

U.S. Department of the Interior
National Park Service
NPS Intermountain Region
Dinosaur National Monument



Dinosaur National Monument

Fire Management Plan

Environmental Assessment

PEPC 120677

December 2024



Public Comment

Public comments on Dinosaur National Monument's Fire Management Plan Environmental Assessment are welcomed by the National Park Service during the 30-day public review period. Comments may be made electronically through the National Park Service Planning, Environment, and Public Comment (PEPC) website at <https://parkplanning.nps.gov/projectHome.cfm?projectId=120677> by retrieving "Dinosaur National Monument Fire Management Plan Environmental Assessment 2024." Comments will not be accepted by fax, by e-mail, 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. Please note that names and addresses of people who comment become part of the public record. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment. We will make all submissions from organizations, businesses, and individuals identifying themselves as representatives or officials of organizations or businesses available for public inspection in their entirety.

ON THE COVER: Lightning-caused wildfire in Dinosaur National Monument, Colorado.

Table of Contents

1. Purpose and Need for the Action	1
1.1 Introduction	1
1.2 Purpose and Need for the Proposal	1
1.3 Background and Description of the Project Area.....	1
2. Alternatives.....	4
2.1 Introduction	4
2.2 Alternatives Carried Forward for Analysis	4
3. Affected Environment and Environmental Consequences.....	9
3.1 Air Quality.....	9
3.2 Cultural Resources	12
3.3 Paleontological Features and Soils.....	18
3.4 Vegetation	22
3.5 Special Status Species	27
3.6 Visitor Use, Experience, and Recreation.....	36
4. Consultation and Coordination	39
5. References.....	42
Appendix A.....	47

List of Tables

Table 1: Dinosaur Air Quality Monitoring Data.....	10
Table 2. Key vegetation communities at Dinosaur based on Coles et al. (2008), modified from Jones et al. (2021).....	23
Table 3. List of species included within the biological assessment.....	42

1. Purpose and Need for the Action

1.1 Introduction

The United States (U.S.) Department of the Interior (DOI), National Park Service (NPS) is proposing to develop and implement a new fire management plan (FMP) for Dinosaur National Monument (Dinosaur, monument) to conform with current NPS policy; promote fire personnel and public safety; protect and maintain the monument's natural and cultural resources and infrastructure; and outline how fire management decisions would be made.

Dinosaur's existing FMP, approved in 2004, no longer aligns with DOI FMP Framework policy and needs to be rewritten. The 2004 Dinosaur FMP and associated 1990 Environmental Assessment allowed for the same types of wildland fire management actions as the proposed FMP.

This environmental assessment (EA) evaluates the potential effects of two fire management plan alternatives on the natural and cultural resources of Dinosaur and provides an opportunity for public comment, pursuant to the National Environmental Policy Act of 1969, Council on Environmental Quality regulations (40 Code of Federal Regulations 1500–1508), DOI NEPA regulations (43 CFR Part 46) and other applicable laws, regulations, and policies.

The term wildland fire is used throughout this EA, as defined in NPS Directors Order #18, Wildland Fire Management (2008): Wildland fire is any non-structure fire that occurs in the wildland in vegetation or natural fuels. There are two types of wildland fire: 1) Planned ignitions, including broadcast prescribed fire and pile burning, where fire is intentionally ignited by management under an approved plan to meet specific objectives, and 2) Unplanned ignitions, including unplanned human caused fire and naturally ignited (lightning) fire, are also referred to as wildfire. A prescribed fire that has escaped the predetermined prescribed fire area may be designated a wildfire. Additionally, fire management actions for this EA are defined as management response to wildfires, prescribed (planned) fire, and non-fire manual and mechanical fuel treatments.

1.2 Purpose and Need for the Proposal

Each NPS unit with burnable vegetation must have an approved FMP. The purpose of this proposal is to develop an FMP that aligns with the DOI FMP Framework and NPS fire management planning guidance as described in [Reference Manual \(RM\) - 18, Fire Planning, Chapter 4](#); is grounded in science; and incorporates potential impacts from climate change. Additionally, the purpose of the FMP is to develop programmatic goals and objectives, ensure fire personnel and public safety, protect, and maintain the monument's natural and cultural resources and infrastructure, and outline how fire management decisions would be made.

The proposed FMP is needed to provide a flexible range of wildfire strategies and activities the NPS could use to respond to changes in environmental conditions and the specific needs of fire management within Dinosaur National Monument. It is also needed because until a new FMP is approved, current policy dictates NPS units must take a suppression action on all wildfires, and no prescribed fire, manual, or mechanical fuels treatments would be approved.

1.3 Background and Description of the Project Area

For this EA, the project area is defined as the administrative boundary of Dinosaur National Monument (Figure 1). Dinosaur is located within the Rocky Mountains and straddles the border of northeast Utah and northwest Colorado. It lies on the northern edge of the Colorado Plateau region. It is approximately 20 miles east of Vernal, UT, and 50 miles west of Craig, CO, and 120 miles north of Grand Junction, Colorado. The monument encompasses a total of 210,282 acres and is surrounded by Bureau of Land Management (BLM) land with approximately six private inholdings inside the monument.

Dinosaur was established in 1915 by a Presidential Proclamation to protect "...an extraordinary deposit of Dinosaurian and other gigantic reptilian remains of the Jurassic and Triassic period." These dinosaur fossils are preserved at the original quarry site and are enclosed by the visitor center. In 1938, the monument was expanded by Presidential Proclamation to include canyons of the Green and Yampa Rivers that enlarged the jurisdictional ownership to over 210,000 acres.

In 1978, 205,672 acres of Dinosaur National Monument in Colorado and Utah were recommended as wilderness under the provisions of the Wilderness Act. Current NPS policy requires potential and recommended wilderness to be managed as wilderness until an actual designation occurs.

The vegetation of Dinosaur National Monument reflects the region's semi-arid climate. Wide, and often abrupt, variations in elevation, slope, exposure, soil characteristics and moisture availability result in a mosaic of vegetative types. For the purposes of the proposed FMP and this EA, Dinosaur would be considered one Fire Management Unit (FMU). Fire management strategies for all wildfires would be based on incident specific strategic objectives and management requirements.

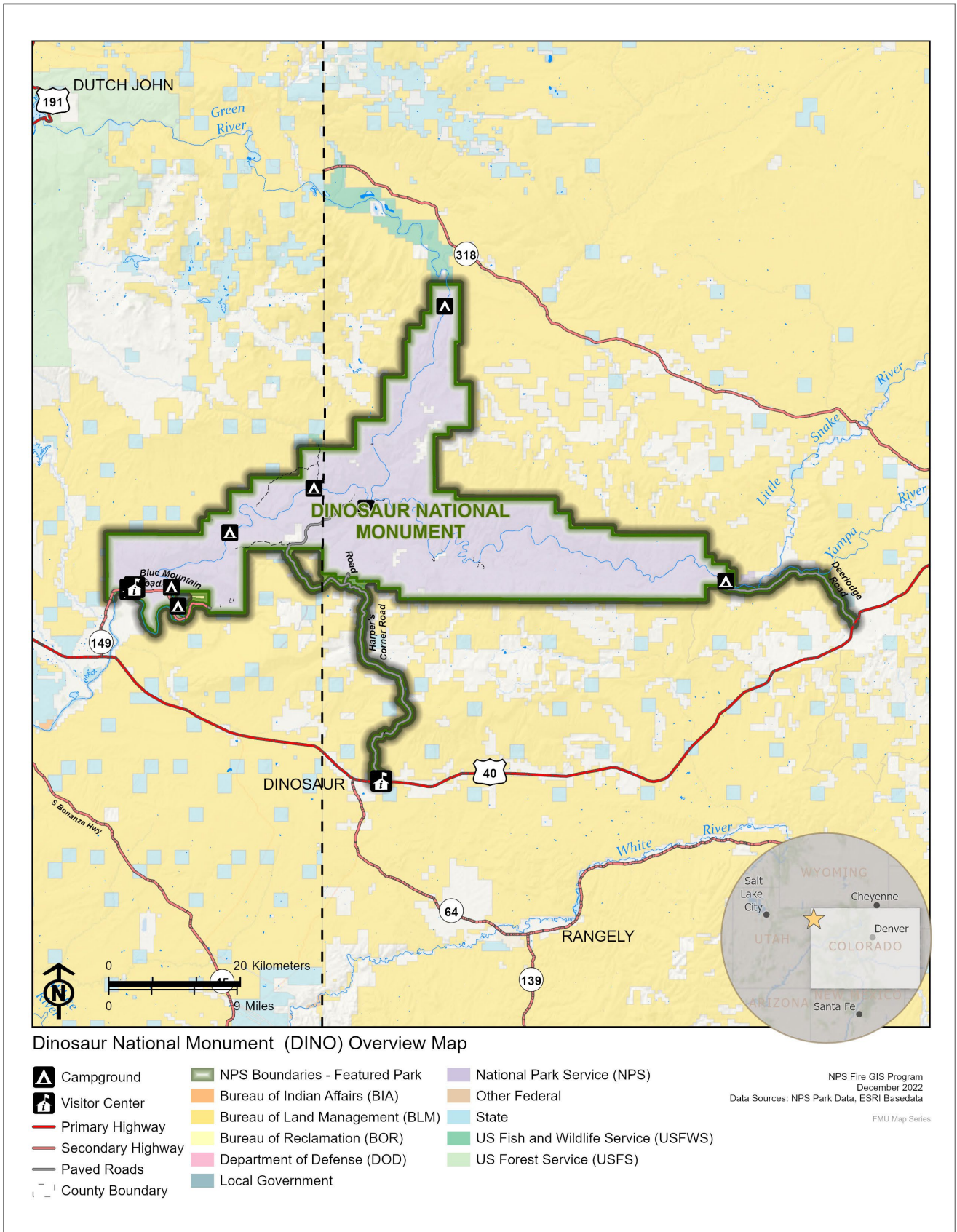


Figure 1. Dinosaur National Monument and Vicinity

2. Alternatives

2.1 Introduction

This EA considers and evaluates the potential effects of two fire management plan alternatives on the resources of Dinosaur:

Alternative A (no action alternative): a suppression-oriented wildland fire management program where suppression fire management actions would manage risk to people, natural and cultural resources, and infrastructure; and enhance relationships and collaboration for fire suppression. Suppression actions would happen throughout the monument wherever wildfires occurred.

Alternative B (proposed action and preferred alternative): a multiple strategy wildland fire management program where fire management actions would manage risk to people, natural resources, cultural resources, and infrastructure; enhance relationships and collaboration in all fire management activities which would include wildfire, prescribed fire, and non-fire manual and mechanical fuel treatments; prioritize ecosystem stewardship; allow naturally ignited wildfires to function as part of the ecosystem; and employ monitoring and research. The monument would be considered one FMU, and all wildfire strategies, prescribed fire, manual, and mechanical treatments could occur anywhere within the monument.

Wildfire suppression is common to both alternatives.

2.2 Alternatives Carried Forward for Analysis

2.2.1 Alternative A – Suppression Only, No Action Alternative

Under Alternative A, the no action alternative, Dinosaur would not implement the proposed FMP for the monument. Fire management would include suppression of all wildfires. This alternative would not include any type of prescribed fire, manual, or mechanical fuel treatment strategy as these strategies are no longer approved under the 2004 FMP.

Common tools and strategies associated with Alternative A and wildfire suppression include the following.

- Helicopters and other aircraft to transport fire personnel, equipment, and water to wildfires, especially in remote locations.
- Wildfire engines and vehicles of various types, depending on terrain and fire behavior, to transport fire personnel, equipment, and water to wildfires.
- Hand tools such as chainsaws, axes, and shovels for removing fuels and for digging fire lines.

The following goals would be included in Alternative A.

- Minimize risk to employees, fire responders, and the public.
- Contain all wildfires to the smallest size possible using suppression strategies and tactics consistent with managing risk to employees, fire responders, and the public.
- Protect highly valued resources and assets within the monument.

Alternative A would be implemented using Best Management Practices (BMPs) to minimize impacts to natural and cultural resources, infrastructure, and the public. The following measures would be used and should be considered as part of Alternative A for purposes of impact analysis.

BMPs Included in Alternative A – No Action Alternative

- The Superintendent must approve the use of heavy equipment (e.g., dozers, plows) and off-road vehicle travel in support of wildfires unless there is an immediate threat to life and property.
- The Superintendent must approve the use of aircraft removing and transporting water from the Yampa and Green Rivers unless there is an immediate threat to life and property. The Yampa River is managed as a Wild and Scenic River per Section 7 (b) of the Wild and Scenic Rivers Act.
- If water must be used from the rivers, preidentified spawning bars for the Colorado pikeminnow and razorback sucker would be avoided.
- The Superintendent must approve the use of retardant unless there is an immediate threat to life and property; however, if retardant must be used, a 300 foot buffer for retardant around water bodies would be employed.
- Locations of known federally listed plant populations would be identified before fire season starts and these areas would be avoided whenever possible during fire suppression activities.
- Equipment and vehicles would be power-washed prior to entering the fire area and the area of ground disturbance would be limited.
- A resource advisor would be used whenever possible.
- A resource advisor would be contacted if any undocumented cultural or natural resources are discovered.
- Cultural resource surveys of the appropriate intensity would be conducted, as determined by a NPS archaeologist, before any ground disturbing activities (driving off road, fire line construction, slash removal by dragging, etc.) begin in order to avoid or minimize damage to cultural resources.
- Notifications would be made to all potentially impacted monument neighbors, visitors, employees, river permit holders, and grazing lease permit holders.
- [Minimum Impact Strategies and Tactics \(MIST\)](#) would be used for all fire management actions. MIST can be found in Exhibit 1 of RM-18 Chapter 2 and by following the link above).
- Mitigation procedures found in [Publication Management System 444, Guide to Preventing Aquatic Invasive Species Transport by Wildland Fire Operations](#), or updated documents would be employed as they become available. 444, Guide to Preventing Aquatic Invasive Species Transport by Wildland Fire Operations, or updated documents would be employed as they become available.
- Ground protection for refueling and maintenance activities with vehicles, pumps, and other equipment, and refuel at least 200 feet from water sources would be used.
- The use of portable toilet facilities (either outhouses or bags) for spike camps would be considered.
- Evaluate post-fire erosion and vegetation recovery to determine the need for watershed protection to protect threatened, endangered, or sensitive animal and plant species.
- A programmatic Minimum Requirement Analysis would be completed for all suppression actions within recommended wilderness.

2.2.2 Alternative B: Multiple Strategy Wildland Fire Program, Preferred Alternative

Under Alternative B, the preferred alternative, Dinosaur would implement a new FMP for the monument. Fire management activities would manage wildfires for risk, protection, and resource management objectives using all available strategies and tactics. Response to each wildfire would be dependent on location, time of season, current and expected weather, and environmental conditions. Planned fuels treatments would include prescribed fire, manual, and mechanical treatments. These fuels treatments would be aimed at achieving fuels reduction,

creating and maintaining desired landscapes, resource objectives, or other site-specific objectives. This alternative would also enhance relationships and collaboration, prioritize ecosystem stewardship, allow naturally ignited wildfires to function as part of the ecosystem, and employ science-based decisions.

Common tools and strategies associated with Alternative B include the tools and strategies listed under Alternative A and would also include the following:

- Manage wildfires for risk, protection, and resource benefit objectives.
- Manual treatments using hand tools such as chainsaws, weed trimmers, lawn mowers, and other small equipment.
- Mechanical treatments using wheeled or tracked implements such as brush hogs, masticators, tractors, chippers, or other machinery.
- Prescribed (planned) fire as either a broadcast burn or pile burns.

