxious weed list, and any additional invasive exotic plant species that become a threat to park resources in the future. The tools used to control invasive exotic plants could include manual removal, mechanical control, and herbicide application, either separately or in combination with one another.

The proposed plan includes conservation measures that would be implemented to avoid and minimize potential impacts to federally listed species. General measures include minimizing the disturbance footprint from mechanical and manual removal, and conducting spot treatments to exotic invasive species, while broadcast treatment (uniform application over an entire area) will only be considered for the most severe infestations, such as when a monoculture of invasive exotic plants is present. Herbicides with the potential to persist in soils, leach into groundwater, or disperse through the ground will not be applied in areas where the water table is high. Only herbicide formulations labeled as practically non-toxic for aquatic species will be used for spraying in riparian ecosystems, wetlands, or water influence zones adjacent to greenback cutthroat trout populations or within Arapahoe snowfly habitat. Additional conservation measures are provided as well in the biological assessment.

Based on the information provided in your letter and biological assessment, the Service concurs with your determination that the proposed project may affect but is not likely to adversely affect the greenback cutthroat trout, Mexican spotted owl, and Arapahoe snowfly. The Service concurs with your determination that the proposed action would not affect the Canada lynx and would not jeopardize the continued existence of the North American wolverine. The proposed action will not occur in areas of designated critical habitat for any of these species.

If any additional species that are Federally-listed, proposed for Federal listing, or candidate for Federal listing are found in the project area, if critical habitat is designated in the project area, or if project plans change, this office should be contacted to determine if further consultation will be required. If the Service can be of any additional assistance, please contact Leslie Ellwood of this office by telephone at (303) 236–4747 or email (leslie_ellwood@fws.gov).

Sincerely,

Drue DeBerry
Colorado and Nebraska Field Supervisor

Project/NPS/NPS_RMNP_Exotic Plant Mngt Plan_2018_FWS concur

Exotic Plant Management Plan
Rocky Mountain National Park
Biological Assessment

June 2018

National Park Service – U.S. Department of the Interior

Rocky Mountain National Park

1000 US Highway 36

Estes Park, Colorado 80517

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INTRODUCTION

The purpose of this biological assessment (BA) is to review the proposed project to adaptively manage exotic species at a parkwide scale, and to determine to what extent the proposed action may affect federally listed threatened, endangered, candidate, or proposed species or their critical habitat. The exotic plant management plan (plan) is needed to protect and restore native species, ecosystems, cultural resources, and the visitor experience from the detrimental effects of exotic plant invasions within the boundary of Rocky Mountain National Park (RMNP or park). The park is experiencing an increase in the number and extent of exotic plant invasions, which threaten to displace native plant communities, disrupt fire cycles, alter wildlife habitat, impede ecosystem functions, and adversely affect the visitor experience.

The management tools currently available to the park are outlined in the 2003 Invasive Exotic Plant Management Plan and Environmental Assessment (2003 plan) (National Park Service (NPS) 2003). These tools have been ineffective in controlling invasive exotic plant infestations in the face of new species invasions, a warming climate, changing fire regimes, and ongoing nitrogen deposition, which continue to aggravate the spread of exotic plants. The 2003 plan is insufficient because it limits herbicide use to only 15 species of exotic plants; contains acreage thresholds that prevent eradication of newly established infestations and smaller existing infestations; does not contain a framework for addressing exotic species newly discovered in the park; and lacks the flexibility to use the best available techniques to manage exotic plants, including new techniques that may become available in the future. A new management plan is needed to expand the range of methods available to control and, if possible, eradicate exotic plant infestations and prevent their spread. Table 1 provides a comparison between the 2003 plan and the proposed action.

This BA was prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act of 1973, as amended (16 United States Code (USC) 1536, et seq.) (ESA); and follows the standards established in NPS Director's Order 12 (DO-12).

CONSULTATION HISTORY

On December 30, 2002, the NPS prepared a letter seeking concurrence from the U.S. Fish and Wildlife Service (USFWS) with their "not likely to adversely affect" determination for the 2003 plan, outlining controls and mitigations to reduce and prevent effects for several threatened, endangered, and rare species. The USFWS concurred in a letter dated July 3, 2003 that these measures were adequate and would not likely result in an adverse effect on federally listed species.

Prior to preparing this BA, the NPS initiated informal consultation with the USFWS. A list of federally listed threatened, endangered, candidate, and proposed species potentially occurring in the action area was obtained from the USFWS using the Information, Planning, and Conservation System (IPaC) website (USFWS 2017a). The NPS submitted a letter to the USFWS on March 2, 2017 for concurrence on effects for several threatened, endangered, and rare species that could be affected by the 2018 plan (NPS 2017). The USFWS responded by a request to complete a consultation for potential effects from the 2018 plan for several species (Table 3 on page 22) (Abouelezz 2017). Since the 2003 plan was implemented, the Canada lynx (*Lynx*

canadensis) has been listed as threatened, the wolverine (*Gulo gulo luscus*) has been proposed for listing, the Arapahoe snowfly (*Arsapnia arapahoe*) has become a candidate for listing, the greenback cutthroat trout (*Oncorhynchus clarkii*) continues to be listed and potential suitable habitat in the park has been delineated for the Mexican spotted owl (*Strix occidentalis lucida*). For the Canada Lynx a streamlined consultation process has been developed through the use of the Intra-Agency Southern Rockies Lynx Project Decision Screens. The actions in the proposed Exotic Plant Management Plan have been determined to have no effect under pre-screen 2, noxious weed treatments. Use of pre-screen 2 was affirmed appropriate by the USFWS on February 9, 2018 (Watry, M.K. 2018). Therefore Canada Lynx will not be analyzed within this BA. The remaining species require analysis in this BA.

PROPOSED ACTION

The NPS is proposing to adopt a parkwide adaptive management decision-making framework that incorporates the best available science, expert knowledge, site assessment, and monitoring. This framework will be used to determine the extent of exotic species infestations, prioritize treatments, and determine the most effective treatment methods and other management actions. Management actions will be prioritized based on the level of threat to park resources, the size and extent of species infestations, and the park's ability to control those infestations. The park will use a structured decision-making process to assist in setting invasive exotic plant management priorities (Figure 1) and assist in determining control methods for invasive exotic plants (Figure 2). The park will have the flexibility to manage invasive exotic plant species listed in the 2003 plan, species listed on the Colorado noxious weed list, and any additional invasive exotic plant species that become a threat to park resources in the future. The tools used to control invasive exotic plants could include manual removal, mechanical control, and herbicide application. These control methods will be used separately or in combination with one another, depending upon which species are targeted for management. Components of the proposed action are described below.

Background

NPS *Management Policies 2006* state that "Exotic species will not be allowed to displace native species if displacement can be prevented," and "In general, new exotics will not be introduced to parks." In addition, Executive Order (EO) 13112, signed in 1999 and amended December 2016, provides guidance for the management of invasive species and ensures that "federal agency activities concerning invasive species are coordinated, complementary, cost-efficient, and effective." EO 13112 was updated in 2016, and now directs agencies to "prevent the introduction, establishment, and spread of invasive species," to "monitor invasive species accurately and reliably," and to "provide for the restoration of native species, ecosystems, and other assets that have been impacted by non-native species." NPS *Management Policies 2006* further state that, "Programs to manage exotic species will be designed to avoid causing significant damage to native species, natural ecological communities, natural ecological processes, cultural resources, and human health and safety."

Invasive exotic plants are capable of spreading rapidly, outcompeting native plants, and drastically altering ecosystem conditions and processes, even in wilderness areas. The number

of invasive exotic plant species in the park is growing, and the distribution and acreage of invasive exotic plants is expanding. This is happening despite efforts to control these occurrences.

The park is currently managing exotic invasive plant infestations in accordance with the 2003 plan. While the 2003 plan provides a mechanism for addressing some exotic invasive plant infestations within the park, it does not allow managers the flexibility to deal with new species infestations, does not contain a framework to allow new control methods, prevents the eradication of some exotic species, and does not contain a structured framework to incorporate new science and information into the decision-making and management process.

Under the proposed action, the park will have the flexibility to use a full range of integrated pest management tools, including mechanical control, responsible chemical control, cultural practices, early detection, and monitoring the effectiveness of management strategies that are consistent with NPS policy and specifically DO #77-7: Integrated Pest Management (NPS 2010). The park will continue current efforts to prevent introduction of invasive exotic plants to the park, as outlined below and in Table 1. These efforts include using weed-free hay, inspecting construction vehicles entering the park for invasive exotic plant seed, and washing vehicles before they enter a construction zone. The park also will continue current education and outreach efforts to park visitors and the community as described in the 2003 plan (NPS 2003).

Table 1. 2003 plan and proposed action comparison.

Action	2003 Plan	Proposed Action
Inventory	Invasive exotic plant surveys are conducted every year by park staff and volunteers, focusing on road shoulders and hiking trails in the park. Wilderness areas are surveyed if time allows. Rangers are trained to identify invasive exotic plants and report them.	In addition to the inventory actions in the 2003 plan, the park will increase inventory and documentation of invasive exotic plant species occurrence and distributions, with a focus on early detection that will allow the park to better prioritize treatments in the future.
Process for Determining Invasive Exotic Plant Management Priorities	The park prioritizes invasive exotic plants to be controlled based on the management strategies contained in a risk assessment (Rutledge and McLendon 1996) and management zones (NPS 1976). The park assigns species an urgency score of high, medium, or low based on their ecological impact and relative ease of control. Additional details are available in the 2003 plan.	The park will evaluate each invasive exotic plant species infestation based on criteria described in Figure 1 to determine management priorities. The desired future condition for each management site will be determined.
Process for Determining Invasive Exotic Plant Control Methods	Control techniques are evaluated based on cost and effectiveness and nontarget effects. Herbicides are applied as a last resort; the effectiveness of mechanical, cultural, biological, and other methods are evaluated before synthetic herbicide control is proposed. Use of herbicides is limited as described below under Integrated Pest Management. Additional detail is available in the 2003 plan.	The specific control method for each invasive exotic plant species will be determined using the structured decision-making process outlined in Figure 2. The control method, or combination of methods, for each species will be determined based on the best scientific information available.
Monitoring	The park monitors areas where invasive exotic plants have been removed.	In addition to the monitoring actions in the 2003 plan, the park will manage invasive exotic plants using principles of adaptive management including monitoring invasive exotic plant populations and monitoring the effectiveness of invasive exotic plant management actions. The proposed action will include monitoring impacts of management actions on nontarget native species, as well as broader scale monitoring of the rate of spread of exotic plant infestations.

Action	2003 Plan	Proposed Action
Invasive Exotic Plant Management	The park uses Integrated Pest Management (IPM) tools including manual control, mechanical control, responsible herbicide application, cultural practices, and biological control. Use of herbicides is limited to 15 invasive exotic plant species identified in the 2003 plan: • Canada thistle (*Cirsium arvense*) • cheatgrass **(***Bromus tectorum*) • common St. Johnswort (*Hypericum perforatum*) • Dalmatian toadflax (*Linaria dalmatica*) • diffuse knapweed (*Centauera diffusa*) • field bindweed (*Convolvulus arvensis*) • houndstongue (*Cynoglossum officianale*) • leafy spurge (*Euphorbia esula*) • oxeye daisy (*Chrysanthemum leucanthemum*) • orange hawkweed (*Hieracium aurantiacum*) • quackgrass (*Agropyron repens*) • smooth brome (*Bromus inermis*) • spotted knapweed (*Centaurea maculosa*) • sulfur cinquefoil (*Potentilla recta*) • yellow toadflax (*Linaria vulgaris*) Herbicide use is only implemented on these species when the number of plants in one location exceeds thresholds established in the 2003 plan.	The park will have the flexibility to use a full range of exotic plant management tools, including manual control, mechanical control, responsible herbicide application, and cultural practices (including fire and native habitat restoration). Implementation of each management technique will be the same as under 2003 plan, with the exception of biocontrol and herbicide application. Using the decision process in Figure 2, the park will have the flexibility to use herbicides on additional invasive exotic plants in the park when other control methods are widely known to not be effective or have been proven to not be effective in the park. In addition, the proposed action will not have plant population thresholds for herbicide application. In addition to the 15 invasive exotic plant species listed in the 2003 plan, the park anticipates that herbicides will be used to treat myrtle spurge (*Euphorbia myrsinites*) and yellow starthistle (*Centaurea solstitialis*) from Colorado Noxious Weed List A; bouncingbet (*Saponaria officinalis*), bull thistle (*Cirsium vulgare*), Russian knapweed (*Acroptilon repens*), scentless chamomile (*Matricaria perforata*), musk thistle (*Carduus nutans*), and sulfur cinquefoil (*Potentilla recta*) from Colorado Noxious Weed List B; common burdock (*Arctium minus*) and common mullein (*Verbascum thapsus*) from Colorado Noxious Weed List C; baby's breath (*Gypsophila paniculata*) and hoary alyssum (*Berteroa incana*), both on the Colorado Noxious Weed Watch List; and reed canary grass. Other species on the Colorado Noxious Weed List not yet known to occur in the park also will be considered for herbicide or other treatment methods, as well as species that appear on the Colorado Noxious Weed List in the future, on any surrounding state's noxious weed lists, or any other invasive plant species known to present ecological or human health hazards.
Additional Actions Common to the 2003 Plan and Proposed Action	The park will: • continue current efforts to prevent introduction of invasive exotic plants to the park, and • continue current education and outreach efforts to park visitors and the community as described in the 2003 plan.	Same as 2003 plan.

Exotic Plant Management Plan Environmental Assessment

Rocky Mountain National Park

Structured Decision-Making Process to Assist in Setting Invasive Exotic Plant Management Priorities

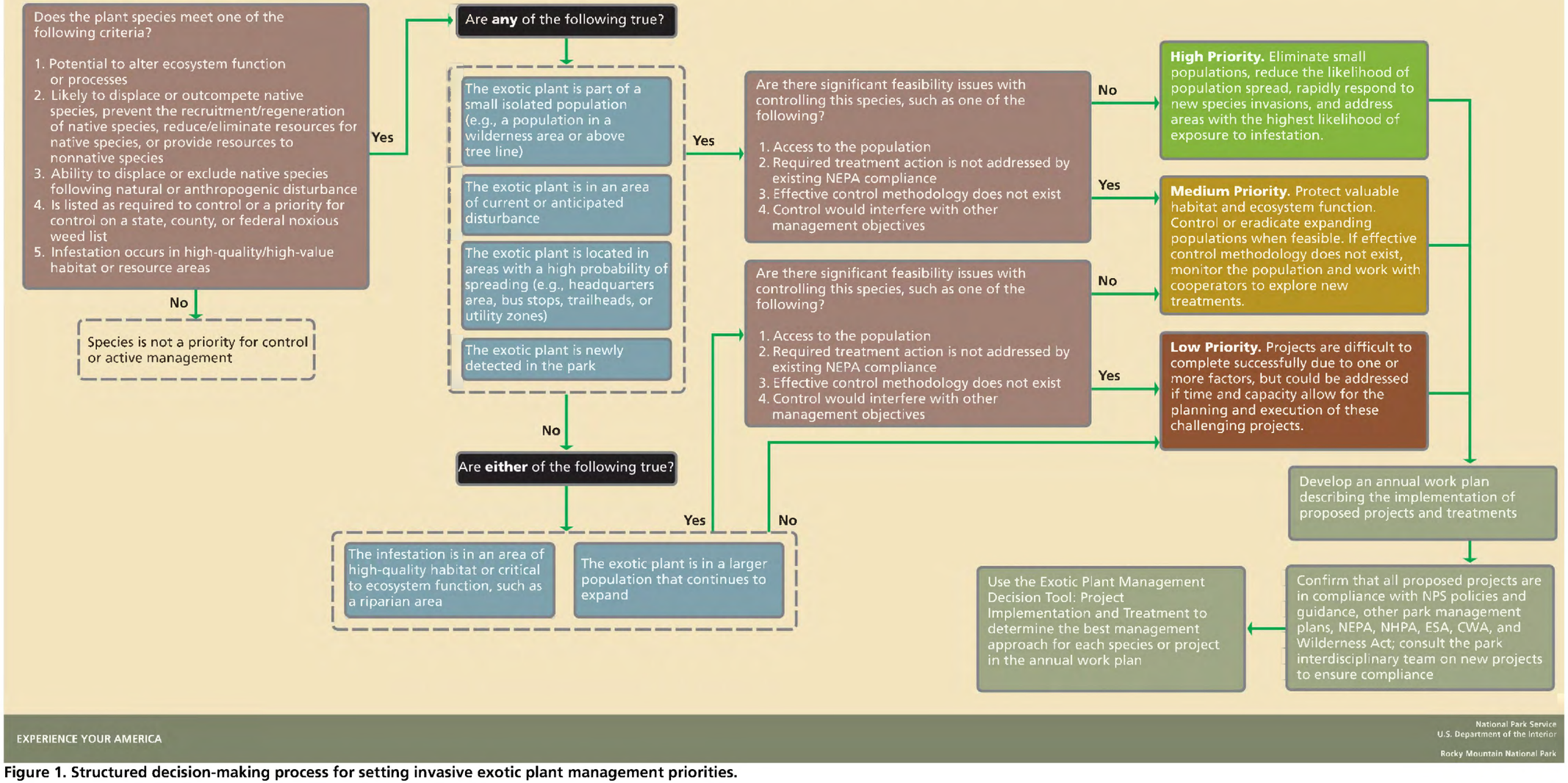

Figure 1. Structured decision-making process for setting invasive exotic plant management priorities.

