National Park Service
U.S. Department of the Interior

Yellowstone National Park
Wyoming, Montana, Idaho

Yellowstone National Park Wildland Fire Management Plan

Environmental Assessment
September 2012

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Note to Reviewers

To comment on this environmental assessment (EA), please go to http://parkplanning.nps.gov/ynpfireplan and send in comments on-line, or mail them to the address below. Comments must be submitted by 11:59 EST October 19, 2012. Comments cannot be received by e-mail.

For additional information and copies of this EA please contact:

Compliance Office
Attn: Fire Management Plan EA
P.O. Box 168
Yellowstone National Park, WY 82190

Before including your address, telephone number, electronic mail address, or other personal identifying information in your comments, you should be aware that your entire comment (including your personal identifying information) may be made publicly available at any time. While you can request to withhold your personal identifying information from public review by checking the box "keep my contact information private," we cannot guarantee that we will be able to do so.

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ACRONYMS AND ABBREVIATIONS

BMP	Best Management Practice
CASTNet	Clean Air Status and Trends Network
CFR	Code of Federal Regulations
CLI	Cultural Landscape Inventory
CLR	Cultural Landscape Report
DO	Director's Order
EA	Environmental Assessment
EPA	Environmental Protection Agency
ERC	Energy Release Component
ESA	Endangered Species Act
FMP	Fire Management Plan
GYA	Greater Yellowstone Area
ICC	International Code Council
IDT	Interdisciplinary Team
IMPROVE	Interagency Monitoring of Protected Visual Environments
MOA	Memorandum of Agreement
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NWE	Northwestern Energy
PL	Public Law
RMP	Resource Management Plan
ROW	Right of Way
USC	United States Code
USDI	United Stated Department of Interior
USFWS	United States Fish and Wildlife Service
WFDSS	Wildland Fire Decision Support System
YELL	Yellowstone National Park

1.0 PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

Yellowstone National Park (Yellowstone or Park) is located primarily in the northwest corner of Wyoming, with portions extending into southwestern Montana and southeastern Idaho (Figure 1-1). It is the core of the Greater Yellowstone Area (GYA), an approximately 14 million-acre area that includes Grand Teton National Park and John D. Rockefeller, Jr. Memorial National Parkway to the south, seven national forests, three national wildlife refuges, state lands, towns and private property. The GYA is the largest and most nearly intact temperate ecosystem in the contiguous United States.

Yellowstone proposes to update and improve its Fire Management Plan (FMP) as recent fire program management guidance and policy has changed. Fire management policy has evolved since the last FMP Environmental Assessment (EA), which was prepared in 1992, and the last FMP update in 2004. This document supersedes the earlier versions of Yellowstone's Fire Management Plan/EA. This document describes the alternatives and their consequences to the Park's natural and cultural resources, for implementing a comprehensive fire program which includes wildland fire response, fire prevention and fuels management utilizing prescribed fire and non-fire treatments.

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 and regulations of the Council on Environmental Quality (40 CFR 1500-1508) and NPS Director's Order (DO)-12 (*Conservation Planning, Environmental Impact Analysis, and Decision-Making*).

The scope of the FMP is confined to areas within the authorized boundaries of Yellowstone. Therefore, the FMP would address the approximately 2,221,772 acres (3,472 square miles) of federal land. However, this EA considers impacts outside of the Park that could reasonably be impacted by fire management actions.

1.2 PURPOSE OF AND NEED FOR ACTION

An updated FMP is required for Yellowstone to manage wildland fire in accordance with the 2009 Guidance for Implementation of Policy, NPS *Management Policies 2006* (NPS, 2006a), Interagency Standards For Fire and Fire Aviation Operations Manual NFES 2724 (Red Book) (National Interagency Fire Center, 2012), and guidelines under NPS DO-18 and RM-18. These policies and directives require an approved FMP for any national park with burnable vegetation. The FMP acts as a guiding document for the fire management program; it provides details and documentation associated with on-the-ground planning and implementation needed to manage fire.

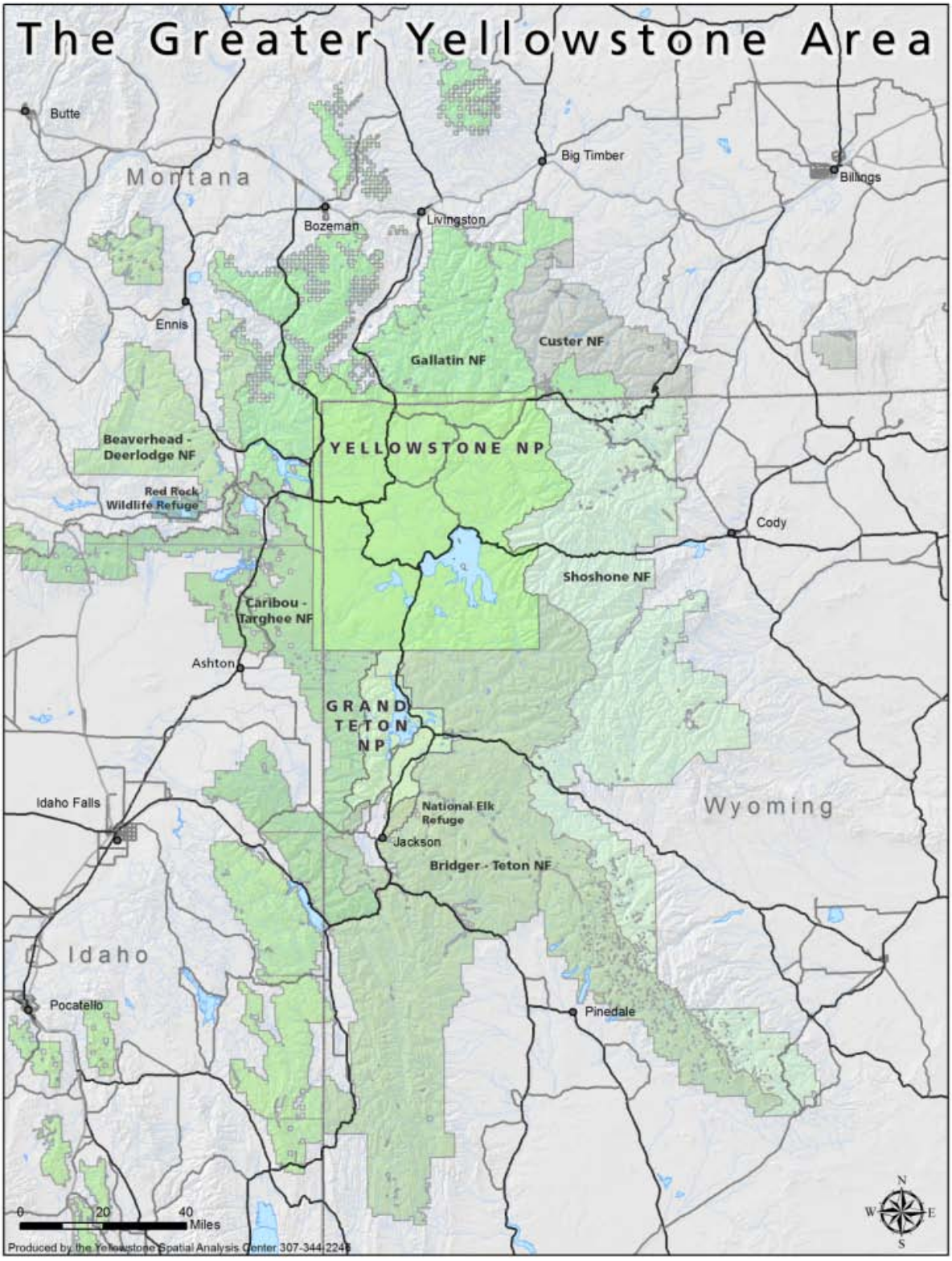

Figure 1-1. Vicinity map of the Greater Yellowstone Area.

Updates to existing plans and policies and the creation of new ones were a direct result from human fatalities during the 1994 fire season and the escape of the Cerro Grande prescribed fire in New Mexico in 2000. These incidents resulted in the 1995 and 2001 Federal Wildland Fire Management Policy Review and Updates. In 2009, the Guidance for Implementation of Federal Wildland Fire Management Policy (USDA/USDI, 2009) helped provide consistent implementation of the 1995/2001 Federal Wildland Fire Management Policy.

Under DO-18, wildland fire is divided into two broad categories: planned and unplanned fires. Planned fires are prescribed fires ignited by management for the purpose of achieving specific, predetermined objectives. Unplanned fires can be either natural or human caused. The FMP will articulate a comprehensive plan for the perpetuation of a healthy and safe fire environment within Yellowstone through the effective and appropriate management of wildland fire.

The updated FMP incorporates the following components:

- Annual updates from the Interagency Standards for Fire and Fire Aviation Operations (Red Book).
- Revised decision-making process, terminology, and format based on the Guidance for Implementation of Federal Wildland Fire Management Policy (February 2009).
- Fire management suppression strategy zones to facilitate prompt fire management response to unplanned fire.
- The National Park Service (NPS) Director's Order 18: Wildland Fire Management (DO-18) (USDI, 2008a) and supporting Reference Manual 18: Wildland and Prescribed Fire Management Policy (RM-18) require "Each park with vegetation capable of burning will prepare a fire management plan to guide a fire management program that is responsive to the park's natural and cultural resource objectives and to safety considerations for park visitors, employees, and developed facilities."

As described in the existing 2004 Fire Management Plan (NPS, 2004), the current fire management strategy in use at Yellowstone includes suppression, wildland fire use, prescribed fire, and manual and mechanical treatments. This plan needs to be rewritten to reflect policy changes and to incorporate new terminology, scientific research and improved resource and safety knowledge.

The FMP is a comprehensive document that outlines Yellowstone fire management goals and describes the policies and actions by which these goals would be realized. It also outlines Park specific fire management decision-making process and procedures, further articulates fire management strategies and the Park's fire management organization and responsibilities. It establishes the direct linkage between resource management goals and fire management strategies.

The implementation of the 2012 FMP would allow fire to continue its ecological role in the Park while protecting human life, developments, and sensitive cultural and natural resources. The decision-making process includes specifically managing wildland fire using best available technology to maintain ecosystem processes, and the use of resource information gained through

inventory and monitoring to evaluate and improve the wildland fire management program. See Table 2-2 for definitions of terminology used within this environmental assessment.

Natural systems contain communities that are fire adapted or fire dependent and may require periodic fire to retain their ecological integrity. Loss of fire (suppression) can result in diminished integrity including unnatural succession, loss of species, and vulnerability to intense wildland fire based on fuel loading. To comply with NPS policy, Yellowstone needs to have a comprehensive fire management program that protects natural and cultural resources, the general public, employees, and Park developments.

1.3 BACKGROUND

1.3.1 Park Purpose and Significance

Congress established Yellowstone National Park to "dedicate and set apart as a public park or pleasuring ground for the benefit and enjoyment of the people; … for the preservation, from injury or spoliation, of all timber, mineral deposits, natural curiosities, or wonders within said park, and their retention in their natural condition" (U.S. Congress 1872). Yellowstone's purpose and significance are rooted in its enabling legislation, subsequent legislation, and current knowledge of its natural, cultural, and visual resources. Statements of a park's significance describe why the park is important within a global, national, regional, and ecosystem-wide context and are directly linked to the purpose of the park.

Purpose
The world's first National Park, Yellowstone:
- Preserves geologic wonders, including the world's most extraordinary collection of geysers and hot springs and the underlying volcanic activity that sustains them.
- Preserves abundant and diverse wildlife in one of the largest remaining nearly intact wild ecosystem on earth, supporting unparalleled biodiversity.
- Preserves an 11,000 year old continuum of human history, including the sites, structures, and events that reflect our shared heritage.
- Provides for the benefit, enjoyment, education and inspiration of this and future generations.

Significance
- An international symbol of natural preservation.
- A Biosphere Reserve and a World Heritage Site.
- Contains more than 10,000 thermal features, including more than 300 geysers, which represent more than half of the total number of geysers in the world.
- Home of the world's tallest active geyser, Steamboat, which erupts to more than 300 feet.
- One of the few places in the world with active travertine terraces.
- Hydrothermal features which are habitats for microbes that are providing links to primal life, origins of life, and astrobiology; plus they are proving useful in solving some of our most perplexing medical and environmental problems.
- With the restoration of the gray wolf in 1995, the Park now contains all the large mammal species known to be present when European Americans first arrived.

1.3.2 Historical Role of Fire in Yellowstone

Natural fires have been a part of Yellowstone's environment for thousands of years prior to the arrival of modern humans (Romme and Despain, 1989). Written fire records date back to 1870 and significant fires are noted in early annual Superintendents' reports. However, fire statistics from 1872 through 1899 are minimal, with only large fires being reported. Record keeping improved somewhat at the beginning of the twentieth century. From 1900 through 1929, approximately 374 fires burned 11,670 acres. Reliable fire statistics have been kept from 1930 to present.

During the 1988 fire season, 50 fires burned approximately 800,000 acres in the Park. This assessment of number of acres burned was based on satellite imagery taken during October 1988. Subsequent GIS mapping of fire perimeters indicates that approximately 1.1 million acres were affected by the 1988 fires including downfall. Romme and Despain (1989) evaluated Yellowstone's fire history in light of the 1988 fires. They suggested that fire suppression efforts since 1886 may have only postponed the fires of 1988 by a few decades. They noted large fires might have occurred during the dry summers of 1949, 1953, 1960, or 1961 without fire suppression efforts. They further noted that fire behavior, in terms of heat release, flame height, and rate of spread, were probably similar to the fires which burned a significant percentage of the study area in the early- to mid-1700s. They concluded the 1988 fires represented a nearly natural event. The fires were mainly the result of extremely warm, dry, and windy weather combined with an extensive forest cover of highly flammable fuels, consisting of mainly lodgepole pine.

The normal fire season in Yellowstone is June 15 through September 30, based on historical weather and fire occurrence statistics. From 1972 through 2010, excluding the 1988 fire season, the Park averaged 29 fires and 4,611 burned acres per year. Critical factors influencing the fire season include the number of summer lightning storms and the timing and amount of summer precipitation. Since the majority of fires are started by lightning, the periods in spring before the grasses green and in the fall after dormancy and before snowfall begins, are normally periods of few fire starts. Summer drought conditions and frequent lightning storms can result in many fire starts within the Park, with the potential for large acreages to burn.

1.3.3 Laws, Regulations, and Policies

The 2012 FMP is consistent with the following related laws, policies, guidelines and plans discussed below.

National Environmental Policy Act (NEPA)
The National Environmental Policy Act was passed by Congress in 1969 and took effect on January 1, 1970. The purpose of NEPA is to encourage productive and enjoyable harmony between man and his environment; to promote efforts which would prevent or eliminate damage to the environment and stimulate the health and welfare of mankind; and to enrich the understanding of the ecological systems and natural resources important to the Nation. NEPA requirements are satisfied by successful completion of a NEPA document which could include a

Categorical Exclusion, Environmental Assessment, Environmental Impact Statement, in addition to a decision document.

NPS Organic Act of 1916

Congress directed the U.S. Department of the Interior and NPS to manage units "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations" (16 U.S.C. § 1). Congress reiterated this mandate in the Redwood National Park Expansion Act of 1978 by stating the NPS must conduct its actions in a manner that will ensure no "derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress" (16 U.S.C. § 1 a-1).

The NPS Organic Act and the General Authorities Act prohibit impairment of park resources and values. The NPS *Management Policies 2006* uses the terms "resources and values" to mean the full spectrum of tangible and intangible attributes for which the park is established and managed, including the Organic Act's fundamental purpose and any additional purposes as stated in the park's establishing legislation. The impairment of park resources and values may not be allowed unless directly and specifically provided by statute. The primary responsibility of the NPS is to ensure park resources and values will continue to exist in a condition that will allow the American people to have present and future opportunities for enjoyment of them.

The evaluation of whether impacts of a proposed action would lead to an impairment of park resources and values is included in this environmental assessment. Impairment is more likely when there are potential impacts to a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified as a goal in the Park's general management plan or other relevant NPS planning documents.

NPS Omnibus Management Act

The National Park Service Omnibus Management Act of 1998 (P.L. 105-391, 112 Statute 3497) addresses resources inventory and management in Title II. Section 201 defines the purposes of this title to enhance and encourage scientific study in National Park System (NPS) units. Section 202 authorizes and directs the Secretary of the Interior to assure management is enhanced of NPS units by a broad program of high quality science and information. Section 205 states the Secretary may solicit, receive, and consider requests from Federal and non-Federal public or private entities for the use of NPS units for scientific study. Such proposals must be: 1) consistent with applicable laws and the NPS Management Policies, and 2) the study would be conducted in a manner as to pose no threat to park resources or public enjoyment of those resources.

Director's Order-12 (DO-12)
DO-12 (2001a) is the NPS guidance for Conservation Planning, Environmental Impact Analysis, and Decision Making. DO-12 states the guidelines for implementing NEPA according to NPS regulations. DO-12 meets all Council on Environmental Quality (CEQ) regulations for implementing NEPA. In some cases, NPS has added requirements under DO-12 that exceed the CEQ regulations.

Director's Order-18 (DO-18)
DO-18 (2008a), the NPS guidance for Wildland Fire Management, states that "every NPS unit with burnable vegetation must have an approved Fire Management Plan." DO-18 defines what an approved FMP must include, stressing that "firefighter and public safety is the first priority" and promoting "an interagency approach to managing fires on an ecosystem basis across agency boundaries." Director's Order-18 also directs parks to identify, manage, and reduce, where appropriate, accumulations of hazard fuel. Procedures for completion, review, approval, and required contents for FMPs are provided in Reference Manual-18 (RM-18). Until an FMP is approved, NPS units must use an aggressive suppression strategy on all wildland fires.

2009 Guidance for Implementation of Federal Wildland Fire Management Policy
The Wildland Fire Leadership Council approved the Guidance for Implementation of Federal Wildland Fire Management Policy (USDA/USDI, 2009) to provide consistent implementation of the federal fire policy. The guide defines two types of wildland fire: planned (prescribed fire) and unplanned (wildfire). The revision increases managers' flexibility to respond to changing incident conditions and firefighting capability while strengthening strategic and tactical decision implementation supporting public safety and resource management objectives.

NPS Management Policies
NPS *Management Policies 2006* (2006a) establishes service wide policies for the preservation, management and use of park resources and facilities. These policies provide guidelines and direction for management of natural resources within a park (including natural processes that shape them, such as fire). Chapter 4 states that "naturally ignited fire, including the smoke that it produces, is part of many of the natural systems that are being sustained in parks" and requires that the NPS "adopt park resource preservation, development, and use management strategies that are intended to maintain the natural population fluctuation and processes that influence the dynamics of individual plant and animal populations, groups of animal and plant populations, and migratory animal populations in parks".

With regard to the disruption of natural processes such as ecosystems where the natural fire regime has been altered by suppression efforts, NPS *Management Policies 2006* state the NPS will "seek to return human disturbed areas to the natural conditions and processes characteristic of the ecological zone in which the damaged resources are situated." Additionally, those policies state that "biological or physical processes altered in the past by human activities may need to be actively managed to restore them to a natural condition or to maintain the closest approximation of the natural condition in situations in which a truly natural system is no longer attainable."

Fire managers are required to follow NPS regulations and policies. This includes putting the safety of visitors and firepersons first, above all else, and being fiscally responsible for all fire

management actions. This also includes adhering to NPS policy that states the NPS has adopted the International Code Council's Wildland-Urban Interface Code (sections 603 and 604) which describes defensible space and maintenance requirements around structures.

National Historic Preservation Act of 1966

The National Historic Preservation Act (NHPA) sets forth Government policy and procedures regarding historic properties including districts, sites, buildings, structures and objects included in or eligible for the National Register of Historic Places. Section 106 of NHPA requires Federal agencies consider the effects of their actions on such properties, following regulations issued by the Advisory Council on Historic Preservation (36 CFR 800).

Fire managers are required to follow the NHPA. Yellowstone's Chief of Cultural Resources is the Section 106 coordinator for the Park, and will be consulted on all new fire management activities.

Endangered Species Act of 1973

The Endangered Species Act (ESA) provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The lead federal agencies for implementing ESA are the U.S. Fish and Wildlife Service (USFWS) and the U.S. National Oceanic and Atmospheric Administration (NOAA) Fisheries Service. The law requires federal agencies, in consultation with the USFWS and/or the NOAA Fisheries Service, to ensure actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species.

Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act

The Migratory Bird Treaty Act of 1918 protects migratory birds and implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful. The Bald and Golden Eagle Protection Act, enacted in 1940, and amended several times since then, prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs.

Wilderness Act of 1964

The Wilderness Act of 1964 (Public Law 88-577, 16 USC §§ 1131-1136, 78 Stat. 890) established the National Wilderness Preservation System and identified the National Park Service as one of the four federal agencies responsible for protecting and preserving the nation's wilderness resource.

Roughly 91 percent, or 2,032,721 acres of Yellowstone National Park is recommended wilderness, and is treated as wilderness in National Parks (DO-41, and NPS *Management Policies 2006*). Park and fire managers take this into account whenever an activity is conducted in a backcountry setting and minimum requirement analyses are completed for every mechanized, non-emergency activity within the wilderness. During emergency actions, such as fire incidents, fire managers continually assess the appropriate strategies to use in wilderness areas. Minimum impact tactics are first and foremost in discussions. Rehabilitation tactics are

also commonly used if need be, such as pulling handline back into place once fire is under control, and ensuring there are no signs of human actions within the wilderness once the fire is out.

1.3.4 Relationship of Proposal to Other Park Planning Documents

The current Resource Management Plan (RMP) for Yellowstone (1998) documents the Park's needs and programmed actions related to natural and cultural management goals and objectives. The plan identifies staffing needs, and budgets for over 100 individual and integrated natural and cultural resource projects to achieve the Park's stated goals. The following objectives for wildland fire management are stated in the RMP and are integral components of the 2012 FMP:

- Preserve the natural and cultural resources of Yellowstone and to allow natural processes and interactions between resources to occur with a minimum of human influence.
- Use aggressive tactics to suppress wildfires, commensurate with values at risk (i.e. life, property, sensitive natural and cultural resources).
- Use fire suppression strategies which result in minimal impacts to Park resources.
- Complete rehabilitation of areas impacted by suppression activities.
- Correlate data from completed fuel monitoring with fire weather readings and use in ongoing program to determine fire danger on site.
- Accomplish hazard fuel reduction by thinning trees and understory vegetation at developed areas in the Park.
- Consider using prescribed fire (planned fire) to protect values at risk.
- Cooperate with and support research on prescribed fire and other fire management topics.
- Incorporate fire management plans and data into the Park's GIS system.

The FMP is designed to support management goals and objectives defined in the Yellowstone RMP and each alternative in the EA was developed with consideration of these goals.

1.4 FIRE MANAGEMENT OBJECTIVES

National Park Service Wildland Fire Management Guidelines (DO-18) require all parks with vegetation capable of sustaining fire develop a wildland fire management plan. The plan should meet the specific resource management objectives for the park and ensure firefighter and public safety is not compromised. These guidelines further state that all non-structural fires occurring in the wildland are classified as either planned or unplanned events. Planned and unplanned fires may be authorized by an approved wildland fire management plan and contribute to a park's resource management objectives.

DO-18 identifies three paramount considerations for each park's fire management program. They are:

- Protect human life and property both within and adjacent to park areas;
- Perpetuate, restore, replace, or replicate natural processes to the greatest extent practicable; and

- Protect natural and cultural resources and intrinsic values from unacceptable impacts attributable to fire and fire management activities.

Yellowstone's fire management goals, which follow, incorporate the Park's overall management goals as well as previously discussed federal fire management policy principles and goals, including firefighter and public safety, collaboration, and accountability.

As identified in its mission, the NPS Fire Management Program "is dedicated to protecting lives, property and resources while restoring and maintaining healthy ecosystems". The use of fire is an important tool for meeting this goal. The Park's fire management goals tier directly from both this national fire program goal and from the Park's resource management goals. Fire management goals in Yellowstone are:

- Firefighter and public safety is the first priority in every fire management activity.
- Allow fire to play its ecological role in the Park to the greatest extent possible through the use of appropriate management strategies.
- Suppress human caused wildfires in a safe, cost-effective, and environmentally sensitive manner.
- Maintain an active fire prevention program.
- Maintain a fully qualified fire management staff to implement the FMP.
- Maintain an interpretive and public information program that will educate the public on the ecological role of fire in the Park and provide daily fire danger and situation information.
- Reduce hazard fuel in areas where life and/or property may be threatened by wildfire, or may impede the ability to allow fire to play its ecological role in the Park.
- Coordinate and cooperate with adjacent land management agencies.

1.5 IMPACT TOPICS

To focus the environmental assessment, the NPS selected specific issues for further analysis and eliminated others from evaluation.

An interdisciplinary team of NPS staff conducted internal project scoping to clearly define the project design, project scope, issues, and impact topics to be analyzed in this environmental assessment.

1.5.1 Impact Topics Retained for Further Analysis

Impact topics for this project were identified on the basis of federal laws, regulations, and orders; NPS *Management Policies 2006*; and NPS knowledge of resources within Yellowstone. The impact topics selected by the interdisciplinary team are as follows:

- Air Quality
- Water Quality
- Geological Resources
- Wilderness
- Vegetation and Wetlands

- Fish and Wildlife
- Threatened and Endangered Species
- Visitor Use and Experience
- Cultural Resources
- Socioeconomic Resources

In this section, the NPS evaluates all potential impacts by considering the direct, indirect, and cumulative effects of the proposed action on the environment, along with connected and cumulative actions. Impacts are described in terms of context and duration. The context or extent of the impact is described as localized or widespread. The duration of impacts is described as short-term, ranging from days to three years in duration, or long-term, extending up to 20 years or longer. The intensity and type of impact is described as negligible, minor, moderate, or major, and as beneficial or adverse. The NPS equates "major" effects as "significant" effects. The identification of "major" effects would trigger the need for an Environmental Impact Statement (EIS). Where the intensity of an impact could be described quantitatively, the numerical data is presented; however, most impact analyses are qualitative and use best professional judgment in making the assessment.

The NPS defines "measurable" impacts as moderate or greater effects. It equates "no measurable effects" as minor or less effects. "No measurable effect" is used by NPS in determining if a categorical exclusion applies or if impact topics may be dismissed from further evaluation in an EA or EIS. The use of "no measurable effects" in this EA pertains to whether NPS dismisses an impact topic from further detailed evaluation in the EA. The reason NPS uses "no measurable effects" to determine whether impact topics are dismissed from further evaluation is to concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail in accordance with CEQ regulations at 1500.1(b).

Air Quality

The 1970 Federal Clean Air Act stipulates Federal agencies have an affirmative responsibility to protect a park's air quality from adverse air pollution impacts. All types of fires generate smoke and particulate matter, which can impact air quality within the Park and surrounding region. In light of these considerations, air quality impacts are analyzed in this EA.

Water Quality

NPS policies require protection of water resources consistent with the Federal Clean Water Act and Executive Order 12088. Water is an important resource in the planning area and throughout the region. Because activities addressed under the proposed alternatives have the potential to impact water quality in the planning area, it is addressed as an impact topic.