Manual, mechanical, and prescribed fire treatments would be completed to remove vegetation and fuels to create defensible space around highly valued resources and assets and to reduce the risk of adverse effects from wildfire. Treatments would range in size from a few acres to a few hundred acres. An example of a typical treatment would be to remove vegetation, fallen trees, and the lower limbs of trees around infrastructure within the monument to create defensible space. This would reduce the risk of fire spreading near or up to the infrastructure during a wildfire. These treatments would typically occur between 0-300 feet around infrastructure, depending on building materials and the surrounding fuel type.

Dinosaur would use an Interdisciplinary Team (IDT) to discuss and prioritize proposed fuels treatment projects. The IDT would consist of managers from disciplines including, but not limited to, fire management, natural and cultural resources. The IDT would also review and provide input for treatment scopes of work, and the Superintendent would have final approval.

Criteria for fire managers and the IDT to determine if an area should be treated may include the following:

- Create defensible space in the wildland urban interface.
- Reduce the potential of a wildfire originating within Dinosaur and negatively impacting areas outside of the monument.
- Seek opportunities to protect high value resources and assets.
- Enhance cultural landscapes and viewsheds.
- Increase opportunities to manage wildfire as an ecological process within recommended wilderness within the monument.
- Restore vegetation, habitat, and/or fire regimes.
- Maintain previously treated areas.

Best available science would also be used to determine treatment areas and methodology.

Once areas to be treated are determined, planned fuels treatment projects would be prioritized by fire managers with input from the IDT. Examples of criteria which may be used to prioritize treatments are below.

- Fuel loading and defensible space characteristics.
- Degree of impact on natural and cultural resources.
- Proximity to past wildfires.
- Logical project sequence with other planned projects.
- Maintenance cycles for previously treated areas.
- Practicality of implementation and cost effectiveness of treatment.
- Coordination efforts with adjacent land managers.

- [NPSage](#) initiative projects.
- Cost to complete resource surveys for treatment area.

A treatment scope of work would be completed for all fuels treatments and include the project's goals and objectives, mitigation measures, and treatment specifications. This EA does not analyze specific projects areas where these treatments would happen, however, as treatments are planned, they would be addressed through the IDT and additional site-specific compliance and analysis would be completed. This additional compliance may include Section 7 consultation with the USFWS, Section 106 consultation with the State Historic Preservation Office, and Tribes, as appropriate.

When the IDT determines prescribed fire is the best strategy to treat an area, Clean Air Act policies would be followed. In Colorado, the Department of Public Health and Environment Air Quality Division regulates smoke emissions through the issuance of smoke permits. This program is operated under Regulation 9 of the Colorado Air Quality Control Commission. Regulation 9 requires all open burning such as prescribed burning, to be permitted. Therefore, any prescribed burns must be conducted under the provisions outlined in a permit. Permit requirements for Colorado include an analysis of impacts resulting from the production of smoke for all prescribed fires and only burning on days with good smoke dispersion. In addition, there are specific public communication requirements in Colorado before a prescribed fire may take place. Utah also requires that a smoke production modeling system be used to determine impacts of smoke produced and only burning on days with good smoke dispersion. Smoke permits in Utah are required for any wildfire larger than 20 acres, and the Utah Division of Air Quality would be notified.

The following goals and objectives would be included in Alternative B.

Goal 1

Minimize risk to employees, responders, and the public during every fire management activity.

Goal 1 Objectives:

- Evaluate risks and ensure risk-based decisions are made at the appropriate level.
- Apply the most current risk management processes in all decision making.
- Update risk management and leadership training annually to incorporate current best practices.
- Utilize Operational Leadership concepts to ensure the necessary steps are taken to understand the potential risks, severity, probability, and exposure of actions before engaging in wildland fire management.

Goal 2

Minimize adverse fire effects and impacts to the monument's infrastructure and natural and cultural resources.

Goal 2 Objectives:

- Identify, map, and assess risk and impacts for highly valued resources and assets.
- Utilize wildfire strategies and tactics for fire response that prioritize the monument's resources.
- Utilize resource specialists, when necessary and possible, on planned and unplanned fires that may affect natural or cultural resources.
- Implement a wildland fire prevention program to minimize human-caused fires.
- Design and implement fuel treatments to reduce fire risk near and adjacent to infrastructure, private properties, and cultural and sensitive resources.

Goal 3

Promote ecological and social conditions that create, maintain, and restore fire-resilient landscapes in uncertain climate futures.

Goal 3 Objectives:

- Evaluate and adjust fuels treatments and objectives as needed for adaptive management through monitoring.
- Use fuels treatments to simulate the desired effects of wildland fires to meet resource objectives based on the best available science.
- Manage fuels to allow wildfire to fulfill its ecological role in the monument.
- Use wildfire strategies that take advantage of natural ignitions when there is potential for resource benefits on the landscape.
- Manage wildfires in recommended wilderness where and when ecologically beneficial to preserve wilderness character.

Goal 4

Foster and maintain a wildland fire management program that aligns with and promotes values of shared stewardship, risk management, initiative, and pursuit of excellence.

Goal 4 Objectives:

- Maintain a wildland fire program that creates workforce capacity, promotes budget efficiencies, and enhances program administration while providing for reduced risk, efficient, and ecologically sound fire management.
- Use best available science to guide an ecologically sound, robust, and innovative fire management program.
- Respond to and manage fire incidents with strategic approaches that include interdisciplinary and interagency coordination.
- Cultivate and maintain internal and external relationships through collaboration, communication, and coordination by fostering understanding and support among staff, stakeholders, and partners.

Alternative B would be implemented using BMPs to minimize impacts to natural and cultural resources, infrastructure, and the public. The following measures, along with all of the BMPs listed under Alternative A for suppression activities, would be used and should be considered as part of Alternative B for purposes of impact analysis.

BMPs Included in Alternative B – Preferred Alternative

- Slash would not be piled in riparian areas and wetlands.
- Fuels treatments would be designed to avoid impacts to threatened, endangered, or sensitive plant and animal species.
 - Surveys for federally listed vegetation and wildlife species would be conducted using accepted U.S. Fish and Wildlife Service (USFWS) protocols if a fuels treatment is planned within known habitat. If federally listed species are found within the treatment area, the treatment would either be postponed until the species migrates (e.g., monarchs, etc.) or avoided completely (e.g., Mexican spotted owls, etc.). The monument would consult with USFWS for individual fuel treatments.
 - Snags and cavity bearing trees that serve as habitat would be left standing during fuels treatments outside of developed areas and around other highly valued resources and assets.
 - In some cases, some coarse woody debris that serves as habitat for small mammal species would be left on the ground within fuels treatments outside of developed areas and around other highly valued resources and assets.

- Buffers would be placed around mesa tops for prescribed fires to prevent burning fuels from entering owl habitat in slot canyons when possible.
- Fire management activities would be avoided around known wolf dens and rendezvous sites between April 15-August 1.
- Fuels treatment activities would be avoided during twilight and nighttime hours to lessen likelihood of disrupting wolves.
- Prior to fuel treatments, existing monument information on potential fossil localities and formations would be referenced to determine the sensitivity for the presence of paleontological resources. If there is a potential for fossils to be affected, the area would be surveyed and if found, the area would be avoided.
- The monument would conduct a pedestrian Class III archaeological survey and consult with the Utah State Historic Preservation Office (SHPO), Colorado SHPO, and Tribes on the identification of properties and treatment options before implementing any prescribed burns, manual, or mechanical treatments. Adverse impacts on eligible or potentially eligible cultural resources would be avoided during treatment layout and implementation, in coordination with a NPS archaeologist.
- Landowners and/or agencies located near treatment areas would be contacted and issuance of a press release would be considered.
- Inform employees and visitors of treatments and special safety warnings.
- Personnel would arrive at the treatment area with Personal Protective Equipment (PPE), vehicle, tools, and equipment clean and free of plant materials from outside sources and any adjacent areas with dense invasive vegetation species.
- A programmatic Minimum Requirement Analysis would be completed for all planned fire management activities within recommended wilderness.
- Use of local/regional seed sources/banks will be prioritized for all post-fire restoration activities. DINO will identify potential sources for collections in coordination with NPS seed collection and banking efforts.

3. Affected Environment and Environmental Consequences

This chapter describes the Affected Environment (current and future expected conditions of the environment, including trends in conditions) and analyzes the potential Environmental Consequences that would occur as a result of implementing the alternatives. This chapter discusses the effects on the biological, physical, cultural, and social environment at Dinosaur National Monument from the implementation of Alternative A, a fire suppression-oriented wildland fire management program, and Alternative B, a multiple strategy wildland fire management program.

The IDT identified potential impact topics, several of which were retained for detailed analysis in this EA. Other impact topics that were considered but dismissed from detailed analysis are discussed in Appendix A. Each impact topic retained for analysis is further discussed and analyzed in detail below.

3.1 Air Quality

3.1.1 Affected Environment

The Clean Air Act (42 United States Code [USC] 7401 et seq.) gives federal land managers legal responsibility to protect and prevent significant deterioration of air quality in national parks (NPS, 2018). Specifically, Section 118 of the Clean Air Act requires parks to meet federal, state, and local air pollution standards. Dinosaur National Monument is considered a Class II airshed according to the Clean Air Act, which means moderate increases in new pollution may be allowed. The Clean Air act is managed at the state level, and therefore Dinosaur must comply with two different sets of state air quality regulations: Colorado and Utah.

The Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for six commonly occurring air pollutants to protect public health and welfare. The six criteria air pollutants are carbon monoxide, lead, particulate matter, ozone, nitrogen dioxide, and sulfur dioxide. Fine particulate matter, particulate matter measuring 2.5 micrometers or less in diameter (PM_{2.5}), is the primary constituent of wildland fire smoke that affects air quality and human health (Urbanski 2014). Emissions of nitrogen oxides and volatile organic compounds can contribute to the formation of ozone (Alvarado et al. 2015). Visibility is primarily impacted by particulate matter (EPA, 2021). The EPA designates areas that do not meet the NAAQS for a pollutant to be in “non-attainment” for that pollutant; Dinosaur is currently in attainment (or is unclassifiable) for all pollutants.

There is currently an ozone monitoring station at Dinosaur. The following table (Table 1) shows the most recent available air quality data and trends from the monument’s ozone station (NPS 2024a). The condition column shows the current condition of the air quality parameter, based on the most recent available data, for a five-year average from 2018-2022. The trend column shows the trend of the parameter, based on the most recent available data, for a 10-year trend from 2013-2022.

Table 1: Dinosaur Air Quality Monitoring Data

Parameter	Condition	Trend
Overall air quality	Fair	Varied (up and down)
Visibility/Haze Index	Fair	Unavailable
Ozone/Human Health	Fair	Improving
Ozone/Vegetation Health	Fair	Relatively Unchanged
Wet Nitrogen Deposition	Poor	Unavailable
Overall Nitrogen Ecosystem Response	Fair	Deteriorating
Wet Sulphur Deposition	Good	Unavailable
Overall Sulphur Ecosystem Response	Fair	Improving
Wet Mercury Deposition	Good	Unavailable

Presently, there are two Class I airsheds within 100 miles of Dinosaur; the Flat Tops Wilderness located approximately 55 miles southeast, on the White River National Forest. The second is the Mount Zirkel Wilderness, located approximately 80 miles east to northeast of Dinosaur. Smoke sensitive areas, which are defined for this purpose as any area where human health, visibility, or welfare could be adversely impacted by smoke, exist to the south and west of Dinosaur; Highway 40 runs approximately 20 miles to the south, and Highway 191 is approximately 10 miles to the west of the monument. The town of Vernal is also located approximately 10 miles to the west. Additionally, there are five scenic drives in Dinosaur National Monument which offer expansive views of the monuments, and these views can become obscured by smoke during the summer months.

Trends and Planned Actions – Air Quality

Ongoing and planned actions within the monument that could affect air quality include road and trail construction and maintenance, building demolition and construction, and utility line maintenance. The three main roads in Dinosaur - Deerlodge road, Harpers Corner road, and the Green River District road will have improvements completed (involving rehabilitation of the existing roadbeds and the parking lot at the Quarry Exhibit Hall) by the end of 2025. The Deerlodge boat ramp will also be replaced in the near future. In 2026 the Yampa District Multi-Ops building will be constructed and the condemned building demolished but will stay in the existing disturbed footprint. The ongoing and planned actions within the monument could affect

air quality by producing dust and particulate matter and increasing vehicle emissions during construction.

Additionally, climate change would impact air quality and predictions point toward increases in temperature, reduced snowpack, more severe drought, and increases in acreage burned by wildfires (Gonzalez 2020). Data show current temperatures in Dinosaur have already shifted above the historic range of variability (Hegewisch and Abatzoglou, 2024) and are predicted to increase 4-7 °F between the years 2035-2065 (NPS Climate Change Response Program 2024). Under the highest greenhouse gas emissions scenario, projected climate change could increase the frequency of large fires (greater than 20 square miles) up to three times across the forests of the Western United States by 2050 (Barbero et al. 2015). Also, regional drought caused by climate change (Copeland, Bradford, Duniway, & Schuster, 2017), could result in an increase in windstorms that could raise dust more frequently than in the past.

Ongoing actions outside of the monument that affect air quality are air pollution from oil and gas development coupled with temperature inversions which have led to elevated wintertime levels of ground-level ozone (Prenni et al. 2022). In addition to air pollution from oil and gas development, wildfires in surrounding states typically contribute to poor air quality within the monument.

3.1.2 Impacts of Alternative A (No Action): Suppression Only

Impact Analysis – Air Quality - Alternative A

Under Alternative A, all wildfires would be suppressed and there would be no fuels treatments. Although all wildfires would be suppressed at the smallest size possible, some wildfires could escape initial suppression efforts, may become large, and could produce enough smoke and particulates to impact air quality in the entire monument, as well as smoke sensitive areas such as Highway 40 and Highway 191. This would potentially inhibit views within the monument. Given the predominant wind pattern from the west and southwest, it is unlikely that smoke produced from wildfires in Dinosaur would impact the Flat Tops Wilderness to the south. While it may impact the Mount Zirkel Wilderness, effects would typically only last a few to several days during a wildfire.

After several years of suppressing all wildfires and a lack of fuel treatments, hazard fuels would increase, and wildfires could become more frequent, burn larger areas, and could become more severe, which would produce more smoke and particulates (Kreider et al. 2024). Over time, this would degrade air quality due to more smoke during wildfires, which could last a few days to a few months and be widespread throughout the monument dependent on where the wildfires occur.

Cumulative Effects – Air Quality - Alternative A

Ongoing and planned construction activities within the monument, and oil and gas development and wildfires outside of the monument, would contribute adverse cumulative effects to air quality. Alternative A would also contribute adverse impacts to air pollution, which could last a few days to a few months, be either unnoticeable to severe, and widespread throughout the monument and surrounding areas. Overall, when actions under Alternative A are combined with other past, present, and reasonably foreseeable future actions, the cumulative impacts to air quality would be adverse.

3.1.3 Impacts of Alternative B (Proposed Action and Preferred Alternative): Multiple Strategy Wildland Fire Management Program

Impact Analysis – Air Quality - Alternative B

Under Alternative B, wildfires would still occur, however, they would be smaller, and less severe due to fuel treatments (Kreider et al., 2024). These smaller, less severe wildfires could still affect viewsheds, smoke sensitive areas, and Class 1 Airsheds close to the monument, depending on location of the wildfire and wind direction. These effects would last a few days to a few weeks dependent on the size and duration of the wildfire, but overall would be less impactful than large, severe wildfires under Alternative A.

In addition to wildfires, prescribed fire would occasionally effect air quality that could last a few hours to a few days, dependent on the vegetation burned. Colorado and/or Utah burn permits would be acquired, permit requirements would be followed, and prescribed fires would only take place on days with good smoke dispersion. The effects would be localized to areas downwind of the prescribed fire. During the first few years' Alternative B has the potential to increase smoke emissions due to not suppressing every wildfire and completing prescribed burns, however over the course of several years to decades wildfire impacts would lessen due to fewer large, severe wildfires.