Exotic Plant Management Plan Environmental Assessment

Rocky Mountain National Park

Structured Decision-Making Process to Assist in Determining Invasive Exotic Plant Control Methods

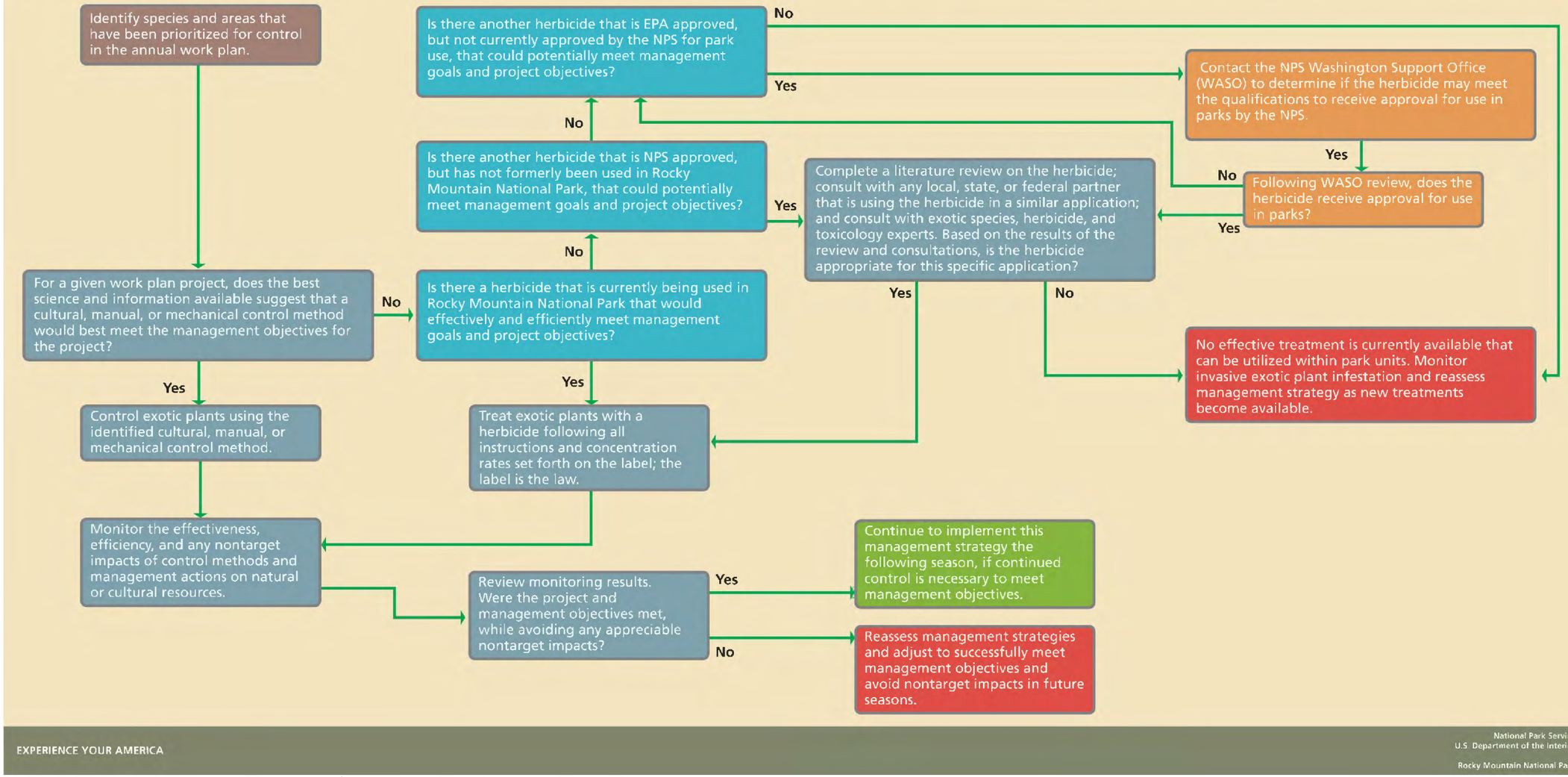

Figure 2. Structured decision-making process for invasive exotic plant control methods.

Curent Invasive Exotic Plant Management Actions

The proposed action will continue to manage invasive exotic plants using the following methods, as outlined in the 2003 plan.

Manual Control

Manual control will involve clipping, hand pulling, and shoveling. This technique generally will occur at the park's lower elevation areas from April through October and at elevations from 7,000 to 10,500 feet.

Mechanical Control

Mechanical control could involve mowing or using gas-powered string trimmers. Mowing requires one or two park staff and generally will occur in roadside meadows at elevations from 7,000 to 9,500 feet. String trimmers will generally be used in teams of two to eight park staff and will be used to spot treat infestations at elevations from 7,000 to 10,500 feet. In the future, mechanical control may be needed at higher elevations as invasive exotic species expand their elevational range in the park. Mechanical treatments would generally occur April through October.

Cultural Practices

Cultural practices create an environment where exotic species have greater difficultly invading a site, and can include native habitat restoration and prescribed fire. Native habitat restoration activities would generally occur from April through October at elevations of 7,000 to 10,500 feet. The restoration practices used will include activities that prevent the growth of invasive exotic species, including the establishment of native vegetation communities where exotic species may otherwise spread. Whenever possible, native seed collected from within the park will be hand spread by staff or volunteers and gently raked into the soil surface. After seeding, the restoration site will be mulched using wood chips, also spread by hand. Crews and volunteers will also plant native seedlings grown from seed or propagated from other plant material collected within the park. Minor digging and ground disturbance will be necessary when planting grasses, forbs, shrubs, and trees. Most plants from the park's nursery stock are usually in 1-inch cones or quart-sized pots, which will determine the size of hole needed for each plant. In certain cases, topsoil and erosion control will be necessary to favor the establishment of native plantings. Topsoil may be brought in and spread by crews with rakes or spread by small equipment such as a skid steer (usually only on the roadside). Erosion control typically is only needed on steeper slopes and will involve installing erosion barriers such as wattles or matting to prevent soil movement and soil loss. Depending on the type of cultural practice, the level of ground disturbance, and the potential for effects to non-target species and resources, additional consultation and compliance may be required for specific activities.

Prescribed fire could be used at elevations below 9,500 feet and in areas previously consulted on and identified in the Fire Management Plan (NPS 2012). The Fire Management Plan identifies treatment areas included in the Long-Term Fuels Treatment Plan (NPS 2012, Figure 4, p. 54)

where prescribed fire, manual treatments (work completed by hand tools including chainsaws), and mechanical treatments (work completed using machinery) may be implemented to reduce hazardous fuels or create or maintain desired landscapes or other site-specific objectives. The Long-Term Fuels Treatment Plan identifies approved areas where fuels treatments may occur over the life of the Fire Management Plan, estimated at about 20 years starting in 2012 (NPS 2012).

Proposed Exotic Invasive Plant Management Actions

Under the proposed action, the park will implement the following management tools and methods. Table 1 outlines how the proposed action will differ from the 2003 plan with respect to these strategies.

Inventory

The park will increase inventory and documentation of invasive exotic plant species occurrence and distributions, with a focus on early detection that will allow the park to better prioritize treatments in the future. Comprehensive inventories and early detection will allow the park to better execute rapid response strategies, which prevent new invasive exotic plant species from becoming established in the park or from spreading to new areas within the park.

The park will conduct desktop analysis and on-site field surveys prior to treatments to determine the presence and proximity of natural resources that may be at risk from invasive exotic plant treatments, including aquatic resources and special status species. The park will consult park plant databases, as well as soil and vegetation geographic information system (GIS) layers, to identify known and likely locations of rare plants. If surveys are warranted, surveys will be conducted when plants are expected to be flowering or have aerial stems or catkins to determine the presence or absence of sensitive species in the park prior to treatment.

On-site surveys will involve one or two park staff hiking trails and walking meadows in a grid pattern to find new infestations and document their extent by collecting observational data. These activities will occur on most park trails and meadows across the entire elevational range of the park. Trails and meadows will be inventoried from May through October. When funding and resources are available, a full inventory will be completed over a 2-year period and ideally will be repeated every 5 years. In most years, fewer surveys will occur and a full park inventory will be completed over a longer timeframe.

Process of Determining Invasive Exotic Plant Management Priorities

The park will evaluate each invasive exotic plant species based on criteria described in Figure 1 to determine management priorities. Based on the outcome of the process outlined in Figure 1, each species and project site will be ranked as high, medium, or low priority for management. The park will develop an annual work plan describing the implementation of proposed projects and treatments for management of invasive exotic plants. If an exotic plant species population is determined to be a management priority using this framework, the desired outcome of

managing that species will be delineated in the annual work plan. For example, if a population of invasive reed canary grass (*Phalaris arundinacea*) is identified as a priority for control, the desired outcome, or desired future condition of the project site, will be described in the work plan. That outcome within the first 12 months might be a 50% reduction in the population size, or a 30% reduction in population density. The long-term desired outcome might be a reduction of the population by 90% and restoration of native flora. Clearly defining the desired future condition of, or simply the goals for, the project site, allows managers to know if those goals are being met. If management actions are not successful in achieving the desired future condition identified for the site, park managers can then adaptively change their approach to better achieve success. Once exotic species populations have been prioritized for management, individual projects are identified, and desired future conditions are determined for the project sites, park managers will then determine the exotic plant management methods to be implemented.

Process for Determining Invasive Exotic Plant Management Methods

The specific management method for each invasive exotic plant species will be determined using the structured decision-making process outlined in Figure 2. The management method or methods for each species will be determined based on the best scientific information available. Prior to using any herbicide that has not previously been used in the park, the park will complete a literature review and consult with local, state, and federal entities that are using the herbicide and consult with other experts to determine if the herbicide is appropriate for use for a specific application in the park. Prior to using a herbicide that is not currently approved for use by the NPS, the park will consult with the NPS Washington Support Office (WASO) to determine if the herbicide meets the qualifications to receive approval for use in parks by the NPS. The park will develop an annual work plan describing the implementation of proposed projects and treatments for management of invasive exotic plants. Following the implementation of the projects listed in the annual work plan, the park will monitor the effectiveness of management methods and reassess management strategies annually, or as appropriate, based on the results of monitoring.

Monitoring

The park will manage invasive exotic plants using principles of adaptive management. The park will monitor sites where invasive plants have been controlled to determine if the management objectives have been met or if additional methods should be used to help achieve objectives. If a management tool is used that is new to the park (e.g., the use of an EPA approved herbicide that is approved by the NPS that has not been used in the park previously), a pilot monitoring study will be implemented to determine the effectiveness of the new tool. The proposed action will also include monitoring impacts of management actions on nontarget native plant species to ensure that if unanticipated nontarget effects occur, they are known and able to be remedied. Monitoring data will be used, along with the best available science, to implement management actions and to inform changes to those actions.

Monitoring will also be implemented for larger infestations of invasive exotic plants, which generally occur from 7,000 to 9,500 feet in elevation, even if the infestation is not targeted for immediate control. Monitoring of larger infestations allows park staff to understand the rate of

spread and the threat to park resources. This information will then serve to inform the prioritization of exotic plant infestations. Monitoring will typically involve a team of two park staff and will occur from May through October using observational data collection methods such as photographs, line transects, plots, and mapping using a global positioning system (GPS) unit. Inventory and monitoring data will be stored in a database and formatted for effective analysis.

Invasive Exotic Plant Management Tools

Under the proposed action, the park will have the flexibility to use a full range of exotic plant management tools – including manual control, mechanical control, responsible use of herbicides, and cultural practices (including fire and native habitat restoration) – that are in compliance with NPS policies and guidance, other park management plans, NEPA, National Historic Preservation Act (NHPA), Endangered Species Act, Clean Water Act, and Wilderness Act. Over time, the park anticipates the elevational range for treatments will increase as warming, nitrogen deposition, or other factors expand the range of exotic plants to include higher elevations. Exotic plant management techniques will generally be the same under the proposed action as under the 2003 plan (see Table 1). The proposed action differs from the 2003 plan in that it allows for flexible use of herbicides when other control measures are exhausted; and eliminates the requirement to set exotic plant population thresholds prior to herbicide use.

Under the proposed action, the park will no longer be required to set exotic plant population thresholds prior to the use of herbicides. For example, under the 2003 plan, the invasive species cheatgrass (*Bromus tectorum*) would have to reach a population that covered greater than 100 square meters (1,076 square feet) prior to using herbicide for control. Another example is the requirement for leafy spurge to cover greater than 10 square feet in any one location prior to using herbicide to control the infestation. Allowing invasive exotic plant populations to reach a certain size prior to using herbicide to control the population is counterproductive to successful exotic plant management. Exotic plant species are most easily managed and eradicated when their population size is very small. The proposed action will eliminate this threshold requirement and allow plant populations to be treated with effective and approved methods before reaching a predetermined population size, thus increasing the likelihood of successfully controlling the targeted exotic plant population.

The proposed action would allow the park to have flexibility to use herbicides on additional invasive exotic plants in the park when other control methods are not effective. Herbicide application will be conducted by park staff or contractors, or other responsible parties knowledgeable in safe and responsible application of herbicides. A crew of 5 to 10 people will use backpack sprayers along roadsides and in some meadows. A synopsis of label contents pertaining to the application of each herbicide currently used or proposed is presented in Table 2.

Mechanized Application Methods

Limited use of utility task vehicles (UTVs) with wand or boomless sprayers and one or two nozzles that fan out to spray a line 10 to 20 feet wide could also occur. UTV use will occur both on- and off-trail. UTVs and trucks with mounted sprayers will not be used within 100 feet of streams, lakes, or wetlands because of the potential for herbicide drift when using the boomless

or nozzle sprayers. However, a hose with a wand sprayer may be extended from the UTV in order to spray closer to waterways as permitted by each herbicide label.

Additional application methods may be used in the future as technology improves. The park will only use herbicides that have been through both the Environmental Protection Agency (EPA) and NPS approval processes for target species that are approved to be sprayed near water or close to waterways, and conservation measures will be implemented in all cases. Treatments generally will occur from April through October at elevations from 7,000 to 10,500 feet. Additional herbicides will be permitted under the proposed action in addition to those allowed under the 2003 plan.