Geological Resources (including Geothermal Resources, Paleontological Resources, and Soils)

Yellowstone is host to a variety of outstanding geothermal features with unusual intrinsic value. Many of these geothermal features are regularly viewed and studied by a wide range of visitors, educators, and scientists and are considered a valuable natural resource. The Park has sites containing paleontological resources which can be affected by fire itself and by fire suppression activities. Erosion, loss of fertility, and contamination of soils can have effects on a variety of resources. Because activities addressed under the proposed alternatives have the potential to

impact geological resources in the planning area, this topic will be carried forward into the detailed analysis of this EA.

Wilderness
NPS *Management Policies 2006* state "fire management activities conducted in wilderness areas will conform to the basic purposes of wilderness." Activities addressed under the proposed alternatives have the potential to impact wilderness and wilderness values in the planning area.

Vegetation and Wetlands
Management actions, whether active or passive, can have tremendous effects on plant communities and the health and integrity of ecological systems. Executive Order 11990 requires federal agencies to minimize the loss or degradation of wetlands. This policy requires impacts to wetlands be avoided if possible, and if wetlands are impacted then mitigation may be required. Because activities addressed under the proposed alternatives have the potential to impact vegetation and wetlands in the planning area, these resources are addressed as an impact topic. Additionally, the Park recognizes some species not federally listed, as species of special management concern, which may occur in the planning area and are addressed in this impact topic.

Fish and Wildlife
There are resident populations of various species of fish, reptiles, amphibians, birds, mammals, and invertebrates, and their habitats, that can be adversely and/or beneficially impacted by fire management activities. Therefore, impacts to fish and wildlife are evaluated in this EA. Additionally, the Park recognizes some species not federally listed, as species of special management concern, which may occur in the planning area and are addressed in this impact topic.

Threatened and Endangered Species
The Endangered Species Act, under Section 7, requires federal agencies to consult with the USFWS regarding activities that may impact listed species. Because activities addressed under the proposed alternatives have the potential to impact federal and state listed species which may occur in the planning area, threatened and endangered species are addressed as an impact topic.

Visitor Use and Experience
The 1916 Organic Act directs the NPS to provide for public enjoyment of the scenery, wildlife and natural and historic resources of national parks, "in such a manner and by such means as would leave them unimpaired for the enjoyment of future generations." NPS *Management Policies 2006* state that scenic views and visual resources are considered highly valued characteristics. Wildfires, associated smoke, and fire management activities may influence visitor use and visual resources in the Park. Therefore, potential impacts of the proposed FMP on visitor use and visual resources are addressed in this EA.

Cultural Resources (including Archeological Resources, Historic Resources, Cultural Landscapes, and Ethnographic Resources)
Section 106 of the National Historic Preservation Act of 1966, as amended, provides the framework for federal review and protection of cultural resources, and ensures they are

considered during federal project planning and execution. The Park has archeological sites, cultural landscapes, ethnographic resources, and historic structures. These cultural resources can be affected by fire itself and by fire suppression activities, thus potential impacts to cultural resources are addressed in this EA.

Socioeconomic Resources (including Concessions and Gateway Communities)
Fire management activities in the Park may have impacts on the local economy, concessionaires in the Park, and surrounding gateway communities. Because activities addressed under the proposed alternatives have the potential to impact gateway communities, this topic is addressed as an impact topic.

1.5.2 Impact Topics Dismissed From Further Analysis

In this section of the EA, NPS provides a limited evaluation and explanation as to why some impact topics are not evaluated in more detail. Impact topics are dismissed from further evaluation in this EA if:

- they do not exist in the analysis area, or
- they would not be affected by the proposal, or the likelihood of impacts are not reasonably expected, or
- through the application of mitigation measures, there would be minor or less effects (i.e. no measurable effects) from the proposal, and there is little controversy on the subject or reasons to otherwise include the topic.

Due to there being no effect or no measurable effects, there would either be no contribution towards cumulative effects or the contribution would be low. For each issue or topic presented below, if the resource is found in the analysis area or the issue is applicable to the proposal, then a limited analysis of direct and indirect, and cumulative effects is presented.

Floodplains
Floodplain or flood-prone areas include those low-lying areas that are flooded during 100 year storm events. The alternatives would not involve the filling or alterations of floodplain areas, and would not require the construction of any structures. Earthwork and construction activities that could adversely affect flood-prone areas are not part of the proposed alternatives. Given that the alternatives proposed would not affect floodplain values, this topic will not be carried forward into the detailed analysis.

Climate Change
A growing body of scientific research, published in peer reviewed journals and synthesized by groups such as the Intergovernmental Panel on Climate Change and the U.S. Climate Change Science Program, depicts a global climate that is changing. Some researchers have also speculated that increasing temperatures in conjunction with uncertain precipitation scenarios may result in increased fire occurrence, intensity, and duration both regionally and locally. The highly uncertain outcome of varying scenarios of climate change, and its affect on fire occurrence and behavior make climate change impossible to quantify in a dynamic environment such as fire. The Yellowstone Fire Management program collects fire monitoring and fire

history data, and therefore will be capable of validating or rejecting projections of increased fire activity. While Park managers recognize climate change and its potential to influence fire activity, they also recognize wildfire is a natural part of the Park's ecosystem and therefore this topic will not be carried forward into the detailed analysis.

Park Operations

Parks must consider the potential effects of proposed actions on overall park operations. Planned and unplanned wildfires are not anticipated to impact normal operations within Yellowstone, and if they do, it will be short-term. Non-fire hazard fuel projects will be planned around other on-going park operations, and will be completed during shoulder seasons if need be. Therefore this topic will not be carried forward into the detailed analysis.

Natural Soundscape

In accordance with NPS *Management Policies 2006* and NPS *Director's Order-47: Sound Preservation and Noise Management* (2001b), an important part of the NPS mission is preservation of natural soundscapes associated with parks. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in park units, together with the physical capacity for transmitting natural sounds. The proposed alternatives would not create additional noise other than short-term use of some equipment (i.e., chainsaws, helicopters, and water handling equipment such as portable pumps). Therefore, this topic will not be carried forward into the detailed analysis.

Environmental Justice

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 disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. The EA alternatives would have no health or environmental effects on minorities or low-income populations or communities.

Unique and Prime Farmlands

In August 1980, the Council for Environmental Quality (CEQ) 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 produces specialty crops, such as fruits, vegetables, and nuts. Since the project area does not meet the definition of farmland as stated in Title 7, Chapter 73, Section 4201 (c)(1) of the Farmland Protection Policy Act (FPPA), it is not applicable to the FPPA.

Cultural Resources – Museum Objects

The proposed projects under both alternatives lack the potential to affect curated museum objects housed within the project area. Therefore, the topic Cultural Resources – Museum Objects was dismissed as an impact topic in this document.

1.6 PUBLIC INVOLVEMENT

Scoping is a public process that determines the breadth of environmental issues and alternatives to be addressed in an EA. Scoping involves obtaining internal and external input on project related issues from resource specialists and the public.

A letter describing the project, announcing a scoping meeting, and requesting public input was sent on November 22, 2011 to 264 recipients including elected officials, individuals, organization, agencies, and local tribes and tribal representatives. A public scoping meeting was held on December 6, 2011 in Cody, Wyoming. Three members of the community attended the scoping meeting. Attendees were able to ask questions of NPS staff, review maps, and express their thoughts about the FMP on a comment form that was distributed to attendees. Written comments could be submitted at the meeting, online at the Park's Planning, Environment, and Public Comment (PEPC) website: http://parkplanning.nps.gov, or sent by regular mail.

Ten comment letters, along with several comments recorded at the public meeting, were received during the scoping period and addressed a wide range of issues. A scoping report is provided in Appendix A.

NPS internal discussions, along with input received during public scoping led to identification of the main impact topics to be addressed in this EA. Additionally, public comments contributed to development of mitigation measures (i.e., aquatic invasive species considerations), specific issues addressed in the impact analyses (i.e., fire management in whitebark pine stands), and explanation of management approach (i.e., use of 300 foot buffer for retardant around water bodies).

2.0 ALTERNATIVES

2.1 INTRODUCTION

This chapter describes a range of reasonable alternatives that address the purpose and need for action. Two alternatives were identified for this project, a no action alternative and an action alternative. This chapter also describes two alternatives that were dismissed from further consideration (those not analyzed in Chapter 3). A summary table comparing alternative components is presented at the end of this chapter.

Actions Common to all Alternatives

> ***Wildland*** is an area in which development is essentially nonexistent. Structures, if any, are widely scattered.
>
> ***Wildland fires*** are any non-structure fires, other than prescribed fires, that occur in the wildland. Wildland fires are either unplanned or planned. For all unplanned fires, multiple response strategies exist, including: monitor, point/zone protection, and suppression.
>
> ***Prescribed Fires*** are any fires ignited by management actions in defined areas under predetermined weather and fuel conditions to meet specific objectives.

Consistent with the 2009 Guidance for Implementation of the Federal Wildland Fire Management Policy document, wildland fire is a general term describing any non-structure fire which occurs in the wildland. Wildland fires are categorized into two distinct types: unplanned ignitions and planned ignitions. Unplanned ignitions are natural fires (e.g. lightning caused), human caused wildfires, or prescribed fires which are declared wildfires. Planned ignitions are prescribed fires. A wildland fire may be concurrently managed for one or more objectives, where objectives may change as the fire spreads across the landscape and over time. Objectives are affected by changes in fuel, weather and topography; time of season; and involvement of other governmental jurisdictions having different missions and objectives. Management response strategy (i.e. monitor, point/zone protection, suppression) to a wildland fire within the Park is based on objectives established in Yellowstone's Fire Management Plan, along with applicable Land or Resource Management Plans, and applicable laws, regulations, and policies. Initial response strategy on human-caused wildfire will be to suppress the fire at the lowest cost with the fewest negative consequences, and respect to firefighter and public safety.

2.2 ALTERNATIVE 1 - NO ACTION

The No Action alternative represents a continuation of current management actions under the 2004 Fire Management Plan; it does not mean an absence of active management of fire and fuel. The 2004 Fire Management Plan allows for naturally occurring fires within the Park to be assessed for management of multiple goals and objectives under specific pre-set prescriptions, suppression of unwanted fires, manual and mechanical fuel treatments, and prescribed fires. Under the current FMP, unplanned naturally ignited fires could be monitored under specific weather and fire behavior prescriptions. Natural and human caused fires could also be suppressed throughout the Park whether it is a human caused fire or a naturally occurring fire

which is either not meeting specific goals and objectives, or weather and fire behavior prescriptions are not being met. Fuel reduction projects including manual, mechanical, and prescribed fire treatments would take place, with a focus on reducing hazard fuel around values at risk within developed areas, historical districts, and around backcountry cabins. A value represents any improvement (e.g. structure, device) or important natural or cultural resource (e.g. whitebark pine plus trees, historical walkways and fences) which must be protected.

Every unplanned fire would be assessed following a decision support process that examines the full range of potential management response strategies. This decision making process involves collaboration between the Park Superintendents Office, the Chief Ranger's Office and the Fire Management Office. Each incident is evaluated for potential to be managed for wildland fire use through a process directed by the NPS National Fire Office. The NPS directed National Fire Office decision support process currently being used on federal land is the Wildland Fire Decision Support System (WFDSS).

2.3 ALTERNATIVE 2 – PROPOSED ACTION

The Park would be divided into fire suppression strategy zones to assist managers in quickly determining the correct management strategy to use when an unplanned wildfire event occurs (Figure 2-1). These zones would be composed of one quarter mile (0.25) buffers around frontcountry developed areas (e.g. Mammoth, Canyon Village, Northeast Entrance, etc.) to mitigate risk to values. All unplanned wildfires which originate within the suppression strategy zones will have an immediate suppression strategy response due to the close proximity of people and property. The zones will help facilitate a faster response time to wildfires within these zones. The balance of the Park's landscape would be considered for all unplanned wildfire response strategies (i.e. monitor, point/zone protection, suppression), where management decisions would reflect the goal of allowing natural ecological processes to occur utilizing the safest, most effective, and most efficient methods available while meeting Park managers' identified goals and objectives. Backcountry or wilderness values at risk will be protected using a point/zone protection strategy to lessen the effects of fire around the value. Opportunities to mitigate risk to Park resources and values using manual, mechanical, and prescribed fire treatments would be included in this alternative.

Current fire management guidance has replaced several terms used to describe the activities undertaken within the current FMP. Updated terminology under Alternative 2 includes planned (i.e. prescribed fire) and unplanned (i.g. natural or human caused) wildfires. Unplanned wildfires would be managed with one, or a combination of, different response strategies which include: monitor strategy, point/zone strategy, and/or suppression strategy. The language under Alternative 1 utilizes the old terminology (e.g. wildland fire use), but is replaced with current language under Alternative 2 (i.e. monitor strategy, point/zone protection strategy, suppression strategy). See Table 2-1 for a list of terms and definitions.

Yellowstone proposes to treat fuels within the Park using manual (e.g. chainsaws and hand tools), mechanical (e.g. chippers and masticators), and prescribed fire methods. These methods can be used independently, or together to achieve a desired outcome and project specific

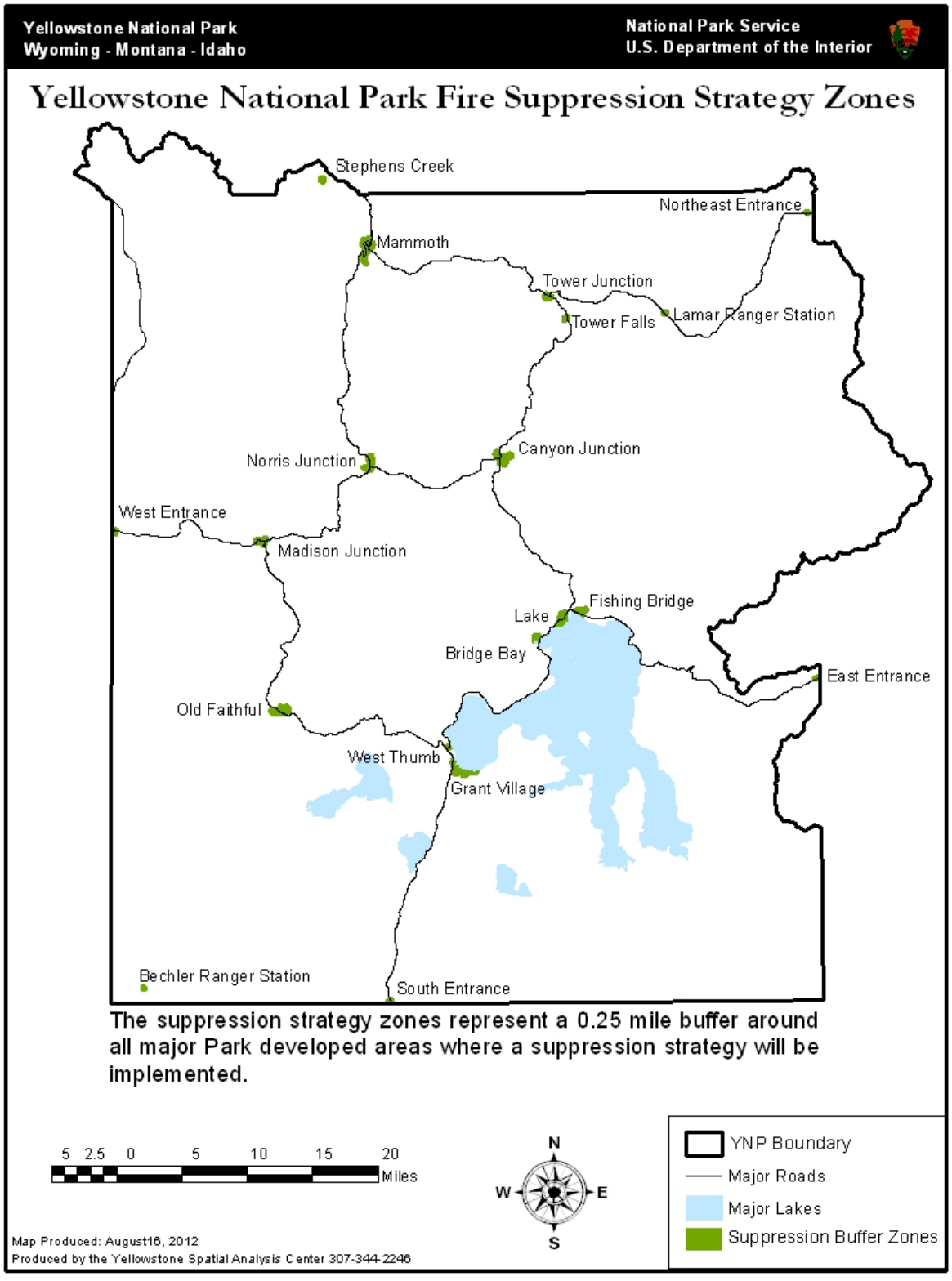

Figure 2-1. Fire Suppression Strategy Zones, Yellowstone National Park.

Table 2-1. Definitions of new terminology under the 2009 National Fire Policy.

Terminology	Potential Action or Definition
Appropriate Management Response (AMR)	**Replace with**: Response to Wildland Fire
Initial Attack	**Replace with:** Initial Action
Initial Response	**Replace with:** Initial Action
Long Term Implementation Plan (LTIP)	**Replace with:** Wildland Fire Decision Support System (WFDSS), or NPS directed National Fire Office decision support process
Management Ignited Prescribed Fire (MIPF)	**Replace with:** Prescribed Fire, or planned ignition
Planned Ignition	**Definition:** The initiation of a wildland fire by hand-held, mechanical, or aerial device where the distance and timing between ignition lines or points and the sequence of igniting them is determined by environmental conditions, firing technique, and other factors which influence fire behavior and fire effects and is prepared in advance.
Prescribed Fire	**Definition:** Any planned wildland fire ignited by management actions to meet specific objectives. A written approved prescribed fire plan must exist and NEPA requirements (where applicable) must be met prior to ignition.
Prescribed Natural Fire (PNF)	**Replace with:** Response to Wildland Fire, or unplanned wildfire monitor strategy
Response to Wildland Fire	**Definition:** The mobilization of the necessary services and responders to a fire based on ecological, social, and legal consequences, the circumstances under which a fire occurs, and the likely consequences on firefighter and public safety and welfare, natural and cultural resources, and values to be protected. The response strategy can be any of these, or a combination of these strategies: monitor, point/zone protection, and/or suppression.
Strategic Implementation Plan (SIP)	**Replace with:** Wildland Fire Decision Support System (WFDSS), or NPS directed National Fire Office decision support process
Suppression	**Definition:** The work of extinguishing or confining a fire beginning with its discovery.
Unplanned Ignition	**Definition:** The initiation of a wildland fire by lightning, volcanoes, unauthorized human-caused fires and escaped prescribed fires where the objective is to protect values at risk while meeting resource objectives specified in Land/Resource Management Plan.
Unwanted Ignition	**Definition:** An ignition from any source that is unplanned and unwanted. Consider replacing with Unplanned Ignition.
Wildland Fire Use (WFU)	**Replace with:** Response to Wildland Fire, or unplanned wildfire monitor strategy

objectives. Park managers recognize the requirement to protect life, structures, and property from wildfire, and the need for wildfire to fulfill its role in maintaining healthy ecosystems. To achieve these desired outcomes and goals, strategies have been developed that meet both requirements through a process of reducing hazard fuel levels in areas where there are significant values at risk; strategies for developed areas, and strategies for point/zone protection of isolated values at risk throughout the Park's vast recommended wilderness.

The following sections broadly outline the fuel treatment methods and strategies for protecting values at risk; the fuel treatment methods and strategies using point/zone protection within the recommended wilderness; and fuel treatment methods that may be used for accomplishing resource enhancement and research within the Park. A value at risk is defined as any manmade structure (e.g. buildings, roads, trails, walkways, fences, weather stations, wooden bridges), or natural or cultural resource (e.g. cultural landscapes, archeological sites) which may be threatened by wildfire. A hazard fuel is defined as any fuel which may inhibit the defense of a value at risk from the threat of wildfire. A list of potential projects is in Appendix B; this list is not in priority order, and is not meant to be an all-inclusive list of treatment projects within Yellowstone, rather it is provided to demonstrate the general breadth of the Yellowstone fire program.

Developed Areas

The first and foremost goal of wildland fire management in Yellowstone is to provide for the safety of employees and the public. The second goal is to protect communities and infrastructure. The Park would use hazard fuel reduction projects (manual, mechanical, and/or prescribed fire) to create defensible space around any building, structure, historical area, or in areas within the Park adjacent to gateway communities. Park managers would also implement the suppression strategy zones located around Park developed areas, and all fires which originate within these zones would have an immediate suppression strategy response. These zones would streamline the process for responding to fires within these areas and will make for a quicker response.

The Park is required to be in compliance with *International Code Council* (ICC) *Sections 603* and *604* (ICC, 2011). These sections outline the minimum wildland-urban interface standards based on the defensibility of the value at risk. These distances may be increased based on fuel type, continuity of fuel, slope, building material (e.g. flammable, non-flammable), and the location of the value at risk. The code stipulates the minimum requirement for defensible space around structures is 30 to 100 feet, based on site specific analysis of local conditions (Figure 2-2) (ICC, 2011). The Park's fire dependent lodgepole pine, flammable construction material, and fuel loading is at the extreme end of the fire risk scale, and the need for additional clearance beyond the minimum 30 to 100 feet may need to be evaluated.

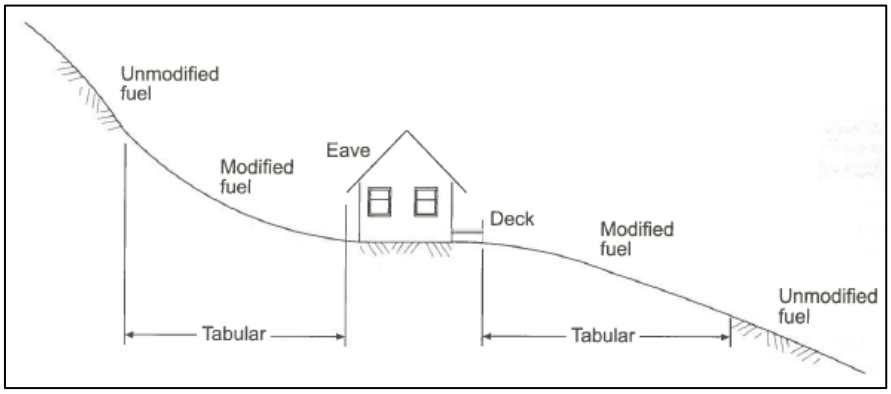

Figure 2-2. Diagram of Fuel Modification Distance (ICC, 2011).

All treatment projects would be evaluated using specific criteria and an Interdisciplinary Fire and Fuels Team (IDT) process to determine site specific goals and objectives. The Fire and Fuels IDT consists of Park managers from disciplines including, but not limited to: fire management, rangers, planning and compliance, maintenance, public affairs, cultural resources, vegetation, concessions management, resource education and youth programs, and wildlife. The IDT will be consulted on all planned fire management treatment projects, and will help determine project specific boundaries, goals, objectives, prescriptions, coordination with other Park projects, and potential resources affected.

The criteria for the IDT to determine if an area should be treated may include:

- if current fuel conditions in the wildland-urban interface developed areas need to be treated to lower the risk of crown fire and therefore make values at risk more defendable when threatened by a wildfire;
- reducing the potential of an unplanned and/or unwanted wildfire originating within the Park and negatively impacting a gateway community;
- seeking opportunities to protect a value at risk within the wildland-urban interface while at the same time enhancing cultural landscapes and viewsheds; and
- increasing opportunities to manage fire for natural processes within a region of the Park.

All treatments would meet the NPS adopted, *International Wildland-Urban Interface Code* (Sections *603* and *604*), and the most current Interagency Prescribed Fire Planning and Implementation Procedures Guide.

A typical manual or mechanical hazard fuel treatment within a Park developed area would focus on protecting values at risk by removing standing live and dead trees, along with ladder fuels to reduce the threat of crown fire. Dead and down fuel would also be removed to reduce flame length and fire intensity. This could include some of the actions listed below, which could be completed using handtools, chainsaws, chippers, or small mechanical equipment designed to minimize ground impact:

- Removing all vegetation within three feet of the value at risk. Only green grass which is kept mowed to under three inches is allowed to touch the structure, as long as that part of the structure is not flammable (e.g. concrete or rock foundation).
- Removing any vegetation within 30 to 100 feet which can ignite and send embers toward the value at risk. This does not necessarily mean all vegetation will be cut; it is dependent on site specific conditions. It is important to protect values at risk while preserving area aesthetics and recognizing other resource concerns. Trees and native vegetation may be allowed within this area provided the horizontal distance between canopies of adjacent trees and structures, or unmodified fuel is not less than an average of 20 feet.
- Continue thinning trees to an average of 20 foot canopy spacing as far as 400 feet out from the value at risk.

Specific project prescriptions can vary, but will typically involve reducing the canopy density of standing trees to reduce the threat of crown fire. Effective canopy spacing can vary from project

to project depending on the values at risk, topography of the area, and specific fuel types, but 20 foot canopy spacing is the most common prescription used to reduce the threat of crown fire. Creating the correct canopy spacing in an aesthetically acceptable or historically compatible manner is as much art as science, and Park managers recognize the need to conduct repeated partial treatments several years apart rather than attempting to meet all defensible space criteria for values at risk in one treatment.

Manual and mechanical treatment methods would be the most commonly used tools to complete hazard fuel treatments within Park developed areas. Treatments would use a prescription of reducing canopy density to a predetermined level to reduce the threat of crown fire. Fuel treatments completed within the Park may also use various methods to remove the biomass of thinned trees. These methods may include using pile burns, a chipper, a masticator, a UTV, trucks with trailers, or firewood permits to remove unwanted biomass. Whenever possible wheeled/tracked vehicles would be kept on existing roadbeds, but occasionally if wheeled/tracked vehicles need to leave the roadbed, the IDT will be consulted, all Park revegetation and top soil guidelines will be followed, and all areas will be rehabilitated to previous existing conditions.

During an emergency action such as a threat of an unwanted wildland fire, all values at risk within the Park could be protected through the use of shelter material to wrap structures, a sprinkler system, water drops from a helicopter, retardant from an air tanker, or by firing out around a structure to remove flammable vegetation.

If the IDT determines prescribed fire (planned fire) is the best method to treat hazard fuel, the most current Interagency Prescribed Fire Planning and Implementation Procedures Guide will be used. This guide provides policy and direction for the planning and implementation processes for prescribed fire. All prescribed fires require a burn plan with minimum requirements, which include but are not limited to: agency administrator's signature, complexity analysis, description and map of the treatment area, objectives, prescriptions, organization and equipment, communication, safety, holding plan, contingency plan, and monitoring. All burn plans will be developed with the IDT, and will be approved by an agency administrator such as the Park Superintendent or Deputy Superintendent. Pile burns are considered a type of prescribed fire, therefore if a fuel treatment takes place and the preferred method of biomass disposal is through pile burns, a burn plan will be developed.

Figure 2-3. Pre (left) and post (right) photos of a typical fuel reduction project.

Figure 2-4. Photo of typical piles to be burned after a fuel reduction project.