Cumulative Effects – Air Quality - Alternative B

Ongoing and planned construction activities within the monument, and oil and gas development and wildfires outside of the monument, would contribute adverse effects to air quality. Alternative B would also contribute adverse impacts to air pollution because not all wildfires would be suppressed immediately, and prescribed fires would occur. These impacts could last a few days to a few months, be either unnoticeable to severe, and widespread throughout the monument and surrounding areas. However, Alternative B would have less overall impact on air quality than Alternative A due to less large and severe wildfires over the course of several years. Overall, when actions under Alternative B are combined with other past, present, and reasonably foreseeable future actions, the cumulative impacts to air quality would be adverse, but less than Alternative A.

3.2 Cultural Resources

3.2.1 Affected Environment

Archaeological Resources

Humans have occupied the area now known as the monument for over 13,000 years, from the Paleoindian (11,500 – 6,400 B.C.) through the Historic (1881 - 1950 A.D.) periods (Kelly and Todd 1988; Reed and Metcalf 1999; Spangler 2002).

Cultural resource surveys and excavations within the monument have occurred since 1937. Within the last sixty years, surveys have been primarily conducted to fulfill requirements set forth in Section 106 of the National Historic Preservation Act (NHPA). To date, approximately 38% of the monument has been surveyed for archeological resources and resulted in the documentation of over 1,000 sites. Site types include camps, pithouses, granaries, food gathering and processing locales, lithic scatters, quarries, rockshelters, petroglyph and pictograph panels, wickiups, historic artifact scatters, historic inscriptions, and isolated finds. Approximately half of all sites have been evaluated for eligibility for listing in the National Register of Historic Places (NRHP).

In addition to documented sites, the monument contains one NRHP Archaeological District in Castle Park. This district contains 32 pre- and protohistoric sites over a 680-acre area, with most sites having a Formative era (300 – 1300 A.D.) component (Bernard and Prokopetz 2004). Work is currently underway to develop NRHP Archaeological District nominations for other areas of

the monument that have a dense site concentration, including the Jones Hole, Cub Creek, and Rainbow/Island Park areas.

Historic Resources

The monument contains a variety of historic resources related to ranching, Euroamerican exploration and settlement, river rafting, scientific exploration, and NPS administration that began in the 19th century and continued through the 1960s. These resources include Mission 66 campgrounds, roads, administrative buildings, and employee housing units; historic cabins; quarrying sheds and laboratories; infrastructure related to grazing activities; historic boat wrecks; Echo Park dam geologic testing locations; and CCC-era building projects.

There are 56 historic structures within the monument in the NPS Cultural Resource Inventory System. Of these 56 total structures, four are unevaluated for eligibility on the NRHP, one is a National Historic Landmark, 21 are eligible and listed on the NRHP, 28 were found ineligible for listing on the NRHP, and two are recommend eligible for listing. Most of these eligibility determinations were made in 1986 as part of a multi-resource historic study within the monument (Mehls 1985).

In addition to NRHP evaluations, select structures within the monument have additional levels of documentation, including archaeological site form recordings, Historic Structure Preservation Guides and/or Reports for the Wade & Curtis Cabin (McDonald 1999b), Chew Ranch Complex (McDonald 1999a), Quarry Visitor Center (Denver Service Center 2003), and Josie Bassett Morris Ranch Complex (McDonald 2000), a historical photography report for the Josie Bassett Morris Ranch Complex (Havice 2000), and a Historic Preservation Report on the Stabilization of Doors and Windows for the Josie Bassett Morris Ranch Complex (Warren 2007).

In 2021, a Determination of Eligibility document was also completed for Mission 66 resources in the Green River and Yampa districts of the monument. Contributing elements to the historic district include the Quarry Entrance/Blue Mountain Road, Harper's Corner Road, Split Mountain, and Green River Campgrounds, first mile of the Sound of Silence Trail, employee housing units, the Green River District and Yampa District Maintenance Buildings, the Headquarters building, and the Canyon Visitor Center. These two districts and their associated contributing features have been determined eligible for the NRHP.

Additional structures that are not included in any previously listed document but are treated as historic resources for planning purposes due to their age and condition include the monument's fire towers at Zenobia and Roundtop, select roads and roadside features, miscellaneous grazing and ranching infrastructure, and other small-scale structural elements across the landscape.

Cultural Landscapes

Cultural landscapes are geographic areas that are historically significant and display evidence of human interaction with the physical environment. They can include cultural and natural resources and may contain human-modified ecosystems and constructed works. These landscapes are associated with a historic event, person, or activity or exhibit other cultural or aesthetic values.

Cultural Landscapes Inventories (CLI) have been developed for select areas of the monument, including Deerlodge Road (Mardorf et al. 2013) and the Chew Ranch Complex (Cypher and Braa 2004). Both cultural landscapes have received consensus determinations of eligibility. Other CLIs that are in draft form and have not received consensus determinations of eligibility include the Josie Bassett Morris Ranch complex. A drafted Cultural Landscape Report (CLR)

was also developed in 2001 for the Josie Bassett Morris Ranch complex, but it has not received consensus determination of eligibility as a cultural landscape.

Not all potentially eligible cultural landscapes within the monument have been inventoried, and additional locations, such as the Ruple Ranch complex, Quarry Visitor Center/Quarry Exhibit Hall, and the Green and Yampa River corridors, have been identified as areas for future study (NPS 2015). For the purposes of planning, historic properties within the above *Historic Resources* section may contain potentially eligible cultural landscape resources. CLIs and CLRs identify, among other topics, vegetation and vegetation patterns that are significant to the landscape. These documents, in turn, inform management decisions regarding use of the landscape, including fuels treatment.

Trends and Planned Actions – Cultural Resources

Cultural resources at Dinosaur National Monument are subject to a multitude of disturbances, ranging from natural processes of weathering, erosion, and wildfire, to human-caused issues such as looting, social trailing, and graffiti. Most sites within the monument have minimal human intervention or protective measures and are preserved in place.

Cultural resources across all disciplines, including archeology, historic structures, and cultural landscapes, need baseline documentation development to inform monument wide resource management (NPS 2015; Fisk et al. 2017). Historic structures and cultural landscapes lack baseline documentation (e.g., historic structure report, cultural landscape report and treatment plans, etc.). Currently, surveys and protection of resources are completed on a project-by-project basis.

Examples of current and future projects that may impact cultural resources include maintenance of monument infrastructure (i.e., buildings, roads, trails, campgrounds), vegetation management using herbicide, grazing, and utility improvements. Specific upcoming projects include the demolishment of a condemned Mission 66 maintenance building and construction of a new multi-operations building in its place and resurfacing of the Mission 66 Harper's Corner Road and Blue Mountain Road. Both projects are in previously disturbed contexts, and effects to the eligibility of these resources are evaluated during project planning in coordination with CO and UT SHPOs and Tribes. Additionally, herbicide treatments are planned for select invasive species over the next several years. Surveys would be completed in advance of these treatments to inform monument management on the location of cultural sites that should be buffered and avoided during chemical applications.

Additionally, climate change can make cultural resources vulnerable to degradation or complete loss (Rockman et al. 2016). Several direct impacts of climate change, such as increased temperature, freeze and thaw cycles, and wind can all directly affect archeological and historic structures. Increased temperatures, for instance, can cause microcracking of site contexts from thermal stress of archeological resources. Similarly, increased evaporation rates can lead to a higher degree of crystallization of efflorescent salts and increased rates of structural cracking and deterioration of historic structures (Rockman et al 2016). Additionally, larger, more severe wildfires are expected under future climate scenarios (Barbero et al 2015), which can damage or potentially destroy non-renewable cultural resources.

All proposed projects within the monument are subject to multiple cultural resource protection laws, including the NHPA. As part of this law and its implementing regulations, the monument as a federal land management agency is required to consider the effects of proposed actions on properties that are listed or eligible for inclusion in the NRHP (36 CFR Part 800).

3.2.2 Impacts of Alternative A (No Action): Suppression Only

Impact Analysis – Cultural Resources - Alternative A

Under the no-action alternative, suppression activities in response to wildfires would have the potential to negatively impact cultural resources. The absence of fuels management treatments would allow fuel accumulation, which in turn would lead to the potential for increased wildfire severity and intensity during wildfires.

Archaeological Resources

The treatment area for the proposed Fire Management Plan includes the entirety of the monument. As such, all documented cultural resources, and those that have not yet been identified, would be at risk from wildfires and associated suppression-oriented fire management activities. The effects of fire on surface and subsurface artifacts would vary depending on fuels load and fire behavior and could include permanent damage to sites, features, and objects because of scorching, spalling, cracking, and charring. Organic materials, such as wood, botanical remains, and textiles could be completely lost.

Suppression activities, such as use of heavy machinery, could crush underlying subsurface sites and items. Retardant drops and use of chemicals in or near archaeological sites can cause irreparable damage, and activities such as fire line construction may disturb and displace both surface and buried archaeological resources. These activities have the potential to not only damage individual artifacts and features, but also lead to the loss of integrity for archaeological sites.

While fire staff would coordinate with a monument Cultural Resources Specialist on suppression techniques and areas of concern to avoid impacts to known archaeological sites, wildfire behavior and safety concerns may dictate the location and timing of wildfire suppression actions. Measures that could be taken to mitigate damage to documented archaeological sites include construction of fire lines to prevent spread of fire into site boundaries; movement of fire lines to avoid site boundaries; use of fire-resistant sheeting to protect combustible features and artifacts; removal of fuel within and immediately adjacent to sites to reduce risk of fire spread; and application of fire shelters directly onto combustible archaeological resources.

Additionally, during and after a wildfire, a plan would be developed to ensure site stabilization and information retrieval for areas known to contain cultural deposits. A qualified cultural resource specialist would assist in developing a plan and its post-fire implementation to note any damages to sites as a result of fire activities. Resource advisors may also be used during suppression activities in areas without known survey data to identify sites and propose protective measures.

Historic Resources

All historic structures and sites within the monument are at risk from wildfire and associated suppression activities under this alternative. Historic structures, such as cabins and wickiups, are primarily constructed with wooden elements and would be especially vulnerable to wildfires with the potential for complete loss of the resource. Use of retardant and other suppressant chemicals can damage structural integrity of buildings if the full weight of retardant is dropped onto the structure, and retardants have the potential to stain historic building fabric. Trees around historic structures that become weakened from wildfires can pose a future threat. Similar to archaeological resources, soil disturbances resulting from use of heavy machinery or construction of fire lines also has the potential to impact historic resources, including historic artifacts associated with a standing structure, building foundations, and subsurface historic deposits.

Visual impacts resulting from wildfires and suppression activities also have the potential to create negative effects on a given historic structure or district if such impacts affect the character, setting, feeling, or overall integrity of the resource. Similarly, increased or intensive use of cultural resource areas, such as Mission 66 campgrounds, roadways, and pull-outs, during suppression activities could lead to accidental damage or increased stressors on these resources.

The monument would conduct suppression activities in a manner to protect infrastructure, which includes historic resources. Fine fuel loads and woody materials within or immediately adjacent to historic resources would be removed if time permitted during a wildfire to reduce the potential for structural damage or loss. Fire lines would avoid known historic resources, and use of shelters or protective sheeting would be considered to protect combustible structures. Fire staff would consult with a Cultural Resources Specialist to identify areas of resource concern and develop a suppression plan which minimizes impacts to known historic resources.

Cultural Landscapes

Cultural landscapes experience impacts when defining characteristics of the landscape are altered, which can occur during wildfire and suppression activities. These activities, such as removal of vegetation, fire line construction, and ignition events, can alter aspects of the landscape that are necessary for the integrity and National Register of Historical Places eligibility of the resource. These activities, such as vegetation removal by wildfire and development of fire lines, can be beneficial in preserving certain aspects of the landscape like individual historic structures and features but can also cause damage by removing important vegetation, disturbing sensitive areas, creating both temporary and permanent scars within the landscape, and/or impacting the viewshed.

Similar to archaeological and historic resources, the monument would handle wildfires and suppression activities in a way that would protect cultural resources to the maximum extent possible while also preserving human life and property. Fire staff would consult with a Cultural Resources Specialist or resource advisor to identify areas of cultural landscape concern and develop a strategy for handling the wildfire that minimizes impacts to the monument's cultural landscapes.

Cumulative Effects – Cultural Resources - Alternative A

The impacts of ongoing and planned actions such as road resurfacing, building demolition, vegetation management, and new construction within the monument would be limited to the previously disturbed footprint in the monument's developed areas and/or in areas easily accessible for herbicide applications. For each planned action, any adverse impacts would be analyzed and mitigated during project planning with Section 110 surveys conducted ahead of any planned activity within the monument and therefore would not contribute any adverse impacts to cultural resources.

Alternative A could contribute adverse impacts, however, best management practices such as consulting with a Cultural Resource Specialist or resource advisor during wildfires would minimize impacts to cultural resources.

Overall, when actions under Alternative A are combined with other past, present, and reasonably foreseeable future actions, the cumulative impacts to cultural resources could be minor and adverse, however would be mitigated with the use of best management practices.

3.2.3 Impacts of Alternative B (Proposed Action and Preferred Alternative): Multiple Strategy Wildland Fire Management Program

Impact Analysis – Cultural Resources - Alternative B

Impacts to cultural resources under Alternative 2 would be like those described for the no action alternative for activities such as suppression of wildfires. Alternative 2, however, proposes to utilize a more expansive fire management program that includes prescribed fire and fuel treatment activities. These strategies, while beneficial for reducing fuel loads and hazard trees, could impact cultural resources that are present within or adjacent to areas for proposed fuel treatments. The monument would implement several strategies and best management practices to ensure impacts to cultural resources would be avoided or minimized, including ensuring all proposed fuel treatment areas have archaeological survey data and separate National Historic Preservation Act Section 106 compliance reviews before any activities are undertaken.

Archaeological Resources

Prescribed fires and related activities would result in beneficial effects with the reduction of fuel loads throughout the monument, and the size of wildfires that would need to be suppressed may be smaller and require less maintenance to manage. Smaller wildfires of lower severity would result in lower adverse impacts on archaeological resources from reduced contact with fire, exposure of artifacts, and other effects described above. There is the continued risk, however, of inadvertent archaeological site, artifact, or feature destruction and loss of resources due to trampling, compression, scorching, or excavation while implementing fuels treatments, especially if resources are discovered during treatment activities. To lessen the potential for adverse effects, best management practices would be implemented before all non-emergency prescribed fire and non-fire fuel treatments. These would include the involvement of the Inter Disciplinary Team (IDT) during the planning stage of the project. Also, because archeological surveys are incomplete in areas where prescribed burns and fuel reductions activities may be proposed, before any fuel treatment occurs, the NPS would complete a site-specific Section 106 compliance review, including identification of cultural resources through surveys, consultation with Tribes and SHPOs, and the development of an appropriate monitoring strategy.

Historic Resources

The potential for wildfire impacts to historic resources is anticipated to be reduced under Alternative B due to fuels treatment initiatives that would continually maintain defensible spaces around historic buildings. Defensible space helps to reduce the likelihood of complete loss of structures during a wildfire. Although there is still the potential for damage, similar to the effects and types of damage discussed in Alternative A for suppression activities, the creation of defensible space and active management before wildfires occur would be beneficial and allow for a decreased need for suppression activities near historic resources during the time of an incident, and thus a reduced chance for accidental impacts. When planning for fuels treatment projects in and near historic structures, the NPS would remove as little vegetation as possible to protect the resource, and the IDT would adhere to the Secretary of the Interior's Standards for the Treatment of Historic Properties (NPS 2017) to ensure the integrity of the historic resource is maintained.