Wetlands, Surface Waters, and Water Influence Zones

Herbicides will not be used in standing or flowing water, and applicators will ensure that no drift gets into waterways or lakes based on site-specific assessments. Herbicide application near waters will follow herbicide-specific buffers (see Table 2). Water influence zones, where vegetation plays a major role in sustaining the long-term integrity of aquatic systems, will be identified to reduce risk of unwanted exposure to toxins by nontarget species. Water influence zone sizes will vary based on the specific characteristics of each treatment site. A general recommended minimum buffer is 25 feet from the top of each streambank. For this plan, the water influence zone, is defined as 100 feet from the top of each streambank, or a distance equal to the mean height of mature dominant late seral upland vegetation, whichever is greater. Water influence zone size may be increased based on the specific characteristics of each treatment site, including slope, soil characteristics, and potential for runoff or water contamination. Some herbicides may have greater or smaller recommended distances for application from surface water, including up to surface water edges. All herbicides would be applied in accordance with the label.

Table 2. Characteristics of herbicides.

Herbicide (Example) Current or Proposed Usage	Treated Species	Environmental Effects	Application	Mechanism
Imazapic/Imazapyr **(Plateau)** **2003 plan and proposed action**	• cheatgrass • spurges	• Practically nontoxic to terrestrial mammals, birds, fish, and aquatic invertebrates • Does not bioaccumulate in mammals	• For cheatgrass, this herbicide is applied as a preemergent to the soil where seeds of cheatgrass have dropped in the early fall • For leafy spurge, this will be applied directly to the leaves of individual plants • Should not be applied directly to water or where surface water is present • Can be applied to soil to prevent seed germination of weedy species	• Selective for grasses and some other weedy species • Kills plants by inhibiting the activity of the enzyme acetohydroxy acid synthase (i.e., inhibits production of amino acids required for protein synthesis and cell growth)
Aminopyralid **(Milestone)** **2003 plan and proposed action**	• thistles • asters • knapweeds • sweetclover • mullein	• Practically nontoxic to terrestrial mammals, birds, fish, honeybees, earthworms, and aquatic invertebrates • Low potential for bioaccumulation	• Spot treatments to individual plants and plant populations • Can be applied up to the edge of surface waters	• Selective for broadleaf weeds, particularly thistles and clovers • Aminopyralid is a plant growth regulator that possesses auxin-like qualities that can turn on and off vital plant processes • Aminopyralid will bind at receptor sites normally used by the plant's natural growth hormones in susceptible plant species
Chlorsulfuron **(Telar XP)** **2003 plan and proposed action**	• toadflax • thistles • mullein • mustards	• Practically nontoxic to terrestrial mammals, birds, fish, and aquatic invertebrates • Low potential for bioaccumulation	• Spot treatments to individual plants and plant populations • Should not be applied directly to water or where surface water is present	• Selective for broadleaf weeds • These chemicals block the normal function of the enzyme acetolactate actohydroxy acid synthase, which is essential in amino acid synthesis
Dicamba/ Diflufenzopyr **(Overdrive)** **2003 plan and proposed action**	• thistles • bindweed • mustards • knapweeds • spurges	• Slightly toxic to terrestrial mammals • Practically nontoxic to birds, fish, and aquatic invertebrates from acute exposure • Potential for chronic toxicity to fish and invertebrates • Low potential for bioaccumulation	• Spot treatments to individual plants and plant populations • Should not be applied directly to water or where surface water is present	• Selective for broadleaf weeds • Diflufenzopyr is an auxin transport inhibitor allowing buildup in the meristematic tissue of a plant • Dicamba is a synthetic auxin that can disrupt plant cell growth in newly forming stems and leaves by affecting protein synthesis and normal cell division

Herbicide (Example) Current or Proposed Usage	Treated Species	Environmental Effects	Application	Mechanism
Metsulfuron **(Alligare MSM 60)** **proposed action**	• Canada thistle • common mullein • mustards • clover	• Practically nontoxic to terrestrial mammals, birds, fish, and aquatic invertebrates • Nontarget plants may be affected by drift and runoff • Can be highly mobile in soil and potentially contaminate groundwater sources	• Spot treatments to individual plants and plant populations • Should not be applied directly to water or where surface water is present	• Selective for many broadleaf weeds and some grasses • Blocks the normal function of acetolactate actohydroxy acid synthase, an enzyme essential in amino acid synthesis
Quinclorac **(Quinstar 4L)** **2003 plan and proposed action**	• Canada thistle • bindweed • spurges	• Practically nontoxic to terrestrial mammals, birds, and fish • Slightly toxic to aquatic invertebrates • The use of this chemical where soils are permeable, particularly where the water table is shallow, may result in groundwater contamination	• Spot treatments to individual plants and plant populations • Applied in early spring or in fall prior to first frost • Should not be applied directly to water or where surface water is present	• Selective for certain broadleaf weed species • Quinclorac is a synthetic auxin that disrupts plant cell growth in the newly forming shoots and leaves by affecting protein synthesis and normal cell division
2,4-Dichlorophenoxyacetic Acid, Dimethylamine Salt **(2,4-D Amine)** **proposed action**	• thistles • mustards • Russian thistle • orange hawkweed • sweetclover	• Slightly toxic to terrestrial mammals and birds • Moderately toxic to fish • Toxic to aquatic invertebrates • Drift or runoff may adversely affect aquatic invertebrates and nontarget plants • Can be moderately persistent in the soil • May result in groundwater contamination in areas where the water table is shallow • Bioaccumulation potential is unknown	• Spot treatments to individual plants and plant populations • Should not be applied directly to water or where surface water is present	• Selective for broadleaf weeds • Synthetic herbicide that disrupts plant cell growth in newly forming stems and leaves by affecting protein synthesis and normal cell division
Picloram **(Tordon 22K)** **proposed action**	• knapweeds • toadflax • thistles • mustards • mullein	• Slightly toxic to terrestrial mammals and aquatic invertebrates • Practically nontoxic to birds and fish • Moderate potential for bioaccumulation	• Spot treatments to individual plants and plant populations • Should not be applied directly to water or where surface water is present	• Selective for susceptible broadleaf weeds, woody plants, and vines • Synthetic auxin that disrupts plant cell growth in newly forming stem and leaf tissue by affecting protein synthesis and normal cell division

Herbicide (Example) Current or Proposed Usage	Treated Species	Environmental Effects	Application	Mechanism
Indaziflam **(Esplanade)** **proposed action**	• annual grasses • Canada thistle • Russian thistle • mustards	• Practically nontoxic to terrestrial mammals and birds • Toxic to fish and aquatic invertebrates • Drift and runoff from treated areas may be hazardous to aquatic organisms in adjacent sites • Does not bioaccumulate	• This herbicide is used as a preemergent, and will be applied in areas of very high infestations where the ground could be treated to prevent seed germination • Treatments will be applied locally to specific areas • Should not be applied directly to water or where surface water is present	• Selective control of annual grasses and broadleaf weeds • Controls weeds by inhibiting cellulose biosynthesis
Clopyralid **(Alligare Clopyralid 3)** **proposed action**	• knapweeds • thistles • clovers • hawkweed • oxeye daisy	• Slightly toxic to terrestrial mammals • Practically nontoxic to birds, fish, and aquatic invertebrates • May contaminate groundwater if used in areas with highly permeable soil and shallow groundwater • Does not bioaccumulate in terrestrial mammals	• Spot treatments to individual plants and plant populations • Should not be applied directly to water or where surface water is present	• Selective for broadleaf weeds and woody brush • Synthetic auxin that disrupts plant cell growth in newly forming stem and leaf tissue by affecting protein synthesis and normal cell division
Triclopyr 4E **proposed action**	• thistles • mustards • sweetclover • burdock • bindweed	• Slightly toxic to terrestrial mammals, birds, and aquatic invertebrates • Moderately toxic to fish • Does not bioaccumulate	• Spot treatments to individual plants and plant populations • Should not be applied directly to water or where surface water is present	• Selective control of broadleaf weeds • Synthetic auxin that disrupts plant cell growth in newly forming stem and leaf tissue by affecting protein synthesis and normal cell division
Triclopyr 3A **proposed action**	• thistles • mustards • sweetclover • burdock • bindweed	• Slightly toxic to terrestrial mammals, birds, and aquatic invertebrates • Practically nontoxic to fish • Does not bioaccumulate	• Spot treatments to individual plants and plant populations • May be used adjacent to surface waters, including in wetlands and edges of lakes with no continuous flows • Setbacks are required for use near potable water intakes (refer to label)	• Selective control of broadleaf weeds • Synthetic auxin that disrupts plant cell growth in newly forming stem and leaf tissue by affecting protein synthesis and normal cell division
Glyphosate **(Aquamaster)[1]** **proposed action**	• bindweed • hoary alyssum • cheatgrass • reed canarygrass	• Practically nontoxic to terrestrial mammals and aquatic invertebrates • Practically nontoxic to fish • Slightly toxic to birds • Does not bioaccumulate	• Spot treatments to individual plants and plant populations • Applied in early spring before most native plants begin growing in the spring or very targeted treatment of exotic plants so as not to harm adjacent native vegetation • Should not be applied directly to water or where surface water is present	Broad-spectrum post-emergent herbicide, thus would only be used sparingly on difficult to manage exotic plants

[1]Rocky Mountain National Park does not use the Roundup formulation of glyphosate. Roundup formulations of glyphosate have been found to be about 5 times more toxic to fish than glyphosate alone due to the surfactant included in the RoundUp formulation.

Sources: Albaugh, LLC. (2011, 2014, 2106, no date); Alligare, LLC. (2007a, 2007b, no date); Bayer Environmental Science (2015, 2016, no date); BASF NA Product Regulations (2009, 2011, 2014, 2015); Dow AgroSciences LLC. (2014a, 2014b, 2015a, 2015b); EPA (1990, 1993, 1995, 1998, 1999, 2005a, 2005b, 2005c, 2006a, 2006b, 2010, 2018); Integrated Management Center (2018); Monsanto Company (2010. 2015); National Center for Biotechnology Information (2018); Tatum (2004); USFS (2004a, 2004b, 2004c); U.S. National Library of Medicine (2018); Universal Crop Protection Alliance, LLC (no date); Woodward (1982)

Conservation Measures

The following conservation measures will be implemented to protect federally listed species. General conservation measures for reducing disturbance and impact, and for the application of herbicide are listed, followed by measures specific to Canada lynx, wolverine, Mexican spotted owl, cutthroat trout, and Arapahoe snowfly. A synopsis of label contents pertaining to the application of each herbicide currently used or proposed is presented in Table 2.

General

- Inventory for exotic invasive species populations will be as accurate as possible to minimize the disturbance footprint that will result from mechanical and manual removal and application of herbicides.

- If cultural practices can be used alone, or in concert with herbicide application or mechanical control, to successfully eradicate or reduce invasive exotic plant infestations, these methods will be explored and implemented.

- Herbicides will not be applied directly to water. All herbicides will be applied in accordance with the label and with consideration of effects on water and aquatic organisms and vegetation. A synopsis of label contents pertaining to the application of each herbicide is presented in Table 2.

- Only herbicide formulations labeled as practically non-toxic for aquatic species will be used for spraying in riparian ecosystems, wetlands, or water influence zones adjacent to greenback cutthroat trout populations or within Arapahoe snowfly habitat.

- Within riparian and wetland areas, spot treatments will be conducted with a wand or wick applicator based on herbicide labels and recommendations from the NPS Intermountain Region IPM Coordinator.

- Herbicides with the potential to persist in soils, leach into groundwater, or disperse through the ground (see Table 2) will not be applied in areas where the water table is high.

- The park will monitor treated areas to determine the effectiveness of the herbicide in accordance with the park document “Vegetation Monitoring: Project Design, Field Methods, Data Analysis, Reporting” (NPS 2014). Monitoring of treated areas may be conducted with other governmental and nongovernmental organizations and academic partners. These partnerships, as well as literature reviews, may aid in the design and implementation of effectiveness monitoring. In many cases, simple photo monitoring or other newer technologies may be sufficient to determine the effectiveness of treatments.

- The park will ensure that all herbicide applicators can identify federally listed plant and animal species in the area.

- Equipment washing and disposal of excess herbicides will be done according to label and away from surface water sources.

- To prevent environmental contamination and exposure of nontarget species to toxins, herbicides will be applied in the smallest amount necessary for effective treatment and application will be localized to target species whenever possible.

- To reduce effects on nontarget species, spot treatments that are applied to exotic invasive species individuals or populations will be the most common method of application. Broadcast treatment (uniform application over an entire area) will only be considered for the most severe infestations, such as when a monoculture of invasive exotic plants is present.

- To reduce effects on nontarget species, herbicides that target specific species or functional groups will be used when effective and available. Broad-spectrum herbicides will only be used when no specific herbicides will successfully meet management objectives. This approach may depend on climate conditions, which could change the timing of phenology for certain species.

Canada Lynx

- All project activities will adhere to all relevant conservation measures outlined in the Lynx Conservation Assessment and Strategy (Interagency Lynx Biology Team (ILBT) 2013).

Wolverine

- If a wolverine or evidence of wolverine is observed, work in the area will cease until surveys are conducted to verify presence and potential denning areas. If confirmed, work will be avoided during the critical breeding and denning timeframe and in future years, surveys will occur prior to work. If surveys detect a wolverine near target treatment areas, the park would consult with the USFWS before proceeding with treatments.

- Herbicide application will specifically avoid spraying carcasses or in the immediate vicinity of carcasses.

Mexican Spotted Owl

- No Mexican spotted owl (MSO) or nesting have been documented in the park but MSO have the potential to expand into the park. The Park is working continuously with USFWS to refine the definition of potential nesting habitat based on observed nesting of MSO in Colorado. Work will be avoided in potential MSO nesting habitat and the adjacent area to buffer impacts of noise producing equipment for application during the critical breeding and nesting timeframe from March 1 through August 31. If this

timeframe cannot be avoided surveys for MSO in theses treatment areas will take place and treatment may proceed if no MSO are present.

- Prior to spraying, maps of potential MSO habitat will be provided to staff and contractors.

- If surveys detect a Mexican spotted owl near target treatment areas, the park would consult with the USFWS before proceeding with treatments. If nests are identified but not active, the park will consult with the USFWS on proposed actions and guidance on whether work can proceed.

Greenback Cutthroat Trout

- Any invasive exotic plant control activities that could impact this species will be avoided. Herbicide use will follow label instructions, which include protecting waters by not using herbicides in standing or flowing water. In addition, applicators will ensure that no airborne drift gets into waterways or lakes.

- Only herbicides that are practically non-toxic to fish and other aquatic organisms will be used within the water influence zone (see Table 2).

- If fish mortality or distressed and unusual behavior is observed, spraying will cease and the park will consult with USFWS.

- NPS or USFWS wildlife biologists will conduct site reviews during peak spawning and reproduction periods. The most critical time for greenback cutthroat trout is spawning through hatching based on when most offspring are lost in hatchery settings (Bryan Johnson, unpublished data). Greenback cutthroat trout spawn in the spring. The timing of spawning is driven by temperature with onset of spawning occurring once mean daily water temperature remains above 5C throughout an entire week (Kennedy 2016). In Rocky Mountain National Park the onset of spawning ranges from mid-May to mid-July. Eggs hatch in approximately 1.5 months and timing to hatch was consistent between the earliest and latest spawning sites (Chris Kennedy, unpublished data). Based on these data the critical timeframe to avoid spraying hear greenback cutthroat streams or lakes is May 15 – August 31.

Arapaho Snowfly

- NPS or USFWS wildlife biologists will conduct site reviews before the park conducts invasive exotic plant management activities in areas adjacent to Arapaho snowfly habitat. Any invasive exotic plant control activities that could impact this species will be avoided.

- To reduce the risk of take, manual, mechanical, and chemical control activities in Arapaho snowfly suitable habitat will take place only during summer months, when this species is inactive.