Point/Zone Protection Strategy within Recommended Wilderness

The fuel adjacent to a value at risk within Yellowstone's recommended wilderness areas may require treatment to help ensure their survival. Point/zone protection of values at risk during an unplanned wildland fire may include such methods as manual treatment to remove excess fuel immediately adjacent, using shelter material to wrap structures, setting up a portable water pump and sprinkler system, water drops from a helicopter, retardant from an air tanker, or by firing out around a structure to remove flammable vegetation. The following list is an example of values at risk commonly found within the Park's recommended wilderness:

- backcountry cabins,
- fire lookouts,
- cultural resources,
- sensitive natural resources,
- whitebark pine plus trees (i.e. trees with potential resistance to whitebark pine blister rust),
- seismic stations,
- weather stations,
- radio repeaters,
- SNOTEL sites,
- powerline corridors,
- wooden bridges,
- footbridges,
- fish weirs, and
- water control devices.

The above list is not all inclusive, it is only meant to provide examples of values at risk commonly found within the Park's recommended wilderness. Most of the time manual methods (handtools, chainsaws) would be used to create defensible space around backcountry cabins within recommended wilderness areas of the Park; if mechanical methods were being considered, Park managers would complete the wilderness minimum requirement analysis process. The minimum requirement analysis is a process led by the Wilderness Committee within the Park, and is meant to be a check and balance to ensure the minimum tool (e.g.

helicopter versus pack horses) is used for each job to preserve the character of the Park's wilderness.

Resource Enhancement and Research
Yellowstone may also treat fuel for resource enhancement and research purposes throughout the Park. Examples of research treatments may include:

- studying fire's effects on exotic and native vegetation species;
- studying fire's effects on ungulate forage;
- studying fire's effects on different plant associations found within the Park;
- studying fire return intervals;
- studying fire behavior in different fuel models, utilizing various methods of (manual, mechanical, prescribed burning) treatments;
- removal of biomass for vegetation studies; and
- improving or restoring historical and or cultural landscapes.

The process of identifying projects, and specific project goals and objectives would include the involvement of the IDT. All NPS adopted policy would be followed when implementing projects.

The above information is not intended to be all inclusive. Its purpose is to provide examples of when, why, and how the Park would use either mechanical, manual, prescribed fire, or a combination of these tools to produce a desired outcome.

Every unplanned fire would be assessed following a decision support process that examines the full range of potential responses. This decision making process involves collaboration between the Park Superintendent's Office, the Chief Ranger's Office and the Fire Management Office. Each incident is evaluated for potential to be managed using a monitor strategy or point/zone protection strategy, through a Park decision process and a process directed by the NPS National Fire Office. The NPS directed National Fire Office decision support process currently being used on federal land is WFDSS. In addition, a Park specific go no-go checklist would be used for all wildland fires which start outside of the suppression strategy zones. The go no-go checklist may include items such as: location of fire, current and forecasted fire weather, staffing levels, national preparedness level, 1000 hour fuel moistures, drought conditions, live fuel moistures, anticipated incident complexity level, energy release component (ERC), time of year, and political and social climates at the time within the Park. Ultimately, some wildfires will be suppressed due to an unfavorable combination of factors prompted and evaluated through the go no-go process. The go no-go checklist is completed in collaboration with the Park Superintendent, Deputy Superintendent, Chief Ranger, Fire Management Officer, Assistant Fire Management Officer, and the Fire Ecologist. An example of the go no-go can be found in Appendix C. The Park Superintendent has the final determination on fire management strategy.

Important improvements to this alternative include greater emphasis on interdisciplinary planning as well as increased efficiency in response to unwanted fires. Desired conditions, goals, and objectives are better defined for fire management under this alternative.

2.4 ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is the one that best meets the criteria identified in the CEQ regulations of the National Environmental Policy Act as outlined below.

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

The NPS has determined that Alternative 2, the Proposed Action, is the environmentally preferred alternative because it provides the full spectrum of fire management strategies and practices to accomplish Yellowstone fire and resource management objectives while protecting human life, and identified resources and values. This alternative would allow a broader set of goals and objectives for wildfires; rather than more confined prescriptions, allowing for the safety of firefighters, visitors, employees, and Park neighbors and the protection of Park development, while allowing fire to play its ecological role in the Park to the greatest extent possible. The Proposed Action would be more streamlined with the inclusion of suppression strategy zones, safer, more cost effective wildfires, and could lead to quicker initial response.

Alternative 1, No Action, represents the current management direction for Yellowstone National Park in conformance with the Park's 2004 Wildland Fire Management Plan. The No Action alternative is not the environmentally preferred alternative because it would not achieve fire management goals to as great an extent as the Proposed Action.

2.5 ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

The following project alternatives were considered but dismissed from further analysis in this environmental assessment. The rationale for eliminating alternatives from further analysis is based primarily on factors relating to whether the alternative is reasonable or feasible.

2.5.1 Full Wildland Fire Suppression Strategy Only

A full suppression alternative was considered. Under a full suppression alternative all ignitions, including those of natural origin, would be suppressed, and no management ignited prescribed fires would be conducted. Full suppression does not necessarily mean all Park fires would be

small or have limited impacts. Some fires would burn with such intensity that suppression efforts could only attempt to lessen impacts until burning conditions changed enough to allow for effective suppression. Full suppression does not achieve National Fire Policy objectives relative to "Integrating fire as a natural process into Park biotic communities to the fullest extent possible." For these reasons, a full suppression alternative was rejected.

2.5.2 Full Wildland Fire Suppression Strategy and Fuels Management

The concept of an alternative that is a combination of suppression coupled with fuel management (i.e. prescribed fire and mechanical fuel reduction) was considered. While this alternative would seem viable and worthy of consideration, it would be inconsistent with National Fire Policy as it does not provide the greatest opportunity to enhance ecological resource values.

This alternative is dismissed from further consideration for the following reasons: 1) the inability to maintain a natural fire regime through only prescribed burns and mechanical fuel reduction; 2) the increased risk of catastrophic wildland fire which could result from the exclusion of the area's natural fire regime; 3) the prohibitively high cost of large scale mechanical fuel reduction and prescribed burns; 4) non-conformance with the existing interagency management scheme and a potential to cause an impairment of Park resources and values.

2.6 MITIGATION MEASURES

The following best management practices (BMPs) and mitigation measures would be used to prevent or minimize potential adverse effects associated with fire management. These practices and measures would be incorporated to reduce the magnitude of impacts and ensure major adverse impacts would not occur. Mitigation measures undertaken during project implementation would include, but would not be limited to, those listed below. The impact analysis in the "Environmental Consequences" section was performed assuming these BMPs and mitigation measures would be implemented as part of all action alternatives.

<u>Fire Management Activities, including Hazard Fuel Reduction Projects</u>
NPS policy requires fire managers and firefighters to select management tactics commensurate with a fire's existing or potential behavior, but which cause as little impact to natural and cultural resources as possible. All fire management activities and fuel reduction projects in Yellowstone would therefore incorporate the minimum impact tactics, to the greatest extent feasible and appropriate for the given situation. Examples of minimum impact tactics to be implemented include:

- The use of any heavy equipment (e.g. dozers, plows) in support of wildfires would require prior approval from the Superintendent's office.
- The use of motorized equipment for hazard fuel reduction projects within recommended wilderness areas would require approval through the minimum requirement analysis process.
- Avoid using fireline explosives in non-forested areas. Keep fireline width as narrow and shallow as possible when it must be constructed.
- Use existing natural fuel breaks and human-made barriers, wet line, or cold trailing the fire edge in lieu of fireline construction whenever possible. Avoid ground disturbance as much

as possible, particularly within known natural and archeological/cultural/historic resource locations. When fireline construction is necessary in proximity to these resource locations it would involve as little ground disturbance as possible and be located as far outside of resource boundaries as possible.
- Use water in lieu of fire retardant whenever possible.
- Using soaker hose, sprinklers or foggers in mop-up; avoiding boring and hydraulic action.
- Minimizing cutting of trees when possible.
- Scatter or remove debris as prescribed by the incident commander or project leader.
- Except for emergency actions such as wildfires, search and rescue missions, maintaining equipment that enhances safety (communications, lookouts,) training, etc.; all helicopter landings in recommended wilderness must go through the minimum requirement analysis process. If a helicopter or heavy equipment will be needed for a hazard fuel reduction project, the minimum requirement analysis tool will be utilized.
- All proposed hazard fuel treatment projects will adhere to the Park's Bear Management Area seasonal restrictions to avoid displacement of bears from prime food sources and minimize bear/human habituation and injuries.

Human Health and Safety

Firefighter and public safety is the highest priority in every fire and fuel management activity. In light of this:

- Only fully qualified (i.e. meeting NWCG qualifications and accepted interagency knowledge, skills and abilities for the assigned fire job) personnel would be assigned fire management duties (unless assigned as trainees, in which case they would be closely supervised by an individual fully qualified for the given position).
- No operation would be initiated until all personnel involved have received a safety briefing describing known hazards and mitigating actions, current fire season conditions, and current and predicted fire weather and behavior.
- Wildland fire incident commanders would minimize firefighter exposure to heavy smoke when possible.
- Park neighbors, visitors and local residents would be notified of all fire management events that have the potential to impact them.
- The superintendent or designee may, as a safety precaution, temporarily close parts of the Park to the visiting public.

Property

- To the greatest extent feasible and appropriate, Park infrastructure, any other development, and adjacent non-federal agency land would be protected during all fire management activities.

Air and Water Quality

- The Park would comply with the Clean Air Act, the Clean Water Act, and all other applicable federal, state, and local laws and requirements. Additionally:

- The unplanned wildfire response strategy selected to manage a wildland fire would consider air quality standards. All prescribed fires will follow Department of Environmental Quality air quality standards and reporting requirements.
- During fire suppression strategies, water would be used in lieu of fire retardant whenever possible. If retardant must be used, bodies of water would be avoided.
- A 300 foot buffer for retardant around water bodies would be employed. This is a nationally recognized standard (April 2000, Interagency Guidelines for Aerial Delivery of Retardant or Foam near Waterways) which states:

  When approaching a waterway visible to the pilot, the pilot shall terminate the application of retardant approximately 300 feet before reaching the waterway. When flying over a waterway, pilots shall wait one second after crossing the far bank or shore of a waterway before applying retardant. Pilots shall make adjustments for airspeed and ambient conditions such as wind to avoid the application of retardant within the 300-foot buffer zone.

  This buffer is understood, and implemented by all fire managers working within Yellowstone.
- Water would not be transported between 5th Level (10 digit) hydrologic units (HUC) watersheds, unless in an emergency (life or structure loss). If water is transported, Yellowstone Aquatic Invasive Species staff will be contacted to determine if aquatic invasive species (AIS) have been transported and if so, a monitoring plan would be developed and implemented.
- If equipment is used in an area known to contain AIS or suspected to contain AIS, the equipment would be inspected by Yellowstone Aquatic Invasive Species staff. If aquatic invasive species are found, the equipment would need to be decontaminated. Decontamination may consist of:
  - Draining all water from equipment and compartments, cleaning equipment of all mud, plants, debris, or animals, and dry equipment for five days in summer (June, July & August); 18 days in Spring (March, April & May) and Fall (September, October & November); or three days in Winter (December, January & February) when temperatures are at or below freezing.
  - Using a high pressure (3500 psi) hot water (140° F) pressure washer to thoroughly wash equipment and flush all compartments that may hold water.
- All equipment will be fueled at least 150 feet from water sources. If portable pumps are used near water sources, a fuel containment system will be used at all times.

<u>Natural and Cultural Resources</u>

- Natural and cultural resources would be protected from the adverse effects of fire and fuel management activities. During all management activities, the minimum impact tactics (MIST) policy would be incorporated to the greatest extent feasible and appropriate, employing methods least damaging to Park resources for the given situation.
- Historic structures would be protected from wildland fire via the maintenance of existing defensible space around each, appropriate to the cultural landscape itself.
- Avoiding ground disturbance within known sensitive or unique natural and cultural resource locations. When ground disturbance is necessary in proximity to these resource locations it will involve as little impact as possible and be located as far outside of resource boundaries as possible.

- Prior to prescribed burning and fuel reduction project implementation, an archeologist meeting the Secretary of the Interior's standards would inventory unsurveyed areas for cultural resources, and the Park would ensure compliance with Section 106 of the National Historic Preservation Act.
- Prior to prescribed burning and fuel reduction project implementation, an IDT process will be used, which includes the Park's T&E coordinator, to determine if the project will have detrimental effects on T&E species. The USFWS will also be consulted for all non-emergency fire management actions to ensure compliance with Section 7.
- No mechanized heavy equipment would be used within archeological site boundaries.
- A member of resource management staff will be contacted during the initial stages of emergency actions (e.g. unplanned wildfire), and a resource advisor may be assigned to the incident. The interdisciplinary team approach will be used to mitigate effects to sensitive resource areas during non-emergency fire management actions (e.g. prescribed fire and hazard fuel treatments).
- Pre-Attack Planning During the Fire Season: The pre-attack plan, part of the Park's fire management program, would be reviewed and revised annually prior to each fire season based on the following priorities: sensitive cultural and natural resource areas and sites, wildland urban interface, timber type, vegetation maps, wildlife habitat, fuel maps, and smoke/air quality impact models.
- A minimum requirement analysis will be completed for all non-emergency mechanical (e.g. helicopter landings) actions proposed to take place within recommended wilderness areas of the Park.
- Fire crews would be trained in and use *Best Management Practices* for reducing the chances of bear conflicts with wildfire response efforts, including training crews in food storage, actions to prevent encounters on the fire-line, how to react to bear encounters, how to react to charging bears, use of bear spray, and placement and management of front-country fire camps and backcountry spike camps to avoid conflicts with bears. Bear-proof food storage boxes would be used for food and garbage storage in all backcountry fire camps. Bear-proof garbage cans and dumpsters would be used in all front-country fire camps. Best bear management practices are used on all wildland fire incidents within the Park.
- Backcountry firefighter camps will be located greater than one mile from known active lynx dens and wolf dens or rendezvous sites. To minimize human-wildlife interactions, each camp will be attended by a resource advisor who enforces camp protocols. Large firefighter camps (greater than 100 people) will be strictly limited to pre-existing disturbed sites (e.g., baseball fields) in the vicinity of developed areas and roads.
- Avoid implementation of non-fire fuel treatments within one mile of known active lynx den sites and/or suspected denning areas between May 1 and July 31, known grizzly bear den sites between November 15 and April 15, and known active gray wolf den or rendezvous sites between April 15 and August 1.
- Monitor for occurrences and establishment of exotic vegetation invasions following fuel treatments and suppression activities, if sufficient funding is available.
- All non-emergency hazard fuel removal projects will be completed after August 1 every year, outside of the bird breeding period, unless nesting bird surveys are completed within the treatment area.

- During extended attack (non-initial attack), all fire vehicles and equipment will be cleaned and inspected when they enter the Park.
- Firelines, fire camps, and spike camps will be rehabilitated post-fire as necessary.
- Geothermal areas will be avoided as much as possible to protect the sensitive areas and for firefighter safety.
- A landscape architect will review/assist with the proposed treatment plans for each hazard fuel project, as an active member of the Interdisciplinary team, and when appropriate by assisting in the marking of trees to be cut in collaboration with the fire management specialists.
- Educate fire personnel about known locations and the cultural resources of the Park, including known cultural landscape resources for avoidance during implementation within the project area. Defensible spaces in historic districts often include vegetation surrounding buildings and structures, and may also include roads, trails, walkways, fences, rock walls, etc.
- Minimize ground disturbance when possible, including avoidance of fire control lines, new roads, and trails through cultural resources.
- Topsoil: The seeds and mycorrhizae contained in topsoil are the best means for revegetation in disturbed areas. Fragile topsoil will be protected during tree cutting activities in order to ensure all disturbed areas will revegetate and no scars will be left due to the dragging of slash, equipment turn-arounds, and ground compaction. Park topsoil stripping, stockpiling, salvaging, and replacement methods will be followed.
- Screening during hazard fuel projects: ecotone areas (the transition area between meadow and forest) are usually thicker and have more screening potential due to sun exposure at the meadow's edge. For those structures that have been constructed with the intention of utilizing the screen of the ecotone, mechanical thinning should maintain the overall screening characteristic whenever possible.
- Roads and trails during hazard fuel projects: the screening characteristics of vegetation along corridor(s) within the site will be preserved whenever possible.
- Debris will be scattered, such as cut trees, limbs, and brush produced by manual thinning actions; large amounts of debris will not be left in the project area.
- Flush cut stumps as low to the ground as possible, and cover the stumps during the rehabilitation phase.

Table 2-2. Fire Management Goals and the Ability of the Alternatives to Meet Them.

Fire Management Goal	Alternative 1: No Action	Alternative 2: Proposed Action
Firefighter and public safety is the first priority in every fire management activity.	Meets goal as all actions will conform to safety policies defined in agency and departmental policy. The commitment to and accountability for safety would ensure compliance with established safe fire	Meets goal as all actions will conform to safety policies defined in agency and departmental policy. The commitment to and accountability for safety would ensure compliance with established safe fire

Fire Management Goal	Alternative 1: No Action	Alternative 2: Proposed Action
	management practices.	management practices.
Allow fire to play its ecological role in the Park to the greatest extent possible through the use of management response strategies.	Meets goal by allowing use of fire management strategies and tactical treatments (wildland fire use prescribed fire, non-fire fuel treatments).	Meets goal through a balanced approach of fire treatments (wildfire response strategies, prescribed fire, non-fire fuel treatments) Park wide.
Suppress human caused wildfires in a safe, cost effective, and environmentally sensitive manner commensurate with the values at risk.	Meets goal by providing for safety of employees and the public through all phases of fire suppression. Mitigation measures would be used to prevent or minimize potential adverse environmental effects associated with fire management. All fire management activities and fuel reduction would incorporate the minimum impact tactics.	Meets goal by providing for safety of employees and the public through all phases of fire suppression. Mitigation measures would be used to prevent or minimize potential adverse environmental effects associated with fire management. All fire management activities and fuel reduction would incorporate the minimum impact tactics.
Maintain an active fire prevention program.	Meets goal, as a fire prevention program is a component of the 2004 FMP.	Meets goal, as a fire prevention program would be a component of the 2012 FMP.
Maintain a fully qualified fire management staff to implement the FMP.	Meets goal through the roles and responsibilities by specific Park staff positions that provide clear direction and accountability for implementation of a responsive fire management program.	Meets goal through the roles and responsibilities by specific Park staff positions that provide clear direction and accountability for implementation of a responsive fire management program.
Maintain an interpretive and public information program that will educate the public on the ecological role of fire in the Park and provide daily fire danger and situation information.	Meets goal with fire education activities and information efforts that would occur with help from fire staff, public affairs office, the Division of Resource Education and Youth Programs, and other Federal agency information and education personnel.	Meets goal with fire education activities and information efforts that would occur with help from fire staff, public affairs office, the Division of Resource Education and Youth Programs, and other Federal agency information and education personnel.

Fire Management Goal	Alternative 1: No Action	Alternative 2: Proposed Action
Reduce hazard fuel in areas where life and/or property may be threatened by wildfire, or may impede the ability to allow fire to play its ecological role in the Park.	Meets goal with prescribed fire and non-fire fuel treatments that would take place with a focus on reducing hazard fuel around values at risk within developed areas and around backcountry cabins.	Meets goal with prescribed fire and non-fire fuel management that would reduce hazard fuel accumulation around structures within the wildland-urban interface of developed areas and around backcountry cabins.
Coordinate and cooperate with adjacent land management agencies.	Meets goal through collaborative processes that include interagency fire management agreements and planning with Grand Teton National Park, the six adjoining national forests under the direction of the Greater Yellowstone Coordinating Committee, state dispatch centers, and rural fire departments.	Meets goal through collaborative processes that include interagency fire management agreements and planning with Grand Teton National Park, the six adjoining national forests under the direction of the Greater Yellowstone Coordinating Committee, state dispatch centers, and rural fire departments.

Table 2-3. Comparison of Alternatives.

Component	Alternative 1: No Action	Alternative 2: Proposed Action
Wildfire Suppression Strategy	Suppression could be used on natural and human caused fires throughout the Park if the fire is either not meeting specific goals or objectives, or weather and fire behavior prescriptions are not met. There would not be any wildfire suppression strategy zones.	All wildfires would use the suppression strategy within the suppression strategy zones. Fires could be suppressed outside of the zones when they no longer meet specific pre-identified objectives. Initial action on human-caused wildfire would be a suppression strategy.
Response to Wildfire	Wildland fire use would be permitted under specific prescriptions, including weather and fire behavior conditions, anywhere in the Park.	A monitor or point/zone protection strategy would be permitted on fires where management decisions would reflect the goal of allowing natural ecological processes to occur utilizing

Component	Alternative 1: No Action	Alternative 2: Proposed Action
		the safest, most effective, and most efficient methods available while meeting Park managers' identified goals and objectives.
Prescribed Fire	Prescribed fire treatments would take place with a focus on reducing hazard fuel around values at risk.	Prescribed fire could be utilized throughout the Park to meet varying fuel and resource management objectives and would be planned through an IDT process.
Non-fire Fuels Management	Non-fire fuel management includes mechanical and manual thinning of trees and understory vegetation to reduce hazard fuel accumulation around structures including backcounty cabins and within the wildland-urban interface of developed areas.	Non-fire fuel management applications would reduce hazard fuel accumulation around structures within the wildland-urban interface of developed areas to protect existing structures and improve firefighter and public safety by creating a defensible space around these developed areas should a wildland fire occur. All fuel management activities would be planned through an IDT process.

Table 2-4. Summary of Alternative Impacts.

Impact Topic	Alternative 1: No Action	Alternative 2: Proposed Action
Air Quality	Negligible to moderate, short-term, localized to regional, adverse impacts on air quality depending on fire characteristics such as size, intensity, fuels, and burning conditions.	Impacts would be similar to Alternative 1 with the following differences: adverse impacts would be offset over the long-term through reduced potential for unwanted fires as a suppression strategy response would occur more quickly because of predetermined

Impact Topic	Alternative 1: No Action	Alternative 2: Proposed Action
		strategy zones, creating lesser amounts of smoke within these areas. However, there could be more smoke generated under Alternative 2 as a variety of wildfire strategies (e.g. monitor, point/zone protection) may be taken more often outside of the suppression strategy zones.
Water Quality	Negligible to moderate, short- to long-term, localized, adverse effects on water quality from impacts caused by fire protection, management of wildland fires, and fuel management.	Negligible to minor, short- to long-term, localized, adverse effects on water quality from impacts caused by fire protection, management of wildfires, and fuel management. Overall, adverse impacts on water quality under this alternative would be lower than under Alternative 1 due to a faster response to unwanted wildland fire because of predetermined suppression strategy zones, and the use of an IDT planning process for all prescribed fire and fuel treatments.
Geological Resources	Negligible to moderate, short- to long-term, local, and adverse impacts on geological resources; and minor to moderate, long-term beneficial impacts. Thermal areas may be adversely affected in the event of a wildfire from deposition of sediment from adjacent burned areas and increased water temperature, which may in turn affect the function, chemistry, and microbiotic communities of the feature. The level of impact would be dependent	Negligible to minor, short- to long-term, local, and adverse impacts on geological resources; and minor to moderate, long-term beneficial impacts for reasons similar to Alternative 1. Overall, adverse impacts on geological resources would be less under Alternative 2 than Alternative 1 as a faster response to unwanted fires because of predetermined suppression strategy zones would increase the likelihood resources could be protected, a more

Impact Topic	Alternative 1: No Action	Alternative 2: Proposed Action
	upon the size of the area burned, proximity of the burn to geothermal areas, and the size of the features. Adverse impacts on paleontological resources could occur from wildfire and subsequent fire management response and rehabilitation activities. Adverse effects from planned fire management actions would be avoided through identifying known paleontological sites prior to disturbance and protecting them. The effects on soils from preparation for and implementation of prescribed fire, fuel reduction projects, and suppression would be adverse. In the long-term, however, the effects of prescribed fires and unplanned wildfire on soils would be beneficial due to perpetuation of natural ecosystem processes.	streamlined IDT process, and by choosing the appropriate wildfire response strategy through goals and objectives rather than prescriptions so the natural ecosystem process would be perpetuated.
Wilderness	Negligible to minor, short-term, localized, adverse impacts on recommended wilderness during and immediately after fire management actions, and changes to wilderness character would be small. Using prescribed fire and allowing wildland fire use in recommended wilderness would enhance and maintain many wilderness characteristics. In the long-term, fewer fires would need to be suppressed, resulting in fewer direct impacts	Impacts on recommended wilderness would be similar to Alternative 1. Flexibility to use the appropriate wildfire response strategy, including a monitor or point/zone protection strategy with resource goals and objectives would promote the natural role of fire across the landscape. The potential for wildfires outside the range of normal variability could be minimized, benefitting recommended wilderness over the long-term. Fuel management activities would

Impact Topic	Alternative 1: No Action	Alternative 2: Proposed Action
	associated with protection actions. There would be minor to moderate, beneficial, long-term effects on recommended wilderness.	be planned and coordinated with an IDT approach and process in such a way as to not adversely affect recommended wilderness, but rather to enhance and maintain many wilderness characteristics. Overall, adverse impacts on wilderness under this alternative would be lower than under Alternative 1 due to an IDT process for all planned fire management activities. Likewise, beneficial effects would be greater under this alternative.
Vegetation and Wetlands	Negligible to moderate, short- and long-term, adverse effects on vegetation, including invasive species and rare plants, and the severity of the impact depends on the nature and intensity of wildland fire. Sedimentation increase in wetlands could occur, creating minor, short-term, adverse effects. Long-term benefits to vegetation from allowing natural processes to perpetuate through wildland fire use, would maintain and restore vegetation to its natural ecological function.	Impacts on vegetation and wetlands would be similar to Alternative 1. There would be fewer adverse impacts on vegetation and wetlands under Alternative 2 than Alternative 1 with a faster response to unwanted fires because of predetermined suppression strategy zones, and the use of an IDT planning process for all prescribed fire and fuel treatments. There could be more short-term adverse impacts with the use of a monitor response strategy to unplanned fires, but also greater long-term benefits from allowing natural processes to perpetuate so vegetation would be maintained and restored to its natural ecological function on more acreage in the Park.
Fish and Wildlife	Negligible to minor, short-term, adverse effects on wildlife and fish associated with fire management	Impacts on fish and wildlife would be similar to Alternative 1. Overall, there would be fewer adverse

Impact Topic	Alternative 1: No Action	Alternative 2: Proposed Action
	activities depending on the nature and intensity of wildland fire. Direct mortality and wildlife displacement due to habitat loss and degradation would occur, although overall wildlife populations in the Park would not be jeopardized. Direct mortality of fish and degradation of fish habitat could occur. Sedimentation increase in fish-bearing streams could occur, creating minor, short-term, adverse effects on fish populations.	impacts on fish and wildlife under Alternative 2 than Alternative 1 due to a faster response to unwanted wildfire because of predetermined suppression strategy zones, and the use of an IDT planning process for all prescribed fire and fuel treatments. There would be more short-term adverse impacts with the use of a monitor response strategy, but also greater long-term benefits from allowing natural processes to perpetuate so that natural ecological function would be maintained and restored on more acreage in the Park.
Threatened and Endangered Species	Negligible to minor, short- to long-term, and adverse or beneficial depending on the species in question. No federally protected species would be harmed by the fire management activities, and many species would benefit from post fire conditions. Some mortality and wildlife displacement due to habitat loss and degradation could occur, although overall wildlife and plant populations in the Park would not be jeopardized.	Impacts on threatened and endangered species would be similar to Alternative 1. Overall, adverse impacts under this alternative would be lower than under Alternative 1 due to the use of an IDT planning process for all prescribed fire and fuel treatments. The use of a monitor or point/zone protection response strategy would provide beneficial effects by allowing natural processes to perpetuate so natural ecological function would be maintained and restored on more acreage in the Park.
Visitor Use and Experience	Negligible to moderate, short-term, localized, and adverse impacts on visitor use and experience due to short episodes of decreased	Negligible to minor, short-term, localized, and adverse impacts on visitor use and experience due to short episodes of decreased

Impact Topic	Alternative 1: No Action	Alternative 2: Proposed Action
	visibility, from closures of areas of the Park for safety, and from burned vegetation. Longer-term adverse impacts would include contributions to regional haze and the possibility of wind-blown dust near the burned areas.	visibility, from short term closures of areas of the Park for safety, and from burned vegetation. Potential adverse impacts could include contributions to regional haze and the possibility of wind-blown dust near the burned areas. Allowing fire to play its natural role on the landscape may result in beneficial impacts over the long-term by maintaining the natural fire regime. Impacts would be overall lower than under Alternative 1 as response to unwanted wildland fires would occur more quickly because of predetermined suppression strategy zones, reducing the length of time for area closures and creating lesser amounts of smoke.
Cultural Resources	Minor to moderate, short- to long-term, adverse or beneficial impacts on cultural resources depending on the nature and intensity of any wildfire and subsequent fire management response and rehabilitation activities. Adverse effects on cultural resources from planned fire management actions would be avoided through identifying the resources prior to disturbance and protecting the resources. Archeological resources could suffer direct, minor to moderate, long-term, adverse impacts during wildfire management activities as unidentified archeological	Negligible to moderate, short- to long-term, local, and adverse or beneficial impacts on cultural resources for reasons similar to Alternative 1. Adverse impacts on cultural resources would be overall lower under Alternative 2 than Alternative 1 with a faster response to unwanted wildland fire because of predetermined suppression strategy zones, and an IDT process used for all non-emergency fire management treatments that would help in identifying and avoiding or protecting cultural resource sites.