Under this Alternative, all non-emergency projects, such as prescribed fire and non-fire fuel treatments, would be planned in advance by the IDT. Because historic baseline documentation efforts are incomplete in areas where prescribed burns and fuel reductions activities may be proposed, before any activity occurs related to non-emergency fire management, the NPS would complete a site-specific Section 106 compliance review, including identification of historic resources, consultation with Tribes and SHPOs, and development of an appropriate monitoring strategy.

Cultural Landscapes

The anticipated impacts to cultural landscapes for Alternative B are expected to be similar to those described for historic structures. Impacts to cultural landscapes would be minimized with active, preparatory management of the monument that would, in turn, result in reduced wildfire potential, accumulated fuel load, and less severe wildfires which would all be beneficial to cultural landscapes.

The effects to cultural landscapes from suppression-oriented activities would remain similar to those described for Alternative A. With ongoing defensible space and fuels treatment projects, however, there would be decreased need for suppression activities near, within, and around cultural landscapes. Although vegetation and views are landscape characteristics that could be impacted by increased fuels treatments, the NPS would remove as little vegetation as possible and complete a site-specific Section 106 compliance review before proceeding with any plan which has the potential to impact cultural landscapes and their integrity.

Cumulative Effects – Cultural Resources - Alternative B

The impacts of ongoing and planned actions such as road resurfacing, building demolition, new construction, and vegetation management would be limited to the previously disturbed footprint in the monument's developed areas and/or in areas easily accessible for vegetation management. For each planned action, any potential adverse impacts would be analyzed, and best management practices would be implemented during project planning and compliance with Section 110 surveys conducted ahead of any planned activity. As a result, there would be very few, if any, adverse impacts from ongoing and planned actions to cultural resources.

Alternative B could contribute adverse impacts, however, best management practices such as consulting with a Cultural Resource Specialist or resource advisor during wildfires and while planning prescribed fires and non-fire fuel treatments, surveying planned treatment areas, and consultation with SHPO and Tribes would minimize any potential negative impacts to cultural resources.

Overall, when actions under Alternative B are combined with other past, present, and reasonably foreseeable future actions, the cumulative impacts to cultural resources could be minor and adverse, however, the use of best management practices would mitigate any potential adverse effects, and the reduction of severe, large wildfires due to prescribed fires and non-fire fuels treatments would be beneficial over the course of several years as fuels loads were reduced.

3.3 Paleontological Features and Soils

3.3.1 Affected Environment

Dinosaur National Monument contains an internationally significant fossil record extending some 540 million years and includes extraordinary fossil deposits of dinosaurs and other life. Fossils range from pollen to dinosaurs and trace and body fossils of plants and animals. The Carnegie Quarry and numerous backcountry and front country fossil sites not only provide remarkable experiences for fossil enthusiasts, but also contribute to new scientific discoveries in the many extinct ecosystems preserved in the geological record of the monument. The world-famous Carnegie Quarry provides an extraordinary window onto the Late Jurassic world of dinosaurs. There the National Park Service pioneered the in situ (in place) preservation of fossils, with 1,500 dinosaur bones available for viewing, touching, and study. This approach has served as a model for many other fossil sites around the world, is a key attraction at Dinosaur, and served as the primary catalyst for the creation of Dinosaur.

There are 24 known geological formations within the monument, and all are predominantly sedimentary units, composed of limestone, mudstone, siltstone, and sandstones. These

sedimentary units and their soils are all considered highly erodible, but also aid in determining if paleontological resources may be found within an area using a Potential Fossil Yield Classification system (PFYC). Additionally, Dinosaur has biological soil crust that forms, which helps control erosion and is used as an indicator of soil health (Livensperger and Witwicki 2024).

Trends and Planned Actions – Paleontological Features and Soils

Activities in the monument that affect paleontological and soil resources include road and trail construction and maintenance, fencing repair and construction, building demolition and construction, utility line maintenance, and invasive plant suppression and native plant revegetation. Specific projects in Dinosaur include road resurfacing in 2025. The Deerlodge boat ramp will also be replaced in the next few years. In 2026 the Yampa District Multi-Ops building will be constructed and the condemned building demolished but will stay in the existing disturbed footprint. These planned projects would be within already disturbed areas and include best management practices for soil disturbance. Additionally, the PFYC system would be used to determine if paleontological resources are likely to be found in the area before construction, and if so, a monitor would be present during all surface disturbing work. Because of these BMPs, these planned actions are expected to have minor to no adverse effects.

Additionally, within the monument, climate change, land use such as grazing, and increased recreation also could impact paleontological resources and soils. Climate change predictions point toward increase in temperature, reduced snowpack, more severe drought, and increases in area burned by wildfires (Gonzalez 2020). The predictions also suggest that 99% of the Colorado Plateau region, which includes Dinosaur, will experience drying by 2075 and increase aridity by approximately 17% (Copeland et al, 2017). Increased aridity of the area would lead to vegetation dying off and soils and paleontological features being more exposed to elements such as heavy rainfall and wind erosion. An increase in burned area could also lead to a lack of vegetation and expose these resources to water and wind erosion.

Cattle grazing and increased visitation within the monument could have the potential to disturb or destroy fragile biological soil crust, which helps to reduce water and wind erosion, and would take multiple years to decades to recover. So far however, these adverse effects are not happening within the monument. Using data from monitoring plots in Dinosaur with data collected between 2010-2020, (Livensperger and Witwicki 2024) found current microbial crust conditions to be good and improving across all three vegetation types sampled, and soil stability conditions to be good, and improving, across two out of the three vegetation types sampled.

3.3.2 Impacts of Alternative A (No Action): Suppression Only

Impact Analysis – Paleontological Features and Soils - Alternative A

Impacts of Alternative A to paleontological features at Dinosaur could include damage to fossils from the heat of a wildfire or destruction from fire suppression activities such as digging fire line, retardant use, soil compaction from staging areas, social trails created by fire personnel accessing wildfires, and driving vehicles off road. These impacts could be reduced with the use of the PFYC when wildfires start, to determine the likelihood of paleontological resources being found within the area, and these resources could then be avoided whenever possible.

Additional impacts to paleontological features could include degradation and erosion after a wildfire removes vegetation and features are exposed to the elements. Because no fuels treatments would take place under this alternative, wildfires would become more severe and larger in size due to a buildup of burnable vegetation (Barbero et al 2015). Climate change and its associated influences, such as increased number of wildfires and acres burned, more severe wildfires, increases in storm frequency/intensity, increased drought, and heat waves, could

accelerate impacts under Alternative A to paleontological features through weathering and erosion. Any degradation of paleontological features would be permanent and severe.

Impacts to soils in Dinosaur could include soil disturbance from fire suppression activities such as fire personnel digging fire line, soil compaction from staging areas, social trails created by fire personnel accessing wildfires, and vehicles driving off road. Digging of fire line could result in soil impacts for two to four months as fire lines would be rehabilitated once the wildfire is declared out. However, if biological soil crusts were disturbed during suppression activities, it would be adverse and could take multiple years to decades to recover. Best management practices to lessen impacts would include avoiding vehicles driving off road. Soil compaction could last several years depending on the vegetation in the area and the amount of use the area received during suppression activities. All these impacts could occur throughout the entire monument wherever wildfires occur. Additional impacts to soils could include increased erosion because of a lack of vegetation on highly erodible soils, hydrophobicity (when soil repels water), and high severity wildfires. Indirect impacts such as hydrophobicity would only last a few weeks to two months, while soil erosion would be permanent. Additionally, wildfires can alter the flow of water and minerals into surrounding geological units, which can change conditions in canyon and cave systems, increase erosion and weathering, and lead to debris flows and mudslides. These impacts could be a few weeks to permanent in nature. All of these impacts could occur throughout the entire monument wherever wildfires occur.

If paleontological features, which are a fundamental monument resource, are destroyed or damaged during wildfires or resulting suppression activities, the impact would be permanent as fossils are non-renewable resources. However, best management practices, such as using the PFYC system to delineate areas where fossils are likely to be found before wildfires start, not driving off road in areas of no ground vegetation and using a resource advisor during wildfires would reduce the chance of damaging or destroying these features.

Cumulative Effects – Paleontological Features and Soils - Alternative A

The impacts of ongoing and planned actions such as road and trail construction and maintenance, fencing repair and construction, building demolition and construction, utility line maintenance, grazing, invasive plant suppression, and native plant revegetation would mostly be limited to previously disturbed area. For planned actions, any adverse impacts could be reduced with best management practices for soil disturbance and use of the PFYC to determine if paleontological resources are likely to be found in the area before construction, therefore they are expected to have minor to no adverse effects.

Alternative A could contribute adverse impacts, however, best management practices such as not driving vehicles off road, avoiding areas of biological crusts whenever possible, and using the PFYC to determine if fossils are likely to be found near a wildfire area would reduce adverse impacts to soil and paleontological resources.

Overall, when actions under Alternative A are combined with other past, present, and reasonably foreseeable future actions, the cumulative impacts to soil and paleontological resources could be minor and adverse, however would be reduced with the use of best management practices.

3.3.3 Impacts of Alternative B (Proposed Action and Preferred Alternative): Multiple Strategy Wildland Fire Management Program

Impact Analysis – Paleontological Features and Soils - Alternative B

Direct impacts on paleontological features and soils from fire suppression activities would be the same under Alternative B as described above under Alternative A. However, under Alternative B not all wildfires would be suppressed immediately, and fuels treatments

(prescribed fire, manual, and mechanical) would take place, so impacts would be less negative, and at times beneficial, than compared to Alternative A. Restoring smaller, less severe wildfires, along with prescribed fires and fuels treatments would also help reduce the impacts of climate change, soil erosion, and weathering within the monument by reducing the number and size of high severity fires.

Prescribed fire, and fuels reduction activities would use the PFYC system during planning to avoid areas suspected to have fossils. If a treatment were to take place in an area suspected to have fossils, surveys would be completed ahead of time, and best management practices would be put in place to reduce the chance of adverse effects to paleontological resources.

Prescribed fire and fuels reduction would result in smaller and less severe wildfires and would help protect soils, though there would be disturbance in areas lasting a few weeks to a few months where fuels are treated. Also, a higher number of small, less severe fires may occur across the landscape, which could result in a temporary increase in exposed soils that might be prone to increases in erosion. Best management practices would help minimize the adverse effects of fuels treatments and any impacts would be very localized to the treatment area and short-term lasting one day to a few months.

Prescribed fire can lead to increased nutrient input to soils and are beneficial to soils if done properly (e.g., low severity, during the correct time of year) (Alcaniz et al 2018). Such increases may provide favorable conditions for many plant species, nitrogen-fixing microbes, and nitrifying bacteria. Soil conditions following prescribed fire would favor establishment and growth of native herbaceous and shrub species. If wildfires and prescribed fires are kept to lower severity, there would also be less vegetation loss and subsequently less erosion. Also, with fewer large wildfires, unplanned use of heavy equipment on the landscape would be reduced, resulting in a long-term benefit of several months to multiple years to soils.

Cumulative Effects – Paleontological Features and Soils - Alternative B

The impacts of ongoing and planned actions such as road and trail construction and maintenance, fencing repair and construction, building demolition and construction, utility line maintenance, grazing, invasive plant suppression, and native plant revegetation would mostly be limited to previously disturbed area. For planned actions, any adverse impacts could be reduced with best management practices for soil disturbance and use of the PFYC to determine if paleontological resources are likely to be found in the area before construction, therefore they are expected to have minor to no adverse effects.

Cumulative impacts under Alternative B include minor soil compaction from fuels reduction projects. Vehicle use for suppression activities would decline under Alternative B and help offset impacts from non-fire related activities. The PFYC would be used for all planned prescribed fire and non-fire fuel treatments, and because of this, there would be minor to no adverse effects to paleontological resources. Overall, under this alternative, soil would have few negative, short-term effects such as compaction in treatment areas, however, most effects would be beneficial due to nutrient recycling from treatments and fires.

When actions under Alternative B are combined with other past, present, and reasonably foreseeable future actions within and surrounding the monument, the impacts would have fewer negative effects and some beneficial effects on paleontological resources and soils, that would be localized, and would last a few months to several years.

3.4 Vegetation

3.4.1 Affected Environment

Vegetation communities in Dinosaur National Monument reflect its topographical diversity on the northern edge of the Colorado Plateau. Across the monument, four broad vegetation types predominate: piñon-juniper woodlands (58%), sagebrush shrublands (14%), native grasslands (8%), and native riparian woody vegetation (less than 1%; Jones et al. 2021). Coles et al. (2008) recognize 687 plant species occurring in Dinosaur, with 75 of those being nonnative; key vegetation communities are summarized below in Table 2.

Upland forest and woodland communities are common and widely distributed. In addition to juniper and piñon-juniper, ponderosa pine or curl-leaf mountain mahogany are found mostly on high elevation rocky summits, Douglas-fir stands are found along steep upper north facing slopes of canyons, and aspens occur on some high elevation lee slopes that collect snow.

Upland shrubland communities are also diverse and widespread, and most commonly include Wyoming and mountain big sagebrush, where deep soils are present. Shadscale and other desert shrubs are found on marine shales, and black sagebrush occurs on limestone ridgelines. Cool, rocky slopes harbor serviceberry, mountain mahogany, and chokecherry. In sandy habitats where the sagebrush has burned, rubber rabbitbrush occurs and the understory is often dominated by cheatgrass. Along dry alluvial terraces, black greasewood and basin big sagebrush are common. Rocky canyon walls in river canyons often harbor littleleaf mockorange and green Mormon-tea.

Upland grass communities are common over thin or windswept soils or on fire scars. Native bunchgrasses that colonize burned piñon-juniper or sagebrush habitats include needle-and-thread, streamside wildrye, and bluebunch wheatgrass. Cheatgrass dominates post-fire areas and other disturbed areas.

Riparian and wetland forest and woodland communities are found along floodplains and tributary canyons, and are mostly characterized by box elder and cottonwoods, except in some narrow, rocky canyons that include Douglas-fir. Tamarisk is an abundant invader, especially in Lodore canyon now that dam releases no longer achieve the magnitude of historical spring floods.

Riparian and wetland shrubland communities are narrowly distributed around stream banks, stock pond margins, and seeps in Dinosaur, and include Coyote willow, threeleaf sumac, and water birch. Tamarisk also often replaces native species in these habitats.

Riparian and wetland herbaceous plant communities are similarly limited to habitats with water near or at the surface for part of the year, such as hanging gardens with diverse species including Mancos columbine, ditch reed grass, shooting star, and helleborine orchid. Riverbanks support prairie cordgrass and wild licorice, with rough cocklebur in sandy riverbank habitats. Common invasives include Russian knapweed, leafy spurge, Canada thistle, and perennial pepperweed.

Table 2. Key vegetation communities at Dinosaur based on Coles et al. (2008), modified from Jones et al. (2021).

Ecological System	Map Unit Name	Area (ha)
Piñon-Juniper Woodlands	Piñon-Juniper / Basin Big Sagebrush Woodland	80
	Piñon-Juniper / Black Sagebrush Woodland	1,021
	Piñon-Juniper / Herbaceous Woodland	17,910
	Piñon-Juniper / Littleleaf Mtn Mahogany Shrubland and Woodland	7,028
	Piñon-Juniper / Mixed Desert Shrub Woodland	2,070
	Piñon-Juniper / Sagebrush Woodland	6,095
	Piñon-Juniper / Soil Crust Woodland	3,650
	Piñon-Juniper / Sparse Understory Woodland	7,115
	Piñon-Juniper / True Mountain Mahogany Woodland	4,453
	Piñon-Juniper-Curleaf Mountain Mahogany Woodland	86
	Rocky Mountain Juniper / Sagebrush Woodland	4
Total:		49,511
Sagebrush Shrublands	Sagebrush/Rabbitbrush Shrubland	10,785
	Sagebrush-Antelope Bitterbrush Shrubland	781
Total:		11,565
Native Grasslands	Native Grasslands	6,640
	Total:	6,640
Native Riparian Woody Vegetation	Box Elder / Netleaf Hackberry Woodland	6
	Box Elder Woodland	273
	Broadleaf Cottonwood Woodland	134
	Threeleaf Sumac Riparian Thicket	7
	Total:	420

Trends and Planned Actions – Vegetation

Activities in the monument that affect vegetation resources include road and trail construction and maintenance, fencing repair and construction, building demolition and construction, utility line maintenance, visitor use, grazing, and invasive plant suppression and native plant revegetation.