- Herbicide use will follow label instructions, which include protecting waters by not using herbicides in standing or flowing water. In addition, applicators will ensure that no airborne drift gets into waterways or lakes.

- Only herbicides that are practically non-toxic to aquatic invertebrates will be used within the water-influence zone in potential Arapaho snowfly habitat to reduce the risk that nymphs or adults will be exposed to herbicide residue on water, soil, or detritus.

DESCRIPTION OF THE ACTION AREA

The action area includes all areas where threatened, endangered, candidate, or proposed species may be directly or indirectly affected by the proposed action. The action area is defined as the entirety of the park, as the proposed action will be a parkwide management plan. Areas where exotic species are concentrated have been identified, although the proposed action will enable the park to identify areas where management will be prioritized in the future (Figure 3).

The action area elevation ranges from 7,800 feet to more than 12,000 feet above sea level, and includes riparian and wetland, montane, subalpine, and alpine habitats. There are approximately 1,000 known vascular plant species in the park and hundreds of wildlife species. The Rocky Mountains' north-south orientation and abrupt changes in elevation influence the climate of the park and surrounding areas. The western slopes tend to experience greater precipitation, while the eastern slopes are warmer and dryer, which contributes to distinct vegetation communities across the park (NPS 2006).

Major vegetation types in the park include ponderosa pine (*Pinus ponderosa*) woodlands and shrub/grasslands at lower elevations, lodgepole pine (*Pinus contorta*) forests and Engelmann spruce (*Picea engelmannii*)/subalpine fir (*Abies lasiocarpa*) forests at higher elevations, and alpine tundra above 11,500 feet (NPS - RMNP 2003). Aquatic and riparian areas occur along the 147 lakes and 450 miles of streams scattered throughout the park (NPS 2006).

At least 42 exotic plant species are known to occur in the park. Only 35 exotic plant species were documented in 2003 (NPS 2003). The largest concentrations of invasive exotic plants occur around developed areas in the lower elevations of the park. Higher elevation areas have been thought to be outside the range for exotic species establishment; however, yellow toadflax, spotted knapweed, and curly dock have been found at subalpine and alpine elevations near Trail Ridge Road (NPS 2003). Aquatic and riparian areas throughout the park are particularly susceptible to exotic plant infestation because of high human visitation rates and sensitivity to environmental stressors.

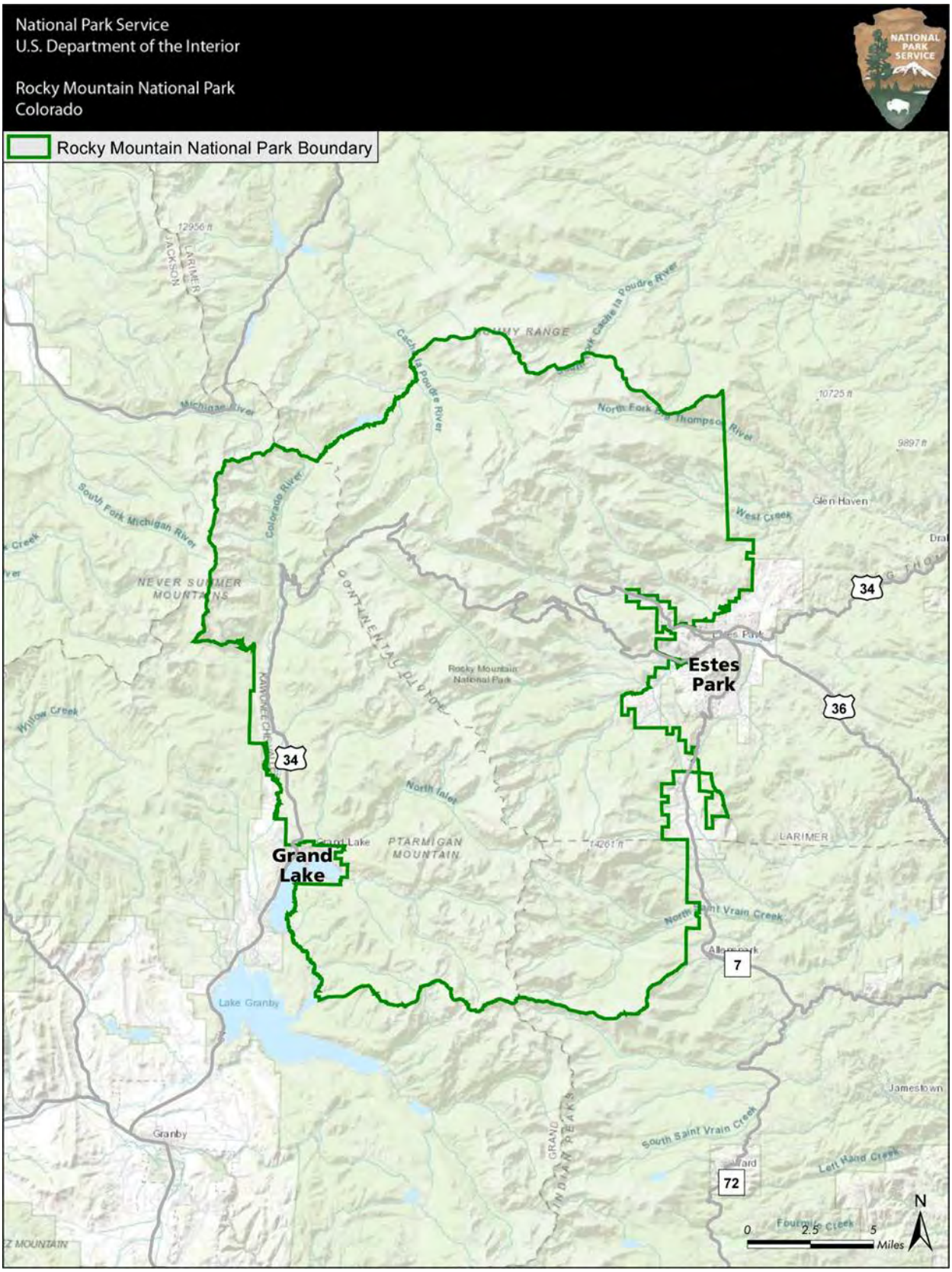

Figure 3. Action area, Rocky Mountain National Park.

SPECIES ACCOUNTS AND STATUS OF SPECIES IN THE ACTION AREA

Federally listed threatened, endangered, candidate, and proposed species potentially occurring in the action area are presented in Table 3. The USFWS species list (USFWS 2017a) was obtained and reviewed, and species not having the potential to occur in the action area were excluded from further review with a no effect determination.

Table 3. Threatened, endangered, and candidate/proposed species with the potential to occur in the action area.

Species Common and Scientific Name	Status[1]	Potential to Occur	Rationale for Exclusion[2]	Habitat Description and Range in Colorado
MAMMALS				
Canada lynx *Lynx canadensis*	T, CH	Yes	IALS	Canada lynx occur in boreal forest types and adjacent habitats with a high density of snowshoe hares. In the southern Rocky Mountains, Canada lynx occur within subalpine and upper montane forest zones, usually above 8,000 feet in elevation. Lynx use riparian areas during the fall. Lynx have been detected within the park. No critical habitat has been designated in the action area (USFWS 2017b). Potential lynx habitat is present throughout the park and portions of three LAUs (Upper Colorado, Estes, St. Vrain) overlap the action area. No critical habitat is present in the park.
Preble's meadow jumping mouse *Zapus hudsonius preblei*	T	No	ELE	Preble's meadow jumping mouse occurs in shrubby riparian and wet meadow habitat at elevations below 7,600 feet. The action area occurs outside of the known elevational range for the species.
North American wolverine *Gulo gulo luscus*	P	Yes	Included	Wolverines inhabit alpine and arctic tundra and boreal and coniferous mountain forests, especially large wilderness areas and areas with snow on the ground in winter. Wolverines may disperse through atypical habitat. Habitat for the wolverine is located within the park, but there are currently no known populations or individuals in Colorado (USFWS 2017c).
BIRDS				
Mexican spotted owl *Stix lucida occidentalis*	T	Yes	Included	The Mexican spotted owl inhabits coniferous mixed woodlands in isolated mountain ranges and canyonlands of the southwestern U.S. (USFWS 2012). No Mexican spotted owls have been documented in the park; however, nesting habitat is present on slopes with mixed conifer forests and steep canyons with streams and mixed conifer forests (Blakesley 2009). Potential MSO habitat is concentrated on the eastern border of the park and near Grand Lake on the western border of the park (Figure 4).

Species Common and Scientific Name	Status[1]	Potential to Occur	Rationale for Exclusion[2]	Habitat Description and Range in Colorado
Yellow-billed cuckoo *Coccyzus americanus*	T	No	ELE	In the western U.S., this species breeds in large blocks of riparian habitats, particularly woodlands with cottonwoods and willows. The park is above the elevation range for the cuckoo and does not provide suitable habitat (Hughes 1999; NatureServe 2017).
FISH				
Greenback cutthroat trout *Oncorhynchus clarkii stomias*	T	Yes	Included	Cutthroat trout are found in cold, clear, gravelly headwater streams and mountain lakes. This species inhabits clear, swift-flowing mountain streams with cover such as overhanging banks and vegetation. Juveniles tend to shelter in shallow backwaters and in lakes (NatureServe 2017). Greenback cutthroat trout spawn in riffles and still water. Originally, this species was thought to be limited to streams and lakes in the mountain and foothill areas of the South Platte River system. Consultation is required on certain pure cutthroat populations on both sides of the Continental Divide. Pure populations are known within the park (Figure 5).
INSECTS				
Arapahoe snowfly *Arsapnia arapahoe*	C	Yes	Included	Very little is known about the environmental conditions suitable for Arapahoe snowfly to survive and persist (Young et al. 2016). This species is known to inhabit first, second and fourth-order tributaries with steep slopes in five drainage basins in Larimer, Boulder and Jefferson Counties (Fairchild et al. 2017). Vegetation communities associated with habitat include ponderosa pine, cottonwood, willow and riparian vegetation. Inhabited streams generally have pebble, cobble, or bedrock substrates (Nelson and Kondratieff 1988). Habitat for this species has been identified within the eastern park boundary (Figure 6).
PLANTS				
Colorado butterfly plant *Gaura neomexicana* spp. *coloradensis*	T	No	ELE	Colorado butterfly plant occurs in moist to wet alluvial meadows and riparian areas within a known elevational range of 5,000 to 6,400 feet. The action area is outside of the known elevational range for this species.
Ute ladies'-tresses orchid *Spiranthes diluvialis*	T	No	ELE, ODR	Ute ladies'-tresses orchid occurs in low elevational riparian areas with the closest occurrences in the Boulder Creek and Clear Creek drainages near Boulder and Golden, respectively.

[1] **Status Codes**: **E**=federally listed endangered; **T**=federally listed threatened; **C**=federal candidate for listing; **P**=federally proposed for listing; **EXP**=nonessential experimental population; and **CH**=designated critical habitat.
[2] **Exclusion Rationale Codes**: **ODR**=outside known distributional range of the species; **ELE**=outside of elevation range of species; and **IALS** = Inter-Agency Lynx Screens used.

As indicated in Table 3, the wolverine, Mexican spotted owl, greenback cutthroat trout, and Arapahoe snowfly are the only federally listed threatened, endangered, candidate, or proposed species with the potential to occur in the action area and do not have a pre-existing streamlined consultation process. Therefore, only these four species are addressed hereafter in this BA.

Wolverine

Species Background

The distinct population segment (DPS) of the North American wolverine inhabiting the contiguous United States was proposed for listing as threatened under the ESA on February 4, 2013 (USFWS 2013). On August 14, 2014, the USFWS withdrew the proposal to list the DPS as threatened (USFWS 2014b); however, the USFWS's withdrawal of the Proposed Rule to list the DPS of North American wolverine was vacated by the courts on April 4, 2016. The USFWS returned the wolverine to proposed status in May 2016.

Wolverines are widely distributed in Canada and Alaska, with smaller populations in the contiguous U.S. in Montana, Idaho, and Wyoming. In the northern part of their range, wolverines occur in a wide variety of arctic, subarctic, and alpine habitats. Wolverines can occupy extensions of boreal forests in montane regions and shift elevation seasonally, potentially driven by prey abundance (Copeland et al. 2010). Approximately 300 individuals occur in the contiguous U.S., with the majority occurring in the northern Rocky Mountains (USFWS 2011). Although a viable wolverine population once occurred in Colorado, the state's last confirmed historic wolverine sighting was in 1919. In recent years, a male wolverine traveled from Wyoming and spent several years in Colorado (2009-2012) including utilizing habitat inside the park before traveling to North Dakota where he was eventually shot and killed. Colorado has the potential to support approximately 100 individuals given the amount of alpine habitat available in the state (CPW 2017).

Wolverines do not appear to specialize on specific geological or vegetation habitat attributes, but instead select areas with deep, persistent, and reliable spring snow cover (April 15 to May 14) (USFWS 2016). Wolverine year-round habitat use takes place almost entirely within the area defined by deep, persistent spring snow (USFWS 2013). Denning occurs between February and May. No records exist of wolverines denning anywhere but in snow, despite the wide availability of snow-free denning opportunities within the species' range (USFWS 2013, 2014b; Copeland et al. 2010).

Wolverines require large areas of suitable high-elevation habitat and have home ranges between 150 and 500 square miles. Wolverines are opportunistic feeders and consume a variety of foods, including carrion, small mammals and birds, fruits, berries, and insects (USFWS 2015). When inactive, wolverines occupy dens in caves, rock crevices, under fallen trees, in thickets, or similar sites (NatureServe 2017).

Habitat and Occurrence in the Action Area

The following wolverine habitats are present in the park, according to a model developed by Inman et al. (2003): maternal habitat, primary habitat, female dispersal habitat, and male

dispersal habitat. Primary habitat is defined as areas suitable for survival/use by resident wolverines; maternal habitat occurs in higher quality habitat. Males typically disperse more than females and use lower quality habitat for dispersal (Inman et al. 2013).

The park has riparian, boreal, and coniferous mountain forest habitat, and has snow cover during winter months. In 2009, an individual male wolverine dispersed from Wyoming to Colorado (CPW 2011). This wolverine was detected within the park and on adjacent USFS land between 2009 and 2011 along the Continental Divide, indicating the park has suitable habitat to support wolverine populations (CPW 2011).

Mexican Spotted Owl

Species Background

The USFWS listed the Mexican spotted owl as threatened on March 16, 1993 (58 Code of Federal Regulations (CFR) 14248). The Mexican spotted owl ranges throughout Utah and portions of Colorado, Arizona, Texas, New Mexico, and Mexico and is typically found between 6,000 and 9,350 feet in elevation. Threats include historic and continued habitat alteration from timber harvest practices that produce and maintain even-aged forest stand conditions. The Mexican spotted owl is also threatened in some areas by the potential for high-severity stand-replacing fire (USFWS 2012). Key habitat components for Mexican spotted owls in forested environments consist of very large trees (greater than 24 inches in diameter), large trees (18 to 24 inches in diameter), large snags, large down logs, and hardwoods with multilayered canopies (USFWS 2012).

The nesting season for the Mexican spotted owl is March 1 through August 31, during which time a mated pair occupies a breeding territory. Mexican spotted owls nest on cliff ledges and caves, in stick nests built by other birds, in tree nests, and in tree cavities (Ganey and Balda 1989). Tree nests are constructed on platforms such as old squirrel nests or other raptor nests, in cavities formed by broken off branches or tops, and on witches' brooms formed by dwarf mistletoe (*Arceuthobium* sp.). Mexican spotted owls typically lay eggs in early April. Incubation lasts approximately 30 days, during which time the female rarely leaves the nest. Eggs usually hatch in early May and the owlets fledge four or five weeks after hatching in early to mid-June (Ganey 1988). Dispersal typically occurs in September through early October (Ganey et al. 1998). Mexican spotted owl prey consists primarily of small mammals (USFWS 2012).