Impact Topic	Alternative 1: No Action	Alternative 2: Proposed Action
	sites sometimes cannot be protected. Direct damage to or loss of historic structures and sites from wildfire and wildfire suppression activities would result in long-term, adverse impacts of minor to moderate intensity. The effects on historic structures from fuel reduction projects would be localized, short-term to long-term, minor to moderate, and beneficial. Fire or suppression activities could have short- and long-term, minor to moderate adverse impacts on cultural landscapes as viewshed changes could result in loss of trees and structures, burned vegetation and stumps, exposed soils in fire lines altering the character of the landscape. Fire can also have long-term, minor to moderate beneficial impacts on cultural landscapes as vegetation composition can be altered beneficially. Long-term, minor to moderate, adverse impacts on ethnographic resources if they are lost or damaged by wildland fires or fire suppression strategy activities. Long-term, minor to moderate, beneficial impacts on ethnographic resources as fire can be beneficial to culturally important plant species.	
Socioeconomic Resources	Negligible to minor, short-term, beneficial impacts on socioeconomic resources from spending on fire management	Impacts would be similar to Alternative 1. Faster response time to unwanted fires would decrease impacts on visitor

Impact Topic	Alternative 1: No Action	Alternative 2: Proposed Action
	activities. Negligible, short-term, adverse impacts associated with disruptions of visitor activity and corresponding business activity inside the Park and in gateway communities.	spending as closures would be reduced because of predetermined suppression strategy zones, but also decrease spending during fire events. Implementing a monitor or point/zone protection response strategy could decrease visitor spending but increase Park expenditures to support fire management activities.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter provides an evaluation of the potential effects or impacts of each of the alternatives on the resources described in the issue statements presented in Chapter 1, Purpose and Need for Action. This chapter is organized by impact topic. These topics focus on the presentation of the affected environment and environmental consequences and allow a standardized comparison between alternatives.

3.1 METHODOLOGY

Potential impacts are described in terms of type (beneficial or adverse), context, intensity, duration, direct or indirect impacts, and cumulative impacts. Summary impact levels (characterized as negligible, minor, moderate, or major) are given for each issue topic in the analyses. Definitions of impact terms are provided below. Overall, the NPS based the following impact analyses and conclusions on the review of existing Yellowstone National Park literature studies, information provided by experts within the Park and other agencies, professional judgments and Park staff insights, and public input.

Context of Impact
Context is the setting within which an impact is analyzed, such as local, park-wide, or regional. CEQ requires impact analyses include discussions of context. Localized impacts are those that affect the resource area only on the project site or its immediate surroundings, and would not extend Park wide or into the region.

Duration of Impact
Temporary impacts would occur only during the time that fire management activities are being conducted. In the interim between these activities, resource conditions would return to pre-activity conditions. Short-term impacts would extend beyond the time of project activities, but would not last more than one to two years. Long-term impacts would extend for several years and beyond the life of the project even if the actions causing the impacts were to cease; they can potentially continue indefinitely, in which case they could also be described as permanent.

Direct and Indirect Impacts
Direct effects are impacts caused by the alternative(s) at the same time and in the same location as the action. Indirect effects are impacts caused by the alternative(s) that occur later in time or farther in distance than the action, but are still reasonably foreseeable. An indirect impact could occur because of a change to another resource or impact topic.

Intensity of Impact
Impact intensity is the degree to which a resource would be beneficially or adversely affected by an action. Impact intensities are quantified as negligible, minor, moderate, or major. Resource specific criteria used to rate the intensity of project impacts are presented within each resource area impact analysis.

3.2 CUMULATIVE IMPACT SCENARIO

CEQ regulations (40 CFR 1508.7) require the assessment of cumulative impacts in the decision-making process for Federal projects. A cumulative impact is an impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (Federal or non-Federal), organization, or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Cumulative impacts are considered for all alternatives and are presented at the end of each impact topic discussion analysis. To determine potential cumulative impacts, projects in the vicinity of the proposed project site were identified. Potential projects identified as cumulative actions included any planning or development activity that was currently being implemented or that would be implemented in the reasonably foreseeable future.

These cumulative actions are evaluated in the cumulative impact analysis in conjunction with the impacts of each alternative to determine if they would have any additive effects on natural resources, cultural resources, visitor use, or the socioeconomic environment. Because some of these cumulative actions are in the early planning stages, the evaluation of cumulative effects was based on a general description of the project. Known past, current, and reasonably foreseeable future projects and actions in the vicinity of the project area are described below.

- **Tower-Roosevelt Comprehensive Plan (2010)** – This plan will alter or improve visitor services, facilities (buildings, roads, and paved parking areas), and utilities while preserving the distinct and significant rustic western camp character and resources in the Tower-Roosevelt area. This plan does not increase the footprint of the developed area. It does recognize the need to replace existing building material with materials that are more flame resistant. A large hazard fuel reduction project was initiated in the face of the Antelope Fire in 2010 which further increased the defensibility of the Tower-Roosevelt developed area.

- **Lake Comprehensive Plan (2012)** – This plan will alter or improve visitor services, facilities, buildings, roads, paved parking areas, and utilities while focusing on protecting the developed area by managing growth and development.

- **Backcountry Cabins (ongoing**) – Most of the 41 cabins and lookouts scattered throughout Yellowstone's recommended wilderness have had some level of fuel reduction completed. Each cabin site was evaluated for potential threat from a wildfire, and the necessary amount of hazardous fuel was removed. These projects were completed using cross-cut saws, horses for skidding logs, double-bit axes, chainsaws and other hand and power tools. Canopy thinning, removing dead and down fuel and piling and burning of debris were objectives in reducing fuel. These cabin sites will continue to be assessed and appropriately maintained for protection from wildfire.

- **Other Developed Areas (ongoing)** – Many developed areas in Yellowstone have been evaluated and treated for hazard fuel reduction projects, and all of the developed areas must be monitored. Tree canopy density needs to be modified to stop crown fires, which may

initially take several years to accomplish through treatment. A quality fuel reduction project will make allowances for wind-throw, and over the course of a few years of conservative treatment, the final canopy spacing will be achieved. Accumulated dead and down fuels will be removed using chainsaws, chippers and possibly some small, minimal footprint types of machinery. Fuel that is not chipped and removed may be piled and burned when it is safe and appropriate to do so.

- **Vegetation Management Guidelines for Construction Disturbance in Yellowstone National Park (2002)** – Provides guidelines for conservation measures to minimize disturbance to vegetation and soils prior to construction and to enhance re-vegetation efforts following the construction phase of projects. Enhancing re-vegetation efforts may result in placement of hazard fuel adjacent to values at risk. Guidelines should adhere to ICC Wildland-Urban Interface Code sections 603 and 604.

- **Non-native Vegetation Management Plan (in preparation)** – This plan provides guidance to prevent, eradicate, and control the spread of non-native plants through the use of manual and herbicide methods. Prescribed fire may be a tool used to prevent, eradicate and control the spread of non-native plants.

- **Hazard Tree 10 Year Management Plan (2006)** – This plan provides guidance to implement an ecologically sound program which provides surveys to evaluate potentially hazardous trees, and for the removal or mitigation of appropriate hazards. Hazard trees are only associated with potential impacts to a value at risk. Individual trees or small stands of trees will not likely have an impact to the fire management program. However, larger projects such as removing hazardous trees from along a section of road, or potentially a large beetle-killed stand of trees could serve as a fuel break or widening of a fuel break, which may serve as a fire control line.

- **Whitebark Pine Strategy (2011)** – This plan provides strategy for whitebark pine conservation and restoration throughout the Greater Yellowstone Area (GYA), which includes the Park. The Park will manage whitebark pine within the context of the GYA whitebark strategy. This includes maintaining up to 10 whitebark pine plus trees (i.e. trees with potential resistance to whitebark pine blister rust) identified for their potential resistance to whitebark pine blister rust. These valuable trees would be located and protected from wildland fire to the extent possible.

  Native Fish Management Plan (2010) – This plan proposes to conserve native fish from threats of non-native species, disease, climate induced environmental change, and provides guidance and an adaptive framework for managing fisheries and aquatic resources. Fire management strategies (e.g. appropriate unplanned fire response strategy, prescribed fire, and mechanical and manual treatments) may affect native fish by removing vegetative cover in riparian areas, possibly increasing water temperatures or increasing runoff and silt. A wildfire monitor strategy is a “natural process” which the Park encourages. All watersheds within the Park have been affected by wildland fire in the past and have adapted to the temporary changes.

- **Parkwide Road Improvement Plan (1992)** – This plan proposes to preserve and extend the service life of principal park roads, enhance their safety, and continue access to Yellowstone National Park and its features. Improving the roads through widening will enhance emergency vehicle operations and improve the likelihood of success when using the roads as a fire barrier.

- **Northwestern Energy (NWE) Projects (ongoing)** - Northwestern Energy is the servicing power company in Yellowstone National Park. Nearly all of Northwestern Energy's powerlines are above ground, and maintaining the 50 foot wide right-of-way (ROW) is their responsibility. These ROWs are maintained using heavy equipment such as tracked excavators with mower attachments or dozer-like equipment with a mulching head attached. In the past, wildfires have burned over sections of powerline and the company has replaced the poles and lines. Powerline right of ways can serve as a fireline in a low-intensity fire. They are also considered a value at risk and steps can be taken to provide some protection.

- **Surrounding Federal Land Agency Projects (ongoing)** - Yellowstone National Park is surrounded by local, state and federal governments. Much of the federal land adjacent to the Park is wilderness and the use of a wildfire response monitor strategy or a point/zone protection strategy as resource management tools are strongly encouraged. This increases the potential for a naturally occurring wildland fire to enter or leave the Park. Federal wildland policy promotes this type of interagency, large scale wildland fire response and places emphasis on all agencies working together to plan and prepare for this to occur. The federal agencies adjacent to the Park also actively manage fuel through manual, mechanical and prescribed fire treatments. The community of West Yellowstone, which is on the Park's west side, has completed several hazard fuel reduction projects in conjunction with the Gallatin National Forest. Canopy thinning, removing dead and down fuel in West Yellowstone combined with the same type of treatment within the Park and adjacent to the community and forest projects, have created a large buffer which should reduce the threat of wildfire to developments in this area.

- **Housing Development Outside of Park (ongoing)** – Although much of the adjacent land to the Park is federal land and designated wilderness, there is still potential for development in small areas. The most likely areas for this to occur would be near the town of West Yellowstone, MT, on the west side of the Park, and near the area of Silver Gate, MT, adjacent to the Northeast Entrance.

3.3 AIR QUALITY

3.3.1 Affected Environment

The Clean Air Act (42 USC 7401 *et seq*.) recognizes the need to protect visibility and air quality in national parks. By definition, national parks, including Yellowstone, are mandatory Class I areas and are therefore given the highest level of air quality protection. In Class I airsheds, air quality is better than the National Ambient Air Quality Standards (NAAQS), and there is little allowance for deterioration of air quality. Monitoring stations are set up in different areas of the Park to evaluate air quality conditions and compare them with federal and state standards. The Montana Department of Environmental Quality Monitoring and Data Management Bureau

installed and regularly examine a carbon monoxide monitoring station on the northeast side of the west entrance of the Park and a particulate sampling station outside of the Park in the town of West Yellowstone. The Park manages one at Old Faithful. Dry atmospheric deposition and wet (acid rain) deposition are monitored at Tower Falls in the northern portion of the Park, through the Park's participation with the National Atmospheric Deposition Program. Yellowstone also participates with the Environmental Protection Agency (EPA) in operating a site that provides atmospheric data and ground-level ozone through the program CASTNet (Clean Air Status and Trends Network). Lastly, the Park participates in a collaborative visibility monitoring program known as the Interagency Monitoring of Protected Visual Environments (IMPROVE) program. The equipment for both the IMPROVE and CASTNet programs are located at Yellowstone Lake, which measure atmospheric concentrations of aerosols, sulfates, nitrates, ammonium, sulfur dioxide, nitric acid, and ozone levels.

Results from the several monitoring stations throughout the Park indicate all Park areas meet federal and state ambient air quality standards. Because there is little industrial activity and a relatively low human population in northwestern Wyoming, the overall regional air quality of the Park is good. Regional sources of air pollutants that could affect Yellowstone include electric utility power plants, oil and gas processing, coal bed methane wells, industrial fossil fuel combustion, and agriculture. Local sources of air pollution include automobiles, snowmobiles, and wildland fires.

3.3.2 Methodology

Information regarding potential impacts was obtained from interdisciplinary team members and relevant literature. The impact thresholds for air quality are defined as follows:

Negligible: No changes would occur, or changes in air quality or air quality related values would be below or at the level of detection. If detected, effects would be considered slight with no perceptible consequences to health and visibility.

Minor: Changes in air quality or air quality related values would be measurable. The changes would be small and the effects on health and/or visibility would be localized. No air quality mitigation measures would be necessary.

Moderate: Changes in air quality or air quality related values would be readily apparent and measurable, and would have consequences to health and/or visibility. Air quality mitigation measures would be necessary and would likely be successful.

Major: Changes in air quality or air quality related values would be obvious and measurable, have substantial consequences to health and/or visibility, and be noticed regionally. Air quality mitigation measures would be necessary, though success of the measures could not be guaranteed.

3.3.3 Impacts of Alternative 1 (No Action)

Impacts Analysis

Smoke and the chemicals produced by planned and unplanned fires have a variety of effects upon air quality. The primary products of combustion of organic materials include carbon dioxide, water vapor, carbon monoxide, particulate matter, hydrocarbons, nitrogen oxides, and trace minerals. In addition to the compounds considered pollutants in smoke, wildfire smoke also contains and distributes elements, compounds, and minerals considered to be biological building blocks necessary for the creation and production of plant tissues. Nutrients which were previously stored in vegetative or woody matter, such as carbon, phosphorus, nitrogen, calcium, and potassium, while mostly released as ash, are also carried in smoke and fall to the earth's surface over a broad geographic area. Although not widely studied, it is hypothesized these nutrients may stimulate plant production in areas receiving the fallout from fires.

The Clean Air Act mandates that federal land managers have an affirmative responsibility to protect air quality related values including visibility, plants, animals, soils, water quality, cultural resources, and visitor health from adverse pollution impacts. During a wildland fire event, high concentrations of carbon monoxide, other gases, and particulate matter can be released affecting air quality. Air quality standards for allowable emissions are based on health effects to humans. These standards are intended to protect sensitive members of the population with adequate safety margins. Effects to humans from smoke are usually limited to firefighters working on planned and unplanned wildfires. The Park would manage smoke in compliance with federal, state, and local requirements so as to minimize its effects on visitors, firefighters, adjoining lands and neighbors, natural and cultural resources, and roads. The greatest threat to air quality would be smoke impacts on sensitive receptors (e.g. residences, visitors).

In addition to health effects, wildfire smoke could affect visibility in the Park. Fire management activities in Yellowstone which result in the discharge of air pollutants are subject to, and must comply with, all applicable federal, state, interstate, and local air pollution control requirements. Smoke mitigation measures for prescribed fires are employed by the Park to minimize impacts to visibility and air quality within the Park and surrounding areas. It is not possible to accurately predict the number of acres burned and amount of smoke generated.

Smoke events associated with prescribed burns could be short-lived, on the order of a few hours to a few days. Ignition design and timing can minimize smoke production and avoid periods where inversions are likely so that burning would not generate much smoke. The Park would coordinate with the appropriate state to ensure all applicable smoke management practices are implemented and to alert adjoining land owners that a prescribed burn would be occurring. Air quality would be expected to return to very good to excellent quality after prescribed fires are extinguished. The amount of time for regional air quality to return to pre-disturbance condition depends on the prevailing winds and the movement of air masses.

Direct adverse impacts to air quality from unplanned wildland and prescribed fire under this alternative would include release of particulates and smoke into the airshed and the potential for a slight (not measurable) increase in fugitive dust from fire management activities. Smoke particulates could remain suspended in the atmosphere for a few days to several months. Very small particulates can travel great distances and add to regional haze problems. Inversions could occur and smoke from fires may linger in the valleys for a period of time. There could be an

intermittent and short-term exceedance of air quality standards (especially particulates) resulting in short-term, localized, and negligible to minor adverse impacts to air quality. On a regional basis, effects to air quality would generally include minor, short-term, adverse impacts as quantities of pollutants, primarily particulates, are released to the atmosphere and travel beyond Park boundaries. Indirect adverse effects from these air emissions would include reduced visibility along roadways, reductions in recreation values due to visibility limitations, smoke and odors, and possible health effects to sensitive receptors, such as residents and visitors. These adverse indirect effects would be short-term, localized, and minor.

Some air pollutants would be generated by use of gasoline powered equipment in manual and mechanical fuel reduction projects. Emissions would be produced by machines used in site preparation and fuel reduction activities including chain saws, chippers, and vehicles used to respond to a fire and to transport people and equipment. This would contribute to negligible increases in fossil fuel emissions in the area of their use. The adverse effect of these pollutants on air quality, given the small size of the projects and infrequency of activity, would be localized and temporary.

In the event of a large scale unplanned wildfire, greater impacts could be expected as large quantities of pollutants, primarily in the form of particulate matter, would be released to the atmosphere. Indirect adverse effects from these emissions would include impaired visibility along roadways, reductions in recreational values at scenic vistas, and potential health effects to residents and visitors.

Cumulative Effects

Coincident fires in adjoining public and private lands, and fuels management actions in the surrounding national forests and Grand Teton National Park, including the use of prescribed fire to meet management goals, continue to have periodic adverse impacts on air quality. Cumulative effects of smoke from other sources, such as fireplace or campfire emissions, could have adverse impacts during inversions. Development within the Park and in surrounding towns and the use of recreational vehicles may result in local air pollution increases from emissions over time. If these external sources of air pollution were combined with a major unplanned wildfire in the Park, the impacts, although short-term, could be moderately adverse to the regional airshed.

Cumulative adverse effects to regional air quality could range from minor to moderate, depending on the timing and size of other emissions that would coincide with fire events in the Park. Alternative 1 would contribute minor, adverse cumulative impacts on air quality. Combined with known past, current and future projects and actions, there would be minor to moderate, adverse cumulative impacts on air quality.

Conclusion

The magnitude of the impacts of wildland fire on air quality is dependent on a number of characteristics of the fire including size, intensity, fuels, and burning conditions. Fire management under Alternative 1 would have negligible to moderate, short-term, localized to regional, adverse impacts on air quality.

3.3.4 Impacts of Alternative 2 (Proposed Action)

Impacts Analysis
Adverse effects on air quality under Alternative 2 would be essentially the same as those described for Alternative 1 and would result from smoke from planned and unplanned wildfires, and from emissions from vehicles and equipment such as chain saws used for fuel reduction.

Fire management suppression strategy zones under Alternative 2 would assist managers in quickly determining the correct management strategy to use when an unplanned wildfire event occurs. Thus the adverse effects on air quality from management of wildfires under Alternative 2, especially suppression strategies, would be lower than the effects under Alternative 1 because fire response would occur more quickly within the zones. It is expected under this alternative unwanted fires would be of smaller size and would produce less smoke before they are extinguished.

Under Alternative 2, the IDT process would be more streamlined and efficient. All non-emergency projects (prescribed fire, fuel reduction) would be planned by the IDT, resulting in benefits to air quality as all efforts would be made to best manage smoke and emissions.

Fires managed with a monitor or point/zone wildfire response strategy under this alternative would be managed according to goals and objectives rather than specific prescriptions (e.g. weather and fire behavior parameters) as in Alternative 1. This approach may allow for more acres to burn naturally, which could result in more smoke and greater impacts on air quality than under Alternative 1.

Cumulative Effects
Coincident fires in the adjoining public and private lands, and fuel management actions in the surrounding national forests and Grand Teton National Park, including the use of prescribed fire to meet management goals, continue to have periodic adverse impacts on air quality. Cumulative effects of smoke from other sources, such as fireplace or campfire emissions, could have adverse impacts during inversions. Development within the Park and in surrounding towns and the use of recreational vehicles may result in local air pollution increases from emissions over time. If these external sources of air pollution were combined with a major wildfire in the Park, the impacts, although short-term, could be moderately adverse to the regional airshed.

Cumulative adverse effects to regional air quality could range from minor to moderate, depending on the timing and size of other emissions that would coincide with fire events in the Park. Alternative 2 would contribute minor, adverse cumulative impacts on air quality. Combined with known past, current and future projects and actions, there would be minor to moderate, adverse cumulative impacts on air quality.

Conclusion
The magnitude of the impacts of wildland fire on air quality is dependent on a number of characteristics of the fire including size, intensity, fuel, and burning conditions. Fire management activities under Alternative 2 would have negligible to moderate, short-term, localized to regional, adverse impacts on air quality. During the use of a suppression strategy,

impacts on air quality would be lower than under Alternative 1 as response to unwanted wildland fires could occur more quickly because of predetermined suppression strategy zones, creating lesser amounts of smoke where unwanted fires occur. However, there could be more smoke generated under Alternative 2 as more acres may burn to meet resource goals and objectives.

3.4 WATER QUALITY

3.4.1 Affected Environment

Yellowstone encompasses an approximately 3,500 square-mile watershed that provides the surrounding area with high quality water. Streams and lakes in Yellowstone are designated as Class I, Outstanding Resource Waters, by the state of Wyoming. Existing water quality must be maintained in Class I waters. The water resources within Yellowstone cover 112,000 acres. More than 150 lakes compose an area of approximately 108,000 acres. Yellowstone Lake, the largest body of water above 7,500 feet elevation in North America, occupies 139 square miles. Other major lakes include Shoshone, Lewis, and Heart Lakes. More than 220 named, and hundreds of unnamed streams form over 2,650 miles of flowing water in the Park. River systems in the Park include the Gardner, Lamar, Yellowstone, Madison, Firehole, Gibbon, and Lewis Rivers. The hydrology of most streams and rivers in the Park is driven by snowmelt with peak discharge occurring in the late spring. Discharge then declines gradually over summer and returns to near base flow by late fall.

Beginning in 2002, the Yellowstone Center for Resources fisheries and aquatic sciences staff initiated a long-term water quality monitoring program that includes monthly sampling of 19 sites, 12 at streams and 7 in Yellowstone Lake (NPS, 2010a). Water quality information collected from these sites includes water temperature, dissolved oxygen, pH, specific conductance, turbidity, and total suspended solids. Several ions and nutrients metrics are also collected from stream locations.

Chemical, physical, and biological properties of the Park's surface water vary considerably with season, location, elevation, geology, and proximity to thermal activity. Thermal areas affect water temperature, acidity, and dissolved chemicals. Generally, dissolved ion concentrations in Yellowstone waters are relatively low compared to other surface waters, especially in the spring during high runoff; higher concentrations are recorded in the fall and winter during low flow conditions. Distinct patterns of relative dissolved ion concentrations are observed in the Yellowstone and Madison River drainages. The most abundant ion in all watersheds is bicarbonate; concentrations of other major ions vary among watersheds. The Lamar River drainage has higher concentrations of calcium ions than the Yellowstone River main stem, which has higher concentrations of sulfate. In addition to bicarbonate ions, both sodium and chloride are present in approximately equal proportions in the Madison River basin. Both phosphorus and nitrogen concentrations are generally very low in most Park waters. Of the Park's major rivers, the Madison River tends to have the highest nutrient concentrations.

Aquatic invasive species (AIS) disrupt ecological processes because they are not indigenous to the ecosystem. Invasive organisms have become a major cause of species extinction, with the highest extinction rates occurring in freshwater environments. Executive Order 13112 - Invasive Species directs federal agencies to make efforts to prevent the introduction and spread of

invasive species, detect and monitor invasive species, and provide for the restoration of native species. Invasive species are usually destructive, difficult to control or eradicate, and generally cause ecological and economic harm. In Yellowstone, three AIS are having a significant detrimental effect:

- Lake trout (*Salvelinus namaycush*), illegally introduced in Yellowstone Lake where they feed on the native Yellowstone cutthroat trout.
- *Myxobolus cerebralis,* a parasite that causes whirling disease in cutthroat trout and other species.
- New Zealand mud snails (*Potamopyrgus antipodarum*), which form dense colonies and compete with native species.

Other AIS likely to arrive in the area are:

- Eurasian watermilfoil (*Myriophyllum spicatum*), which can create dense mats on calm water surfaces, shading out and displacing native plants.
- Zebra and quagga mussels (*Dreissena polymorpha* and *D. rostriformis bugensis*) native to Eastern Europe, which consume plankton and algae, reducing their availability for native species.

Yellowstone Lake is home of the premier surviving inland cutthroat trout fishery in North America. This fishery is threatened with destruction by illegally introduced lake trout. Each predatory, non-native lake trout can consume at least 41 cutthroat trout each year. Lake trout have the potential to decimate the Yellowstone Lake cutthroat trout population without heightened and maintained management efforts. Lake trout are not an acceptable substitute for cutthroat trout in the ecosystem because they occupy an ecological niche unavailable to cutthroat-eating predators, threatening the many species, such as grizzly bears, bald eagles, and river otters that depend on cutthroat trout for survival.