Once Harpers Corner roadwork is completed, the Green River District Road project (involving rehabilitation of the existing road), including the parking lot at the Quarry Exhibit Hall, will begin in 2025. The Deerlodge boat ramp will also be replaced in the near future. In 2026 the Yampa District multi-ops building will be constructed and the condemned building demolished; however, it will stay in the existing disturbed footprint. Visitation to the monument is expected to increase over the next several years and decades (Fischelli et al 2015). This would mean more vehicles, and potentially more people using trails which can lead to visitors inadvertently spreading more non-native vegetation species to roadsides, trail corridors, and other frequently used areas. The monument has an Invasive Plant Management Plan and associated EA, which drives how the monument will manage invasive plant suppression through mechanical, cultural, chemical, biological control, and expanded prevention techniques. The monument currently has 10 grazing allotments on NPS land and is in the process of writing a Grazing Management Plan EA. Livestock grazing by permitted grazers on established allotments would continue, with rangeland assessment informing animal unit month allowances and exclusion from sensitive habitats to mitigate adverse effects. A concerning trend in sagebrush communities documented by Livensperger and Witwicki (in review) is a decrease in cover of native cool-season grasses, and a dramatic increase in nonnative annuals, predominantly cheatgrass.

Fire suppression through the 20th century has been thought of across the Colorado Plateau as one cause of piñon-juniper expansion. Such thinking shaped management in recent decades at Dinosaur, where prescribed fires were used to address a perceived imbalance of piñon-juniper and sagebrush replacing grassland due to fire suppression and livestock grazing (Coles et al. 2008). Romme et al. (2014) have revised this misconception with an analysis of historical fire and vegetation patterns drawing on General Land Office (GLO) survey records, tree rings, charcoal distribution, and vegetation surveys. Although localized expansion and contraction have occurred along the piñon-juniper/sagebrush grassland interface, in the last 90 years the monument has seen a net reduction in piñon-juniper. Attributing the shift to shorter natural and human-caused fire rotations in recent decades, Arendt and Baker (2013) show net declines of 3-7% in piñon-juniper woodland and 12-19% in montane shrubland, and a corresponding increase of 16-26% in sagebrush shrublands.

The change in fire rotation driving these shifts is explained in Romme et al. (2014) and Floyd et al. (2017). Historical fire rotations were estimated at 550 years for Dinosaur's piñon-juniper (using a reference period from 1500-1900 AD). More difficult to estimate are the fire rotations in the monument's sagebrush, where fire was rare and an insufficient period of observation reduces precision; nevertheless, the estimates of 2,500-5,000 years between wildfires in Wyoming/basin big sagebrush and 458-729 years in mountain big sagebrush are consistent with other studies in the region. For instance, Bukowski and Baker (2013) provide an historic fire rotation estimate of 171-342 years for Wyoming/basin big sagebrush in the West.

For the period 1981-2010, Romme et al. (2014) describes much shorter fire rotations at Dinosaur. During this time, at least 17% of the monument burned (14,518 ha out of 83,315 ha total). Of these fires, 43% were human-caused wildfires, 28% were prescribed fires, and 57% were lightning-caused wildfires. For just lightning-caused fires during this period, the fire rotation at a landscape level is 310 years, already shorter than the historical rotation. When human-caused fires are included, the fire rotation for this period is further shortened to just 176 years. In Wyoming/basin big sagebrush habitat in particular, recent fire rotation was 76 years, owing to prescribed fires. In piñon-juniper it was 233 years. Both are likely too short for recovery and long-term persistence of these communities.

Notwithstanding the impact of higher average temperatures, longer growing seasons, and more frequent and severe droughts associated with climate change, another driver of reduced fire intervals is invasive plants. Most notable is cheatgrass (*Bromus tectorum* L.), an annual invader that arrived in late 19th century, that now dominates many western landscapes, and creates a continuous, flashy fuel that carries wildfire over large areas (Link 2006; Prevéy et al. 2024). Even with just lightning-caused ignitions, some small habitats dominated by cheatgrass have recent fire rotations of as little as 52 years (Romme et al. 2014). Native grasses do not tolerate such frequent fire, whereas cheatgrass thrives after such disturbance, creating a positive feedback loop of frequent fire and cheatgrass dominance (D'Antonio and Vitousek 1992). At Dinosaur, postfire cheatgrass invasion risk is increased at lower elevations (<1,600 m), after fires of greater severity and when soil moisture is low postfire (Sherrill and Romme 2012). Where a cheatgrass seed bank is present, prescribed fire increases cheatgrass cover, particularly in dry postfire years, because cheatgrass utilizes limited soil moisture early, outcompeting native perennials. In wetter years postfire, cheatgrass invasion risk is reduced. Romme et al. (2014) concluded that absent cheatgrass, natural and accidental human ignitions at Dinosaur would probably result in fire rotations similar to the historical fire regime. Where cheatgrass is abundant, full fire suppression to control cheatgrass is advisable.

Dinosaur has ancient piñon-juniper woodlands (Romme et al. 2014). Junipers arrived more than 9,000 years ago, while piñon only arrived about 1,100 years, and some of the monument's

stands may represent early pioneers to the region. Most of the woodlands are intact, lack weeds, and support diverse native vegetation and microbial crusts. Ancient stands at Harpers Corner and Ridge of the Giants have not had stand-replacing fires for many centuries, and mature piñon are more than a meter in trunk diameter, with a lack of continuous fuel in the understory from ground surface to limbs. It appears that these stands, like mature ponderosa pine stands, can support low-intensity surface fire in the understory. In piñon-juniper woodlands, fire is often less important in shaping stand dynamics than climatic fluctuation, insects, and disease. A case in point is the widespread piñon mortality event in the four-corners state region in the early 2000s resulting from drought, high temperatures, and bark beetle outbreaks. Dinosaur's piñon-juniper woodlands avoided widespread mortality in that cycle, despite the presence of the native bark beetle (*Ips confusus*) and scattered, background-level piñon beetle mortality.

But recent years of exceptional drought conditions in 2018 and 2020 have now caused dieback and mortality in piñon-juniper stands at the monument, providing a basis for consideration of long-term strategies like encouraging diversity—species, structural (age-class), and genetic—and protecting refuge populations, plus stand thinning and insecticide spraying of high value trees for *Ips*-vulnerable piñon (Ott et al. 2022). Preventing cheatgrass invasion of these vulnerable intact woodlands is paramount.

3.4.2 Impacts of Alternative A (No Action): Suppression Only

Impact Analysis – Vegetation - Alternative A

In a program of total fire suppression without fuels treatments and prescribed burns the persistence of native vegetation communities in their historical proportions would be jeopardized.

The shift from historically small and heterogenous fires at Dinosaur to more frequent, larger, and higher severity fires in the 1981-2010 period, has reduced fire rotation intervals to much shorter than they were historically. Invasive plants, including cheatgrass but also Russian thistle and kochia, are now the first to recolonize burned areas, and the continuous fuel sources they create can result in a positive feedback loop with larger, more severe fires. Contrasted with low-intensity fires, severe fires can destroy seeds in the soil seedbank, and in piñon-juniper communities can destroy all trees plus the understory vegetation and litter, volatilizing nutrients and limiting subsequent productivity (Covington and Debano 1990). In Alternative A, no tools are available to proactively combat invasive plant establishment, implement fuel reduction strategies, install fire breaks near visitor use areas, or use management tools such as thinning to protect woodlands from drought and beetle-related mortality. The consequence would be larger, more frequent, and more severe fires, resulting in a substantial trend of replacement of native vegetation communities and their associated biodiversity with fire tolerant invasive species. Suppression actions would become more frequent with increasing fuels across the landscape and a changing climate increasing the number, size, and severity of wildfires (Parks & Abatzoglou, 2020).

In addition to the damage caused directly by severe fires, the suppression efforts would also have localized negative impacts on vegetation. Equipment, personnel, and fire suppression strategies would cause trampling, crushing, soil disturbance and compaction, damaging and killing native plants and creating opportunities for invasive plants to expand.

Cumulative Effects – Vegetation – Alternative A

The impacts of ongoing and planned actions such as road and trail construction and maintenance, fencing repair and construction, building demolition and construction, utility line maintenance, visitor use, grazing, invasive plant suppression, and native plant revegetation would have negative and beneficial effects to vegetation within the monument. Construction and

maintenance of roadsides and trails, which is a constant disturbance, could lead to increased non-native vegetation expansion along roadways and trails, as well as away from these areas which would have a negative effect on native vegetation. Additionally, utility line maintenance, an increase in visitor use, and grazing also would have the potential to disturb areas of native vegetation either through trampling or inadvertently spreading non-native vegetation seeds through vehicles and humans, which would also have a negative effect on native vegetation. However, continuing with invasive plant suppression and native plant revegetation would have beneficial impacts.

Impacts from Alternative A would include larger and more severe wildfires, more suppression activities that disturb native plants, and the possibility to inadvertently spread non-native vegetation into areas they currently are not within the monument during suppression activities. Overall, this alternative would have negative effects to vegetation that could last several decades and be minor to moderate in scope.

When actions under Alternative B are combined with other past, present, and reasonably foreseeable future actions within the monument, the impacts would result in slightly more negative cumulative effects to vegetation as more area would be disturbed through planned construction projects and more wildfires.

3.4.3 Impacts of Alternative B (Proposed Action and Preferred Alternative): Multiple Strategy Wildland Fire Management Program

Impact Analysis – Vegetation – Alternative B

Under Alternative B, the localized impacts of fire suppression activities on vegetation communities would be the same as in Alternative A. But the expanded toolkit of fuels treatments and invasive plant suppression would reduce severe fire risk via fuels reduction over the short term, and over the next several years would encourage native vegetation recovery, resulting in diminished and less continuous fuel loads and reduced risk of larger and more severe fires that are outside of the historical range. The impact of mechanical treatments such as mowing and canopy thinning to maintain defensible space would be a few days to a few months, depending on the growth rates and life histories of the plants involved. Direct, localized impacts to native plants would continue for the life of the FMP, with regular fuels treatments along roads and around infrastructure and critical resources. In addition to the resultant beneficial impact to critical resources via reduced fire risk, such buffers would indirectly protect plant communities beyond the treatment area, by interrupting the spread of potentially large, severe fires outside of the historical norm.

Best management practices (found above in Chapter 2, Alternative B) would be used during planned treatments (prescribed fire, manual, and mechanical) to discourage the spread and invasion of non-native vegetation, and some treatments could be designed to encourage native vegetation, therefore having positive impacts on native vegetation.

Cumulative Effects – Vegetation – Alternative B

The impacts of ongoing and planned actions such as road and trail construction and maintenance, fencing repair and construction, building demolition and construction, utility line maintenance, visitor use, grazing, invasive plant suppression, and native plant revegetation would have negative and beneficial effects to vegetation within the monument. Construction and maintenance of roadsides and trails, which is a constant disturbance, could lead to increased non-native vegetation expansion along roadways and trails, as well as away from these areas which would have a negative effect on native vegetation. Additionally, utility line maintenance, an increase in visitor use, and grazing also would have the potential to disturb areas of native

vegetation either through trampling or inadvertently spreading non-native vegetation seeds through vehicles and humans, which could also have a negative effect on vegetation.

Impacts from Alternative B, which includes prescribed fire, manual, and mechanical projects would be planned with other non-native vegetation management efforts in areas prone to invasion (e.g., fire followed by spraying target species that resprout, followed by restoration of surrounding bare areas). This integration would be cost effective and would increase the effectiveness of all treatments, leading to a direct benefit to these vegetation areas and the ecosystem.

Overall, when actions under Alternative B are combined with other past, present, and reasonably foreseeable future actions, the cumulative impacts would be mostly beneficial over the course of several decades, with only limited and extremely short-term negative affects immediately following planned construction projects and fuels treatments, to native vegetation within the monument. The implementation of the FMP under alternative B would be the driver for these overall beneficial cumulative effects.

3.5 Special Status Species

3.5.1 Affected Environment

Federally Listed Species

The U.S. Fish and Wildlife Service (USFWS) maintains an online Information for Planning and Conservation (IPaC) site, used to determine federally listed species, including threatened, endangered, and candidate species under the Endangered Species Act (ESA), which may occur in Dinosaur. Nine species were identified (USFWS 2024):

- Gray Wolf (*Canis lupus*) – Experimental Population, Non-Essential (EXPN*)
- Mexican Spotted Owl (*Strix occidentalis lucida*) – Federally Threatened
- Yellow-billed Cuckoo (*Coccyzus americanus*) – Federally Threatened
- Bonytail (*Gila elegans*) – Federally Endangered
- Colorado Pikeminnow (*Ptychocheilus lucius*) – Federally Endangered
- Humpback Chub (*Gila cypha*) – Federally Threatened
- Razorback Sucker (*Xyrauchen texanus*) – Federally Endangered
- Monarch Butterfly (*Danaus plexippus*) – Candidate Species
- Ute Ladies'-tresses (*Spiranthes diluvialis*) – Federally Threatened

*For purposes of consultation, non-essential experimental populations (see section 10(j) of the ESA of 1973, as amended (16 U.S.C. 1531)) are treated as Federally Threatened species on NPS lands.

Critical habitats were identified for the listed fish species:

- Bonytail (*Gila elegans*)
- Colorado Pikeminnow (*Ptychocheilus lucius*)
- Humpback Chub (*Gila cypha*)
- Razorback Sucker (*Xyrauchen texanus*)

Yellow-Billed Cuckoo – Federally Threatened

Yellow-billed Cuckoo use wooded habitat with dense cover and nearby water, including dense thickets along streams. They often nest in willows along river corridors, using cottonwood galleries as foraging sites. They have a clutch size of 2-3 and a fast-breeding cycle, with 17 days from egg laying to fledging of young. Breeding coincides with appearance of abundant large insects, such as cicadas and caterpillars. This species has disappeared from much of the western U.S., and is now a rare breeder in California, Arizona, New Mexico, and west Texas. It is considered very rare in Utah and Colorado.

Yellow-Billed Cuckoo surveys have been conducted in Dinosaur in late July or early August of 2001, 2002, 2008, 2009, 2010, and 2021 in park-like riparian areas, with no detections (pers comm., Emily Spencer, April 2024). An unconfirmed sighting was reported along Jones Hole Creek in 1983, but there has never been a confirmed sighting in the monument, nor does the monument contain proposed or designated critical habitat.

Mexican Spotted Owl – Federally Threatened

Mexican Spotted Owls reside in mature forests with complex structure, as well as canyon habitat with vertical rocky cliffs, including tributary canyons. They nest from March-August, hatching a clutch of 1-3 chicks in May. While Dinosaur has suitable habitat, only one known Mexican Spotted Owl territory exists within the monument, in an extremely remote canyon with minimal human visitation, where a single bird was observed in two consecutive years in the late 1990s (USFWS 2012). Surveys since that time have failed to detect MSO, most recently involving the deployment of ARUs (autonomous recording units) throughout potential habitat along Yampa and Green rivers in 2022 and 2023. Despite a lack of detected species presence in recent years, an effects analysis for Mexican Spotted Owl is included below.