Critical Habitat

On August 31, 2004, the USFWS issued a final rule designating critical habitat for the Mexican spotted owl (69 FR 53182). Critical habitat boundaries were expanded with the final rule. Critical habitat only includes occupied and recovery habitat (USFWS 1995, 2012). Occupied habitat includes Primary Activity Centers (PACs), which consist of a minimum of 600 acres around a nest site and a roost grove (USFWS 2012). The park does not fall within Mexican spotted owl critical habitat, but critical habitat recovery units and PACs are located south of the park in Jefferson and Douglas Counties on USFS land.

Habitat and Occurrence in the Action Area

Within the park, three classes of Mexican spotted owl habitat are present: nesting, roosting, and foraging (Figure). Nesting habitat is within canyons and in densely forested areas. Roosting habitat consists of areas with large trees outside of nesting habitat. All other areas where Mexican spotted owls may hunt small mammals are considered foraging habitat. Mexican spotted owl habitat is concentrated on the eastern park boundary, with a small habitat patch on the western boundary near Grand Lake. Mexican spotted owl surveys within the park were conducted in 2007 and 2008 in potentially suitable habitat (Blakesley 2009). An additional survey for Mexican spotted owls took place in 2014 in the Alluvial Fan Trail area. No Mexican spotted owls were observed during these surveys. Because of the presence of habitat and proximity to PACs and critical habitat, it is possible Mexican spotted owls could be present in the park, although none have been documented.

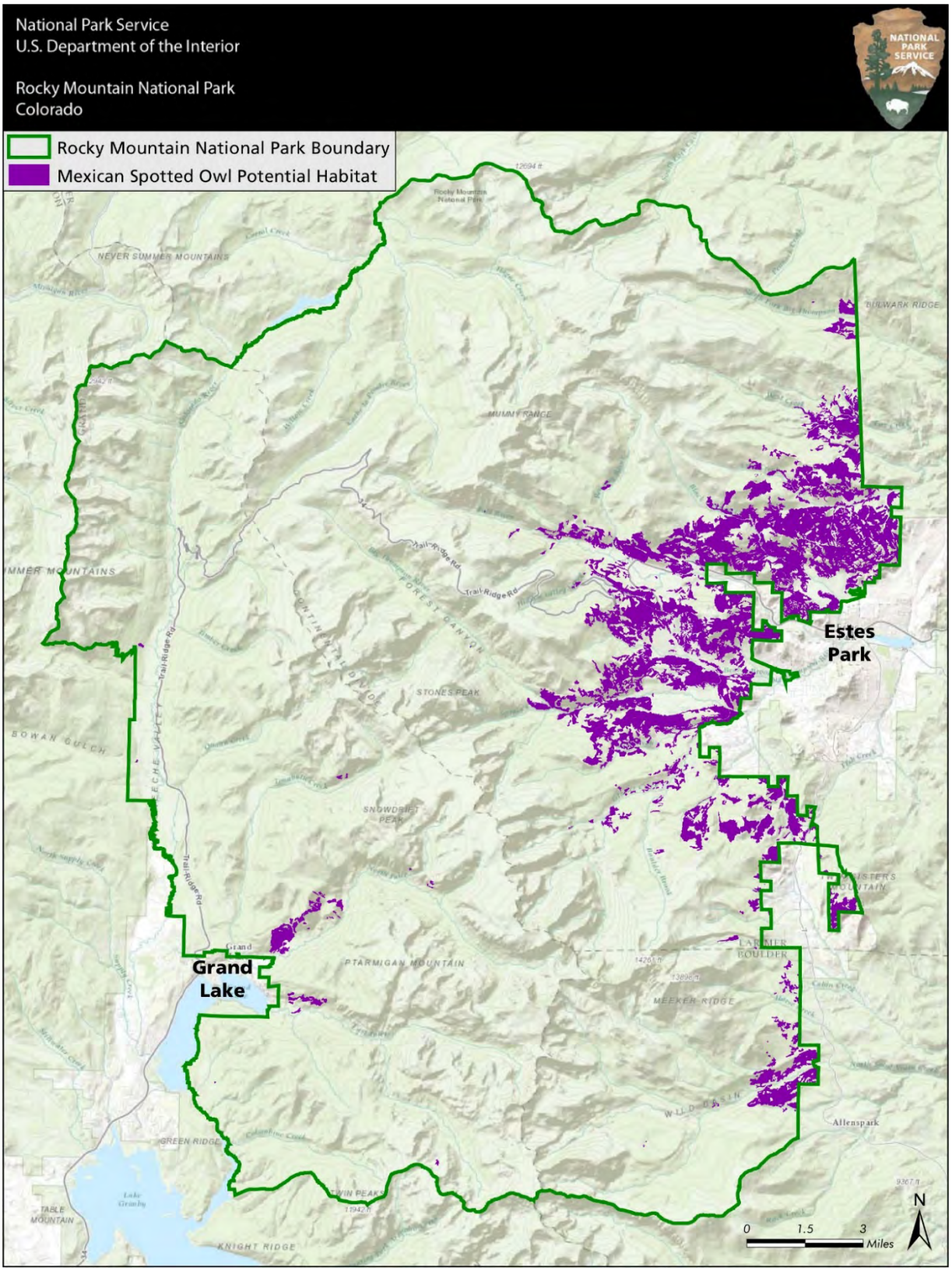

Figure 4. Mexican spotted owl habitat within the park.

Greenback Cutthroat Trout

Species Background

With the enactment of the ESA in 1973, the greenback cutthroat trout was listed as endangered but subsequently downlisted to threatened in 1978 (Young et al. 2002). Until recently, the greenback subspecies was believed to occupy the mountain and foothill areas of the Arkansas and South Platte River basins (Dare et al. 2011). Recent research has delineated six distinct lineages that historically occurred in Colorado, with the greenback cutthroat trout only occupying the South Platte River drainage (Metcalf et al. 2012). The remaining lineages include the Yellowfin and San Juan (both extinct); the green lineage, which historically occurred in the Colorado River and Gunnison River drainages; the blue lineage (Colorado River cutthroat trout), which historically occurred in the Yampa River drainage, and the Rio Grande, which is native to the Rio Grande drainage. Currently, all pure cutthroat east of the Continental Divide that are greenback cutthroat trout, green lineage, or blue lineage are consulted on as if they are greenback cutthroat trout. West of the Continental Divide, any pure greenback cutthroat trout or green lineage populations are consulted on as if they are greenback cutthroat trout. In this BA, these populations will be analyzed as a group using the term greenback cutthroat trout. A pure population is considered a population that is 80% pure by mitochondrial or nuclear DNA.

Cutthroat trout are found in mid- to high-elevation streams with high gradients (Dare et al. 2011). They thrive in cold, clear, gravelly headwater streams and mountain lakes. Temperature is the most important habitat variable. Cutthroat spawn in water temperatures between 5 degrees and 8 degrees Celsius (USFWS 1998a; Coleman 2007). If the water is too warm or too cold, juveniles cannot survive (Dare et al. 2011). The biggest threat to the persistence of greenback cutthroat trout is nonnative rainbow and brook trout (*Oncorhynchus mykiss* and *Salvelinus fontinalis*). Rainbow trout can hybridize with cutthroats, diluting the genetic pool; and juvenile brook trout are better competitors compared with juvenile cutthroats.

Habitat and Occurrence in the Action Area

Reintroduction of cutthroat and removal of competitor nonnative species within the park since the early 1970s has allowed the spread of greenback cutthroat trout into numerous drainages. Populations inhabit many of the park's high-elevation streams and tributaries, on both the western and eastern sides of the Continental Divide (Figure 5). Populations occur in 25 lakes and numerous stretches of streams and creeks. Populations have been observed migrating short distances from lakes and ponds to inlet and outlet streams to spawn (Coleman 2007). Within the park, stocking does not occur to maintain populations. Existing populations are primarily self-sustaining. Some high-elevation introduced populations are declining over time because limited recruitment is not sufficient to maintain the population (Kennedy 2016).

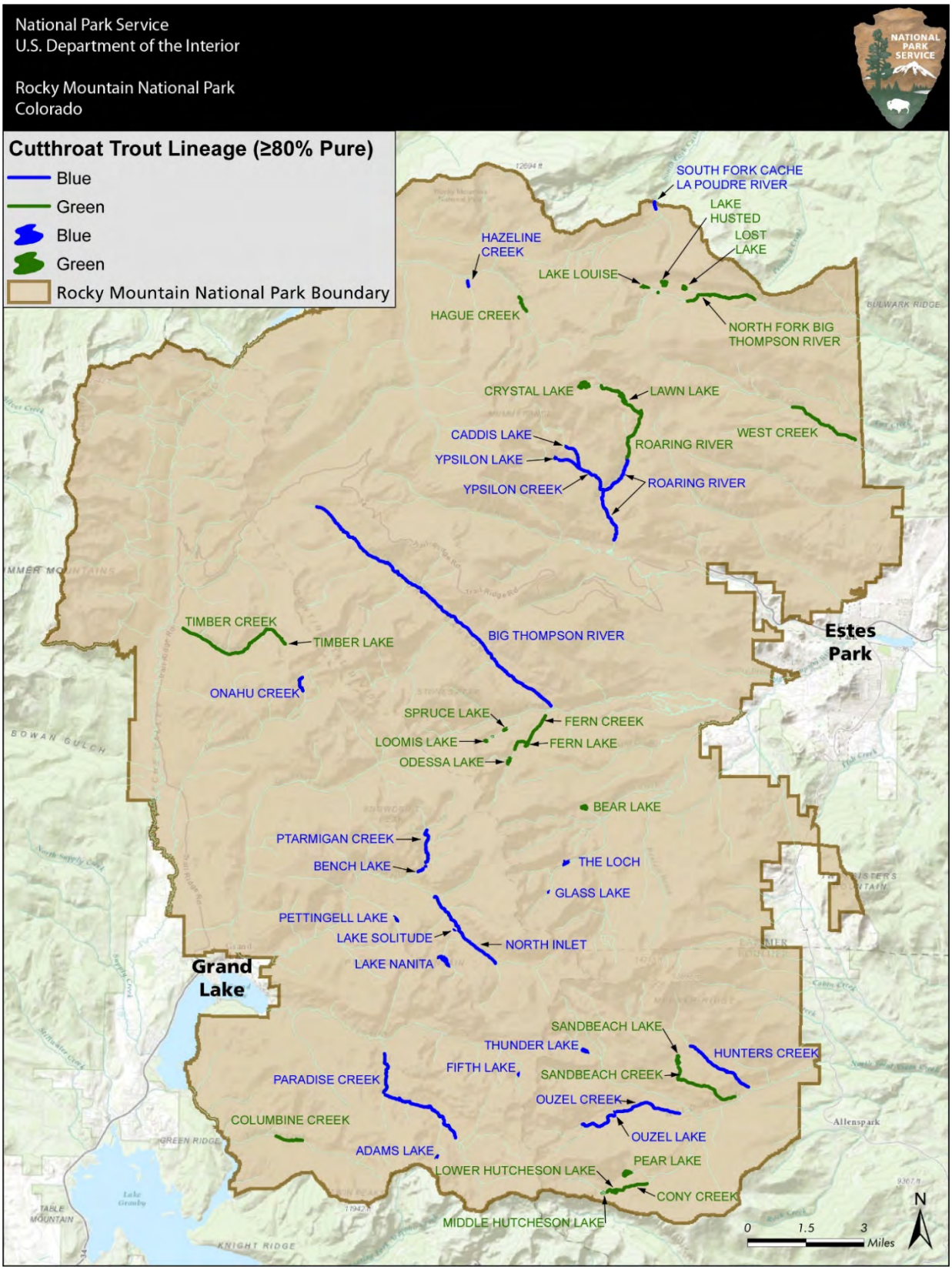

Figure 5. Green- and blue-lineage cutthroat populations within the park.

Arapahoe Snowfly

Species Background

On May 10, 2012, the USFWS added the Arapahoe snowfly to the list of candidate species for federal listing (USFWS 2012). The species was determined to warrant listing but was precluded by higher priority species for listing. The Arapahoe snowfly is endemic to central Colorado and is known to occur in only 21 streams within the South Platte River watershed (Fairchild et al. 2017; Verdone and Fairchild 2017). Very little is known about this species because only a few individuals have been found and it was discovered in 1986 (Nelson and Kondratieff 1988; Belcher 2014). It is a small winter stonefly in the *Capniidae* family.

Winter snowflies generally require cool temperatures for development. Young nymphs hatch in early spring. As the water temperatures increase, nymphs migrate into the loose rocky substrate under the stream saturated with water (hyporheic zone) and undergo an inactive period (diapause) until the water cools in late fall and winter, when they complete development. Dark-colored adults emerge in late winter or early spring and their dark-colored bodies can be easily visible as they crawl across the snow (Nelson and Baumann 1989). The specific feeding behavior of Arapahoe snowfly nymphs has not been observed, but most small winter snowflies feed by shredding detritus. Snowfly nymphs are generally found in leaf packs or woody debris (Merritt et al. 2008). Snowfly species generally only produce one generation per year. Snowflies are an ecologically important species, as they are a food source for temperate-region insectivores during fall, winter, and spring months when few other groups of arthropods are active (Ross and Ricker 1971).

The streams where Arapahoe snowflies have been documented are described as first, second, and fourth order streams with steep slopes in five drainage basins in Larimer, Boulder, and Jefferson Counties (Young et al. 2016; Verdone and Fairchild 2017). Vegetation communities around these streams include ponderosa pine, cottonwood, willow, and other riparian vegetation. Known occupied streams have pebble, cobble, or bedrock substrates that support a hyporheic zone for the young during the warm months (Young et al. 2016). Limited species occurrence data and modeling indicate Arapahoe snowfly habitat occurs at elevations between 5,575 and 6,900 feet, and is more likely to occur in areas that receive greater than 8.7 inches of spring precipitation per year. Suitable habitat is modeled along streams within the foothills of the Front Range (Young et al. 2016). Arapahoe snowfly was observed in 11 previously unknown locations in 2017 (Verdone and Fairchild 2017).

This species' limited habitat is threatened with degradation and destruction from extensive recreational use and increasing development pressures in the 21 streams from which it is known. Research is needed on assessing and strengthening current management practices for existing habitat and evaluating the population size, distribution, and stability in known occurrence areas.

Habitat and Occurrence in the Action Area

Suitable habitat for Arapahoe snowfly is present within the park on the eastern boundary near Estes Park, along streams within the South Platte River watershed (Figure 6). Habitat within the park occurs at lower elevations, in the Big Thompson River, Black Canyon Creek, Cow Creek;

and Beaver Brook. While Arapahoe snowfly has not been documented in the park, it is possible that it could be present in suitable habitat.