Yellowstone found whirling disease in native cutthroat trout taken from Yellowstone Lake near the mouth of Clear Creek (NPS, 2007a). In three separate independent test procedures, 11 out of 41 of the fish sampled tested positive to the disease. Although whirling disease has been widely identified in streams in neighboring areas and is a major concern of regional fisheries managers and anglers, previous routine samplings for the disease in streams and rivers throughout the Park were all confirmed as negative. The microscopic disease spore can be easily transported through water sources from another area; mud on boats, waders, or other fishing gear; fish entrails; birds; other live fish from another area; aquatic plants or weeds; and other unknown methods.

In 1994, New Zealand mud snails were discovered in the Madison River near the Park boundary. Subsequent investigations by independent researchers have documented a rapid spread of this exotic species to the Firehole and lower Gibbon rivers. Similar to other invasions of aquatic nuisance species, long-term effects of this exotic species on the indigenous invertebrate fauna are unknown; however, studies conducted on the middle Snake river in central Idaho suggest that native mollusks may be reduced in abundance or eliminated entirely.

3.4.2 Methodology

Information regarding potential impacts was obtained from interdisciplinary team members and relevant literature. The area of analysis includes Yellowstone, as well as the local and regional environment. The thresholds of change for the intensity of an impact on water resources are defined as follows:

Negligible: Neither water quality nor hydrology would be affected, changes would be either non-detectable or, if detected, would have effects that would be considered slight and short-term. Chemical or physical changes to water quality would not be detectable, would be well below water quality standards or criteria, and would be within historical or desired water quality conditions.

Minor: Changes in water quality or hydrology would be measurable, although the changes would be small and would likely be short-term. No mitigation measure associated with water quality or hydrology would be necessary. Chemical or physical changes to water quality would be detectable, but would be well below water quality standards or criteria and within historical or desired water quality conditions.

Moderate: Changes in water quality or hydrology would be measurable and long-term. Mitigation measures associated with water quality or hydrology would be necessary and the measures would likely succeed. Chemical or physical changes to water quality would be detectable, but would be at or below water quality standards or criteria.

Major: Changes in water quality or hydrology would be readily measurable and would have substantial consequences to the project area. Mitigation measures would be necessary and their success would not be guaranteed. Chemical or physical changes to water quality would be detectable and would be frequently altered from desired water quality conditions. Chemical, physical, or biological water quality standards or criteria would be locally exceeded on a short-term and temporary basis.

3.4.3 Impacts of Alternative 1 (No Action)

Impacts Analysis

Water quality can be affected both by wildfires and fire management activities. Small fires and fires of low intensity would be expected to have very little effect on water quality. Fires that become large could have adverse, minor to moderate, and short to long-term effects on water quality due to increased ash and woody debris deposited into waterways. This type of deposition could increase turbidity downstream from the fire. Loss of vegetation could lead to increased erosion and sediment loading in surface water resources in the Park. However, these effects are considered normal and natural in fire-adapted ecosystems and would be within the normal range of variability. It is when high severity fires burn large portions of a watershed that impacts could exceed the natural range of variability and cause substantial adverse effects. An event that exceeds the natural range of variability could cause sediment loading that is higher than historic rates and the transport capacity of the affected channels, initiating channel adjustments that may require a substantial duration of time for recovery.

Higher intensity fires are expected to cause more sedimentation and ash flow into lakes and streams events following heavy rains because more vegetation has been removed and would take longer to reestablish and stabilize bare soils. Soils that are severely burned also may become hydrophobic, which in turn can increase runoff, suspended sediments, and ash into lakes and streams. Wildland fire within riparian zones may remove vegetation that traps sediment in runoff from adjacent upland systems, increasing chances for water quality degradation. Removal of streamside vegetation could also cause increases in water temperatures resulting from losses of shade and a reduction in cover habitat for fish.

Through changes in soil and vegetation cover, fire influences the volume of water and the rate at which water flows in watersheds. Some slopes are steep or extremely unstable and some soils are highly erodible because of the underlying geology and parent material. If highly erodible soils are located on steep slopes or in geologically unstable areas, fire can have severe consequences on a watershed if vegetation cover is removed and heavy rains fall on bare slopes.

Effects on water quality from fire suppression strategies have the potential to be more severe than other fire management techniques depending on the intensity of the fire and the location of the fire in relation to perennial streams or riparian areas. These effects are related to maintenance of roads, construction of fire lines with hand tools or heavy equipment, installation of water tanks, installation of fire camps, trampling of soils by personnel and equipment at fire lines and camps, and use of aerial water drops or chemical suppressants or retardants. These effects on water quality are generally from runoff from erosion of soils disturbed by these activities.

Fire suppression strategies and prescribed fire generally require the use of fire line. Fire line construction may result in soil erosion, increased sedimentation, and alteration of spatial drainage patterns. The risk of this impact is greater along steep-sloped banks that are adjacent to streams. These potential impacts would be greatly reduced by using the mitigation measures identified in Section 2.6, and the Park would adhere to Interagency Standards for Fire and Fire Aviation Operations (updated annually) for use of suppression chemicals such as foam and retardant.

Use of chemical suppressants can have direct effects if the chemicals enter surface water. Aircraft delivering chemical drops would avoid hitting water. All structures (historic or otherwise) would be protected using standard methods including construction of fire lines, fuel reduction and pretreatment with water and/or foam. No retardant or foam would be applied within 300 feet of any intermittent or perennial stream. If chemical suppressants and retardants enter surface water, they could have moderate to substantial adverse effects on water quality depending on the water body; the effects would likely be short-term and would persist until high flows would dilute any remaining chemicals.

Streams available for water drafting would be identified as part of preparation for a suppression strategy. Dipping from streams using helicopters may occur as well. In an unplanned wildfire event, it is possible that streams or lakes would be used for dipping if a wildfire is close and aircraft can safely access these sites. Water would not be transported between watersheds, unless in an emergency (life or structure loss), so as to prevent transport and spread of aquatic invasive

species (see specific mitigation measures in Section 2.6). The effects on water quantity (surface water) from water drafting and dipping for wildfire suppression strategies would likely be negligible.

In employing wildland fire use, there would be less surface disturbance since managers may choose to utilize natural and man-made barriers rather than use of fire line for aggressive suppression of fires. However, fireline may still be used, and there would be similar impacts as for suppression. Some of this acreage may be immediately adjacent to rivers and streams, so there could be potential runoff as a result of a fire managed for wildland fire use fire. Adverse effects may include increases in water temperature if shading vegetation is burned, increases in sediment if fire removes vegetation immediately adjacent to water sources, and increased stream flow since there would be less vegetation and thus less transpiration on the burned areas. The use of mitigation measures described in Section 2.6, the use of natural boundaries rather than constructed fire lines, and post-fire rehabilitation of fire lines would reduce the potential for water quality impacts during wildland fire use incidents.

Adverse effects of prescribed burning would be similar to the effects of wildland fire use on water quality. Prescribed fire would be managed to avoid or minimize the potential impacts by maintaining, wherever possible, an unburned strip along the water source. There would be no effects on water quality from construction of fire lines for prescribed burning. Existing canopy cover along all riparian areas within 300 feet of any intermittent or perennial surface water would be maintained when constructing fire lines. Any fire line that crosses riparian areas would have water bars installed within 300 feet of any intermittent or perennial body of water, and all fire lines located on steep slopes would have water bars installed at proper intervals. All fire lines would be rehabilitated by replacing the displaced duff and litter to prevent erosion of sediment that would run off into lakes and streams.

Manual and mechanical reduction of fuel would not generally be conducted adjacent to water resources. If they were conducted near water sources, the potential direct adverse impacts of manual and mechanical fuel reductions would include trampling of stream banks or similar disturbances by felled and/or dragged trees and by foot or equipment traffic. These effects can be mitigated by avoidance, where possible, and immediate rehabilitation. The indirect adverse effects of manual and mechanical fuel reduction may slightly increase stream flow since there would be less vegetation and thus less transpiration on the treated area.

Cumulative Effects

Water quality in the Park is affected by the presence of trails and roads along stream channels and roads leading to lakes. Visitor use results in negative affects to water quality as a result of damage to riparian vegetation and accelerated stream bank erosion. Water quality degradation is most common where visitor facilities such as campgrounds and trails are located close to water bodies. Development projects in the Park, such as the alteration or improvement of visitor facilities (buildings, roads, and paved parking areas) and utilities could have site specific impacts on water resources.

Cumulative effects to water quality from such actions would be adverse and minor to moderate. Alternative 1 would contribute minor, adverse cumulative impacts on water quality. Combined

with known past, current and future projects and actions, there would be minor to moderate, adverse cumulative impacts on water quality.

Conclusion
Alternative 1 would have adverse, short- to long-term, localized, and negligible to moderate effects on water quality from impacts caused by fire protection, management of wildland fires, and fuel management. Wildland fire use would perpetuate the historic fire regime within Yellowstone and would benefit water resources and water quality.

3.4.4 Impacts of Alternative 2 (Proposed Action)

Impacts Analysis
Impacts on water quality under Alternative 2 would be essentially the same as those described for Alternative 1 and would result from the appropriate wildfire response strategy, prescribed fire, and manual and mechanical fuel reduction activities.

As fire response would occur more quickly within the suppression strategy zones under Alternative 2 than Alternative 1, the size of unwanted wildfires would likely be smaller, requiring less construction of fire line, installation of fire camps, trampling of soils and vegetation by personnel and equipment at fire lines and camps, and use of aerial water drops or chemical suppressants or retardants. This would translate to lower adverse impacts on water quality with decreased runoff from erosion of soils disturbed by these activities, less ash and woody debris deposited into waterways, and less loss of vegetation that could lead to erosion and sediment loading in surface water.

Under Alternative 2, the IDT process would be more streamlined and efficient. All non-emergency projects (prescribed fire, fuel reduction) would be planned by the IDT, resulting in benefits to water quality as all efforts would be made to avoid or minimize adverse impacts on water bodies and riparian areas.

The appropriate wildfire response strategy, such as a monitor or point/zone protection strategy, under this alternative would be managed according to resource goals and objectives rather than specific prescriptions (e.g. weather and fire behavior parameters) as in Alternative 1. This approach may allow for more acres to burn and perpetuate natural processes. Although adverse impacts could still occur, as described under Alternative 1, greater flexibility to manage wildfires for ecosystem and resource based goals and objectives would promote the natural role of fire across the landscape, overall benefiting water quality.

Cumulative Effects
Water quality in the Park is affected by the presence of trails and roads along stream channels and roads leading to lakes. Visitor use results in negative affects to water quality as a result of damage to riparian vegetation and accelerated stream bank erosion. Water quality degradation is most common where visitor facilities such as campgrounds and trails are located close to water bodies. Development projects in the Park, such as the alteration or improvement of visitor facilities (buildings, roads, and paved parking areas) and utilities could have site specific impacts on water resources.

Cumulative effects to water quality from such actions would be adverse and minor to moderate. Alternative 2 would contribute minor, adverse cumulative impacts on water quality. Combined with known past, current and future projects and actions, there would be minor to moderate, adverse cumulative impacts on water quality.

Conclusion
Alternative 2 would have adverse, short- to long-term, localized, and negligible to minor effects on water quality. Flexibility to manage wildfires for ecosystem and resource goals and objectives would promote the natural role of fire across the landscape. The potential for wildfires outside the range of normal variability would be minimized, benefitting water resources over the long-term. Fuel management activities would be planned and coordinated with an IDT approach and process in such a way as to not adversely affect water resources. Overall, adverse impacts on water quality under this alternative would be lower than under Alternative 1 due to a faster response to unwanted wildland fires because of predetermined suppression strategy zones and an IDT process for all fuel management activities.

3.5 GEOLOGICAL RESOURCES (Geothermal Resources, Paleontological Resources, and Soils)

3.5.1 Affected Environment

Geothermal Resources

Yellowstone contains the world's largest and most active geothermal areas, a principal reason for the establishment of the Park. The Park has more than 300 geysers and over 10,000 thermal features which include hot springs, mud pots, and fumaroles. Underground reservoirs of water, which are heated by partially molten magma, fuel the GYA's thermal features including those in the Park. Thermal areas sustain unique and diverse life and support various microbial organisms, mosses and grasses. These resources in turn support a range of other animals from insects to large ungulates such as bison and elk. Plant life in thermal areas often forms characteristic circular patterns with no vegetation in the hot center. Concentric patterns of vegetation reflect the upper temperature limits of different plants. Typically, mosses grow centrally, and then moving outward from the center grasses, and finally trees are the dominant life form (NPS, 2002).

The Yellowstone caldera, which lies entirely within the Park, is approximately 55 km wide and 72 km long, with the last major eruption occurring about 640,000 years ago. The geothermal areas most accessible to Park visitors because of their proximity to roads include the Upper and Lower geyser basins near the Firehole River, Norris Geyser Basin near the Gibbon River, Mammoth Hot Springs, Mud Volcano, and the West Thumb Geyser Basin, which is the largest geyser basin on the shore of Yellowstone Lake.

Hydrothermal systems may appear powerful; however, they are fragile. Hydrothermal clays form a seal for a geyser's hydrothermal system. If the seal is breached, the geyser function is altered. Seismic activity keeps a geyser's plumbing system open and may affect its function.

Although there are many natural processes which may alter hydrothermal systems, including fire, the Park's intent is to continue to allow natural processes, but protect these systems from human caused change.
Due to their fragile and dangerous nature, hydrothermal areas would be avoided by personnel and equipment during all fire management activities.

Paleontological Resources

Paleontological resources (fossils and their associated data) are a major source of evidence of past life. They are the basis for our understanding of the history of life on Earth, and are an integral part of our planet's biodiversity. Yellowstone preserves an extensive geologic record ranging from the Precambrian through the Holocene epoch. More than 20 fossiliferous stratigraphic units have been identified at Yellowstone, containing fossil plants, invertebrates, vertebrates and trace fossils (Santucci, 1998). The few fossil specimens in the Park museum provide a glimpse into a record of life in the Yellowstone area that extends back hundreds of millions of years.

The most significant aspect of Yellowstone's petrified forests, which are probably the best studied aspect of its fossil resources, is that petrified wood and impressions of fossil leaves are present in the same location. Additional important aspects are: many hundreds of fossil tree trunks are found in vertical and horizontal positions within volcanic layers; successive stratigraphic layers of volcanic mudflows and breccias with fossil trees are preserved; a great diversity of fossil plants have been preserved, including fossil leaves, twigs, needles, cones and seeds; and large geographic areas of petrified forest are exposed.

Nearly 150 species of fossil plants from Yellowstone have been described, including ferns, horsetail rushes, conifers and many deciduous plants such as sycamores, walnuts, oaks, chestnuts, soapberries, maples, and hickories. Seqouia was the dominant conifer. This type of assemblage reflects a warm temperature sub-tropical environment.

Most petrified wood and other plant fossils come from Eocene deposits, which occur in many northern portions of the Park, including the Gallatin Range, Specimen Creek, Tower, Crescent Hill, Elk Creek, Specimen Ridge, Bison Peak, Barronett Peak, Abiathar Peak, Mount Norris, Cache Creek, and Miller Creek. Petrified wood is also found along streams in areas east of Yellowstone Lake. The most accessible fossil forest is west of Tower Falls (Soldier's Station, Wylie Camp). Petrified wood can be seen today in the foundation of Roosevelt Lodge.

Fossil invertebrates are abundant in Paleozoic rocks in the Park, and the limestones associated with the Madison Group are especially fossiliferous. The diversity of fossil invertebrates reported in the Park includes corals, bryozoans, brachiopods, trilobites, gastropods, crinoids, and Pleistocene insects.

Fossil remains of vertebrates are rare, but perhaps only due to insufficient field research. Specimens found include a piece of turtle shell, the skeleton of a Cretaceous plesiosaur, and a dinosaur eggshell fragment. The only other fossil reptile remains known from the Park are a few dinosaur bone fragments. Fossil fish are present in both Paleozoic and Mesozoic sediments, with

phosphatized fish bones in the Permian Shedhorn Sandstone, fish scales reported in the Cretaceous Mowry Shale, and fish teeth discovered in the Cretaceous Frontier Formation. The most significant collection of fossil vertebrates are the subfossil material, including 36 mammal species, that were collected from Lamar Cave.

Soils

Soil is an integral component of most terrestrial ecosystems. The physical, chemical (nutrient), and biotic properties of soil are important in determining function, productivity, and other characteristics of these ecosystems. The three components often interact in complex ways. Important physical properties of soil include texture, composition (sand/silt/clay), bulk density, porosity, structure, infiltration, temperature, and water repellency. Chemical processes include characteristics, processes or reactions derived from the chemical composition or reactions occurring in the soil. Biotic properties relate to functions or attributes of soils that reflect the role of living or dead organisms. Important biotic influences include many relationships between plants and microorganisms than enhance uptake of nutrients while in other cases soil organisms are responsible for diseases.

Four soil types have been identified in Yellowstone. The two predominate soil types in the Park are derived from two major parent materials: rhyolite and andesite. A third type, loess, evolved from glacial episodes and is found in the floodplains of area rivers. A fourth soil type makes up about six percent of the park and is derived from sedimentary rocks consisting of limestones, sandstones, and shales. Andesitic soils have better moisture-holding capacity and higher levels of nutrients compared to rhyolitic soils. Climax lodgepole pine is generally associated with rhyolitic soils, while climax spruce and fir are typically associated with andesitic soils (NPS, 2002).

3.5.2 Methodology

Impact analyses on geological resources were based on recent studies, previous projects conducted within the Park, and information obtained from interdisciplinary team members and relevant literature.

Geothermal Resources

The thresholds of change for the intensity of an impact on geothermal resources are defined as follows:

Negligible: The hydrothermal system and/or individual features would not be affected or the impact would cause insignificant physical disturbance (there would be no effect upon the volume of water flow or change in physical appearance).

Minor: Effects to the hydrothermal system would be slight but measurable. Eruption intervals, thermal water temperature, and/or thermal water or heat flow could increase or decrease, but would return to baseline values within one day. Mitigation measures proposed to offset adverse effects would include measures to ensure the hydrothermal feature(s) is protected.

Moderate: Effects to the hydrothermal system would be measurable and would last for more than one day. Eruption intervals, thermal water temperature, and/or thermal water or heat flow could increase or decrease, but would be expected to return to baseline values. Mitigation measures proposed to offset adverse effects would be extensive.

Major: Effects are readily apparent to the hydrothermal system and are long term. Eruption intervals, water temperature, and/or the volume of thermal water could increase or decrease, and/or new thermal features could be created at project areas. Mitigation measures proposed to offset adverse effects would be extensive and success would not be assured.

Paleontological Resources

The thresholds of change for the intensity of an impact on paleontological resources are defined as follows:

Negligible: The impact is not perceptible and not measurable, and is confined to a small area or a single contributing element of a paleontological resource.

Minor: The impact is perceptible and measurable and is confined to a small area or a single contributing element of a paleontological resource.

Moderate: The impact is sufficient to cause a perceptible change in the character-defining features of a resource and generally involves a single or small group of contributing elements of a paleontological resource.

Major: The impact results in substantial and highly-noticeable change in character defining features of a resource and involves a large group of contributing elements and/or an individually-significant paleontological resource.

Soils

The thresholds of change for the intensity of an impact on soil are defined as follows:

Negligible: Soil would not be affected or the effects would be below or at lower levels of detection. Soil erosion rates would not increase. Any effects to soil productivity, fertility, stability, or infiltration capacity would be slight.

Minor: The effects to soils would be detectable but small. Soil erosion rates would increase slightly. Effects to soil productivity, fertility, stability, or infiltration capacity would be small, as would the area affected. If mitigation was needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.

Moderate: Soil erosion rates would increase substantially and would be noticeable and measurable. The effects would be readily apparent and would result in a change to the soil

character over a relatively wide area. Mitigation would probably be necessary to offset adverse effects and would likely be successful.

Major: Soil erosion rates would increase substantially and would be noticeable and measurable. The effect on soil productivity, fertility, stability, or infiltration capacity would be readily apparent and substantially change the character of soils over a large area. Mitigation measures to offset adverse effects would be needed and potentially extensive, though their success would not be guaranteed.

3.5.3 Impacts of Alternative 1 (No Action)

Impacts Analysis

Geothermal Resources

It is possible a wildland fire could encroach on geothermal resources. Typically there is sparse vegetation present around thermal areas, so there would be no direct effects from wildfire to the feature. However, indirect adverse effects could occur. Loss of vegetation in close proximity to the features, as a result of wildfire and the eventual loss of root structures that retain soils, would result in increased runoff from the burned area. Deposition of sediment into thermal areas could result in alteration of the feature due to clogging or choking. The potential for this to occur is higher at those thermal features which are located down gradient of an intensely burned area. However, such processes are natural and are to be protected. One primary purpose of Yellowstone National Park is the protection of natural geologic and hydrologic processes from human caused changes.

Another effect of vegetation loss as a result of wildfire is decreased water retention by the soil that results in decreased infiltration of water into shallow groundwater. Infiltration of water during periods of precipitation results in a cooling effect of the shallow ground water that feeds geothermal features. In a recent study, it was found that shallow ground water increases in temperature during winter when the ground is frozen and there is no infiltration of surface waters to cool it (NPS, 2002). Decreased water infiltration resulting from a loss of vegetation would decrease the amount of surface water mixing with the shallow ground water which could cause the temperature of the ground water to rise. A change in ground water temperature could affect the activity of a geothermal feature. Increased water temperature of a thermal feature may result in an increase in pressure causing activity changes in features that are normally less active.

The intensity of effect to geothermal features from wildfire could range from negligible to moderate and would be dependent on the proximity of the feature to the burned area, the amount of sedimentation deposited, the changes in shallow ground water temperatures and the size of the thermal feature or area affected. Park managers recognize unplanned fire as a natural process, and therefore these effects would be acceptable. Unacceptable effects to geothermal features would result from human activities altering these fragile systems.

Fire suppression, prescribed fire, and fuel reduction activities would be avoided to the extent possible in or near Park active geothermal resources. All fire management activities immediately adjacent to thermal areas would be implemented in consultation with the Park geologist.

Paleontological Resources

Paleontological resources (both buried and on the surface) occur in many areas of the Park and may be placed at risk from wildland fires and associated suppression and wildland fire use activities. The effects of fire on surface and subsurface specimens vary with fuel loading and fire behavior. More intense fire on surface artifacts may cause fracturing and surface discoloration from sooting. The effects are far less if artifacts are buried under as little as one centimeter of soil.

A study by Benton and Reardon (2006) found that low to moderate fire conditions have minimal impact on fossil resources except in areas where the fossils are in contact with fuel. Additionally, significant fire effects on paleontological resources could be found under high spread rate and high intensity conditions even though there is no fuel contact.

Specimens can be damaged and soils compressed by heavy equipment. Adverse impacts also may result from human activities such as fireline and helispot construction, establishment of field camps or first aid stations, slurry drops, thinning, and artifact collecting by fire crews or visitors. Activities following a fire, including removal of hazard trees, reconstruction of campgrounds, building water bars and trail repair, habitat rehabilitation, and removal of firelines also may disturb buried resources.

Paleontological resources on slopes or in areas without surface vegetation are especially susceptible to soil erosion, which can occur as a result of fire management activities. Erosion can displace in-situ resources or expose buried resources to the elements. Exposed sites become more vulnerable to weathering and unauthorized collecting.

Through the integration of paleontological resource distributions with practical burning constraints, operational burning plans can be developed that would incorporate firing techniques to minimize expected resource damage. The implementation of burning strategies includes black lining, burning away from important resource areas and burning sensitive areas with low rates of spread and low intensities. In addition to these techniques, the control of foot and vehicle traffic in fragile fossil rich areas would also minimize paleontological resource damage.

Soils

There are two types of impacts on soils from fire activities, impacts from fire itself and impacts from preparation and suppression activities. Impacts from fires are generally indirect and result from loss of vegetation cover that leaves soils exposed and susceptible to erosion from wind, rain, or disturbance from people and equipment. Extremely hot fires can directly affect soils by consuming organic matter in the soils (as opposed to a layer of organic litter on top of the soil but not yet incorporated into the soil profile) and changing the soil chemistry so that soils become hydrophobic and unable to absorb water.

Effects on soils from planned fire management activities would result primarily from construction of fire lines for prescribed fires and around historic structures, from pile burning, or from maintenance of roads used for access. Most soils where planned fire management actions would occur are in areas where soils have been previously disturbed by development or previous fire management actions. The Park's topsoil guidelines and mitigation measures would be followed during planned wildfire and hazard fuel projects to lessen the impacts on soils.

Site preparation and implementation of prescribed fires, wildland fire use incidents, and suppression actions have the potential to increase soil erosion because vegetation and organic litter are removed for fire lines or consumed by the fire. Erosion would be greatest along stretches of fire line that run down rather than along the contour of the slope. Soil compaction and disturbance would occur both with hand line and with mopping up after the fire. Hand lines for prescribed fires would be located based on the ability of soils to withstand disturbance so the soils can support vegetation after the fire. Using roads for fire breaks reduces new impacts to soils. Camp and staging areas would be located in previously disturbed areas. Compacted soils on hand lines and at camps located in pristine areas would be broken up with hand tools to allow water penetration and revegetation. Topsoil that was scraped off to construct hand lines would be pushed back onto the hand line.

Pile burning creates variable conditions in small patches. Some patches would burn hotter and would result in small areas of sterile soils. Biological functions would return quickly in these small patches because adjacent areas would serve as sources of soil and seeds. Effects on soils from pile burning would be localized, repeated when shaded fuel breaks are maintained, and negligible.

Suppression activities on large fires sometimes use water or chemical drops from aircraft to suppress or retard fires. Impacts to soils from water or chemical drops are physical impacts that are localized, short-term and negligible. Chemical retardants contain fertilizer-type compounds, including ammonia and nitrates, which can change chemistry of those soils that are otherwise low in these nutrients. The half-lives of these chemicals in soils are short. Impacts from chemical retardants and suppressants on soils are localized, short-term, and negligible to minor.

Extensive postfire studies (including studies from the 1988 fires), mapping of burn intensity, and soil sampling at hundreds of locations over the Yellowstone Plateau have shown that most fires in the Park heat the soil to only light or moderate intensity. Less than one tenth of one percent of soils in the area were heated to an intensity that penetrated more than two inches deep and consequently killed seeds, roots, bulbs, rhizomes, and other plant tissues necessary for regeneration. In certain areas, steep topography and canyon "chimneys" can cause the percentage of high intensity or severe burn to be as high as 10 to 15 percent. Generally, severe heating only occurs beneath large fallen logs, in deep duff, and where dead and dry roots are consumed by fire. Soils that are burned at this intensity have all of the organic matter volatilized, and an external seed source is required to revegetate plants species. Soil heating can also cause short-term changes in water infiltration potential and an increase in water repellency, which may result in increased runoff and possible erosion events if rapid snowmelt or intense summer thunderstorms occur (Christensen, 1988).

Nutrient availability from ash may increase soil fertility for a few years immediately following a fire. This may be favorable for many species of plants, nitrogen-fixing microbes, and nitrifying bacteria. Soil and microclimatic conditions following a fire also favor establishment and growth of native herbaceous and shrub species that may be important in replenishing nitrogen lost during burning (Christensen 1988, Christensen et al., 1989).