Gray Wolf – Experimental Population, Non-Essential

Gray Wolves are an adaptable keystone predator that historically ranged widely in the United States. They form packs to defend territories and prey on ungulates but will also scavenge. Breeding is in February, and 1-10 pups are born 63 days later. Pups stay with their pack for more than a year, and can then disperse long distances, sometimes >600 miles. Gray Wolves have recently been reported on rare occasions in Dinosaur, but no resident animals are presently known. Specifically, Colorado Parks and Wildlife (CPW) staff confirmed a group of at least six wolves in Moffat County, CO, in January of 2020 (CPW 2023). In November of 2020, Proposition 114 passed in Colorado, requiring the Colorado Parks and Wildlife Commission to implement a plan to restore and manage gray wolves in the state. The subsequent plan's goal is to "recover and maintain a viable, self-sustaining wolf population in Colorado, while concurrently working to minimize wolf-related conflicts with domestic animals, other wildlife, and people" (CPW 2023). The plan also outlines a livestock compensation program to address depredation affecting owners of livestock. In December 2023, the first group of wolves was released in Grand and Summit counties. Given suitable wolf habitat in the recommended wilderness of Dinosaur, and the large populations of prey species such as elk and deer, it is reasonable to expect movement of wolves into the monument in coming years.

Fishes – Federally Endangered except for the humpback chub which is Federally Threatened

Four species of ESA listed fishes occur in Dinosaur's rivers: bonytail, Colorado pikeminnow, razorback sucker, and humpback chub. Colorado pikeminnow and razorback sucker are long-lived and make spawning migrations to cobble bars in the monument; both species rely on nursery habitats in the Green River downstream of the monument. Humpback chubs are more site specific to disjunct canyon reaches and have not been found in the monument since 2006, likely due to some years with extremely low baseflows in Yampa Canyon and expansion of invasive smallmouth bass. Reintroduction and augmentation strategies for the humpback chub are being explored by the Upper Colorado River Endangered Fish Recovery Program (Valdez et al. 2021). Bonytail are maintained by stocking of hatchery raised fish, which have demonstrated poor survival and recruitment in the wild. Critical habitat has been identified in the monument for all four species and contains major spawning bars for Colorado pikeminnow and razorback sucker that are essential to the Middle Green River populations of those species.

Monarch Butterfly – Candidate Species

Habitats in Dinosaur are seasonally important to the western population of monarch butterflies, which lay their eggs on milkweed species through multiple generations during the summer (Xerces Society 2015). Adults feed on a diversity of flowering plants in fields, roadsides, and wetlands. The final generation of the summer migrates to overwintering sites along the Pacific coast or near Mexico City. At the monument's latitude, the butterflies are typically only present from May 1 – September 30; the other times of the year they are in the overwintering phase of their migration and not found within Dinosaur (Xerces Society 2015).

Ute Ladies'-tresses – Federally Threatened

Ute Ladies'-tresses are perennial orchids found in wet, herbaceous dominated habitats. In Dinosaur, it occurs in riparian areas along waterways. Periodic disturbance seems to play a role in its life history, as it is found along alluvial banks and floodplains along perennial streams and similar habitats that experience seasonal flooding, grazing, or mowing. In Dinosaur, it is typically found along fluvial surfaces that are influenced by the Green River water levels that are now tied to Flaming Gorge Dam releases (Jones et al. 2021).

Other Special Status Species

Special Status Bats

The richness of canyon, riverine, riparian, shrubland, and ponderosa pine and piñon-juniper woodland habitats at Dinosaur provide habitat for a high diversity of bats, including the species of concern listed above. Bats with special protection status found within the monument include the following:

- Brazilian free-tailed bat (*Tadarida brasiliensis*) S1 (Critically imperiled) in CO.
- Fringed myotis (*Myotis thysanodes*) S3 (Vulnerable) in CO and UT.
- Hoary bat (*Lasiurus cinereus*) S3 (Vulnerable) in CO.
- Spotted bat (*Euderma maculatum*) S2 (Imperiled) in CO.
- Townsend's big-eared bat (*Corynorhinus townsendii*) S2 (Imperiled) in CO and S3 (Vulnerable) in UT.

Brazilian free-tailed bats, fringed myotis, spotted bats, and Townsend's big-eared bats all forage in piñon-juniper and sagebrush shrubland, making them sensitive to alteration of such habitats (Armstrong et al. 2011). Hoary bats forage in open areas, often along riparian corridors, and are typically roost solitarily in foliage of large deciduous or coniferous trees, while spotted bats roost in cracks and crevices of river canyon walls (NatureServe 2024). Crevices and caves in the monument's canyon country are also important roosts for Brazilian free-tailed bats, fringed myotis, and Townsend's big-eared bats. Threats include white-nose syndrome (not yet detected at Dinosaur), disturbance of cave habitats, and loss of forest habitats used for foraging and roosting due to climate change and other direct forms of disturbance.

Special Status Plants

Nearly 100 plant species, found at Dinosaur are categorized as special status or rare on state lists from the Colorado Natural Heritage Program and the Utah Native Plant Society, or on lists maintained by the Bureau of Land Management and the U.S. Forest Service (Spencer and Trost 2022). With a rich composition of 23 exposed rock layers spread across a range of elevations, aspects, and slopes, along with a diversity of soils and moisture availability (from riparian habitats, wetlands, and seeps to semi-desert), the monument contains high plant diversity and many narrowly distributed endemic (only exist in one geographic region) species. NatureServe (2024) ranks species as G1 through G5, with G1 species defined as globally critically imperiled and at very high risk of extinction, G2 species as globally imperiled and at high risk of extinction, G3 as globally vulnerable and at moderate risk of extinction, G4 as globally secure

and at fairly low risk of extinction, and G5 as globally secure and at very low risk of extinction. Monument resource managers decided to focus on G1 and G2 species for this analysis because these are the species at very high or high risk of extinction.

G1 (Globally Critically Imperiled)

- *Astragalus hamiltonii*, Hamilton's milkvetch, is an endemic found in Uintah County, UT on benches and steep slopes at elevations between 4,900-6200 ft, in red, erosive, sandy clay loam soils. There may be undocumented occurrences in Dinosaur.
- *Erigeron wilkenii*, Wilken's fleabane, a tap-rooted perennial with white to light pink flowers, is known from only two verified sites in Dinosaur: Pool Creek and north of Bull Canyon. It occurs on sandstone derived soils of the Weber Formation and is found in partially shaded piñon-juniper habitats.
- *Frasera ackermanae*, Ackerman's green gentian, is a recently discovered local endemic found on yellowish clay containing paleosol inclusions and selenite gypsum fragments (Newberry and Goodrich 2010). It is known from only two localities in the Brush Creek drainage of the Uinta foothills, in association with Utah juniper, mountain brush and desert scrub, and may have undocumented occurrences in Dinosaur.
- *Hymenoxys lapidicola*, rock hymenoxys or stone rubberweed, is a densely matted cushion plant with solitary yellow flower heads endemic to Uintah County, UT, found in sandy crevices associated with Weber Sandstone in communities of piñon-juniper and ponderosa pine-manzanita (Jones et al. 2021). At Dinosaur, it is known from a single site at Hog Canyon.

G2 (Globally Imperiled):

- *Aquilegia grahamii*, Graham's columbine, is endemic to Uintah County, UT, and is found in hanging gardens.
- *Oenothera acutissima*, narrowleaf evening-primrose, is a perennial herb endemic to the mountains of northeastern Utah and northwestern Colorado, found in sandy to gravelly soil in habitats with seasonal moisture, such as arroyos and shallow basins (NatureServe 2024).
- *Penstemon grahamii*, Uintah Basin beardtongue, is found in UT and CO on calcareous soils derived from oil shale barrens of the Green River Formation, in sparsely vegetated communities of piñon-juniper and desert shrub.
- *Platanthera zothecina*, alcove bog orchid, is found in seeps and hanging gardens in UT, CO, and AZ (G2G3).
- *Townsendia mensana*, western townsend-daisy, is a long-lived perennial found only in Duchesne and Uintah counties, UT, on Duchesne, Uinta, and Green River formation shales in association with salt desert shrubland, piñon-juniper and sagebrush (NatureServe 2024).
- *Zigadenus vaginatus*, alcove death camas, is a perennial forb found in moist microhabitats such as canyon walls near seeps and hanging gardens in CO, UT, and AZ.

Trends and Planned Actions – Special Status Species

Actions in the monument that may affect special status species include road and trail construction and renovation, fencing repair, building and utility maintenance and construction, and invasive plant management.

Federal Highways Road projects at Dinosaur include the recently completed resurfacing of a portion of the Harper's Corner Road, and planned resurfacing of the Green River district. This work is rehabilitating existing roads, improving accessibility (for instance, by adding a lane at the entrance station), and repairing cracks and slumping in sidewalks and parking areas.

Building projects include the demolition of the Yampa District multi-ops building and construction of a new building in a similar footprint of the larger disturbed area. Additionally, the boat ramp at Deerlodge is also slated for replacement in the near future. Planned maintenance of fencing and utilities involve replacement and upgrade of existing infrastructure in the same location, without expansion into undisturbed areas. The footprints of the above projects are in developed or previously disturbed areas, and any effects on special status species will be evaluated in project planning.

Renovations of trails are planned for Dinosaur, and with the exception of a trail re-routing out of the riparian zone of the wash at Bull Canyon, will involve work in the existing trail footprint. Rare-plant surveys will be performed as part of the compliance process ahead of this work. Ongoing management would continue, including hazard tree mitigation in campgrounds and invasive plant management using both herbicide treatments and biocontrol.

Livestock grazing by permitted grazers on established allotments would continue, with rangeland assessment informing animal unit month allowances and exclusion from sensitive habitats to mitigate negative effects.

Climate trends at Dinosaur over the last 120 years, and estimates into possible climate futures, are analyzed in a Climate Futures Summary (Climate Change Response Program 2024). Warming has accelerated since 1970, with the rate of warming between 1970-2022 increasing at 6.8 °F per century. During the same period, overall precipitation has decreased, but is highly variable, with more extreme rain events increasing. Climate change modeling points toward two possible climate futures for the monument, “Warm Wet” and “Hot Dry.” All models project increases in average annual temperature, ranging from +2.5 °F to +8.5 °F by 2050. While annual precipitation is projected to increase by +2 inches in a Warm Wet future and by +0.6 inches in a Hot Dry future relative to 1979-2012, more extreme events at both ends of the scale will increase in both futures, with markedly drier and wetter years than have occurred in recent history. Dinosaur may see shifts in vegetation type and changes in habitat suitability for many species as a result of hotter temperatures, more extreme storms, and more severe drought. In both futures the risk of larger, more severe wildfires is expected to increase.

3.5.2 Impacts of Alternative A (No Action): Suppression Only

Impact Analysis – Special Status Species – Alternative A

The effects of larger and more severe wildfires under the no-action alternative could be more substantial and longer lasting, if not irreversible, especially in the context of hotter temperatures and more extreme droughts under climate change. Ever larger fires could alter coverage of vegetation communities on the landscape and outpace postfire regenerative potential, resulting in potentially substantial loss of classes of habitat and populations of special status species dependent on them. While some habitat would be impacted by fire suppression activities, in all but extreme cases, sufficient habitat would remain to support special status species. If major adverse effects were expected to species due to wildfires, the monument would also do emergency consultation with the USFWS on any federally listed species.

Yellow-Billed Cuckoo

Despite multiple years of targeted surveys, the most recent in 2021, there has never been a confirmed sighting of Yellow-Billed Cuckoo in Dinosaur National Monument. The park-like riparian habitat favored by this species is spatially removed from the potential impacts of wildfire and fire suppression activities, including destruction of nests and loss of habitat (in the form of riparian vegetation) due to creation of staging areas or clearing of fire lines, are less likely in wet riparian habitats. In a 5/19/2015 letter, USFWS concurred with the NPS

determination that routine operations in riparian zones were “not likely to adversely affect” cuckoos.

Mexican Spotted Owl

Under Alternative A, when fire suppression activities are in close proximity to Mexican spotted owl habitat negative impacts could result from noise and habitat disruption, but would only last a few days to a few weeks. In addition, larger and more severe fires could reduce the size or remove the one Mexican spotted owl territory found within the monument.

Gray Wolf

Under the no action alternative, a positive feedback loop of larger and more severe fires would be increasingly exacerbated by cheatgrass and other invasive plant expansion. More severe fires over larger areas would adversely affect the seedbank and recovery of native bunchgrasses, negatively impacting browse for ungulates, and indirectly reducing prey availability for wolves immediately after wildfires. In addition, larger and more severe wildfires could injure or kill wolves due to their fast-moving nature, especially mothers with nursing pups, which would reduce their population resiliency and the potential for wolves to return to burned areas. Aircraft, people, and equipment in close proximity to dens and rendezvous sites could disturb wolves enough that they choose to leave the area and find new denning and rendezvous sites. These impacts would be negative on wolves and could last a few months to a few years. Best management practices during wildfires would involve avoidance, where possible, of known dens and rendezvous sites in the selection of staging areas, fire lines, and aircraft and vehicle operations.

Fishes

Under Alternative A, the potential impacts to the listed fish species and their big river habitats include postfire erosion and debris flows that can bury spawning bars, fill in pools and other complex habitat, and alter water chemistry, to the point that dissolved oxygen can plummet and fish kills are possible. The risk of such an event is greater in small tributary streams than large rivers but increases in both habitats when fires are larger and more severe. Fire suppression activities within the river, such as helicopters, portable pumps, and engines removing water from rivers could have negative effects on special status species fishes. Best management practices would include the Superintendent would have to approve aircraft removing and transporting water from the Yampa and Green Rivers unless there was an immediate threat to life and property, and if water were to be used from the rivers, preidentified spawning bars for the Colorado pike minnow and razorback sucker would be avoided.

Monarch Butterfly

Under the no-action alternative, fire suppression activities could have direct negative impacts on monarchs through injury and mortality resulting from trampling by crews and equipment of milkweed hosts and pre-adult stages as well as adults. Damage to foraging habitat in flowering plants could also indirectly negatively impact monarchs. A best management practice could include the use of a resource advisor on wildfires to help identify milkweed to reduce trampling when possible. With larger and severe fires more likely in the absence of treatments, larger tracts of habitat could be impacted, directly killing more monarchs and increasing the time period for vegetation reestablishment, resulting in the adverse impact lasting several years.

Ute Ladies'-tresses

The largely riparian habitat of Ute Ladies'-tresses is less susceptible to direct fire impacts than upland forests and shrublands. However, if suppression activities are staged in the riparian zone, trampling and crushing risks are present. A best management practice would include identifying areas where the plant is present before fire season starts and avoiding these areas whenever

possible for fire suppression activities. Similar to the fishes described above, under a no-action alternative with larger and more severe fires, these orchids are at greater risk of being buried under debris flows or washed away by the floods and erosion that follow.

Other Special Status Species

Special Status Bats

Under the no-action alternative, fire suppression activities could damage or destroy vegetation that serves as food and shelter for insects preyed upon by bats, adversely affecting them by decreasing their food supply. Hoary bats would be most at risk of direct mortality due to their preference for roosting in trees, while Brazilian free-tailed bats, fringed myotis, spotted bats, and Townsend's big-eared bats that all forage in piñon-juniper and sagebrush shrubland would be most impacted by disruption of foraging habitat. The increased risk of larger, landscape level loss of vegetation communities to severe fire, along with longer recovery times, could have long lasting adverse impacts on availability of upland bat foraging habitat.

Special Status Plants

Under the no-action alternative, without proactive fuels treatments and prescribed burns the chances of larger, more severe wildfires would increase. Larger and more severe fires would increase the risk of loss of small, isolated populations of rare plants. Of the G1 and G2 level species listed here, those most at risk are species associated with piñon-juniper and shrub communities: Wilken's fleabane, rock hymenoxys, Uintah Basin beardtongue, western townsend-daisy. Less at risk would be the species associated with springs, seeps, and hanging gardens, found in habitats less vulnerable to fire. In addition to the direct impacts of severe fire, indirect effects include erosion, flooding, and changes to soil quality, potentially leading to loss of seedbanks and adverse impacts to growth and reproduction.