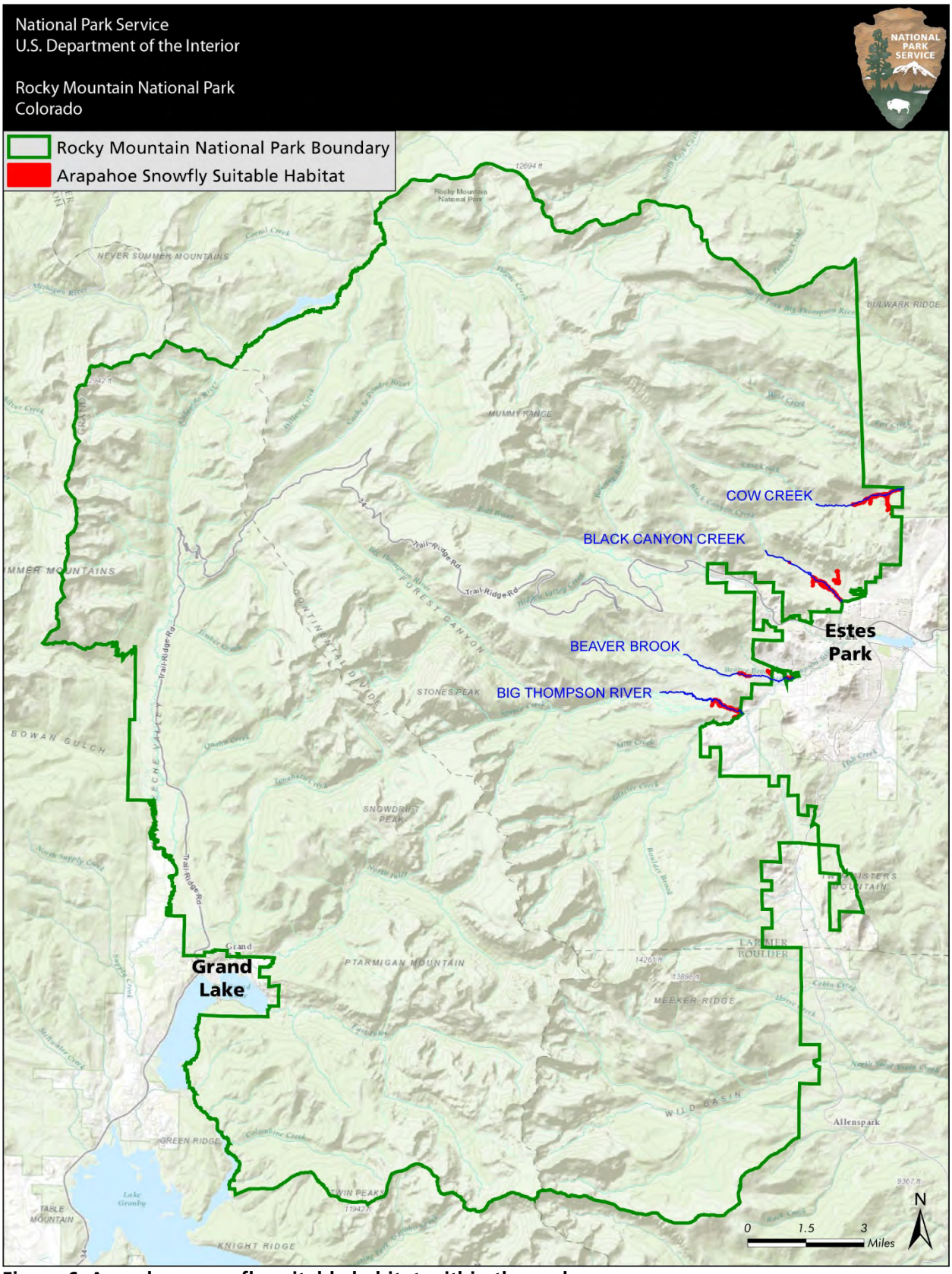

Figure 6. Arapahoe snowfly suitable habitat within the park.

ENVIRONMENTAL BASELINE

As defined under the ESA, the environmental baseline includes past and present impacts of all federal, state, and private actions in the action area; the anticipated impacts of all proposed federal actions in the action area that have undergone formal or early Section 7 consultation; and the impact of state and private actions that are contemporaneous with the Section 7 consultation process. Future actions and their potential effects are not included in the environmental baseline.

Past and current actions in the action area include exotic plant species management under the 2003 plan, periodic road construction and maintenance activities, trail maintenance and evaluation, trail closures, and expansion of visitor facilities and services. Construction of paved and unpaved roads in the park have resulted in removal of vegetation within the road corridor and fragmentation of habitat. Ongoing use of these roads creates noise from traffic and the potential for vehicle collisions with wildlife.

Wildfires and fire suppression have resulted in changes to the forest structure. Most recently, the Big Meadows Fire of 2013 burned approximately 700 acres within a remote area near the western boundary. The Fern Lake Fire of 2012 was started by an illegal campfire and burned more than 3,500 acres of rugged terrain over the course of two months. Both of these recent fires and the firefighting efforts were intensified by drought conditions and fallen beetle-killed trees.

Federal actions for which consultation has been completed include the Fire and Fuels Management Activities Plan in the park (Fire Management Plan) (NPS and USFWS 2012), the Environmental Assessment for the Management of Snowmobiles in the park (June 2002), the Elk and Vegetation Management Plan (NPS 2007), the Bark Beetle Management Plan (NPS 2005), and the Long Draw Environmental Impact Statement [USFS 2009]. The BA/Biological Opinion (BO) for the Fire Management Plan, issued on May 25, 2012, found that the project may affect, but is not likely to adversely affect, greenback cutthroat trout and Mexican spotted owl and is likely to adversely affect Canada lynx. Activities included in the Fire Management Plan, implemented in 2012, include use of fire and manual and mechanical treatments to remove trees and vegetation to prevent and reduce the risk of catastrophic wildfire events and to achieve landscape goals, such as the control of exotic species (NPS 2012). The Bark Beetle Management Plan calls for a variety of treatments including mechanical, cultural, prescribed fire, and chemical. In potential lynx habitat, sanitation (removal of individual beetle-infested trees) would be limited to within 150 feet of roads or parking lots. The plan includes the use of a chemical/insecticide to protect high value trees in developed areas of the park. Carbaryl would be sprayed on the trunks of individual healthy trees as a bark beetle repellant. A maximum of 1,000 trees could be treated each year under the original Environmental Assessment; however, this number was amended in 2008 to increase the limit to 6,500 trees. In potential lynx habitat, insecticide use would only occur within 150 feet of roads or parking lots. Sanitation and removal of hazardous trees that had been affected by bark beetles occurred in 2005 to present. Chemical spraying occurred within the park 2006 through 2016. The park approved a Snowmobile Management Plan EA [NPS 2002] that closed 16 miles of Trail Ridge Road to snowmobile use. One of the reasons for the closure was to protect Canada lynx winter habitat.

In addition, other recreational activities occur primarily in nonmotorized forms such as hiking, camping, fishing, sightseeing, biking, horseback riding, cross-country skiing, snowshoeing and

rock climbing. Bicycles are allowed on roads and in campgrounds; they are generally not permitted on park trails. An exception is a two mile segment on the northern section of the East Shore Trail where bicycles will be allowed once trail modifications are complete. There are more than 350 miles of designated hiking trails. Off-trail hiking can occur throughout the area, but hiking is concentrated along designated trails. Horseback riding and the use of llamas are only allowed on designated trails. All-terrain vehicles and off-highway vehicles are not allowed anywhere within the park boundary. Dogs and pets can only use park roads, picnic areas, parking lots, and campgrounds and have to be leashed. Dogs and pets are not permitted elsewhere within the park. The park is closed to hunting, but land that is now a part of the park was subjected to hunting before the park was established.

Most private land adjacent to the park boundary is already developed. Private inholdings within the park are not being significantly altered or developed. Three resorts operate close to the park boundary. They are the Rocky Mountain Gateway on the park boundary along Highway 34, the YMCA of the Rockies located adjacent to Emerald Mountain, and the Wild Basin Lodge. The YMCA of the Rockies offers a wide range of recreational opportunities, including horseback riding in the park. The Rocky Mountain Gateway and Wild Basin Lodge also offer horseback rides into the park.

Since 1994, 32 prescribed fires have been conducted, covering approximately 1,150 acres (park files). From 2003 to 2015, 2,661 acres of slash pile burning in fuel thinning areas has occurred averaging about 210 acres per year.

No livestock grazing has occurred since the land became part of the park.

Although the acreages are unknown, homeowner associations and private landowners that own land adjacent to the park have been sporadically implementing small fuels reduction projects since about 1979, following the Ouzel Fire. Since the late 1990s, efforts in fuels reduction have advanced on both private and federal lands. The 2001 Interior Appropriations Act (H.R. 4578) and the President's Fire Initiative (known as the National Fire Plan) provided the opportunity to expand fuels management treatments, which is the first major attempt to address fuels reduction in high fire risk areas.

Four water diversions (Grand Ditch, Harbison Ditch, MacGregor Ranch and Copeland Lake) and three dams (Lily Lake, Sprague Lake and Copeland Lake) are within the action area. All other streamflows in the park are natural. The East Portal (the downstream end) of the Alva B. Adams tunnel is located on the park boundary. The tunnel diverts water from the Colorado River basin near Grand Lake and under the Continental Divide to the Big Thompson River drainage near Estes Park. The diverted water is primarily used for irrigation, hydroelectricity, recreation, fisheries, wildlife, municipal, and commercial purposes downstream of the park.

Changes in flow regimes due to snowmelt or heavy thunderstorms are the most common effects on the Big Thompson River, Fall River, and North St. Vrain Creek in the spring and summer. Normally, low flows occur in late summer and during the winter. The flow regime of the Colorado River has been altered by the Grand River Ditch, a transmountain diversion that was constructed starting in the 1800s. Private inholdings in the Kaley Cottage area (located on the south side of Moraine Park) and private inholdings on the west side of the park have residential well permits that allow 1 acre-foot (326,000 gallons of water per year). For NPS-administered

waters, the park acquired Federal Reserve Rights for the east side of the park in 1992 and for the west side in 1995 (park files).

EFFECTS ANALYSIS

Canada Lynx

Noxious weed treatments are a pre-screened activity listed in the Inter-Agency Southern Rockies Lynx Project Decision Screens, pre-screen 2 (2014). These activities have been determined to have No Effect on Canada lynx.

Wolverine

Wolverines are known to be sensitive to human disturbances. Direct and indirect effects could include individuals being temporarily displaced during periods when controls are being implemented, especially manual or mechanical controls. The proposed action may result in slight increases to human activity and noise. This is especially likely if mechanical or manual controls are implemented. Although wolverines are unconfirmed in the action area, if they occur, increased noise levels could displace or alter their movements.

Impacts on wolverine habitat from mechanical, manual, and herbicide treatments will be negligible because these actions will be small, localized, and selective. Herbicide spot treatments will be targeted to nonnative vegetation and have insignificant and discountable impacts on native vegetation or the broader plant community. Broadcast application of herbicide will only be used under the most severe circumstances, such as on monocultures of exotic invasive plants and if other controls are not effective. If broadcast application is needed in occupied wolverine habitat, a review by park biologists will occur before any activity begins. The proposed action will not result in permanent removal of vegetation, will not affect snow cover, and will have an overall insignificant impact on habitat for wolverines or their prey. In areas where exotic invasive plant species are removed, monitoring and reclamation will include restoring native vegetation, which may improve wolverine habitat.

The herbicides proposed for use generally have low toxicity to terrestrial wildlife and would generally be applied in spot treatments to individual plants or small populations. Potential for wolverine to be exposed to herbicides would be reduced by implementing the conservation measures described above. If a wolverine or evidence of a wolverine is observed, work in the area will cease until surveys are conducted to verify presence and potential denning areas. If wolverine presence is confirmed, work will be stopped until the wolverine leaves the area and in future years, surveys will occur prior to work.

Because wolverines are unlikely to occur in the park, and because the areas where exotic invasive plant species are likely to be located and prioritized for removal are lower elevation areas with greater human presence and where wolverines are unlikely to occur if they were in the park, it is not likely that a wolverine will be exposed to herbicide treatments or be affected by human activity associated with exotic invasive plant controls or management.

Mexican Spotted Owl

Potential direct and indirect effects on Mexican spotted owl include disturbance from exotic plant management activities, especially mechanical and manual controls and temporary loss of habitat for small mammal prey species. As discussed above for wolverine, the proposed action may result in slight increases to human activity and noise. This is especially likely if mechanical or manual controls are implemented. Activities would occur during the day, when owls are less active. Although Mexican spotted owls are unlikely to occur in the action area, increased noise levels could displace or alter the movements of any nearby owls.

Habitat impacts from mechanical, manual, and herbicide applications will be negligible because these actions will be small, localized, and selective. Spot treatments will be targeted to nonnative vegetation and will have insignificant and discountable impacts on native vegetation and the broader plant community. Broadcast application of herbicide will only be used under the most severe circumstances, such as on monocultures of exotic invasive plants and if other controls are not effective. If broadcast application is needed in occupied Mexican spotted owl habitat, a review by park biologists will occur before any activity begins. The proposed action will not result in permanent loss of vegetation and, thus, will not result in a loss of habitat for Mexican spotted owl or their prey. The long-term effects of removal of exotic invasive plant species and restoration of native vegetation communities will result in improvement of Mexican spotted owl and prey habitat. In areas of MSO habitat herbicides with no or low potential for bioaccumulation will be used unless no known suitable chemicals are available with those characteristics.

As discussed above for wolverine, the herbicides proposed for use would generally be applied in spot treatments to individual plants or small populations. Potential for Mexican spotted owls to be exposed to herbicides would be reduced by implementing the conservation measures. If a Mexican spotted owl is observed, work in the area will cease until surveys are conducted to verify presence and potential nesting areas. If Mexican spotted owl presence is confirmed, work will be stopped until they leave the area and NPS would initiate consultation with the USFWS. In future years, surveys will occur in confirmed nesting areas or in the vicinity of previous sightings prior to work.

As discussed above for lynx and wolverine, because the areas where exotic invasive plant species are likely to be located and prioritized for removal are areas where greater human presence occurs and where a Mexican spotted owl is not likely to be present, it is not likely that a Mexican spotted owl will be exposed to herbicide treatments or be affected by human activity associated with exotic invasive plant controls or management.

Greenback Cutthroat Trout

Potential direct and indirect effects on greenback cutthroat include exposure to herbicides that may be toxic for fish or for aquatic invertebrate prey. There are two primary paths for herbicides to enter surface waters, which provide habitat for greenback cutthroat trout. First is direct application of herbicide during treatment; second is indirect application by aerial drift, precipitation runoff, or by transport of soil containing herbicide into water resources. These paths will be avoided by implementing the conservation measures, including enforcing a water influence zone around streams, lakes, ponds, and rivers; and using preventive measures to reduce risk of contamination from runoff or drift. No broadcast application will be used in areas where surface water is present. Herbicides that have low to negligible toxicity to fish, such as

Aminopyralid and Metsulfuron, will be used when application near surface water (distance is defined by the EPA approved label) is necessary.

Although conservation measures will be in place, the potential for indirect exposure to herbicides will exist from aerial drift, runoff, or soil transport. Sensitivity of freshwater fish to herbicides is typically determined with an acute toxicity test using a cold water (e.g., rainbow trout) and warm water (e.g., bluegill) species. The test usually lasts 96 hours and is designed to determine the concentration in water required to cause 50% lethality (LC50) in a test population of fish. Because LC50 values are not readily available for cutthroat trout, values for the closely related rainbow trout are used. LC50 values for rainbow trout for each herbicide described above are shown in Table 4.

Table 4. Acute toxicity of herbicides to rainbow trout.

Herbicide	LC50 (ppm)*	Toxicity
Imazapic/Imazapyr (Plateau)	>100	Minimal/nontoxic
Aminopyralid (Milestone)	>100	Minimal/nontoxic
Chlorsulfuron (Telar XP)	250	Minimal/nontoxic
Dicamba/Diflufenzopyr (Overdrive)	28-135	Slight
Quinclorac (Quinstar 4L)	83.5	Slight
Indaziflam (Esplanade)	0.57	High
2,4-D Amine	100	Slight
Picloram (Tordon 22K)	26	Slight
Metsulfuron (Alligare MSM 60)	150	Minimal/nontoxic
Clopyralid (Alligare Clopyralid 3)	>100	Minimal/nontoxic
Triclopyr 4E	1.3	Moderate
Triclopyr 3A	600	Minimal/nontoxic
Glyphosate (Aquamaster)	>1000mg/L	Minimal/nontoxic[1]

*Source: USDA Regional IPM Centers Information Network 2017.