Soils in burned areas tend to warm up sooner in the spring and reach higher temperatures than soils covered by vegetation. For some years following a fire, these warmer temperatures increase soil microbial activity and extend the growing season. In the Yellowstone ecosystem, these factors, plus the increased availability of nutrients, are directly responsible for increased plant production following fires (Christensen, 1988).

Cumulative Effects

The thermal features in Yellowstone and in the surrounding areas are threatened by human activities. Damage to the surface of geothermal resources can occur from trampling by humans and wildlife. Acts of vandalism that add litter and other materials to thermal features tend to destabilize the physical function of these resources. Yellowstone's thermal features have been threatened and are currently being threatened by the potential for geothermal development in areas adjacent to the Park. The boundaries of the underground aquifer which supplies the thermal features in the Park are not well known, but are connected to recharge and discharge areas well beyond the Park's borders. Geothermal development outside Yellowstone is generally prohibited on adjacent lands in Montana, Wyoming has a 15 mile groundwater protection zone around the Park, but no similar protections exist in Idaho. The drilling of geothermal wells may damage the subsurface hydrothermal systems by altering water supply and flow patterns. Other types of subsurface development in areas adjacent to the Park, such as oil and gas drilling, also pose a threat to protection of Yellowstone's geothermal areas.

Yellowstone contains paleontological sites which evidence prehistoric habitation and European-American exploration and occupation. Impacts to paleontological sites associated with human activities in the Park include exposure of buried resources, changes in resource condition, destruction of resources, loss of context, site covering, and contamination of sites. Other actions that affect paleontological sites are visitor use (hiking, camping), construction projects, and maintenance and repairs to roads, trails, and other facilities. Wildland fires also contribute to cumulative losses of paleontological resources available for scientific study. Additionally, natural erosion, and exposure over time contribute to cumulative effects on paleontological resources.

Numerous soil disturbing activities occur throughout the Park as part of natural processes (i.e., erosion) or as part of Park operations (i.e., construction, facility and trail maintenance, scientific sampling). Besides the actual footprint of facilities, soils in the immediate surrounding areas have been impacted by trampling from pedestrian and vehicle traffic. Dispersed soil impacts have also been caused by off-trail pedestrian traffic. Concentrated areas of off-trail pedestrian traffic often take the form of unofficial social trails where vegetation is often denuded and soils are compacted and eroded.

Cumulative effects to geological resources from such actions would be adverse and minor to moderate. In comparison to the potential risks to geothermal resources in the Park as a result of human activity, and effects on paleontological resources and soils, the cumulative adverse effects of Alternative 1 would be minor. Combined with known past, current and future projects and actions, there would be minor to moderate, adverse cumulative impacts on geological resources.

Conclusion
Impacts on geological resources would be negligible to moderate, short- to long-term, local, and adverse. They would also be minor to moderate, long-term, and beneficial.

Thermal features may be adversely affected in the event of a wildfire from deposition of sediment from adjacent burned areas and increased water temperature, which may in turn affect the function, chemistry, and microbiotic communities of the feature. The level of effect is difficult to determine due to a lack of scientific information; however, it would be dependent upon the size of the area burned, proximity of the burn to geothermal features, and the size of the features. Park managers recognize unplanned fire as a natural process, and therefore these effects would be acceptable. Unacceptable effects to geothermal features would result from human activities altering these fragile systems.

Adverse impacts paleontological resources could occur from wildfire and subsequent fire management response and rehabilitation activities. Adverse effects from planned fire management actions would be avoided through identifying known paleontological sites prior to disturbance and protecting them.

The effects on soils from preparation for and implementation of prescribed fire, fuel reduction projects, and suppression would be adverse. In the long-term, however, the effects of prescribed fires and wildland fire use incidents on soils would be beneficial due to the perpetuation of natural ecosystem processes.

3.5.4 Impacts of Alternative 2 (Proposed Action)

Impacts Analysis
Impacts on geological resources under Alternative 2 would be essentially the same as those described for Alternative 1 and would result from suppression strategies, other response strategies such as using a monitor or point/zone protection strategy, prescribed fire, and manual and mechanical fuel reduction activities.

Geothermal Resources

Under Alternative 2, the IDT process would be more streamlined and efficient. All non-emergency projects (prescribed fire, fuel reduction) would be planned by the IDT, resulting in benefits to geothermal resources as all efforts would be made to conduct these projects so as to avoid any adverse impacts on geothermal features.

Unplanned fire management strategies, such as the use of a monitor or point/zone protection strategy, under this alternative would be managed according to goals and objectives rather than

specific prescriptions as in Alternative 1. This approach may allow for more acres to burn and perpetuate natural processes. Although adverse impacts could still occur, as described under Alternative 1, greater flexibility to manage wildfires for resource benefit and goals and objectives would promote the natural role of fire across the landscape, overall benefiting geothermal features.

Paleontological Resources

It is expected under Alternative 2 that unwanted fires would be of smaller size and would potentially requiring less construction of fireline, installation of water tanks, installation of fire camps, and disturbance of soils and vegetation by personnel and equipment. This would result in lower adverse impacts on paleontological resources from reduced contact with wildfire, exposure of sites, and other effects as described above.

Fuel management activities would be planned and coordinated with an IDT approach and process in such a way as to not adversely affect paleontological resources. Such pre-planning that is more streamlined and efficient would allow for known paleontological sites to be avoided and/or protected.

Unplanned fire management response strategy, such as the use of a monitor strategy under this alternative would be managed according to goals and objectives rather than specific prescriptions as in Alternative 1. This approach may allow for more acres to burn and perpetuate natural processes. Although adverse impacts could still occur, as described under Alternative 1, greater flexibility to manage wildfires for resource benefit and goals and objectives would promote the natural role of fire across the landscape, overall benefiting paleontological resources.

Soils

Under Alternative 2, suppression would always be the chosen management strategy within the suppression strategy zones. Suppression could also be used outside of the suppression strategy zones if fires were not meeting Park objectives. Under this alternative, Park staff would be able to respond more quickly to suppress unwanted wildland fires, eliminating any question of the fire management strategy to be employed. Because the suppression areas are a small percentage of the Park, and mechanical removal of fuels would still take place, in addition to the faster response time, adverse impacts from suppression strategies on soils would be lower than under Alternative 1.

Under Alternative 2, the IDT process would be more streamlined and efficient. All non-emergency projects (prescribed fire, fuel reduction) would be planned by the IDT, resulting in benefits to soils as all efforts would be made to minimize soils compaction, erosion, and other adverse effects described under Alternative 1. The Park's topsoil guidelines and mitigation measures would be followed during planned wildfire and hazard fuel projects to lessen the impacts on soils.

Under this alternative, a monitor strategy would be permitted as long as it was meeting specific pre-identified objectives, rather than specific prescriptions as in Alternative 1, including the over-arching Park objective to perpetuate natural processes. This approach may allow for more acres to burn under Alternative 2. Although adverse impacts would still occur, as described under Alternative 1, greater flexibility to manage wildfires for resource benefit and goals and objectives would promote the natural role of fire across the landscape, with overall benefits on soils.

Cumulative Effects

The thermal features in Yellowstone and in the surrounding areas are threatened by human activities. Damage to the surface of geothermal resources can occur from trampling by visitors and wildlife. Acts of vandalism that add litter and other materials to thermal features tend to destabilize the physical function of these resources. Yellowstone's thermal features have been threatened and are currently being threatened by the potential for geothermal development in areas adjacent to the Park. The boundaries of the underground aquifer which supplies the thermal features in the Park are not well known, but are connected to recharge and discharge areas well beyond the Park's borders. While geothermal development outside Yellowstone is generally prohibited on adjacent lands in Montana, Wyoming has a 15 mile groundwater protection zone around the Park, but no similar protections exist in Idaho (NPS, 2002). The drilling of geothermal wells may damage the subsurface hydrothermal systems by altering water supply and flow patterns. Other types of subsurface development in areas adjacent to the Park, such as oil and gas drilling, also pose a threat to protection of Yellowstone's geothermal areas.

Yellowstone contains paleontological sites which evidence prehistoric habitation and European-American exploration and occupation. Impacts to paleontological sites associated with human activities in the Park include exposure of buried resources, changes in resource condition, destruction of resources, loss of context, site covering, and contamination of sites. Other actions that affect paleontological sites are visitor use (hiking, camping), construction projects, and maintenance and repairs to roads, trails, and other facilities. Wildland fires also contribute to cumulative losses of paleontological resources available for scientific study. Additionally, natural erosion, and exposure over time contribute to cumulative effects on paleontological resources.

Numerous soil disturbing activities occur throughout the Park as part of natural processes (i.e., erosion) or as part of Park operations (i.e., construction, facility and trail maintenance, scientific sampling). Besides the actual footprint of facilities, soils in the immediate surrounding areas have been impacted by trampling from pedestrian and vehicle traffic. Dispersed soil impacts have also been caused by off-trail pedestrian traffic. Concentrated areas of off-trail pedestrian traffic often take the form of unofficial social trails where vegetation is often denuded and soils are compacted and eroded.

Cumulative effects to geological resources from such actions would be adverse and minor to moderate. In comparison to the potential risks to geothermal resources in the Park as a result of human activity, and effects on paleontological resources and soils, the cumulative adverse effects of Alternative 2 would be minor. Combined with known past, current and future projects and actions, there would be minor to moderate, adverse cumulative impacts on geological resources.

Conclusion
Impacts on geological resources would be negligible to minor, short- to long-term, local, and adverse. They would also be minor to moderate, long-term, and beneficial.

Thermal features may be adversely affected in the event of a wildfire from deposition of sediment from adjacent burned areas and increased water temperature, which may in turn affect the function, chemistry, and microbiotic communities of the feature. The level of effect is difficult to determine due to a lack of scientific information; however, it would be dependent upon the size of the area burned, proximity of the burn to geothermal features, and the size of the features. Park managers recognize unplanned fire as a natural process, and therefore these effects would be acceptable. Unacceptable effects to geothermal features would result from human activities altering these fragile systems.

Adverse impacts paleontological resources could occur from wildfire and subsequent fire management response and rehabilitation activities. Adverse effects from planned fire management actions would be avoided through identifying known paleontological sites prior to disturbance and protecting them.

The effects on soils from preparation for and implementation of prescribed fire, fuel reduction projects, and suppression would be adverse. In the long-term, however, the effects of prescribed fires and management response strategies, such as using a monitor strategy, on soils would be beneficial due to perpetuation of natural ecosystem processes.

Overall, adverse impacts on geological resources would be lower under this alternative than under Alternative 1 due to faster fire suppression response time, a more streamlined IDT process, and managing unplanned wildfires with goals and objectives rather than prescriptions so that natural ecosystem process would be perpetuated.

3.6 WILDERNESS

3.6.1 Affected Environment

The establishment of the 1964 Wilderness Act (16 USC 1131 et seq.) provided for the protection of wilderness areas for future generations. With completion of the Final Environmental Statement: Proposed Wilderness Classification, Yellowstone National Park, Wyoming (NPS, 1973) NPS recommended 2,032,721 acres in 10 roadless units in Yellowstone be designated as wilderness, and 6,040 acres as potential wilderness by an act of Congress, for a total of 91 percent of the Park. The remaining nine percent of the Park is classified as administrative and facilities, developed areas, and roads. A final determination of the wilderness proposal has yet to be completed by Congress therefore these acres are treated as recommended wilderness. Although a final determination has not been made, these acres of recommended wilderness are treated as designated wilderness within the Park.

Management of natural resources in proposed wilderness focuses on protection and restoration of resources and natural processes. The role of fire as a natural process in wilderness has been

well documented. The 1963 Leopold Report in particular pointed to the need to allow natural fire in areas managed as natural parks and wilderness. This landmark document provided impetus for the transition of wilderness management away from object preservation to the inclusion of the natural processes that create and influence ecosystem structure.

NPS Director's Order 41 (DO-41), Wilderness Preservation and Management and accompanying Reference Manual 41 (RM-41) (NPS, 1999), and NPS 2001 Management Policies (Section 6.3.9) state that "fire management activities conducted in wilderness areas will conform to the basic purposes of wilderness…" Impacts associated with wildland fire response strategies, prescribed fire, and non-fire fuels management conducted within wilderness will be consistent with the minimum requirement concept, and will be conducted in such a way as to protect natural and cultural resources and to minimize the lasting impacts of fire suppression actions." The minimum requirement concept includes two components: 1) whether the proposed action is appropriate or necessary in wilderness and does not result in a potential significant impact to wilderness resources and character; and 2) the techniques and types of equipment needed to ensure that impacts to wilderness resources and character are minimized. The Park will apply the minimum requirement concept analysis when making decisions concerning wildland fire management in the Park's recommended wilderness areas, including aircraft landings.

DO-41 and RM-41 identify the following goals for a fire management program in wilderness areas, including categories of designated, recommended, potential, proposed and study areas:

- Integrate wilderness values and resource considerations in the systematic planning and decision-making processes, determining the most appropriate management response strategies for all planned and unplanned fire.
- Any Delegation of Authority to an Incident Management Team will include appropriate emphasis on the protection of recommended wilderness resources and values.
- Fire management resources should be trained in the concepts of wilderness management, preservation of wilderness values, and wilderness fire management. This requirement should be identified in appropriate delegation orders.
- All wildland fires within recommended wilderness areas will be managed in consideration of firefighter and public safety, minimum impact techniques, sensitive natural and cultural resources, and cost/benefit analysis.
- Park managers will assist in the selection and implementation of appropriate wildfire strategy responses in wilderness.
- Resource advisors must be knowledgeable about wilderness values, objectives, and policies.
- Prescribed fire plans in recommended wilderness will include the necessary prescriptions and procedures to protect wilderness resources and values.

Four qualities of wilderness character, as adapted from Landres et al. (2008a and 2008b), are considered in this EA:

- Untrammeled – Wilderness is essentially unhindered and free from modern human control or manipulation. This quality is degraded by modern human activities or actions that control or manipulate the components or processes of ecological systems inside the wilderness.

- Natural – Wilderness ecological systems are substantially free from the effects of modern civilization. This quality is degraded by intended or unintended effects of modern people on the ecological systems inside the wilderness since the area was designated.

- Undeveloped – Wilderness retains its primeval character and influence, and is essentially without permanent improvement or modern human occupation. This quality is degraded by the presence of structures, installations, habitations, and by the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment.

- Solitude or Primitive and Unconfined Recreation – Wilderness provides outstanding opportunities for solitude or primitive and unconfined recreation. This quality is degraded by settings that reduce these opportunities, such as visitor encounters, signs of modern civilization, recreation facilities, and management restrictions on visitor behavior.

3.6.2 Methodology

Impact analyses on wilderness were based on information obtained from interdisciplinary team members and relevant literature.

The thresholds of change for the intensity of an impact on wilderness are defined as follows:

Negligible: A change in wilderness character may occur, but it would be so small that it would not be of any measurable or perceptible consequence.

Minor: A change in wilderness character would be small and, if measurable, would be highly localized.

Moderate: A change in wilderness character would occur. It would be measurable but localized.

Major: A noticeable change in wilderness character would occur. It would be measurable and have a substantial or possibly permanent consequence.

3.6.3 Impacts of Alternative 1 (No Action)

Impacts Analysis
Direct and indirect impacts caused by fire management activities would affect recommended wilderness characteristics (untrammeled, natural, undeveloped, solitude or primitive and unconfined recreation). These impacts would be caused by such activities as construction of fire lines, ignition operations, water or retardant drops, creation of helispots, creation of spike camps, and approved use of equipment such as aircraft, chainsaws, and portable pumps that may be used for fire suppression strategies and manual and mechanical fuel treatments. Suppression of fires also affects recommended wilderness characteristics by purposely removing a natural process from the landscape, which has created and maintains these wilderness characteristics. The impacts of any fire management actions on wilderness character would be mitigated using

minimum impact tactics and the minimum requirement analysis process to determine the most appropriate tools to be used for non-emergency actions.

Rehabilitation actions taken after a fire has been suppressed may also have the direct or indirect effect of altering recommended wilderness character by increasing noise levels during rehabilitation work and changing the character of the site with the rehabilitation measures.

Wildland fire use would allow natural processes to perpetuate, and in the long term lessen the potential for disruption or change of recommended wilderness character associated with suppression actions. Impacts associated with wildland fire use would include increased noise and visual distractions associated with management activities within wilderness.

Mechanical fuels treatments using mechanized equipment would not occur in wilderness without the minimum impact concept analysis being completed and the involvement of the IDT. Limited hazard fuel treatments using hand tools and hand operated power tools would occur. These fuels management activities would focus on the reduction of fuel loads immediately surrounding fire-sensitive features, such as structures and cultural resources.

To the greatest extent possible, prescribed fire would be focused outside of recommended wilderness; however, this fuel treatment may be necessary in wilderness for purposes of unplanned wildfire protection and resource benefits. Prescribed fire activities that would contribute to recommended wilderness impacts include fire line construction with motorized tools and ignition operations to consume unburned fuels along the fire line.

Effects of fire management activities on recommended wilderness character:

Untrammeled –The implementation of fire management activities, such as suppression of unplanned fires, hazard fuel treatments and prescribed burns could degrade the untrammeled quality of recommended wilderness. The trammeling of recommended wilderness due to fire management activity (e.g. hazard fuel treatments and prescribed burns) could create opportunities to safely and effectively manage naturally occurring wildfires. In these instances, the short-term trammeling of wilderness due to management action would be outweighed by enhancing the untrammeled quality of the Park over the long-term by allowing natural processes such as fire to perpetuate.

Natural – Fire management activities would enhance the natural quality of recommended wilderness through the maintenance and management of natural processes of fire. The presence and associated noise of mechanized and hand operated equipment deemed necessary for fire management activities (e.g. chainsaws, portable pumps, helicopters) would temporarily affect the undeveloped quality of recommended wilderness. The maintenance of natural vegetation communities with fire would enhance the natural quality of recommended wilderness in the long-term.

Undeveloped – Implementation of prescribed fire would leave little imprint as a human-caused effect as fire is a natural process within the Park. Manual fuel treatment activities in strategic locations and in preparation for prescribed fire operations would impact the undeveloped quality

of recommended wilderness. The presence and associated noise of mechanized and hand operated equipment deemed necessary for fire management activities (e.g. chainsaws, portable pumps, helicopters) would temporarily affect the undeveloped quality of recommended wilderness. However, these impacts would be short-lived and last only as long as the equipment is present in recommended wilderness.

Solitude or Primitive and Unconfined Recreation – Opportunities for solitude or primitive and unconfined types of recreation should be relatively unaffected, except on a temporary basis. During unplanned wildfires, visitors may be excluded from certain areas for safety reasons. Fire management activities may require the use of motorized equipment that may disturb this recommended wilderness quality temporarily, but would last only as long as the equipment is present in wilderness.

Cumulative Effects

Human developments located in wilderness at Yellowstone are relatively small and the cumulative effects on the resources and values of the vast area of wilderness at the Park are minimal. Aircraft used to access these sites for maintenance, as well as aircraft used for research within the Park, contribute to the disruption of solitude. In addition to the recommended wilderness area in the Park, 70 percent of the National Forest that borders over half of the Park boundary is managed as designated wilderness. Park wilderness management, in combination with wilderness plans implemented on adjacent Forest Service lands, would, in the long-term, provide increased resource protection and preservation of wilderness in the region.

The cumulative impact on recommended wilderness from such actions would be adverse and minor. Alternative 1 would contribute minor, adverse cumulative impacts on recommended wilderness. Combined with known past, current and future projects and actions, there would be minor, adverse cumulative impacts on recommended wilderness.

Conclusion

Alternative 1 would result in negligible to minor, short-term, localized, adverse impacts on recommended wilderness during and immediately after fire management actions, and changes to wilderness character would be small. Using prescribed fire and allowing wildland fire use in recommended wilderness would enhance and maintain many wilderness characteristics. In the long-term, fewer fires would need to be suppressed, resulting in fewer direct impacts associated with protection actions. There would be minor to moderate, beneficial, long-term effects on recommended wilderness.

3.6.4 Impacts of Alternative 2 (Proposed Action)

Impacts Analysis

Impacts on recommended wilderness under Alternative 2 would be essentially the same as those described for Alternative 1 and would result from the appropriate wildfire strategy response, prescribed fire, and manual and mechanical fuel reduction activities.

Under Alternative 2, the IDT process would be more streamlined and efficient. All non-emergency projects (prescribed fire, fuel reduction) would be planned by the IDT, resulting in

lower adverse impacts on wilderness character as all efforts would be made to not use mechanical tools within the wilderness, to use minimum impact tactics, and complete a minimum impact analysis if it is determined mechanical tools may need to be used within the recommended wilderness for planned (i.e. non-emergency) actions.

The management response strategy, such as using a monitor strategy, under this alternative would be managed according to goals and objectives rather than specific prescriptions as in Alternative 1. This approach may allow for more acres to burn and perpetuate natural processes. Although adverse impacts could still occur as described under Alternative 1, greater flexibility to use a monitor or point/zone protection strategy for resource goals and objectives would promote the natural role of fire across the landscape, overall adding to greater benefits on wilderness character.

Cumulative Effects

Human developments located in recommended wilderness at Yellowstone are relatively small and the cumulative effects on the resources and values of the vast area of recommended wilderness at the Park are minimal. Aircraft used to access these sites for maintenance, as well as aircraft used for research within the Park, contribute to the disruption of solitude. In addition to the recommended wilderness area in the Park, 70 percent of the National Forest that borders over half of the Park boundary is managed as designated wilderness. Park wilderness management, in combination with wilderness plans implemented on adjacent Forest Service lands, would, in the long-term, provide increased resource protection and preservation of wilderness in the region.

The cumulative impact on wilderness from such actions would be adverse and minor. Alternative 2 would contribute minor, adverse cumulative impacts on recommended wilderness. Combined with known past, current and future projects and actions, there would be minor, adverse cumulative impacts on recommended wilderness.

Conclusion

Alternative 2 would result in negligible to minor, short-term, localized, adverse impacts on recommended wilderness during and immediately after fire management actions, and changes to wilderness character would be small. There would also be minor to moderate, beneficial, long-term effects on recommended wilderness. Flexibility to use the appropriate management response strategy (i.e. a monitor strategy or a point/zone protection strategy) on wildfires for resource goals and objectives would promote the natural role of fire across the landscape. The potential for wildfires outside the range of normal variability would be minimized, benefitting recommended wilderness over the long-term. Fuel management activities would be planned and coordinated with and IDT approach and process in such a way as to not adversely affect recommended wilderness, but rather to enhance and maintain many wilderness characteristics. Overall, adverse impacts on wilderness under this alternative would be lower than under Alternative 1 due to an IDT process for all planned fire management activities such as hazard fuel treatments and prescribed fire. Likewise, beneficial effects would be greater under this alternative.

3.7 VEGETATION AND WETLANDS

3.7.1 Affected Environment

Yellowstone National Park contains diverse vegetation as a result of the extreme topographic relief, differing soils, varied slope and aspect, and range of microclimates (Despain, 1990; NPS, 2002). Yellowstone's vegetation is composed primarily of typical Rocky Mountain species. The five generalized vegetation types in the park are: montane forests, sagebrush-steppe, alpine meadows, wetlands/riparian, and hydrothermal communities. Below is a description of each of these vegetation types.

Montane Forests

Approximately 80 percent of Yellowstone is covered by forests and the majority of these forests are dominated by lodgepole pine (*Pinus contorta*) (NPS, 2011a). Lodgepole pine is found in a variety of successional stages at elevations between 7,500 and 9,000 feet. These communities cover 1.4 million acres of the park (NPS, 2002). Lodgepole pines have adapted to the fire prone communities they are found in. In fact, the tree's serotinous cones are sealed shut by a resinous bond that requires temperatures between 113 and 140 degrees to melt the resin and release the seed. In nature, only forest fires generate temperatures of this magnitude within a tree's crown (Utah State University, 2002).

In the absence of fire and in rich and moist soils, subalpine fir (*Abies lasiocarpa*) and Englemann spruce (*Picea engelmannii*) replace lodgepole pine as the dominant species in the canopy (NPS, 2011a). At elevations ranging from 6,000 to 7,000 feet, the common stand trees are Douglas-fir (*Pseudostuga menziesii*) and aspen (*Populus tremuloides*) (NPS, 2002). At higher elevations, above 8,400 feet, whitebark pine (*Pinus albicaulis*) becomes a significant component of the forest. Some of the trees in Yellowstone are several hundred years old and show fire scars from a succession of low intensity ground fires. In contrast, lodgepole and whitebark pine trees have very thin bark and can be killed by ground fires (NPS, 2011a).

The vegetation composition in the understory differs according to precipitation regime, the forest type, and the substrate. Within lodgepole pine forests the understory vegetation is characterized by a very sparse understory composed mostly of elk sedge (*Carex geyeri*) or grouse whortleberry (*Vaccinium sciparium*). Pinegrass (*Calamagrostis rubescens)* is frequently found in the understory vegetation under a Douglas-fir forest. In other areas of the Park, the understory vegetation is composed of species such as Utah honeysuckle (*Lonicera utahensis*), snowberry (*Symphoricarpos* spp.), and buffaloberry (*Shepherdia canadensis*) (NPS, 2011a).

Sagebrush-Steppe

Sagebrush-steppe vegetation is found primarily at the lower elevations, in the northern range of Yellowstone and is dominated by sagebrush (*Artemisia* spp.) and other shrubs. Idaho fescue (*Festuca idahoensis*), needle-and-thread (*Hesperostipa comate*), Sandberg bluegrass (*Poa secunda*), or bearded wheatgrass (*Elymus caninus*) are common, either mixed with the sagebrush or as open meadows. Numerous wildflowers can be found throughout (Despain, 1990; NPS, 2011a).

Alpine Meadows

This is a diverse group of high-elevation open areas, including alpine tundra which occurs above 10,000 feet. Some types are dominated by a thick turf of alpine grasses and forbs, while others are dry and rocky with a more open aspect. Common species include sheep fescue (*Festuca ovina*), timberline bluegrass (*Poa glauca*), and lanceleaf stonecrop (*Sedum lanceolatum*) (Despain, 1990).

Wetlands and Riparian Areas

Wetlands cover 357 square miles of Yellowstone and include lakes, rivers, ponds, streams, seeps, marshes, fens, wet meadow, forested wetlands, and hydrothermal pools. Willows (*Salix* spp.), aspen, and in some places cottonwood (*Populus* spp.) are characteristic of streamside riparian vegetation. Three wetland types can be found in the park and 44 percent are lakes and ponds larger than 20 acres or have water deeper than 6.6 feet at low water; 4 percent are rivers and streams; 52 percent are palustrine. Palustrine wetlands are described by either the dominant vegetation form or, if vegetation covers less than 30 percent of the substrate, by the physiography and composition of the substrate. Wetlands and riparian areas in Yellowstone provide essential habitat for the rare plants, reptiles, amphibians, and numerous insects, birds, mammals and fish in the park (NPS, 2010a). Approximately 38 percent of the park's plant species are associated with wetlands, with 11 percent only growing in wetlands (NPS, 2011a).