Direct impacts of fire suppression activities on special status plants include trampling by vehicles and crews, along with soil compaction that could inhibit seed germination and colonization of disturbed areas. A primary best management practice would be to avoid suppression activities in the vicinity of known populations of special status plants. Nevertheless, the combined adverse effects of severe fires could be widespread and long lasting, as entire landscapes, including vegetation communities, soils, and soil microbiomes could be altered, and most or all of the population of a rare endemic plant with a restricted range could be lost.

Cumulative Effects – Special Status Species – Alternative A

The impacts of past and planned trail, building, utility, and road infrastructure maintenance and repair described above would continue. Livestock grazing would also continue. Impacts of these activities to special status plants, animals and habitats would continue to be limited to the previously disturbed footprint in the monument's developed areas and to established grazing allotments. For each project, adverse impacts would continue to be analyzed and mitigated during project planning and compliance, and scientifically supported best management practices would continue to be implemented. As a result, there would be minor to no negative impacts of planned construction projects on special status species.

Impacts from Alternative A would include more suppression activities that would disturb special status species, and indirect negative impacts from loss of habitat due to larger and more severe wildfires over the course of several years to decades. However, best management practices would be used on wildfires to limit as many negative long-term impacts as possible, and some wildfires may even produce beneficial effects for special status species by improving habitat. However, during large, severe wildfires, there could still be some adverse, short-term impacts due to the loss of habitat until vegetation recovers.

Overall, when the actions under Alternative A are combined with other past, present, and reasonably foreseeable future actions, the impacts on special status species would be beneficial to negative and short-term because best management practices would be used for planned construction projects and wildfires.

3.5.3 Impacts of Alternative B (Proposed Action and Preferred Alternative): Multiple Strategy Wildland Fire Management Program

Impact Analysis – Special Status Species – Alternative B

The effects of larger and more severe wildfires would be reduced in comparison to the no action alternative. Fuels reduction may help native plant communities persist in the hotter conditions expected due to climate change. While treatment activities may increase localized negative impacts to individuals of some species, these disturbances would be short lived and limited in scope.

Avoidance and Best Management Practices

During the seasonal planning process ahead of peak fire season, and prior to preventative treatments, sensitive locations for plant and animal special status species would be identified, and strategies tailored toward minimizing or avoiding adverse impacts at those locations. All planned prescribed fires and non-fire fuel treatments would include Section 7 consultation with the USFWS before activities would begin. When a listed species or critical habitat appears susceptible to an adverse impact from fire management, the monument would initiate emergency Section 7 consultation with USFWS. The monument would avoid population level impacts as a result of consultation and best management practices.

Yellow-Billed Cuckoo

The effects of wildfire and suppression activities would be the same under Alternative A and Alternative B. The park-like riparian habitat favored by this species is spatially removed from the direct effects of proactive fuels reduction projects like manual and mechanical thinning and prescribed fires because these activities are largely restricted to drier upland habitats and in proximity to infrastructure. A related effect of Alternative B would be reduced risk of large, high severity fires, reducing both direct fire risk and indirect flooding and erosion risk to riparian habitats occupied by Yellow-Billed Cuckoo.

Mexican Spotted Owl

While fuels reduction projects or prescribed burns could have short-term adverse impacts in owl habitat due to noise and habitat disruption lasting a few hours to a few days, these activities are highly unlikely to occur in the remote slot canyon nesting sites favored by this species. When fire suppression activities are in proximity to Mexican spotted owl habitat, short-term adverse impacts lasting for a few hours to a few weeks, would result from noise and habitat disruption. A related effect of Alternative B would be reduced risk of large, high severity fires, reducing both direct fire risk in slot canyon owl habitat and supporting more resilient native vegetation communities, benefitting owls by supporting their prey base of small rodents.

Gray Wolf

Under the proposed action, localized risks of disturbance or mortality due to fire suppression activities would remain for wolves, particularly when pups are nursing, and would be minimized through the use of best management practices described for the no action alternative. Similar localized, small risks stemming from the expanded toolkit of fuels treatments would exist, and would likewise be lessened through avoidance, where possible, of known dens and rendezvous sites in the planning stage of activities. But the risk of larger and more severe fires would be reduced, protecting native vegetation communities and the wildlife habitat they provide and preserving a longer, more historically consistent fire rotation that would allow for regeneration

and persistence of woodland and shrubland communities. Wolves would benefit from the preservation of habitat provided by native vegetation, as well as from the healthier ungulate prey populations from more forage availability in intact, biodiverse native plant communities.

Fishes

Under both alternatives, the potential impacts to the listed fish species and their big river habitats are similar in kind, but different in scale. The proposed action would employ preventative management to reduce the risk of large, high severity fires, thus reducing the related risk of large post-fire erosion and debris flows with the potential to cause fish kills and riverine habitat alteration. Under the proposed action, the overall risk of indirect fire impacts on listed fish species would be lessened.

Monarch Butterfly

The same potential adverse impacts of fire suppression activities would pertain for monarchs in Alternative A and B. The risks of such impacts would be increased by the addition of vegetation treatments and prescribed burn activities. However, burns and other mechanical treatments could be planned to avoid vegetation patches identified as prime monarch habitat when monarchs are present, or to temporally avoid monarch impacts by planning activities in the fall and winter when monarchs are absent. The effects of proactive fire management under the proposed action would favor preservation of native plant communities and result in smaller, less severe fires more in line with the historical pattern. This would reduce the risk to loss of large areas of suitable habitat in a single fire, and over the long term would provide more stable and resilient native plant communities on which monarchs depend.

Ute Ladies'-tresses

The expanded toolkit of preventative activities increases the localized risk of injury or mortality to Ute Ladies'-tresses when those activities encroach on their specialized riparian habitats. Longer term trends expected under the proposed action include reduced risk of large, severe fires and subsequent floods and debris flows and increased resiliency of native plant communities with faster recovery times following disturbance. These trends should be beneficial to Ute Ladies'-tresses.

Other Special Status Species

Bats

Under the proposed action, as above, expanded fire management activities in addition to suppression activities would increase the risk of localized damage to bat foraging habitats and insect prey. However, the expanded fire management activities are expected to reduce the risk of abnormally large and severe fires, increasing the resiliency and recovery time of the piñon-juniper and sagebrush shrublands that provide foraging habitats for Brazilian free-tailed bats, fringed myotis, spotted bats, and Townsend's big-eared bats. By reducing the risk of permanent alteration of native vegetation communities, the proposed action would provide a better outlook for persistent bat foraging habitat availability (and tree roosting habitat for hoary bats). In addition, the management activities in the proposed action would impact only a small proportion of the landscape in a given year, allowing bats to exercise avoidance, divert to alternative foraging areas, and reduce the risk of population level impacts.

Special Status Plants

Under the proposed action, the expanded portfolio of fire management activities would increase the localized risk of trampling, uprooting, or burning of special status plants occurring in treatment areas. Other possible adverse impacts include soil compaction from equipment and increased soil erosion by wind and water following vegetation removal. Under such conditions

special status plant seeds might be lost or fail to germinate, and invasive plants could gain a foothold.

Species associated with more fire prone plant communities such as piñon-juniper and shrub habitats, including Wilken's fleabane and rock hymenoxys, Uintah Basin beardtongue, and western townsend-daisy, would be more likely to overlap with management burns and fuels reduction activities. Less likely to be adversely impacted by either preventive management or fire suppression activities are species found in seeps and hanging gardens, including Graham's columbine, alcove death camas, and alcove bog orchid, or seasonally wet arroyos like narrowleaf evening-primrose. Mitigations to reduce adverse impacts of treatment activities would include avoidance of known populations of special status plants, pre-treatment surveys, and employment of invasive plant prevention best management practices.

Despite short term localized impacts, the broader long-term effect of the proposed action is expected to be beneficial for special status plant populations. By reducing the risk of large, high severity fires, the risk of catastrophic loss of whole populations of narrowly distributed rare plants is decreased. The intactness of biodiverse native plant communities would be better protected, and invasive species encroachment would be discouraged, improving conditions for populations of special status plants compared to Alternative A.

Cumulative Effects – Special Status Species – Alternative B

The impacts of past and planned trail, building, utility, and road infrastructure maintenance and repair and livestock grazing described above would continue. Impacts of these activities to special status plants, animals and habitats would continue to be limited to the previously disturbed footprint in the monument's developed areas, as well as established grazing allotments. For each project, adverse impacts would continue to be analyzed and mitigated during project planning and compliance, and scientifically supported best management practices (like cleaning of contaminated construction equipment and herbicide use to suppress invasive plants) would continue to be implemented. As a result, there would be minor to no negative impacts of the infrastructure projects on special status species.

With the expanded toolkit of fire management actions, additional localized activities would contribute to the impact to special status species through vegetation removal, soil disturbance, and habitat alteration. Use of best management practices would reduce the risk of invasive plant establishment in disturbed areas, and the activities would all be tailored toward beneficial effects of preserving the resiliency of native plant communities by reducing the risk of high severity fires.

Overall, when the actions of Alternative B are combined with other past, present, and reasonably foreseeable future actions, the cumulative impacts would be beneficial for multiple years if not decades to preserve the resiliency of habitat and native plant communities of special status species.

3.6 Visitor Use, Experience, and Recreation

3.6.1 Affected Environment

The scenic setting of Dinosaur National Monument attracts visitors year around, although the vast majority of visitation occurs between June and October. In 2023, 326,529 visitors came to see the quarry, raft, camp, or engage in other recreational opportunities (NPS, 2024).

There are six campgrounds in Dinosaur; five are open year around while one closes for the winter. There are two visitor centers, the Quarry Visitor Center in Utah, and the Canyon Visitor Center in Colorado. The Quarry Visitor Center is the most popular and open year around, and

during the summer months, shuttle busses bring visitors between the Visitor Center and the Quarry Exhibit Hall. The Canyon Visitor Center closes during the winter.

Most visitors to Dinosaur come to see the Quarry Exhibit Hall, while the second most popular recreation activity is boating the Green and Yampa Rivers. Visitors can either use a commercial (concessionaire) for one day river trips on the Green River or multi-day (usually 4-5 days) river trips on the Green and Yampa Rivers, or a permit system for private (noncommercial) river trips on both rivers. All private and commercial river trips are strictly managed for group size, put in locations, camping, and take out locations. The high use season on the rivers is mid-May through mid-July (Yampa River) to mid-September (Green River).

Along with river recreation, hiking, fishing, scenic drives and overlooks, camping, limited amounts of horse riding, and picnicking are all common activities by the few visitors that venture past the Quarry Exhibit Hall or are not recreating on the Green or Yampa Rivers. There are approximately 35 miles of hiking trails within the monument, and off-trail hiking is also allowed. There are five main scenic drives within the monument that allow visitors views of the Green River, Yampa River, and canyons.

Dinosaur was designated as an International Dark Sky Park in 2019. Nearly 91% of the monument is managed as recommended wilderness, and night skies, natural sounds and visual resources are all a part of its recommended wilderness character. Natural sounds and unique and valuable scenic vistas are also listed as a key component of the monument's significance within the Dinosaur National Monument Foundation Document (NPS 2015).

Trends and Planned Actions – Visitor Use, Experience, and Recreation

Oil and gas development in the region threatens multiple resource values such as visual resources, natural soundscapes, and dark night skies (Jones et al 2021). Other stressors to night skies and natural soundscapes within the region are projected increases of road traffic from Highways 40 and 64 and an increase in commercial airplanes overhead. Night skies within Dinosaur were measured as being in good condition, with an unknown trend, and overall natural sound conditions warrants moderate concern with an anticipated deteriorating trend by Jones et al in 2021.

Climate change is expected to change visitation patterns within National Parks, including Dinosaur, and increase potential total annual visits, visitation during all seasons, and the length of visitation season due to projected increased monthly temperatures (Fisichelli et al 2015). This could mean staffing needs may change as the monument is expected to have an increase in annual visitation, with the largest increase being shoulder season (early spring and late fall) (NPS 2015).

Additionally, road and trail maintenance, new infrastructure, and other infrastructure improvements are planned during the next few years within Dinosaur. All of these except for one trail reroute are within existing disturbed areas already. These planned construction projects could negatively impact visitor use, experience, and recreation through temporary closures of areas, roads, or trails, traffic delays, and once completed could improve their experience within the monument.

3.6.2 Impacts of Alternative A (No Action): Suppression Only

Impact Analysis – Visitor Use, Experience, and Recreation – Alternative A

Under Alternative A, a suppression-oriented fire program, direct and adverse effects to visitor use, experience, and recreation could result from an increase in suppression activities such as aircraft and chainsaw use, and road closures to areas of the monument due to wildfires.

Increased aircraft and chainsaw use would result in noise pollution and could disrupt visitor's experience to the monument. These adverse effects would last from a single day to multiple days while the fire was burning and would occur anywhere within the monument where a wildfire occurs and aircraft fly over while enroute or leaving a fire. Depending on location of the wildfire, an area or road closure may happen for safety of visitors and fire personnel trying to suppress a wildfire, which could result in adverse effects to visitor use, experience, and recreation. Additionally, smoke impacts from wildfires that could reduce visibility at scenic vistas, and create negative health impacts to visitors from wildfire smoke and particulates would increase under this alternative due to an increase in larger, more severe wildfires within the monument (see Air Quality analysis above).

Under Alternative A, fuel accumulations throughout the monument would have indirect impacts to visitor use, experience, and recreation. Fuel accumulations would result in larger, more severe wildfires in the future, along with an increase in restricted visitor uses during extreme fire danger periods. Large and severe wildfires could have an adverse impact on recreational use for extended periods by closing trails or larger areas due to potential hazards from falling trees, erosion, and flooding; by destroying infrastructure; by closing roads; by affecting views and by negatively impacting aquatic habitats and fisheries. These impacts could last from one day to several months, depending on the size, location, and severity of a wildfire, and would occur anywhere within the monument a wildfire occurs.

Cumulative Effects – Visitor Use, Experience, and Recreation – Alternative A

Ongoing and planned construction activities within the monument, and oil and gas development and increased highway traffic outside of the monument, would contribute adverse effects to visitor use, experience, and recreation. These adverse effects would be minor to moderate and last a few days to a few months. Alternative A would also contribute adverse impacts to visitor use, experience, and recreation which could last one day to several months and would be widespread throughout the monument wherever a wildfire occurs. Overall, when actions under Alternative A are combined with other past, present, and reasonably foreseeable future actions, the cumulative impacts to visitor use, experience, and recreation would be adverse, last one day to several months, and be minor to moderate.

3.6.3 Impacts of Alternative B (Proposed Action and Preferred Alternative): Multiple Strategy Wildland Fire Management Program

Impact Analysis – Visitor Use, Experience, and Recreation – Alternative B

Under Alternative B, some wildfire suppression would still occur, and would have similar direct and indirect effects as Alternative A but would occur less frequently because not all wildfires would be suppressed. Direct effects of not suppressing all wildfires could infrequently be similar to the effects of Alternative A should a wildfire become large enough or be in a location where temporary area closures become necessary, visibility was impacted, or smoke and particulate matter created adverse public health conditions. However, most wildfires that aren't suppressed are likely to occur during shoulder seasons (early spring or late fall) when fire danger and fire severity is low to moderate and limited to surface spread. Because the highest visitation is during the summer and early fall, these wildfires are likely to have very few to moderate one day to several day effects on visitor use, experience, and recreation.