As described in the conservation measures, most herbicides would not be used within the water zone of influence; and the park's water bodies experience dilution as they converge and as precipitation events occur throughout the summer. The propensity of herbicides to degrade in water and when exposed to sunlight further reduces the risk of exposure. Dilution and rapid degradation of herbicides renders the risks of having a harmful amount of herbicide reach cutthroat negligible to none. The benefit to the park's watersheds from controlling exotic invasive species and restoring native vegetation communities and habitat outweighs the slight risk of exposure.

Arapahoe Snowfly

Potential direct and indirect effects on the Arapahoe snowfly include exposure to herbicides that may be for aquatic and/or terrestrial organisms. The toxicity of the herbicides considered for use in the park to aquatic organisms is summarized in Table 2. Conservation measures to reduce or eliminate risk of exposure will be implemented, including enforcing a water influence zone around streams, lakes, ponds, and rivers within snowfly habitat (Figure 6) and using preventive measures to reduce risk of contamination from runoff or drift. No broadcast application will be used in areas where snowfly habitat is present. No herbicides will be applied in Arapahoe snowfly suitable habitat during the early spring, fall, or winter, when Arapahoe

[1] Information for Aquamaster in the table comes from the Aquamaster Herbicide safety data sheet dated 5/29/2015.

snowflies are active. Care will be taken to avoid contaminating snow or water surfaces with pesticide residue.

Because this species undergoes diapause between late spring and early fall, during which time it is found in the hyporheic zone of streams and creeks, the likelihood that nymphs or adults will be exposed to herbicide drift carried by wind is negligible. Avoiding the water influence zone when using herbicides toxic to aquatic invertebrates, as defined under *Conservation Measures* and in Table 2, will also reduce risk that this species could be exposed to herbicide through runoff or drift reaching surface waters while nymphs are in diapause; or through detritus and leaf matter during their active stage in late fall and winter.

As with cutthroat, herbicides that have low to negligible toxicity for aquatic and terrestrial organisms, such as Aminopyralid and Metsulfuron, will be used when application within proximity to snowfly habitat is necessary. Likewise, herbicides that do not persist in soils and water, but degrade rapidly in water and sunlight will be preferred to those that do not degrade rapidly. Because very little is known about this species, the effects of any exposure are unknown. Herbicides that may be toxic to invertebrates, including to insects, will not be used in snowfly habitat.

As with cutthroat, the risk of some herbicide entering the watersheds within the park is small but present; however, the park's water bodies experience dilution as they converge and as precipitation events occur throughout the summer. Dilution and rapid degradation of herbicides render the risks of herbicide exposure to Arapahoe snowfly individuals or populations negligible to none. The propensity of herbicides to degrade in water and when exposed to sunlight further reduces the risk of exposure. The benefit to the park's watersheds from controlling exotic invasive species and restoring native vegetation communities and habitat outweighs the slight risk of exposure.

Cumulative Effects

Cumulative effects are the effects of past, present, and reasonably foreseeable future activities of state, local, or private actions in the action area. As defined under Section 7 of the ESA, the BA should consider:

> "Those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to consultation." [50 CFR § 402.02]

Cumulative effects only involve future actions. The past and present impacts of nonfederal actions are part of the environmental baseline. Future federal actions requiring separate consultation (unrelated to the proposed action) are not considered in the cumulative effects section" (USFWS 1998b). Section 7 only requires consideration of future private actions that are reasonably certain to occur.

The privately owned Grand Ditch on the west side of the park moves water from the west side of the Continental Divide to the east side and is within potential lynx habitat. It is not known what future actions may occur at the Grand Ditch and, therefore, it cannot be determined what the future effects on lynx may be. Private inholdings occur within potential Mexican spotted

owl habitat. There are no known future nonfederal actions planned within these inholdings and, therefore, the potential future impacts on Mexican spotted owl are unknown. There are no other known nonfederal activities in the action area; the action area is surrounded by federal lands. Future federal projects in the area will be addressed under separate Section 7 consultation.

EFFECTS DETERMINATION

Canada Lynx

No Effect. Noxious weed treatments are a pre-screened activity listed in the Inter-Agency Southern Rockies Lynx Project Decision Screens, pre-screen 2 (2014). These activities have been determined to have No Effect on Canada lynx.

Wolverine

A male wolverine traveled from Wyoming and spent several years in Colorado (2009-2012) including utilizing habitat inside the park in 2009 and 2010 before traveling to North Dakota. While there is suitable wolverine habitat throughout the park, no wolverines have been documented since 2010. The proposed action will result in short-term negligible impacts on native vegetation and, over the long term, will improve wolverine habitat by reducing the occurrence of nonnative invasive plant species. With implementation of conservation measures, the risk of exposure to herbicide is negligible to none.

The proposed action would not affect snow cover that could be used for denning. It is highly unlikely, and therefore discountable, that a wolverine will encounter increased human activity from the proposed action. The behavior of wolverines in the park may be slightly altered if one were to encounter human activity associated with the proposed action such as mechanical or manual removal of exotic plants; but these changes will be insignificant and will not result in take. For these reasons, the proposed action **will not jeopardize the continued existence of** the wolverine DPS.

Mexican Spotted Owl

There are no documented Mexican spotted owl observances within the park, although there is potentially suitable habitat and the park is located in reasonable proximity to Mexican spotted owl recovery units and protected activity centers (PACs). As with wolverine, the proposed action will result in short-term negligible impacts on native vegetation and, over the long term, will improve habitat by reducing the occurrence of nonnative invasive plant species. With implementation of conservation measures, the risk of exposure to herbicide is negligible to none.

Because proposed action activities are likely to be concentrated in areas where human activity takes place, the likelihood that a Mexican spotted owl would encounter proposed action activities and be disturbed is negligible. In the event a Mexican spotted owl is disturbed by

proposed action activities, such as mechanical or manual controls, the disturbance would be insignificant and would not result in take. For these reasons, the proposed action **may affect, but is not likely to adversely affect**, the Mexican spotted owl.

Greenback Cutthroat Trout

Greenback cutthroat trout are present in lakes, ponds, streams, and rivers throughout the park and are actively managed for population restoration. Habitat is present in most of the park's surface water bodies. The proposed action will result in negligible to no effects on the greenback cutthroat trout populations. Implementation of conservation measures such as water influence zones would reduce the risk of exposure to herbicides through runoff and drift. The propensity of herbicides to degrade in water and when exposed to sunlight, and the potential for dilution of water bodies, further reduces the risk of exposure. Herbicides used in proximity to water would have low to negligible toxicity and would be applied in low doses. While the risk of exposure is present, with the implementation of conservation measures, the risk of exposure to herbicides is reduced to negligible to none. There may be areas adjacent to streams and lakes that currently contain exotic plant species. Once these are removed the area may be without vegetation until native plants can re-establish. Greenback cutthroat trout obtain approximately half of their diet from terrestrial insects that rely on streamside vegetation. Additionally, there may be temporary loss of shading in these areas. These impacts would be insignificant and short-term. The elimination of exotic invasive species and reestablishment of native plants would result in beneficial effects on trout and their habitat. For these reasons, the proposed action **may affect, but is not likely to adversely affect**, the greenback cutthroat trout.

Arapahoe Snowfly

While no observations of Arapahoe snowfly have been documented in the park, suitable habitat is present within streams and drainages on the eastern park boundary (Figure 6). The proposed action will result in negligible to no effects on the Arapahoe snowfly. As with the cutthroat, implementation of conservation measures such as water influence zones would reduce the risk of exposure to herbicides through runoff and drift. The propensity of herbicides to degrade in water and when exposed to sunlight, and the potential for dilution of water bodies, further reduces the risk of exposure. Herbicides used in proximity to water would have low to negligible toxicity and would be applied in low doses. Water influence zones would be enforced in suitable habitat. While the risk of exposure is present and the response of the snowfly to exposure is unknown, with implementation of the conservation measures, the risk of exposure to herbicide is negligible to none. The elimination of exotic invasive species and reestablishment of native plants would result in beneficial effects on the snowfly and its habitat. For these reasons, the proposed action **may affect, but is not likely to adversely affect**, the Arapahoe snowfly.

Summary

The determination of effects for each species is summarized in Table 5.

Table 5. Determination of effects of the proposed action.

Species	Status	Determination of Effects[1]
Canada lynx	Threatened	NE
Wolverine	Proposed	NJ
Mexican spotted owl	Threatened	NLAA
Greenback cutthroat trout	Threatened	NLAA
Arapahoe snowfly	Candidate	NLAA

[1]**NE**=no effect, **NLAA**=may affect, not likely to adversely affect, **NJ**=will not jeopardize the continued existence of the DPS.

NEED FOR REASSESSMENT BASED ON CHANGED CONDITIONS

This BA and findings above are based on the best current data and scientific information available. A new analysis and revised BA must be prepared if one or more of the following occurs: (1) new species information (including, but not limited to, a newly discovered activity area or other species information) reveals effects on threatened, endangered, candidate, or proposed species or designated/proposed critical habitat in a manner or to an extent not considered in this assessment; (2) the action is subsequently modified or it is not fully implemented as described herein, which causes an effect that was not considered in this assessment; or (3) a new species is listed or critical habitat is designated that may be affected by the action that was not previously analyzed herein.

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Appendix F: Wilderness Minimum Requirements Decision Guide

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ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER

MINIMUM REQUIREMENTS DECISION GUIDE WORKSHEETS

ROMO 2018 Exotic Plant Management Plan

". . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act..."

– the Wilderness Act, 1964

Step 1: Determine if any administrative action is necessary.

Description: Briefly describe the situation that may prompt action.

At Rocky Mountain National Park, exotic invasive plant species do not see boundaries. They originate at park entrances, follow roads and trails and spread their way into wilderness areas of the park. Cars and hikers carry the seeds around the park to new areas where they establish and spread rampantly. Seeds also blow in the wind, stick to the fur of animals, and pass through the digestive systems of birds to further spread these invasive species. Disturbances in the wilderness such as fires, forest canopy reduction due to mountain pine beetles, and other activities have made it even easier for these invasive species to establish in areas where they normally may not have spread aggressively.

The Omnibus Public Lands Management Act of 2009, signed by President Obama, designates nearly 250,000 of the 265,000 acres of the park as wilderness. Before this act was signed into law, only 2,917 acres in the park were designated by Congress as wilderness. Wilderness is defined by the Wilderness Act as an area "untrammeled by man" and "retaining its primeval character and influence". The presence and invasion of exotic plants are altering the ecology of these areas and impacting the natural quality of wilderness character.

The 2003 Exotic Invasive Plant Management Plan for Rocky Mountain National Park outlines the known invasive species in the park and the effective treatments that can be taken to control these species. Canada thistle for example is known to be in several wilderness areas of the park such as along the Ouzel Trail in Wild Basin, Moraine Park, and other locations. Other invasive species are also likely to be found in wilderness areas of the park. This plan however has its limitations.

The 2018 Exotic Plant Management Plan allows for more flexibility in the treatments that may be applied to help control these invasive plant species in wilderness and other areas of the park. This flexibility provides for treatment of invasive species while simultaneously being able to choose methods that will help further protect wilderness character, cultural resources, and other biological and physical resources in the park.

To determine if administrative action is necessary, answer the questions listed in A - F on the following pages.

A. Describe Options Outside of Wilderness

Is action necessary within wilderness?

Yes: ☒ **No:** ☐

Explain: Control and containment of exotic species outside the wilderness are important, but will not be sufficient to prevent the spread of invasive species already present in wilderness areas. The infestations have entered the wilderness and are spreading further into the wilderness each year.

B. Describe Valid Existing Rights or Special Provisions of Wilderness Legislation

Is action necessary to satisfy valid existing rights or a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of the Section 4(c) prohibited uses? Cite law and section.

Yes: ☐ **No:** ☒ **Not Applicable:** ☐

Explain: There are no valid existing rights or special provisions in The Wilderness Act (1964) that specifically allows consideration of any of the Section 4c prohibited uses related to Exotic Invasive Plant control.

C. Describe Requirements of Other Legislation

Is action necessary to meet the requirements of other laws?

Yes: ☐ **No:** ☒ **Not Applicable:** ☐

Explain: There are no valid existing rights or special provisions in ROMO's enabling legislation or wilderness designation that specifically allows consideration of any of the Section 4c prohibited uses related to Exotic Invasive Plant control.

D. Describe Other Guidance

Is action necessary to conform to direction contained in agency policy, unit and wilderness management plans, species recovery plans, or agreements with tribal, state and local governments or other federal agencies?

Yes: ☒ **No:** ☐ **Not Applicable:** ☐

Explain:

1) 2003 Exotic Invasive Plant Management Plan for Rocky Mountain National Park

2) The following sections of the Wilderness Act form the basis of this analysis:

Section 2 (a) Wilderness "shall be administered ... in such manner as will leave them unimpaired for future use as wilderness, and so as to provide for the protection of these areas [and] the preservation of their wilderness character..."

Section 2 (c) An area of wilderness is...an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable..."
Definition of wilderness:

Section 4 (c) Prohibition of certain uses
"...except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act...there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area."

3) Section 4.4.4.2 of the 2006 NPS Management Policy states that exotic plants must be controlled when feasible if they "interfere with natural processes and the perpetuation of natural features, native species, and natural habitats".

4) The Executive Order of February 3, 1999 titled *Invasive Species* and amended on December 5, 2016 requires federal agencies to detect Exotic Invasive Plants and respond quickly to infestations.

E. Wilderness Character

Is action necessary to preserve one or more of the qualities of wilderness character including: untrammeled, undeveloped, natural, outstanding opportunities for solitude or a primitive and unconfined type of recreation, or unique components that reflect the character of this wilderness area?

Untrammeled: **Yes:** ☐ **No:** ☒ **Not Applicable:** ☐

Explain:

Undeveloped: **Yes:** ☐ **No:** ☐ **Not Applicable:** ☒

Explain: No development or use of motorized equipment or mechanical transport is proposed.

Natural: **Yes:** ☒ **No:** ☐ **Not Applicable:** ☐

Explain: The presence of exotic invasive species interferes with the natural quality of the wilderness character. The spread of exotic invasive species in the wilderness area is partly caused or enhanced by human actions (seed introduction, spread along trails and in campsites, etc.). Allowing exotic invasive species to further alter the native vegetation and wildlife habitats would directly affect the natural character of the wilderness.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation:

Yes: ☒ **No:** ☐ **Not Applicable:** ☐

Explain: The wilderness recreation experience is in part dependent on the wilderness setting representing a natural and native ecosystem. If exotic invasive species are allowed to spread and eventually replace native vegetation, the human experience in wilderness will be affected. The effects include changes in vegetation type and wildlife species that depend on native vegetation.

Other unique components that reflect the character of this wilderness:

Yes: ☐ **No:** ☐ **Not Applicable:** ☒

Explain: None identified for this area.

F. Describe Effects to the Public Purposes of Wilderness

Is action necessary to support one or more of the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

Recreation: **Yes:** ☒ **No:** ☐ **Not Applicable:** ☐

Explain: The presence and spread of exotic invasive species in wilderness will degrade the quality of the recreation experience in wilderness as native species are replaced. This may happen due to the changes in vegetation and effects on scenery, habitat, and reduced native forage for wildlife. Many invasive species are prickly such as thistles, or are irritants such as the milky latex found in leafy spurge which can further degrade visitors' recreational experience.

Scenic: **Yes:** ☒ **No:** ☐ **Not Applicable:** ☐

Explain: Exotic invasive plants have the potential to lower the scenic quality of an area. Many of these weeds are capable of producing large monocultures disrupting the scenic biodiversity of the natural landscape. Some of these weeds are also unsightly and produce large stands of dead biomass.

Scientific: **Yes:** ☒ **No:** ☐ **Not Applicable:** ☐

Explain: The presence of exotic invasive species will likely alter plant communities and the habitat for wildlife that depend on these native plant communities. This will reduce the park's value as a reference area for scientific studies comparing the park to more altered areas.

Education: **Yes:** ☒ **No:** ☐ **Not Applicable:** ☐

Explain: The presence of exotic invasive plants will likely alter plant communities and the habitat of wildlife that depend on them, reducing the unique educational value of the wilderness areas.