Hydrothermal Communities

Plant communities have developed in the expanses of thermally heated ground. Many of the species found in the geyser basins tolerate different conditions, and grow all over the western United States. Other species, are typical of the central Rockies, or are endemic to the region (NPS, 2011a).

Other Vegetation in the Park

Approximately 1,150 native plant species and an additional 210 non-native plant species can be found in Yellowstone. Yellowstone is home to three endemic species: Ross's bentgrass (*Agrostis rossiae*), Yellowstone sand verbena (*Abronia ammophila*), and Yellowstone sulfur wild buckwheat (*Eriogonum umbellatum var. cladophorum*). There are also 97 rare plant species within the Park.

Executive Order 13112 - Invasive Species directs federal agencies to make efforts to prevent the introduction and spread of invasive plant species, detect and monitor invasive species, and provide for the restoration of native species. Invasive species are usually destructive, difficult to control or eradicate, and generally cause ecological and economic harm. A noxious weed is any plant designated by a federal, state, or county government as injurious to public health, agriculture, recreation, wildlife, or property. More than 210 exotic plant species reside in the Park. Another threat to the Park's trees include insects and fungus. While the fungus blister rust (*Cronartium ribicola*) is an exotic species, insects are native to the area and include: the mountain pine beetle (*Dendroctonus ponderosae*), spruce beetle (*D. rufipennis*), Douglas-fir beetle (*D. pseudotsugae*), western balsam bark beetle (*Dryocoetes confusu*), and the western spruce budworm (*Choristoneura occidentalis*).

3.7.1.1 Special Status Species

The species listed below are listed by the Park as a species of management concern. Only vegetation species that exist or have the potential to exist in the Park are listed.

Whitebark Pine (*Pinus albicaulis*): Whitebark pine is a major component of the forest community in areas above 8,400 feet and a major understory component of lodgepole dominated forests from 7,000 to 8,400 feet. Seeds of the whitebark pine are important food for grizzly bears and a variety of other wildlife species. Whitebark pine populations in Yellowstone have been declining due to native mountain pine beetles (*Dendroctonus ponderosae*) and non-native blister rust, which is caused by a fungus, *Cronartium ribicola* (Schwandt 2006). In July 2011, the USFWS determined whitebark pine warrants protection under the ESA, but adding the species to the Federal List of Endangered and Threatened Wildlife and Plants is precluded by the need to address other listing actions of a higher priority. This species is now added to the list of candidate species eligible for ESA protection and its status will be reviewed annually. Whitebark pine exist both as an overstory and understory component within the forest communities in many regions of the Park.

Yellowstone Sand Verbena (*Abronia ammophila*): Yellowstone Lake's shore is the only place in the world where Yellowstone sand verbena grows. The presence of a sand verbena at 7,700 feet elevation in the northern Rockies is unexpected, as most members of this North American genus occur in the Southwest or along the Pacific Coast. Warmth provided by the geothermal activity in the area may be helping this species tolerate the long, cold winters followed by a brief summer in which they bloom and reproduce. The taxonomic relationship of this sand verbena population to others is a matter of debate. It may be distinct at the sub-specific level, and is certainly reproductively isolated from the closest sand verbena populations, which are in the Bighorn Basin of Wyoming. Yellowstone sand verbena is restricted to the shoreline of Yellowstone Lake and the location of nearly all of the plants on the Lake's north shore places the species at risk of extinction due to random events affecting the population.

Yellowstone sulfur wild buckwheat (*Eriogonum umbellatum* var. *cladophorum*):
Yellowstone sulfur wild buckwheat is endemic to the Park, only occurring globally from the vicinity of Madison Junction through the Lower and Midway Geyser Basins to the Upper Geyser Basin. This conspicuous wildflower starts blooming in late June and continues into August. It is primarily present on glacial till deposits with some geothermal influence such as the sagebrush steppe community near the Old Faithful Interchange. Yellowstone sulfur wild buckwheat has demonstrated its ability to re-colonize after construction disturbance in the Old Faithful area by its presence on the road prism around the interchange.

Ross' bentgrass (*Agrostis rossiae*): Ross' bentgrass is restricted to Yellowstone National Park occurring in the Lower Geyser Basin, Midway Geyser Basin, Upper Geyser Basin and Shoshone Geyser Basin on geothermally influenced warm ground sites. This Yellowstone endemic is globally rare and was considered for possible listing under the Endangered Species Act, though in June 2011 the U.S. Fish and Wildlife Service determined that listing was not warranted at this time since they determined that existing National Park Service regulatory mechanisms are adequate to protect the species.

3.7.2 Methodology

Impact analyses for vegetation and wetlands were based on recent studies and previous projects conducted within the Park, and assessment of potential impacts to vegetation caused by fire management. These analyses were conducted in the context of the project area.

The thresholds of change for the intensity of an impact on vegetation and wetlands are defined as follows:

Negligible: Vegetation and wetlands would not be affected, changes would be either non-detectable or, if detected, would have effects that would be considered slight and short-term.

Minor: Actions may temporarily affect some individual native plants and would also affect a relatively small portion of that species' population. Short-term changes in plant species composition and/or structure would be consistent with expected successional pathways of a given plant community from a natural disturbance event. There could be an increase in invasive species in limited locations. Mitigation to offset adverse effects, including special measures to avoid affecting species of special concern, could be required and would be effective. There would be no alteration of natural hydrology of wetlands. A U.S. Army Corps of Engineers 404 permit would not be required.

Moderate: There would be effects on some individual native plants along with a sizeable segment of the species' population in the long-term and over a relatively large area. Long-term changes in plant species composition and/or structure would be consistent with expected successional pathways of a given plant community from a natural disturbance event. Widespread increase in invasive species would not jeopardize native plant communities. Mitigation to offset adverse effects could be extensive, but would likely be successful; some species of special concern could also be affected. There would be no alteration of natural hydrology of wetlands. A U.S. Army Corps of Engineers 404 permit would not be required.

Major: There would be considerable long-term effect on native plant populations, including species of special concern, and a relatively large area in and out of the Park could be affected. A widespread increase in invasive species that jeopardizes native plant communities would occur. Mitigation measures to offset the adverse effects would be required, extensive, and success of the mitigation measures would not be guaranteed. Effects to wetlands would be observable over a relatively large area, would be long-term and would require a U.S. Army Corps of Engineers 404 permit. Mitigation measures would be necessary and their success would not be guaranteed.

3.7.3 Impacts of Alternative 1 (No Action)

Impacts Analysis

Under Alternative 1, fire management would continue under the 2004 Wildland Fire Management Plan. Management options with the potential to impact vegetation within the Park would include suppression, wildland fire use, prescribed fire, and non-fire fuels management applications. A combination of these options could be used to promote natural processes within the Park and protect values at risk.

Wildland Fire Use
Under this alternative, wildland fire use would be permitted under specific environmental, social, and political conditions with a goal of perpetuating natural processes. A wildland fire use incident would promote a naturally functioning ecosystem. Direct impacts to vegetation and wetlands would occur from the removal of vegetation, though much of Yellowstone's vegetation cover has adapted to fire prone communities. For example, lodgepole pine, the most abundant tree in the Park, depends on fire to germinate. Removal of vegetation by wildland fire use incidents would have short-term, minor effects on vegetation. Fire tolerant and resistant species would recover over time.

Generally, fire affects plant species and communities by triggering the release of seeds; altering seedbeds; temporarily eliminating or reducing competition for moisture, nutrients, heat and light; stimulating vegetative reproduction of top-killed plants; stimulating the flowering and fruiting of many shrubs and herbs; and influencing community composition and successional stages through its frequency and/or intensity.

Wildland fire use can enhance the cycle of nutrients by releasing nutrients bound in dead plant material, making them available for new plant growth. While fire encourages new growth of many plant species, it can also alter plant community composition. Fire can be used to clear residual plants from a landscape, and when used in conjunction with other management tools, to negatively impact non-native plants or other invasive species that dominate certain habitats to the extent that habitat quality is compromised. Perpetuating a natural fire regime would have long-term, direct, beneficial effects on vegetation.

Wetlands could also be affected by wildland fire use. Due to the greater amount of moisture available, wetlands have longer fire return intervals than adjacent upland plant communities. Most wetlands in Yellowstone would be too wet to carry fire under most conditions. However, under very dry conditions, wildfires can burn within wetlands. These fires would likely be of high severity due to the type of fuels present within wetlands (e.g., light herbaceous species and non-fire adapted species such as willow). However, wildfires normally produce a mosaic of vegetation structure that may increase the diversity of habitats within wetlands. Negligible to minor, short-term impacts to wetlands would be anticipated from a wildland fire use incident.

Prescribed Fire
Under this alternative, prescribed fire would be utilized to reduce hazard fuel loads and address resource management objectives. Impacts to vegetation from prescribed fire would be similar to impacts from wildland fire use incidents. Removal of vegetation through cutting and burning would have a direct minor effect on vegetation. These effects would be localized around the perimeters of prescribed fire areas and structures. Effects would be short-term as vegetation is expected to recover in a reasonable time. Adverse effects would be negligible because the vegetation removed would increase the likelihood values at risk could be protected from uncontrolled and unwanted fires.

Prescribed fire would be used to reduce fuel loading, as well as for a broader range of resource objectives, and along with wildland fire use, could in the long-term reduce the severity and intensity of wildfire in the Park, which in turn could reduce impacts to vegetation. Proper

ecosystem function would be sustained because fire plays an essential role in maintaining serial stages of plant succession.

Since lack of fire favors fire-intolerant species over fire-dependent ones, plant habitat and diversity would be improved with fire. Fuel loadings would be reduced. After a prescribed burn, invasive species would be monitored and controlled.

Fires of low intensity would be expected to have very little effect on wetlands. Under Alternative 1, the Park would protect sensitive resources like wetlands to the maximum extent possible during the preparation and implementation of a prescribed fire. Due to the greater amount of moisture available, wetlands have longer fire return intervals than adjacent upland plant communities. Most wetlands at Yellowstone would be too wet to carry fire under most conditions. Negligible, short-term impacts to wetlands would be anticipated from prescribed fire.

Fire Suppression Strategy
Fire suppression strategies under this alternative would depend on specific prescriptions (e.g. expected weather and fire behavior). Partial or full suppression would be used when wildland fire use is not meeting prescriptions. Direct, short-term, minor effects would result from wildland fire suppression activities that result in the mortality of plants and trees. Vegetation could be mechanically removed during suppression activities. Loss of an individual member of a given plant species would not jeopardize the viability of the populations within and adjacent to the Park, and would be limited to the fire area only. These impacts would also be short-term, as native vegetation is expected to re-colonize after wildland fire events have occurred.

Suppression strategies may include cutting vegetation along fire lines, clearing vegetation around threatened structures, fire line construction with chainsaws, hand tools, or fire line explosives, installation of fire hoses, and setting up and filling portable water tanks at strategic locations. Fire line would vary in width and depth depending on the vegetation of the area, the amount of litter and duff, and the expected fire behavior. Fire lines would usually be a width of one to three feet, and a depth of 0.5 to three inches within Yellowstone's different vegetation communities. The more active the fire behavior and the deeper the litter and duff layers within differing vegetation communities, the wider and the deeper the fire line would be. In some forested areas (e.g. lodgepole pine stands), small trees and shrubs would be cleared for a width of three to 12 feet, depending on the expected fire behavior. Fire line would always be as deep as the layer of litter and duff is down to mineral soil. In all cases after a wildland fire incident, fire line would be pulled back into place and woody debris would be placed over the area to facilitate rehabilitation of the area.

Invasive plant species are generally found in disturbed soil conditions. Surface disturbance from suppression activities (e.g. thinning, building of fire lines, or inadvertently denuding the soil of vegetation) could facilitate the establishment and spread of invasive species. Aggressive non-native species could become established if ground disturbance during suppression strategies is extensive and lengthy. In 2005, Yellowstone adopted an Integrated Pest Management approach with regard to non-native vegetation, emphasizing prevention, education, early detection,

eradication, control, and monitoring (NPS, 2006b). Adverse effects to native vegetation from invasive species would be long-term and moderate.

Small fires and fires of low intensity would be expected to have very little effect on wetlands. Fires that become large could have greater effects on wetlands due to loss of vegetation and increased ash and woody debris deposited into waterways. This type of deposition could affect wetlands downstream from the fire. However, these effects are considered normal and natural in fire adapted ecosystems.

Other suppression activities that could impact wetlands include the use of fire retardant, construction of fire line, spike camps, and helispots. Aerial application of fire retardant or foam may impact the water quality of wetlands. The degree of impact would depend on the volume of retardant/foam dropped into the water body, the size of the water body, and the volume of flow in the stream or river. Wetland areas where flushing of water is wind driven, such as in high marshes, may be impacted more severely than wetlands that are more saturated. The use of retardant will be avoided within 300 feet of water.

Fire line construction may result in soil erosion, increased sedimentation, and alteration of spatial drainage patterns that could affect wetlands. The risk of this impact is greater along steep-sloped banks adjacent to streams and wetlands. Wetlands would be avoided to the greatest extent possible when placing fire lines. Fires in wetlands are expected to be small and of low intensity, having short-term minor effects on wetlands. A U.S. Army Corps of Engineers 404 permit and any other necessary compliance would be obtained prior to projects that may alter natural hydrology of wetlands and thus require consultation and mitigation. Spike camps may result in trampled or removed vegetation, and helispots may result in removed vegetation during a suppression response.

Overall effects from wildfire suppression activities would be both short-term and long-term, and moderate.

Non-Fire Fuel Management
Non-fire fuel management includes mechanical and manual thinning of trees and understory vegetation to reduce hazard fuel accumulation around structures, including backcounty cabins and within the wildland- urban interface of developed areas. Target individual plants within a treatment area would be lost, producing short-term, direct, negligible effects on vegetation in treatment areas.

Disturbance from works crews, removal of individual trees, and thinning would produce short-term, direct, minor effects to vegetation. Some crushing of non-target plants in the treatment could occur, but this would not jeopardize the plant population in the Park.

Before applications, Park botanists would inventory treatment areas for rare plants; the Park would then implement mitigation measures as necessary to avoid impacting rare or species of concern plants.

Mechanical and manual thinning of trees would result in more open canopies around structures. This could result in an increase in sun-tolerant plant species and a decrease in shade-tolerant species. Non-fire fuel treatments are picked based on cost effectiveness weighed against the desired outcome of the treatment type. Also, invasive species could become established in disturbed areas. This would have a short-term, moderate effect on vegetation.

Another potential effect of opening the forest canopy would be the increased likelihood of windthrow, or the exposure and blowdown of trees that were previously protected by a denser population of trees. For example, because of their shallow root system, lodgepole pine trees cannot be thinned too much or the trees are susceptible to blowdown. Yellowstone managers approach fuel treatments within lodgepole pine forests as a long-term process that could take five to 10 years to achieve the correct canopy spacing to stop crown fires. The effects would be short-term and negligible. Trees in the treatment areas exposed to new and different wind stresses from previous construction or fuel treatments may occasionally fail, requiring periodic maintenance of the treatment area. In addition, "feathering" of vegetation would be used to increase the distance from the structure(s), reducing the potential for increased windthrow in the treatment areas. Feathering vegetation results in a more natural look to stands of trees and allows managers flexibility to leave some vegetation as screening, while still removing enough trees to meet the objective of reducing the threat of crown fire.

Overall effects to vegetation from non-fire fuel management to protect structures within the Park would be short-term and negligible to moderate.

Non-fire fuel management would not take place in wetlands.

While recent fires and an epidemic of the mountain pine beetle have contributed to a decline in mature, cone producing whitebark pine, monitoring efforts clearly show sufficient levels of understory whitebark pine regeneration to ensure continued persistence in the Park. Park managers in Yellowstone are aware of the current and future threats to whitebark pine, and hold great value in this ecologically important species. Yellowstone also believes it is important for natural processes to take place, including the natural fire regime of the ecosystems within the Park. Because of this, no special fire management efforts are being implemented in whitebark pine stands other than the implementation of minimum impact tactics (as they are throughout the Park, in all ecosystems), and the protection of the few plus trees (individual whitebark pine trees showing resistance to blister rust fungus) located within the Park. Whitebark pine is a species which needs disturbance to regenerate, and therefore fire can be a positive disturbance within this ecosystem.

Cumulative Effects

Vegetation removal would also occur for the Northwestern Energy right-of-ways, and for development outside of the Park as well as for the 1992 Parkwide Road Improvement Plan. Invasive species could be introduced into the Park during these projects, reducing the amount of native plants found within the Park boundaries. Within the Park the Vegetation Management Guidelines for Construction Disturbance in Yellowstone National Park, the Non-native Vegetation Management Plan, and the Whitebark Pine Strategy plan would be followed to minimize adverse effects on vegetation species.

Erosion and sedimentation of surface water from construction during development of these projects could have adverse effects on wetlands. Additional impacts could occur from erosion of hiking trails, runoff from the roads, and accidental fuel spills.

Cumulative effects to vegetation and wetlands from such actions would be minor and both adverse and beneficial. Alternative 1 would contribute moderate, adverse cumulative impacts on vegetation and wetlands. Beneficial effects are also anticipated because vegetation would be managed to reduce hazard fuel within the Park, increasing the likelihood a value at risk can be successfully protected in the event of uncontrolled wildfire. Combined with known past, current and future projects and actions, there would be moderate, adverse and beneficial cumulative impacts on vegetation and wetlands.

Conclusion
Alternative 1 would have negligible to moderate, short-term and long-term, adverse effects on vegetation, with the severity of the impact depending on the nature and intensity of wildland fire. Direct vegetation loss and degradation would occur, though vegetation populations in the Park would not be jeopardized. Sedimentation increase in wetlands could occur, creating minor, short-term, adverse effects.

Substantial long-term benefits to vegetation would occur by maintaining and restoring wildfire's natural ecological function. Desired vegetation communities and structures would occur in the Park.

3.7.4 Impacts of Alternative 2 (Proposed Action)

Impacts Analysis
Impacts to vegetation and wetlands under Alternative 2 would be similar to impacts discussed under Alternative 1. Under this alternative the 2004 FMP would be replaced with the 2012 FMP.

Wildfire Response Strategy
Under this alternative, the appropriate wildfire response strategy, such as using a monitor or point/zone protection strategy, would be permitted as long as it was meeting pre-identified resource goals and objectives, rather than specific prescriptions (e.g. expected weather and fire behavior) as in Alternative 1. Pre-identified resource goals and objectives include the over-arching Park objective to perpetuate natural processes. This approach may allow for more acres to burn under Alternative 2 because wildfires will not be limited to specific weather and fire behavior prescriptions. Although adverse impacts would still occur, as described under Alternative 1, greater flexibility to manage wildfires for resource goals and objectives would promote the natural role of fire across the landscape, overall benefiting natural vegetation communities.

Overall impacts to vegetation from wildfire would be long-term, direct, and beneficial as well as short-term and moderate. Effects to wetlands would be negligible to minor and short-term. Impacts are discussed in greater detail under Alternative 1.

Prescribed Fires
Under this alternative, prescribed fire could be utilized throughout the Park to meet varying fuel and resource management objectives. Impacts from prescribed fire on vegetation would be negligible and short-term as well as direct, long-term and beneficial. Impacts are discussed in greater detail under Alternative 1.

Under Alternative 2, the IDT process would be more streamlined and efficient. All non-emergency projects (prescribed fire, fuel reduction) would be planned by the IDT, resulting in benefits to vegetation as all efforts would be made to avoid or minimize adverse impacts.

Prescribed fires would have negligible to minor effects on wetlands. Impacts are discussed in greater detail under Alternative 1.

Fire Suppression Strategy
Under Alternative 2, suppression would always be the chosen management response strategy within the suppression zones. Suppression could also be used outside of the zones if fires were not meeting Park objectives. Under this alternative Park staff would be able to respond more quickly to suppress unwanted unplanned wildland fires within the strategy zones, eliminating any question of the fire management response strategy to be employed. Because the suppression strategy areas are a small percentage of the Park, and mechanical removal of fuels would still take place, impacts from suppression strategies on vegetation species would be short-term and moderate.

Non-Fire Fuels Management
Under this Alternative, mechanical and manual thinning could take place throughout the Park. A more streamlined and efficient IDT process in which all non-emergency projects (prescribed fire, fuel reduction) would be planned, would result in benefits to vegetation as all efforts would be made to avoid or minimize adverse impacts. Mechanical and manual thinning in the Park would have a negligible to moderate, direct, short-term effect on vegetation.

Non-fire fuel treatments would not take place in wetlands. Impacts are discussed in greater detail under Alternative 1.

Cumulative Effects
Vegetation removal would also occur in the Northwestern Energy right-of-ways, and for development outside of the Park as well as for the 1992 Parkwide Road Improvement Plan. Invasive species could be introduced into the Park during these projects, reducing the number of native plants. Within the Park the Vegetation Management Guidelines for Construction Disturbance in Yellowstone National Park, the Non-native Vegetation Management Plan, and the Whitebark Pine Strategy plan would be followed to minimize adverse effects on vegetation species. Cumulative impacts are expected to be short-term and moderate. Long-term, beneficial effects are also anticipated because vegetation would be managed to reduce fuels within the Park and by allowing fire adapted and dependent vegetation to perpetuate.

Erosion and sedimentation of surface water from construction during development of these projects could have adverse effects on wetlands. Additional impacts could occur from erosion of hiking trails, runoff from the roads, and accidental fuel spills.

Cumulative effects to vegetation and wetlands from such actions would be moderate and both adverse and beneficial. Alternative 2 would contribute moderate, adverse cumulative impacts on vegetation and wetlands. Beneficial effects are also anticipated because vegetation would be managed to reduce fuels within the Park, increasing the likelihood values at risk can be successfully protected in the event of uncontrolled and unwanted wildfire events. Combined with known past, current and future projects and actions, there would be moderate, adverse and beneficial cumulative impacts on vegetation and wetlands.

Conclusion
Alternative 2 would have very similar impacts on vegetation and wetlands as Alternative 1. Effects would be negligible to moderate, short-term and long-term, and adverse, and the severity of the impact would depend on the nature and intensity of wildland fire. Suppression strategy zones would make up a small percentage of the Park. Direct vegetation loss and degradation would occur, although overall vegetation populations in the Park would not be jeopardized. Sedimentation increases in wetlands could occur, creating minor, short-term, adverse effects.

Long-term benefits to vegetation through wildfire would occur by maintaining and restoring vegetation to its natural ecological function. Short-term benefits would also occur from managing vegetation for predetermined management objectives through prescribed fire or a response strategy to unplanned fire. Desired vegetation communities and structures would occur in the Park.

3.8 FISH AND WILDLIFE

3.8.1 Affected Environment

Yellowstone National Park is home to a wide variety of wildlife. At least 300 species of birds, 60 species of mammals, 4 species of amphibians, 6 species of reptiles, and 12 species of native fish have been documented within the Park. The distribution, abundance, and diversity of species within the Park vary by season, elevation, and variety of habitats present.

The Park is home to the largest concentration of mammals in the lower 48 states with 67 different mammals living within the Park (NPS, 2011b). Yellowstone mammals include the black bear (*Ursus americanus*), coyote (*Canis latrans*), fox (*Vulpes vulpes*), bobcat (*Lynx rufus*), marten (*Martes americana*), striped skunk (*Mephitis mephitis*), mule deer (*Odocoileus hemionus*), bighorn sheep (*Ovis canadensis*), moose (*Odocoieus hemionus*), white-tailed deer (*Odocoileus virginianus*), bison (*Bison bison*), elk (*Cervus canadensis*), beaver (*Castor canadensis*), river otter (*Lontra canadensis*), deer mouse (*Peromyscus maniculatus*), red squirrel (*Sciurus vulgaris*), meadow voles (*Microtus pennsylvanicus*), porcupine (*Erethizon dorsatum*), and the snowshoe hare (*Lepus americanus*). There are also eight species of bats that may be present in the Park including the little brown bat (*Myotis lucifugus*), the big brown bat (*Eptesicus fuscus*), and the silver-haired bat (*Lasionycteris noctivagans*) (NPS, 2011c). All threatened and endangered species are addressed in section 3.9.

Three hundred thirty bird species have been documented in Yellowstone and approximately 148 bird species are known to nest in the Park (NPS, 2011d). While some of these species reside in the park year-round, most migrate to lower elevations and more southern latitudes during the winter seasons, and others migrate to the Park for the winter from further north (NPS, 2010a). Raptors in the Park include the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), osprey (*Pandion haliaetus*), red-tailed hawk (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), and the Swainson's hawk (*Buteo swainsoni*) (NPS, 2011d). A wide variety of other birds inhabit the Park in the summer, including species of: waterfowl; grebes and loons; pelicans and cormorants; cranes, rails and coots; herons, egrets and bitterns; grouse; swifts and hummingbirds; kingfishers; doves and pigeons; owls; shorebirds, gulls and terns; woodpeckers; and passerines (songbirds such as chickadees, warblers, sparrows, and finches).

The cool, dry conditions of Yellowstone limit the amphibian populations to four species: boreal toad (*Anaxyrus boreas boreas*), chorus frog (*Pseudacris maculata*), spotted frog (*Rana luteiventris*), and tiger salamander (*Ambystoma tigrinum*). The population numbers of these species are unknown and some researchers suspect there are more amphibian species in Yellowstone than are currently known (NPS, 2011e).

The cool, dry conditions also limit the number of reptiles found in the Park. Documented reptiles in Yellowstone include the prairie rattlesnake (*Cortalis viridis viridis*), bull snake (*Pituophis catenifer sayi*), valley garter snake (*Thamnophis sirtalis fitchi*), wandering garter snake (*Thamnophis elegans vagrans*), rubber boa (*Charina bottae*), and the sagebrush lizard (*Sceloporus graciosus graciosus*) (NPS, 2011f).

Yellowstone is home to hundreds of lakes and thousands of miles of flowing waters. The Park's fishery comprises 12 species of native fish: the mountain whitefish (*Prosopium williamsoni*), longnose dace (*Rhinichthys cataractae*), speckled dace (*Rhinichthys osculus*), redside shiner (*Richardsonius balteatus hydrophlox*), Utah chub (*Gila atraria*), mottled sculpins (*Cottus bairdi*), longnose sucker (*Catostomus catostomus griseus*), mountain sucker (*Catostomus platyrhynchus*), Utah sucker (*Catostomus ardens*), Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri*), Westslope cutthroat trout (*Oncorhynchus clarkii lewisi*), Arctic grayling (*Thymallus arcticus*) (NPS, 2010a). These native species provided food to both wildlife and human inhabitants. Fishing is an important recreational activity in the Park. The Park's native fish species population has declined during the past century due to exploitation, introduction of non-native and exotic species, and natural factors. Though native species have declined, large-scale habitat degradation has not occurred in the Park (NPS, 2008b).

Yellowstone fish management goals include the reduction in long-term extinction risks for fluvial Arctic grayling, Westslope cutthroat trout, and Yellowstone cutthroat trout. Numerous stressors threaten these fish: drought, whirling disease, accidental stocking of non-native fish, habitat degradation and fragmentation from land use activities. Below is a description of where these fish are located within the Park.

Yellowstone Lake, at over 84,000 surface acres, is home to the largest population of Yellowstone cutthroat trout in existence. In Yellowstone, Westslope cutthroat trout are present in

approximately three kilometers of a small tributary to Grayling Creek, as a restored population in East Fork Specimen Creek, and as a population stocked in Geode Creek in the 1920s. Arctic grayling historically occupied waters of the Madison and Gallatin River drainages on the Park's west side. Introduced populations of lake-dwelling Arctic grayling exist in Wolf and Grebe lakes, which form the headwaters to the Gibbon River (NPS, 2010a).