The increase in fuel treatments under Alternative B could have adverse effects on visitors in the immediate vicinity of treatments while they are being performed. This would only last a few days to a few weeks. Prescribed fires and non-fire fuel treatments would mostly be conducted in the fall, winter, and spring, during times of lower visitation. The visual presence of work crews and evidence of fuel treatments on the landscape could result in localized, minor, and possible adverse impacts to the visitor experience and recreation. However, these treatments could be

used as an interpretive opportunity to educate the public on fire management by including temporary signs describing why the treatment is being completed. Manual and mechanical thinning of vegetation to reduce fuel loads would result in noise intrusions but would be localized, a few hours to a few days in length, and have only minor adverse impacts depending on the proximity of the treatment area to visitor services. Prescribed fires, both pile and broadcast, would be planned in accordance with weather conditions and lower visitation times to minimize road closures. Indirect beneficial effects of Alternative B would be monument and ecosystem wide restoration and maintenance of fire regimes over the course of several years and decades therefore providing a good example to visitors of a functioning ecosystem along with opportunities to interpret and educate the public about wildland fire management's role in ecosystem restoration.

Cumulative Effects – Visitor Use, Experience, and Recreation – Alternative B

The cumulative effects of Alternative B would be very similar to Alternative A, with the addition of a beneficial effect of restoring the ecosystem and improving future visitor's experiences. The negative cumulative effects would be localized and last a few hours to a few days. The beneficial cumulative effects would be localized to ecosystem wide and last a few months to a few decades.

Overall, when the actions under Alternative B are combined with other past, present, and reasonably foreseeable future actions in the monument, the impacts to visitor use, experience, and recreation would be beneficial to slightly negative, localized to the project or wildfire area, and would last a few days to a few decades.

4. Consultation and Coordination

List of Agencies and Individuals Consulted

The following agencies and organizations were contacted and invited to participate in the planning process. Affiliated tribes were also invited to participate in the planning process and are listed below under National Historic Preservation Act and Tribal Consultation.

- Adrift Adventures
- American Rivers
- American River Touring Association (ARTA)
- Bureau of Land Management (BLM) Northwest Fire and Aviation District
- BLM Green River District
- Bureau of Indian Affairs Uintah and Ouray Agency
- Colorado Division of Fire Prevention and Control, Northwest District
- Colorado Governor's Office
- Colorado Outward Bound School
- Colorado Representative Lauren Boebert
- Colorado State Historic Preservation Office (CO SHPO)
- Colorado State Tourism Communications Office
- Colorado Welcome Center
- Craig, CO Chamber of Commerce
- Craig Interagency Dispatch Center
- Dinosaur, CO Town Manager
- Dinosaur River Expeditions
- Don Hatch River Expeditions
- Holiday River Expeditions
- Intermountain Natural History Association

- Jensen, UT Welcome Center
- Mild2Wild Rafting
- Moffat County, Colorado Commissioner
- Moffat County, Colorado Tourism Association
- National Outdoor Leadership School (NOLS)
- National Parks Conservation Association
- National Parks Traveler
- Outdoor Adventure River Specialists (OARS)
- Rangely, CO Town Manager
- Rangely, CO Chamber of Commerce
- Rangely, CO Outdoor Museum
- Rocky Mountain Area Coordination Center
- Rocky Mountain Youth Corps
- Senator Michael Bennet
- Senator Mike Lee
- Senator John Hickenlooper
- Senator Mitt Romney
- Sheri Griffith Expeditions
- Sierra Club – Rocky Mountain Chapter
- Steinaker/Red Fleet/Flaming Gorge State Parks
- The Nature Conservancy
- Uintah Basin Interagency Fire Center
- Uintah County, UT Tourism
- Uintah County, UT Commissioner
- Uintah School District
- U.S. Forest Service (USFS) Routt Zone of the Medicine Bow/Routt National Forests and Thunder Basin National Grasslands
- USFS Ashley National Forest
- U.S. Fish and Wildlife Service (USFWS), Colorado Ecological Services Field Office
- USFWS Browns Park, Arapaho, and Ouray National Wildlife Refuges
- Utah Field House of Natural History State Park Museum
- Utah Governor’s Office of Economic Development, Visitor Services
- Utah Office of Tourism
- Utah Representative John Curtis
- Utah Representative Rob Bishop
- Utah State Division of Forestry, Fire and State Lands
- Utah State Historic Preservation Office (UT SHPO)
- Vernal, UT Area Chamber of Commerce
- Vernal, UT City Manager
- Vernal, UT Mayor
- Vernal, UT City Council

National Historic Preservation Act and Tribal Consultation

As required by Section 106 of the National Historic Preservation Act (NHPA), Dinosaur consulted with thirty-six federally recognized tribes, before making decisions or undertaking activities that may affect federally recognized tribes. For this FMP EA, informal consultation with Tribes was initiated in May 2024, with a summary of the proposed action and an invitation to comment during public scoping held May 13th – 27th, 2024.

National Historic Preservation Act Section 106 compliance consultation is currently being conducted with Colorado and Utah SHPOs and federally recognized tribes in accordance with 36 CFR Section 800.8(a)(1).

The federally recognized tribes consulted include:

- Arapaho Tribe
- Comanche Nation
- Crow Tribe
- Hopi Tribe
- Santo Domingo Pueblo
- Navajo Nation
- Ohkay Owingeh
- Paiute Indian Tribe – Cedar, Indian Peaks, Kanosh, Koosharem, and Shivwits Bands
- Pueblo of Acoma
- Pueblo of Cochiti
- Pueblo of Isleta
- Pueblo of Jemez
- Pueblo of Laguna
- Pueblo of Nambe
- Pueblo of Picuris
- Pueblo of Pojoaque
- Pueblo of San Felipe
- Pueblo of San Ildefonso
- Pueblo of Sandia
- Pueblo of Santa Ana
- Pueblo of Santa Clara
- Pueblo of Taos
- Pueblo of Tesuque
- Pueblo of Zia
- San Juan Southern Paiute Tribe
- Shoshone Tribe
- Shoshone-Bannock Tribes
- Southern Ute Indian Tribe
- Ute Indian Tribe
- Ute Mountain Tribe
- Zuni Tribe

When finalized, the monument will send the Draft EA to the federally recognized tribes, continue further consultation, and document the key findings, stipulations and effects in the decision document for this EA.

Endangered Species Act

NPS prepared a biological assessment (BA) for the proposed project and plan, which was submitted to the USFWS on September 18, 2024, in accordance with 16 U.S.C 1531-1544 and as part of formal consultation under the ESA (NPS 2023). The BA included the following species, critical habitats, and affects determinations in Table 3 below. A concurrence memo was received from the USFWS on October 25, 2024, in which USFWS concurred with the monument's affect determinations for all species and critical habitats.

Table 3. List of species included within the biological assessment.

Species Common and Scientific Name	Federal Status	Potential to Occur	Critical Habitat	Affect Determination
Insects				
Monarch Butterfly (<i>Danaus Plexippus</i>)	Candidate	Yes	No	May affect, but is not likely to adversely affect
Plants				
Ute Ladies'-tresses (<i>Spiranthes diluvialis</i>)	Threatened	Yes	No	May affect, but is not likely to adversely affect
Fishes				
Bonytail (<i>Gila elegans</i>)	Endangered	Yes	Yes	May affect, but is not likely to adversely affect
Colorado Pikeminnow (<i>Ptychocheilus lucius</i>)	Endangered	Yes	Yes	May affect, but is not likely to adversely affect
Humpback Chub (<i>Gila cypha</i>)	Endangered	Yes	Yes	May affect, but is not likely to adversely affect
Razorback Sucker (<i>Xyrauchen texanus</i>)	Endangered	Yes	Yes	May affect, but is not likely to adversely affect
Birds				
Yellow-billed Cuckoo (<i>Coccyzus americanus</i>)	Threatened	Yes	No	May affect, but is not likely to adversely affect
Mexican Spotted Owl (<i>Strix occidentalis lucida</i>)	Threatened	Yes	No	May affect, but is not likely to adversely affect
Mammals				
Gray Wolf (<i>Canis lupus</i>)	Experimental	Yes	No	May affect, but is not likely to adversely affect

When finalized, the monument will continue further consultation, send USFWS the Draft EA for review, and document the key findings, best management practices, and effects in the decision document for this EA.

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Appendix A

Impact Topics Dismissed from Further Consideration

1. Environmental Justice

The Environmental Protection Agency defines Environmental Justice as, “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Executive Order 12898, *General Actions to Address Environmental Justice in Minority Populations and Low-income Populations*, requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing if their programs and policies have disproportionate environmental or health effects on minorities and low-income populations and communities. Implementation of a new fire management plan at Dinosaur would not result in disproportionately high direct or indirect adverse effects on minorities or low-income populations or communities due to the relatively remote area of northwest Colorado and northeast Utah where the monument is located.

2. Ethnographic Resources

Until an ethnographic study can be completed at Dinosaur National Monument all petroglyph and pictographs are managed as archaeological sites only. The monument is beginning an ethnographic overview in late 2024, and this assessment will inform future management actions on wildfires when complete in 2027. Because of best management practices during wildfires and fuels treatments for archeological resources, this impact topic was dismissed from further analysis. As needed, the FMP would be updated following completion of the ethnographic overview to include additional BMPs necessary to minimize impacts to ethnographic resources.

3. Geological Features and Processes

There are 24 rock layers exposed within Dinosaur, which make up one of the most complete stratigraphic columns exposed with the National Park System (National Park Service 2024b). The Green and Yampa Rivers have created deep canyons through a geological process called canyon formation downcutting; downcutting occurs as a river carves out a canyon or valley, cutting down into the earth and eroding away rock (National Park Service 2024b). While large and severe wildfires have the potential to increase erosion and debris flow activity which could indirectly result in minor alterations to geological processes and features during the short term, wildfires would not result in disproportionately high direct or indirect adverse effects outside of erosion that is already happening, therefore this topic was dismissed from analyses.

4. Indian Trust Resources

Indian Trust Resources are assets or interests (e.g., land, minerals, natural resources, hunting rights) that are held in trust for American Indian and Alaska Native tribes and individual Indians by the federal government through treaties, statutes, judicial decisions, and executive orders (NPS 2006). There are no Indian trust resources at Dinosaur, so this topic was dismissed from further analysis.

5. Lightscapes

Natural lightscapes are the resources and values that exist without artificial light sources at nighttime, such as the starry sky and nocturnal wildlife habitat. Lightscapes may also be essential to the historical character of a location. Implementation of a fire management plan at Dinosaur does not propose the use of any artificial light sources. Fires may burn overnight causing impacts to lightscapes, but these effects are anticipated to be temporary and very minimal.

6. Museum Collections

Museum collections would not be affected by any of the analyzed alternatives, and therefore this topic was dismissed from further analysis.

7. Prime and Unique Farmlands

In August 1980, the Council on Environmental Quality directed that federal agencies must assess the effects of their actions on farmland soils classified by the U.S. Department of Agriculture's Natural Resources Conservation Service as prime or unique. Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland is defined as soil that produces specialty crops such as fruits, vegetables, and nuts. There were no prime or unique farmlands located within Dinosaur; therefore, the topic of prime and unique farmlands was dismissed as an impact topic in this EA.

8. Public Health and Safety

During fuels reduction and wildfire suppression activities, the monument would implement measures to protect visitors, monument employees, and fire personnel. For example, the monument would restrict visitors and NPS employees from active work areas and burn unit to ensure their safety during fuels reduction activities. In the event of a large wildfire, areas within the monument could be closed to visitors and employees not associated with fire suppression to reduce risks to health and safety. The monument would follow requirements under smoke permits issued by the state of Colorado or Utah to burn under appropriate smoke dispersion conditions and reduce smoke inhalation. Further, crews working on the prescribed burn units would comply with required safety procedures when conducting prescribed fire activities. Over the long term, the proposed fuels reduction activities and fire suppression strategies implemented under the proposed action would reduce human health and safety risks associated with the ignition and spread of wildfires. For these reasons, human health and safety has been dismissed from the detailed analysis.

9. Socioeconomic Minority and Low-Income Populations

The National Environmental Policy Act requires consideration of impacts to the "human environment," including economic, social, and demographic elements in the affected area. Although there may be some impacts, such as increased employment for firefighters (beneficial) and short-term closures (negative) of Dinosaur, implementation of a fire management plan is not expected to have measurable impacts on the population, income, or employment base of neighboring communities. Therefore, this impact topic is dismissed from further analysis.

10. Soundscapes

A soundscape is the acoustic environment of an area; each national park has a unique soundscape. Dinosaur's soundscapes may be impacted by implementation of a fire management plan due to periodic and short-term noise from mechanical equipment, fire engines, and use of heavy machinery and helicopters, which is discussed in the Visitor Use, Experience, and Recreation impact topic in Chapter 3 above. Use of this equipment would be temporary, infrequent, and dispersed over different areas in the monument at different times, and therefore would not greatly interfere with the character of the natural soundscape. This topic was dismissed from further analysis.

11. Viewsheds

National Park Service Management Policies (2006) state that scenic views and visual resources are considered highly valued characteristics. Wildfires, associated smoke, and fire management activities within the monument may impact Dinosaur National Monument viewsheds, however, impacts are anticipated to be temporary and last only a few days to a few weeks, and is analyzed in the Air Quality, Cultural Resources (Cultural Landscapes), and Visitor Use, Experience, and Recreation impact topics, therefore this topic was dismissed from further analysis.

12. Water Resources (Floodplains, Water Quality, Wetlands)

The Clean Water Act requires the NPS to "comply with all Federal, State, interstate, and local requirements, administrative authority, and process and sanctions respecting the control and abatement of water pollution" (33 U.S. Code 1251 et seq., Section 313). Within Dinosaur, there are 105 miles of

rivers, numerous wetlands, and only minimal amounts of land designated as floodplains. All these features are associated with watersheds that could be affected by runoff created by large, high severity wildfires and fuels treatments. However, runoff into waters within the monument is analyzed under Special Status Species due to four federally listed threatened or endangered fishes, along with their critical habitat, and Paleontological Resources and Soils. There are also best management practices in place for all fire management activities proposed, therefore this topic was dismissed from further analysis.

13. Wilderness

In 1978, 205,672 acres in Dinosaur were recommended to Congress for formal wilderness designation under the provisions of the Wilderness Act. Although this recommendation was never acted on by Congress, the National Park Service manages potential and recommended wilderness as designated wilderness until actual designation occurs.

NPS Management Policy 6.3.9 Fire Management requires all fire management activities conducted in recommended wilderness areas conform to the basic purposes of wilderness and actions taken to suppress wildfires must use the minimum requirements concept. Therefore, any wildfires or fuels treatments in wilderness areas will be subject to the minimum tool requirement of the recommended wilderness. In addition, Minimum Impact Strategies and Tactics (MIST) tactics are required by NPS policy and will be employed for any fire management actions within recommended wilderness areas.

A programmatic minimum requirements analysis (MRA) for wildfire management at DINO will be completed in support of developing the fire management plan. Wildfires have been frequently suppressed since the monument was established to protect essential facilities and infrastructure, the life, and the health and safety of the public and monument staff. Wildfires have occurred and are likely to continue to occur in the recommended wilderness based on historic wildfire ignition data and changing climate. Without continued active management of fires, the trend toward large fires could increase, endangering monument resources.

The MRA outlines in detail the policies and authorities, alternative tools and methods, and the impacts on wilderness character for managing wildland fire actions in the monument's recommended wilderness. The minimum requirements determination includes managing wildfires in recommended wilderness by using aerial and ground operations, mechanical and non-mechanical tools. Suppression of fires would continue in the recommended wilderness based on values at risk, time of year, and weather conditions. Fuels treatments could occur within the recommended wilderness. Air resources such as water drops by rotor-wing aircraft, or water or retardant drops by fixed-wing aircraft, could also be used for life safety and risk management reasons related to wildfires.

The approved MRA for wildfire management in Dinosaur would include effective suppression methods that would minimize the degradation of wilderness character and also protect wilderness character. Fuels reduction treatments such as manual or mechanical removal, or prescribed fire would be limited in recommended wilderness under Alternative B. Therefore, the potential for impacts to wilderness character by suppression activities would be the same and any planned fuels treatments would conform to the MRA, so wilderness was considered but dismissed from further analysis and consideration.