Conservation: **Yes:** ☒ **No:** ☐ **Not Applicable:** ☐

Explain: Exotic invasive plants tend to interfere with the growth of native species and may actually cause populations of natural species to decline and degrade the habitat for native fish and wildlife.

Historical use: **Yes:** X **No:** ☐ **Not Applicable:** ☒

Explain: While some historic areas in the park have non-native trees or shrubs planted as part of the historic landscape, in most situations exotic invasive plants will alter the historic landscape and context of the wilderness area.

Step 1 Decision: Is any administrative action necessary in wilderness?

Yes: ☒ **No:** ☐ **More information needed:** ☐

Explain: Exotic invasive plant control is necessary to protect the natural quality of wilderness character including native plant communities, wildlife habitat and overall native biodiversity.

Systematic monitoring, early detection, active control and ongoing monitoring of exotic invasive plant outbreaks can minimize the overall administrative footprint of invasive plant control and minimize impacts to the natural quality of wilderness.

If action is necessary, proceed to Step 2 to determine the minimum activity.

Step 2: Determine the minimum activity.

Description of Alternatives

For each alternative, describe what methods and techniques will be used, when the activity will take place, where the activity will take place, what mitigation measures are necessary, and the general effects to the wilderness resource and character.

Actions common to all alternatives:

Information and Education: To prevent the further introduction and spread of weed seeds, information will be provided to visitors of the wilderness, park volunteers, and attendees of certain programs and seminars in the park.

Early Detection: Areas likely to support exotic plants will be monitored to detect new infestations and recurrence of past infestations early.

Mitigation: Prevention measures will be implemented to ensure that treatment activities will not adversely affect native vegetation or water.

Safety: Required safety procedures will be implemented and required personal protective equipment will be used at all times.

Alternative # 1

Description: Exotic Plant Management under the 2003 Exotic Plant Management Plan

Park staff would use a combination of manual, mechanical, cultural, and chemical practices to treat exotic plants in wilderness. Herbicide application would be mostly by backpack sprayers. While most treatments would involve EPA registered herbicides, these treatments may also involve more experimental methods such as hot steam, or soil carbon additions using sucrose or wood chips. Such methods have been used at RMNP in the past and would be less likely to be used due to mixed results. Herbicide application would be limited to only 15 species that have been identified in the 2003 plan as requiring herbicide application for treatment. Herbicides would also only be used when populations exceed threshholds identified in the 2003 Plan which is counter to early detection and rapid response protocols from treating new infestations of exotic invasive plants. In wilderness areas close to roads, a UTV may be used to drive to near the edge of wilderness (in most cases 100ft to 200ft from the road), and a hose attached to UTV mounted pump will be stretched into the wilderness. Only the hose will be in the wilderness and the pump and UTV will remain outside of the wilderness boundary. The hose with nozzle will act as backpack sprayer in the sense that it will allow for spot treatments of invasive weeds limiting the amount of herbicide used in wilderness. Treatments in which a UTV would have to drive through wilderness areas would be covered under a separate Minimum Requirements Analysis. For sites in backcountry wilderness, non-mechanical transport methods (foot and stock travel) would be used to move herbicide, people, and supplies to treatment areas and non-motorized backpack sprayer equipment would be used for application of the herbicide. Since most infestations in wilderness are currently of a low density, only spot treatments would be applied, thus using the smallest amounts of herbicides necessary in wilderness.

Effects:

Wilderness Character

"Untrammeled" – Exotic invasive plant treatment reduces the untrammeled quality of wilderness because it is human control and manipulation of the wilderness resource.

"Undeveloped" – The wilderness would remain undeveloped and no motorized equipment would be used in wilderness for treatments.

"Natural" – Exotic invasive plant treatment would enhance the natural quality by restoring or maintaining native vegetation and reducing the influence of non-native species on all components of the wilderness resource. The use of herbicides introduces a chemical into the natural environment and is an adverse effect on the natural quality, but would be used in minimal quantities as necessary to control exotic invasive plants. Herbicide use does however limit disturbance to the soil which in turn is better for the "natural" wilderness character and also reduces the possibility of disturbing cultural resources in wilderness areas. Since only select species may be controlled under the 2003 Exotic Invasive Plant Management Plan, certain species will not be controlled under this alternative, which may negatively affect the natural environment over the long term.

"Outstanding opportunities for solitude or a primitive and unconfined type of recreation" – In the short term, the presence of treatment crews using herbicides may adversely affect the wilderness experience of those in the area. Treatment crews will be in wilderness areas for short durations up to a week (with the exception of Moraine Park), and will only reduce opportunities for solitude during these short periods of time. In the long term, the restoration of native vegetation will serve to enhance the wilderness recreation experience.

Heritage and Cultural Resources

Cultural resources could be affected by manual control of exotic invasive species. Because of species threshholds for the use of herbicide identified in this alternative, manual control would need to be used more often resulting in a higher likelihood of impacting these resources.

Maintaining Traditional Skills

This option helps maintain skills for use of traditional tools (travel by foot and stock).

Special Provisions

None

Safety of Visitors, Personnel, and Contractors

There is a risk to crews from working with herbicides and from tools, stock and travel over rugged terrain. Effects on visitors can be minimized by making the areas and times of treatment known. Temporary signs will not be placed in wilderness, but notfication at trailheads may occur as appropriate.

Economic and Time Constraints

Implementing manual treatments will increase the project time needed and may be less cost effective than alternatives that include herbicide treatment. Manual treatment alone is far less effective than herbicides and will require repeated treatments. Manual treatments would require additional time and labor costs. This alternative does allow for herbicide treatment in wilderness. But because of population size threshholds and the limited number of species in which herbicides may be used, manual control would be used much more frequently in wilderness.

Additional Wilderness-specific Comparison Criteria

None identified.

Alternative # 2

Description: Exotic Plant Management under the 2018 Exotic Plant Management Plan

Park staff would use a combination of manual, mechanical, cultural, and chemical practices to treat exotic plants in wilderness. Park staff would use the best available science and adaptive practices to determine which treatment methods would be most effective for each species of exotic invasive plant. Park staff would use a decision making process outlined in the 2018 Plan to prioritize where to treat, which species to treat, and which methods to use. Herbicide application would be mostly by backpack sprayers. While most treatments would involve EPA registered herbicides, these treatments may also involve more experimental methods such as hot steam, or soil carbon additions using sucrose or wood chips. Such

methods have been used at RMNP in the past and would be less likely to be used due to mixed results. Herbicide application could be used on a much wider diversity of exotic plants in which herbicide is considered an effective methods for treatment. Because there would be no population size restrictions, the park would not be restrained by treshholds and would have the potential to eradicate populations of exotic invasive plants from park wilderness using herbicides. In wilderness areas close to roads, a UTV may be used to drive to near the edge of wilderness (in most cases 100ft to 200ft from the road), and a hose attached to a UTV mounted pump will be stretched into the wilderness. Only the hose will be in the wilderness and the pump and UTV will remain outside of the wilderness boundary. The hose with nozzle will act as backpack sprayer in the sense that it will allow for spot treatments of invasive weeds limiting the amount of herbicide used in wilderness. Treatments in which a UTV would have to drive through wilderness areas would be covered under a separate Minimum Requirements Analysis. For sites in backcountry wilderness, non-mechanical transport methods (foot and stock travel) would be used to move herbicide, people, and supplies to treatment areas and non-motorized backpack sprayer equipment would be used for application of the herbicide. Since most infestations in wilderness are currently of a low density, only spot treatments would be applied, thus using the smallest amounts of herbicides necessary in wilderness.

Effects:

Wilderness Character

"Untrammeled" – Effective exotic invasive plant treatment reduces the untrammeled quality of wilderness because it is human control and manipulation of the wilderness resource.

"Undeveloped" – The wilderness would remain undeveloped and no motorized equipment would be used in wilderness for treatments unless approved in a supplemental wilderness minimum requirement document.

"Natural" – Effective exotic plant treatment would enhance the natural quality by restoring native vegetation and reducing the influence of non-native species on all components of the wilderness resource. Manual control would introduce some soil disturbance which would be minimized as much as possible. Herbicide treatment would introduce a chemical into the wilderness environment. Because use of herbicides to eradicate invasive species is an option under this alternative, there would be an overall benefit to the "natural" character of the wilderness by potentially eliminating these unwanted species that would otherwise crowd out native vegetation and degrade wildlife habitat.

"Outstanding opportunities for solitude or a primitive and unconfined type of recreation" – In the short term, the presence of treatment crews may adversely affect the wilderness experience of those in the area. This alternative would allow crews to use the most effective tools available which would help reduce the amount of time they would need to spend in wilderness. In the long term, the removal of exotic species and restoration of native vegetation will serve to enhance the wilderness recreation experience.

Heritage and Cultural Resources

Cultural resources could be affected by manual control of exotic invasive species. Because this alternative allows for more flexibility in which tools to use under which circumstances, the impacts to cultural resources can reduced by choosing non-soil disturbing methods in areas when such resources are likely to be encountered. Manual control in wilderness would occur in areas that have been previously surveyed for cultural resources, or natural resource staff would have to consult with Cultural Resource Specialist before conducting manual control in any new wilderness areas not previously surveyed. Removal of exotics species now may help further protect cultural resources later.

Maintaining Traditional Skills

This option helps maintain skills for use of traditional tools (travel by foot and stock).

Special Provisions

None

Safety of Visitors, Personnel, and Contractors

There is a risk to crews from working with tools and stock, and from travelling over rugged terrain. There is a risk to crews in that some noxious weeds contain substances that may cause slight reactions when exposed to skin. Effects on visitors can be minimized by making the areas and times of treatment known. Temporary signs will not be placed in wilderness, but notfication at trailheads may occur as appropriate.

Economic and Time Constraints

Implementing herbicide treatments will decrease the project time needed when compared to other treatments. Herbicide applications by backpack sprayer are efficient and effective, but likely may need to be repeated once a year over several years. Overall the time required in wilderness for these treatments would be far less than the repeated treatments that would be required with manual control methods.

Additional Wilderness-specific Comparison Criteria

None identified.

Alternative # 3

Description: No Treatment.

Neither herbicide application, hand pulling, nor grazing would be used to control exotic invasive plants. Nature would be left to take its course and invasive species would be allowed to continue to spread and crowd out native vegetation and wildlife habitat.

Effects:

Wilderness Character

"Untrammeled" – Because exotic invasive plant treatment would not take place under this alternative, there is no effect on the untrammeled quality of wilderness. However, in most cases exotic invasive plants are in the wilderness because of human activity (hiking, fighting wildfires, etc.).

"Undeveloped" – There is no effect on the undeveloped quality of wilderness character because there is no use of motor equipment.

"Natural" – Exotic invasive plants would be allowed to continue to spread and crowd out native vegetation and wildlife habitat. While plant species have the ability to spread through seed dispersal, humans are moving such species around at an unnatural rate. These infestations of exotic plant species are thus considered a detriment to the natural environment and cause losses of biodiversity.

"Outstanding opportunities for solitude or a primitive and unconfined type of recreation" – Under this alternative, crews will not be in the wilderness. Therefore, there will be no adverse effects to opportunities for solitude. However, with the continued spread of invasive species, there could be adverse effects on recreational experiences.

Heritage and Cultural Resources

None identified

Maintaining Traditional Skills

None

Special Provisions
None

Safety of Visitors, Personnel, and Contractors
There is a risk to visitors who may encounter exotic invasive plants with thorns, spines, or natural chemical irritants.

Economic and Time Constraints
None.

Additional Wilderness-specific Comparison Criteria
None identified.

Comparison of Alternatives

It may be useful to compare each alternative's positive and negative effects to each of the criteria in tabular form, keeping in mind the law's mandate to "preserve wilderness character."

	Alternative 1 2003 Management Plan	Alternative 2 2018 Management Plan	Alternative 3 No Treatment
Untrammeled	/-	/-	0
Undeveloped	-	-	0
Natural	+/-	++/	--
Solitude or Primitive Recreation	+/-	+/-	+/-
Unique components	N/A	N/A	N/A
WILDERNESS CHARACTER	++/----	+++/---	+/---

	Alternative 1 2003 Management Plan	Alternative 2 2018 Management Plan	Alternative 3No Treatment
Heritage & Cultural Resources	N/A	+	N/A
Maintaining Traditional Skills	+	+	N/A
Special Provisions	N/A	N/A	N/A
Safety	-	-	-
Economics & Time	+/-	+/-	N/A
Additional Wilderness Criteria	N/A	N/A	N/A
OTHER CRITERIA SUMMARY	++/--	+++/--	-

Step 2 Decision: What is the Minimum Activity?

Selected alternative: Alternative #2 2018 Management Plan

Herbicide application with backpack sprayers will be the treatment method for perennial and rhizomatous invasive plants as well as cheatgrass, a prolific seed producer spreading at a rampant rate. Herbicides may also be used on annual and biennial species that respond well to this type of treatment. Severing root systems may be used to control annual and biennial species in cases where this method seems appropriate. Non-mechanical transport (foot and stock) means will be used to move herbicide, people and supplies to treatment areas. Adjacent landowners and the local county weed management agency will be contacted to assist in the treatment of adjacent private lands. Treatment of these wilderness areas

will also help in early detection monitoring efforts. Associated signage will be place at trailhead locations when appropriate.

Rationale for selecting this alternative:

This alternative allows for use of the most effective tools and methods while reducing impacts to wilderness.

- Hand-pulling is known to be an effective treatment for many annual and biennial taprooted species if the treatments are repeated until the infestation is controlled. Reliance exclusively on hand pulling as the primary treatment method for all non-native invasive species would not effectively address the increase in occurrence or spread.
- Hand-pulling of many perennial and rhizomatous species such as leafy spurge, toadflax, and Canada thistle is not an effective eradication measure because these species often have either a rhizomatous root system or a taproot which can extends deep into the ground. Hand pulling results in breaking off the root system only a few inches underground. This promotes further growth of the species. Therefore, some form of herbicide use is needed for effective control of these species.
- Use of herbicide on some nearby private lands, in conjunction with hand pulling, has been successful at containing the plant when spraying is conducted for a minimum of five consecutive years.
- Input from the local county governments and adjacent landowners are entirely in favor of aggressive weed treatment using herbicides in wilderness.
- Having both manual and chemical methods available will allow for better protection of cultural resources in wilderness areas as crews can avoid soil disturbance in more culturally sensitive areas by using herbicide applications.
- Using an array of available methods allows for the potential eradication of invasive species populations in wilderness, rather than just slowing the spread of these species.

Rationale for not selecting the other alternatives:

- No treatment would result in further spread of invasive plant species and would further degrade the wilderness.
- Treatments under the 2003 Management Plan have been effective at slowing the spread of invasive species. However wilderness continues to degrade from the impacts of these invasive species. More effective control measures need to be taken to protect wilderness areas.

Monitoring and reporting requirements:

Monitoring of treatment areas will be conducted to determine effectiveness of treatments and minimize future treatments.

A map and total acreage of wilderness treated by 1) manual treatment and 2) herbicide treatment will be provided annually to the ROMO wilderness coordinator.

Check any Wilderness Act Section 4(c) uses approved in this alternative:

- ☐ mechanical transport
- ☐ motorized equipment
- ☐ motor vehicles
- ☐ motorboats
- ☐ landing of aircraft
- ☐ temporary road
- ☐ structure or installation

No Wilderness Act Section 4(c) uses are authorized.

Approvals	Signature	Name	Position	Date
Prepared by:		Jim Bromberg	Restoration Ecologist	8/3/18
Recommended:		Paul McLaughlin	Wilderness Coordinator	8/3/2018
Recommended:				
Approved:		Mark Pita	Chief Ranger	8/7/18

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National Park Service
U.S. Department of the Interior

Rocky Mountain National Park
Colorado

Rocky Mountain National Park
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As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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