Five non-native fish species are well established in the Park. While four of these species are native to North America: eastern brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*), lake trout (*Salvelinus namaycush*), and lake chub (*Couesius plumbeus*), the other non-native fish species, brown trout (*Salmo trutta*), is native to Europe (NPS, 2010a).

3.8.1.1 Special Status Species

The species listed below are listed by the Park as a species of management concern. Only species that exist or have the potential to exist in the Park are listed. See Section 3.9 for threatened and endangered species topics addressed.

Boreal toad (*Bufo boreas*): The boreal toad typically breeds in park areas with water chemistry characteristics that include a pH greater than 8.0, high conductivity, and high acid-neutralization capacity; many of the sites have a geothermal influence (Koch and Peterson, 1995). Boreal toad breeding areas are common in the upper Geyser Basin and have been documented in the Swan Lake Flats area. Boreal toads can also be found in riparian and riverine areas where they feed if adequate cover is available. Although declining throughout much of their range, boreal toads remain widespread throughout the Park.

Bald eagle (*Haliaeetus leucocephalus*): The USFWS removed the bald eagle from the list of endangered and threatened wildlife on August 8, 2007. Current data indicate populations of bald eagles have recovered in the lower 48 states, with an estimated minimum of 9,789 breeding pairs now, compared to 417 active nests in 1963 (USFWS, 2007). Nesting and fledgling bald eagles in Yellowstone increased incrementally from 1987 to 2005 (McEneaney, 2006). Resident and migrating bald eagles are now found throughout the Park, with nesting sites located primarily along the margins of lakes and shorelines of larger rivers. The bald eagle management plan for the Greater Yellowstone Ecosystem achieved the goals set for establishing a stable bald eagle population in the Park, with a total of 26 eaglets fledged from 34 active nests during 2007. This is the most fledged eaglets ever recorded within Yellowstone, and the increasing population trend indicates habitat is not presently limiting the growth of the population.

American peregrine falcon (*Falco peregrines anatum*): The American peregrine falcon was removed from the list of endangered and threatened wildlife on August 25, 1999 due to its recovery following restrictions on organochlorine pesticides in the United States and Canada, and implementation of various management actions, including the release of approximately 6,000 captive-reared falcons (64 FR 46541). The U.S. Fish and Wildlife Service has implemented a post-delisting monitoring plan pursuant to the Endangered Species Act that requires monitoring peregrine falcons at three year intervals which began in 2003 and will end in 2015. Monitoring estimates from 2003 indicate territory occupancy, nest success, and productivity were above target values set in the monitoring plan and that the peregrine falcon

population is secure and viable (71 FR 60563). Peregrine falcons reside in Yellowstone from April through October, nesting on large cliffs. The number of nesting pairs and fledglings in the Park has steadily increased from zero in 1983 to 32 pairs and 47 fledglings in 2007 (Baril et al., 2010).

Trumpeter swan (*Cygnus buccinator*): Trumpeter swans were nearly extinct by 1900, but a small group survived by remaining year round in the Greater Yellowstone Area. In 2010 there were approximately 46,000 trumpeter swans in North America (USFWS, 2010). Yellowstone supports resident, non-migratory trumpeter swans through the year, and its areas of ice-free water that diminish as winter progresses provide limited, temporary habitat for migrants from the region, Canada, and elsewhere during the winter. The NPS is committed to the conservation of resident trumpeter swans and preserving habitat for winter migrants in Yellowstone because swans are part of the natural biota and a species with considerable historical significance. However, counts of resident, adult trumpeter swans in the Park decreased from a high of 69 in 1961 to 10 in 2012. Causes of this decline are unknown, but may include decreased immigration, competition with migrants, and the effects of sustained drought, human disturbance, and predation on productivity (McEneaney, 2006). The trumpeter swan population operates at a scale larger than Yellowstone, and the dynamics of resident swans in Yellowstone appear to be influenced by larger sub-populations and management actions in the Greater Yellowstone Area and elsewhere.

White pelican (*Pelecanus erythrorhynchos*): American white pelicans were identified as a Species of Management Concern because numbers of nesting pairs fluctuate widely, and Yellowstone has the only nesting colony of white pelicans in the national park system (Smith et al., 2012). Pelican control in the 1920s followed by human disturbances in the 1940s and 1950s kept the population at low levels. Since then, pelican numbers have increased but the number of nesting attempts and fledged juveniles fluctuates greatly from year to year. Flooding occasionally takes its toll on production, as does disturbance from humans or predators (Smith, 2011). In 2012, a total of 270 pelicans fledged from the 392 nests while none of the 684 nests fledged young in the previous year. Difference in success from year to year is primarily attributed to fluctuations in lake water levels, but bald eagle predation is also a contributing factor. Yellowstone cutthroat trout are the main food for white pelicans in Yellowstone, but declines in this species since lake trout introduction may influence the population.

Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri*): A range-wide status review estimated that the conservation population (>90 percent genetic purity) of Yellowstone cutthroat trout occupy over 6,300 km within their native range in Idaho, Montana, Nevada, Utah, and Wyoming. Yellowstone Lake, at over 84,000 surface acres, is home to the largest population of Yellowstone cutthroat trout in existence (Varley and Schullery, 1998); they are an important food source for many animal species in the Park. In Yellowstone Lake, recent threats such as lake trout introduction, drought, and whirling disease have severely diminished the ecological role of this fish.

Westslope cutthroat trout (*Oncorhynchus clarkii lewisi*): Numerous stressors, including stocking of non-native fish, habitat degradation and fragmentation from land use activities, have reduced the distribution and abundance of Westslope cutthroat trout. The subspecies currently

occupies only 19 percent to 27 percent of its historical range east and west of the Continental Divide in Montana and about 36 percent of its historical range in Idaho. Even some of the historically secure populations in Glacier National Park and the Flathead Basin of Montana are in serious decline. In the upper Missouri river drainage, Westslope cutthroat trout now occupy less than five percent of their historical range. The remaining population persists as small-stream residents occupying isolated habitats ranging from several hundred meters to a few kilometers in extent. As a result, these populations face a high risk of extinction. In Yellowstone, Westslope cutthroat trout are present in approximately three kilometers of a small tributary to Grayling Creek, as a restored population in East Fork Specimen Creek, and as a population stocked in Geode Creek in the 1920s.

Arctic grayling (*Thymallus arcticus*): Arctic grayling are listed as a Species of Management Concern by the NPS and the USFWS. Fluvial (stream-dwelling) grayling were once widespread in the Missouri River drainage, but wild grayling persist only in the Big Hole River, representing approximately four percent of their native range in Montana. In Yellowstone, fluvial grayling historically occupied waters of the Madison and Gallatin River drainages on the Park's west side. Introduced populations of a fluvial (lake-dwelling) grayling exist in Wolf and Grebe lakes, which form the headwaters to the Gibbon River. A 2005–2006 study indicated the small number of grayling in the Gibbon and Madison rivers are likely emigrants from Wolf and Grebe lakes and the native fluvial grayling population has most likely been extirpated from the Park.

North American pronghorn (*Antilocapra americana*): Yellowstone's pronghorn population was one of only a few not exterminated or decimated by the early 20th century and, as a result, was the source for re-establishing or supplementing populations throughout much of its range (Lee et al., 1994). These pronghorn express much of the genetic variation that was formerly widespread in the species, but is no longer present elsewhere (Reat et al., 1999). This population also sustains one of only two long-distance pronghorn migrations that persist in the greater Yellowstone region (White et al., 2007). There are serious concerns about its viability because low abundance (~200) and apparent isolation have increased its susceptibility to random, naturally occurring catastrophes (NPS, 2010d; National Resource Council, 2002).

Wolverine (*Gulo gulo*): The wolverine is a wide-ranging mustelid that naturally exists at low densities throughout much of northern and western North America (Beauvais and Johnson, 2004). Wolverines are highly adapted to extreme cold and life in environments that have snow on the ground all or most of the year (Aubry et al., 2007). In the contiguous United States, these habitats are highly mountainous and occur at elevations above 8,000 feet (Copeland et al., 2007).

Overexploitation through hunting and trapping, as well as predator poisoning programs, likely caused wolverine populations to contract along the southern portion of their historical range in North America since the early 1900s (Banci, 1994). However, recent surveys indicate wolverines are widely distributed in remote, montane regions of Idaho, Montana, Washington, and parts of Wyoming (68 FR 60113).

Wolverines have been detected in the Greater Yellowstone Ecosystem including the eastern, northern, and southern portions of the Park (Beauvais and Johnson, 2004; Copeland et al., 2007). Wolverines have protected status in Washington, Oregon, California, Colorado, Idaho, and

Wyoming (Banci, 1994). In Montana, wolverines are classed as furbearers and trapper harvests are managed through a quota system that limits the number of animals that can be taken. The USFWS has listed the wolverine in the contiguous United States as a candidate species.

Bison (*Bison bison*): Plains bison in Yellowstone have been petitioned for listing as an endangered species twice in the past 15 years and both times the U.S. Fish and Wildlife Service has declined to list the species. The Yellowstone bison population has been identified as a distinct population by USFWS definition. The population is comprised of plains bison that historically occupied about 20,000 square kilometers (km^2) in the headwaters of the Yellowstone and Madison rivers of the western United States. While nearly extirpated in the early 20^{th} century, the Park provides sanctuary to the only wild and free-ranging bison population to continuously occupy historic range. Intensive husbandry, protection, and relocation were used to bring back the population, and during the summer of 2012 there were about 4,300 bison in the Park. Yellowstone bison are managed as a single population having two distinct breeding areas with individuals that move across an extensive landscape (350,000 acres). These bison are subject to natural selection factors such as competition for food and mates, predation, and survival under substantial environmental variability. Thus, they have retained the adaptive capabilities of plains bison. Yellowstone bison contribute a unique genetic lineage to plains bison that is not represented elsewhere within populations managed by the Department of Interior. They have high genetic diversity compared to other populations of plains bison, and are one of a few bison populations with no evidence or suggestion of potential cattle ancestry.

The central herd occupies the central plateau of Yellowstone National Park, extending from the Pelican and Hayden valleys in the east to the lower elevation and thermally influenced Madison headwaters area in the west. Central herd bison congregate in the Hayden Valley for breeding. Most bison move between the Madison, Firehole, Hayden, and Pelican valleys during the rest of the year. Some of these bison are likely to migrate north to the Gardiner Basin during the winter months and return to the Hayden Valley to breed. Emigration has been observed with more bison emigrating north from the central range than vice versa. The northern herd occupies the area commonly referred to as the northern range, extending from the high elevations along the east boundary from Cooke City south to the Needle (a small number of males summer in the upper Lamar Valley to Saddle Mountain) westward to include the Mirror Plateau, Specimen Ridge and Upper Slough Creek all the way to the lower reaches of the Gardiner Basin at Yankee Jim Canyon. This sub-population breeds at the eastward end of their range and slowly moves down in elevation as the fall and winter months pass. By late winter and early spring the majority of the northern range group is located west of Tower and follows the chronology of spring green up conditions back to the high country for the July and August breeding period.

Bison tend to be observed in open grassland or shrub steppe habitats but due to the juxtaposition of these habitats in Yellowstone, there are many travel corridors along rivers and over high elevation passes that provide connections to all of the major watersheds throughout the Park.

3.8.2 Methodology

Impact analyses of fish and wildlife were based on recent studies and previous projects conducted within the Park, and assessment of potential impacts to wildlife and fish and their

habitat caused by fire management. These analyses were conducted in the context of the project area.

The thresholds of change for the intensity of an impact on fish and wildlife are defined as follows:

Negligible: Neither wildlife nor fish would be affected, changes would be either non-detectable or, if detected, would have effects that would be considered slight and short-term.

Minor: Temporary displacement of a few localized individuals or groups of animals or fish; mortality of individuals that would not impact population trends; mitigation measures, if needed to offset adverse effects, would be simple and successful

Moderate: Effects to wildlife would be readily detectable, long-term and localized, with consequences affecting the population level(s) of specie(s). Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.

Major: Effects to wildlife would be obvious, long-term, and would have substantial consequences to wildlife populations in the region; mortality of a number of individuals that subsequently jeopardizes the viability of the resident population; extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

3.8.3 Impacts of Alternative 1 (No Action)

Impacts Analysis
Under Alternative 1, fire management would continue under the 2004 Wildland Fire Management Plan. Management options with the potential to impact fish and wildlife within the Park include suppression, wildland fire use, prescribed fire, and non-fire fuels management applications. A combination of these options could be used to promote natural fires and reduce negative impacts to values at risk.

Wildland Fire Use
Under this alternative, wildland fire use would be permitted under specific environmental conditions with the goal of perpetuating natural processes. Wildland fire use incidents could result in the temporary displacement of wildlife or individual mortality of wildlife species. Wildland fires would have an immediate effect on wildlife and wildlife habitats by removing plant material, exposing soils, stimulating growth of some plants, and killing or reducing the vigor of some plants. The amount of habitat removed may depend on the following fire characteristics: size, severity, patchiness, and time of year. The loss of habitat would have an indirect, short-term minor effect by displacing wildlife.

Since fires have historically occurred in Yellowstone, most Yellowstone wildlife species have evolved with natural fires. The ability of mammals to survive fire depends on their mobility and on the uniformity, severity, size, and duration of the fire. Most small mammals seek refuge underground or in sheltered places within the burn, while large mammals must find a safe location in unburned patches outside the burn. Direct fire-caused mortality for large mammals

including coyote, white-tailed deer, mule deer, elk, bison, black bear, and moose is most likely caused when fire fronts are wide and fast moving, fires are actively crowning, and thick ground smoke occurs (USFS, 2000).

Fire-caused bird mortality depends on the season, uniformity, and severity of the wildfire. For instance, eggs and young of ground-nesting birds are vulnerable to spring fires. Long-term fire effects on bird populations depend partly on their tendency to re-nest. In forested areas, fire effects on birds depends on fire severity; young of birds nesting on the ground in low vegetation are vulnerable even to understory fire during nesting season. Species nesting in the canopy would be injured by intense surface fire and crown fire (USFS, 2000).

Although reptiles and amphibians have limited mobility, there are few reports of fire-caused injury. Many reptiles and amphibians live in moist environments and these areas are likely to burn less often (USFS, 2000).

Though all of the wildlife species found in Yellowstone are mobile species, some animals, such as insects and small mammals, have limited ability to move over large distances. Direct mortality of some mammals, birds, amphibians, and reptiles could occur from a wildland fire use incident. The direct mortality and displacement of a few localized individuals or groups of animals, but would not jeopardize population trends. Wildlife mortality from fire would have a direct, short-term effect on wildlife populations.

Changes in vegetation structure and composition that result in wildlife displacement are the most important effects from fires, and the degree of vegetation change depends on the intensity of the fire. A low severity, discontinuous burn may generate substantial spatial heterogeneity within a landscape and potentially increase species diversity by creating a variety of different habitats. In addition, a widespread, high severity fire may have the opposite effect, creating a more homogeneous environment across the landscape. How wildlife responds to fire depends on the species. After a fire, some species may respond favorably and increase in numbers, while others may respond negatively and decrease.

Less severe wildland fires would have long-term beneficial effects for a few decades on some species of wildlife such as cavity-nesting birds that use burnt snags, ungulates that browse on new growth that re-sprouts from some plants after fires, and some animals that favor more open habitats over dense forest. The preservation of fire as a natural process would contribute to maintaining a naturally functioning ecosystem. Impacts from wildland fire use would mostly be minor, short-term, and beneficial.

Wildland fire use would have minor, adverse effects on fish species and fish habitat. Fires can result in immediate mortalities to fishes. Increased suspended sediment loads from rain events over areas covered in ash could degrade the water quality of fish habitat. A majority of the fires would burn themselves out in moist streamside areas, providing a natural buffer strip that would filter out products of erosion before they entered the stream.

Prescribed Fire
Prescribed fire would be used to reduce hazardous fuel loads and address resource management objectives. Impacts to wildlife from prescribed fires would have similar effects as those described under wildland fire use. Adverse effects would include wildlife mortality and displacement due to habitat loss. Less severe prescribed fires would result in mortality and displacement of a few localized individuals or groups of animals and would not jeopardize population trends. Thus adverse effects would be short-term and minor.

The ability of fire to alter plant species composition and abundance could provide a variety of habitat conditions which would better meet the resource needs of wildlife species. Prescribed burns can have beneficial effects by enhancing nutrient cycling by releasing nutrients bound in dead plant material, making them available for new plant growth. Fires encourage new growth of many plant species, which provides a food source for some wildlife species. Altering plant species composition and abundance could provide a variety of habitat conditions for the wildlife in the Park. Prescribed fire could be used to reduce the long-term severity and intensity of wildfire in treatment areas for the protection of values at risk. Overall impacts on wildlife from prescribed fires would be short- and long-term, minor and beneficial.

Prescribed burning is not expected to be a threat to fish bearing streams. Consideration of fish bearing streams would be taken when planning prescribed burns through the IDT process and during implementation of prescribed fires care would be taken to avoid streams and rivers. Fish and aquatic habitats could be adversely affected due to small amounts of short-term sedimentation from ash from prescribed burning.

Fire Suppression
Impacts to wildlife from a fire suppression strategy would depend on a number of variables, including vegetation type, habitat condition, and climatic conditions. Adverse impacts on wildlife habit could occur if vegetation were removed in sensitive areas or if surface disturbance and fire suppression strategies facilitated the establishment and spread of invasive plant species. Aggressive non-native plant species could become established if ground disturbance during fire suppression strategies is extensive and lengthy. If invasive species are left unchecked, they could have an impact on wildlife habitat quality by decreasing native vegetation which is used as a food source and habitat cover.

Wildlife could be affected by the removal of trees, logs, and snags; from drifting smoke; from noise and disturbance from personnel and equipment used for suppression, including helicopters; and noise and disturbance from preparation for suppression including installing water tanks, constructing fire lines, and removing hazard fuel. Wildlife could be temporary displaced due to noise and human disturbance. These adverse effects would not jeopardize the viability of the wildlife populations throughout the entire Park, and thus would be minor.

Many birds return after a fire to take advantage of the altered habitat while others abandon burned areas because the habitat does not provide the structure or foods they require to survive and reproduce. Large mammals, such as moose and deer, which depend on vegetation for forage, bedding, cover, and thermal protection, abandon burned areas if severe fire removes many of the habitat features they require. Many small mammals also leave burned habitats until

a new litter layer had accumulated. Little is known about reptiles and amphibians and their response after fires (USFS, 2000).

Wildfire suppression guidelines set conditions on certain suppression strategy activities and limit how close suppression activities could be to water resources. These guidelines limit the use of fire retardant to areas more than 300 feet from perennial streams to the extent practicable and within aircraft safety requirements.

Direct, long-term effects on fish and aquatic habitat could occur from using a suppression strategy on unplanned fires. High severity fires and heavy fuel and slash accumulations in riparian zones are factors that contribute to fish mortality. Effects to fish and fish habitat would be long-term and minor to moderate and adverse.

Fire retardants can also cause fish mortality by degrading water quality and causing fish mortality. The number of retardant drops and orientation to the stream are key factors in fish mortality. Because the Park would consider fish-bearing streams when developing suppression strategies and fire retardants would be limited to areas more than 300 feet from streams to the extent practicable, it is not anticipated that major impacts would occur. This 300 foot buffer around streams would cause fire retardants to become diluted by plants, soils, roots, and debris before reaching fish habitat.

Indirect, adverse effects on fish and aquatic habitat could occur from an increase in sedimentation due to vegetation removal. The amount of sedimentation that would occur depends on the intensity and size of the fire, the amount of soil disturbed from suppression strategies, as well as climatic conditions. If a rain event occurs immediately after a fire, disturbed soils would be washed into fish-bearing streams. Fire lines, spike camps, and helispots would be rehabilitated immediately after fire suppression to reduce the potential for erosion and runoff into streams. Best management practices would be used to avoid sediment delivery into streams from any activity needed during and for rehabilitation of burned areas after suppression of wildfires. Best management practices for avoiding sediment delivery into streams include the use of silt screens, no refueling of equipment within 150 feet of a stream, fuel spill prevention plan for fueling and use of on-site equipment, use of weed-free straw on exposed soils if needed until revegetation is complete, and stabilization of any structures within the inner gorge of streams to prevent bank erosion. Impacts from sedimentation are expected to be minor to moderate. Some individual fish or groups may be affected by sedimentation, but fish populations would not be jeopardized.

Large scale, severe fires and associated suppression strategies have the potential for substantial adverse effects on water habitats. Erosion from large scale fires and suppression strategies could be substantial in the first rains that follow the fires. After large scale, severe fires, nutrient outputs would increase because vegetation has been removed, and there would be an increased mineralization and leaching of elements accumulated in the watershed. High sediment loads would cause fish mortality and habitat degradation including raised water temperatures, pH, and alkalinity. The direct effects of burned materials entering streams and the long-term, indirect effects of erosion of bare soils after a large scale, severe fire could have moderate to major short-term impacts on fish species. Nutrient output could increase as well as water temperature and

light penetration. Large scale suppression strategy fires are not anticipated, however, because suppression measures should be limited to fires that do not meet park objectives. Therefore suppression strategies would cause short-term, minor to moderate effects.

Non-Fire Fuels Management
Non-fire fuels management includes mechanical and manual thinning of trees and understory vegetation to reduce hazard fuel accumulation around structures including backcounty cabins and within the wildland-urban interface of developed areas. Mechanical and manual thinning in the Park would have a negligible, direct, short-term effect on wildlife. Disruption or destruction of habitat and foraging areas would be limited to very small areas. Opening the canopy around structures would likely allow the understory in these small areas to develop to a much greater degree than is normal in dense lodgepole pine forests, the most common vegetation community that would be treated. These small areas could become dominated by forbs and shrubs, providing a negligible benefit to birds, small mammals, and bears.

Wildlife mortality is not anticipated because most wildlife are mobile and those that are not can find refuge in secure burrows, rock crevices, and under moist forest litter. Retention of some downed wood and snags in the treatment areas would provide valuable habitat for wildlife and would result in long-term, negligible beneficial effects to wildlife (NPS, 2002).

Adverse effects to fish and aquatic habitat would be negligible. Mechanical and manual thinning would take place in small areas and sedimentation from these areas would not alter water quality or fish populations. Treatments would be conducted outside of the nesting bird season, typically after August 1, unless bird surveys are completed for the project area.

Cumulative Effects
Vegetation removal would occur around backcounty cabins, other developed areas in the Park, Northwestern Energy right-of-ways, and development outside of the Park as well as for the 1992 Parkwide Road Improvement Plan. While wildlife mortality would not be expected from these projects, wildlife would be displaced. Invasive plant species could be introduced into the Park during these projects, reducing the amount of native plants found within the Park boundaries which provide food and habitat for fish and wildlife. The Vegetation Management Guidelines for Construction Disturbance in Yellowstone National Park, the Non-native Vegetation Management Plan, and the Whitebark Pine Strategy plan would be followed to minimize adverse effects on wildlife species and habitat.

Erosion and sedimentation of surface water from construction during development of these projects could have adverse effects on surface water, and thus fish and aquatic habitat. Additional impacts could occur from erosion of hiking trails, runoff from the roads, and accidental fuel spills. There are also impacts on individual fish from the heavy recreational fishing; however, the fisheries are managed so as not to adversely affect overall fish populations.

Cumulative effects to fish and wildlife from such actions would be minor and both adverse and beneficial. While some individuals and groups would be displaced, overall wildlife populations would not be jeopardized. Alternative 1 would contribute minor, adverse cumulative impacts on fish and wildlife. Beneficial effects are also anticipated because vegetation would be managed to

reduce fuel within the Park, lowering the chance of a large scale, severe fire. Combined with known past, current and future projects and actions, there would be minor, adverse and beneficial cumulative impacts on fish and wildlife.

Conclusion

Alternative 1 would have negligible to minor, short-term, adverse effects on wildlife and fish associated with fire management activities depending on the nature and intensity of wildland fire. Direct mortality and wildlife displacement due to habitat loss and degradation would occur, although overall wildlife populations in the Park would not be jeopardized. Direct mortality of fish and degradation of fish habitat could occur. Sedimentation increase in fish-bearing streams could occur, creating minor, short-term, adverse effects on fish populations. Long-term benefits to fish and wildlife from prevention of large scale, severe wildfires would be substantial, to the extent of long-term benefits from restoration and maintenance of natural habitat would occur through wildfire. Short-term benefits would also occur from managing vegetation for management objectives as wildlife habitat could be enhanced or created, increasing the population of some wildlife species.

3.8.4 Impacts of Alternative 2 (Proposed Action)

Impacts Analysis

Impacts to fish and wildlife species under Alternative 2 would be similar to impacts discussed under Alternative 1. Under this alternative the 2004 FMP would be replaced with the 2012 FMP.

Wildfire Response Strategy

Under this alternative, a wildfire response strategy, such as using a monitor or point/zone protection strategy, would be permitted as long as it was meeting specific pre-identified objectives, including the over-arching Park objective to perpetuate natural processes. A monitor strategy under this alternative would be managed according to goals and objectives rather than specific prescriptions as in Alternative 1. This approach may allow for more acres to burn so that natural ecological function would be maintained and restored in more of the Park. Although adverse impacts could still occur, as described under Alternative 1, greater flexibility to manage wildfires for resource benefit and goals and objectives would promote the natural role of fire across the landscape, overall benefiting fish and wildlife.

Impacts from wildfire would be minor, short- and long-term, adverse and beneficial. Using the appropriate wildfire response strategy would have negligible effects on fish species and habitat. Impacts are discussed in greater detail under Alternative 1.

Prescribed Fires

Under this alternative, prescribed fire could be utilized throughout the Park to meet varying fuel and resource management objectives. The IDT process would be more streamlined and efficient. All non-emergency projects (prescribed fire, fuel reduction) would be planned by the IDT, resulting in benefits to fish and wildlife as all efforts would be made to avoid or minimize adverse impacts.

Impacts from prescribed fire would be negligible to minor, short- and long-term, adverse and beneficial. Impacts are discussed in greater detail under Alternative 1.

Fire Suppression Strategy
Under Alternative 2, a suppression strategy would always be the chosen management strategy within the suppression zones. Park staff would be able to respond to unwanted wildland fires more quickly, resulting in less acreage of unwanted fire burned. Because the suppression areas are a small percentage of the Park and mechanical removal of fuels would still take place, impacts from suppression strategies on fish and wildlife species would be short-term and minor.

Non-Fire Fuels Management Applications
Under this alternative, mechanical and manual thinning could take place throughout the Park. The IDT process would be more streamlined and efficient. All non-emergency projects (prescribed fire, fuel reduction) would be planned by the IDT, resulting in benefits to fish and wildlife as all efforts would be made to avoid or minimize adverse impacts. Mechanical and manual thinning in the Park would have a negligible, direct, short-term effect on fish and wildlife as well as a negligible benefit to birds, small mammals, and bears. Impacts are discussed in greater detail under Alternative 1.

Cumulative Effects
Vegetation removal would occur around backcounty cabins, other developed areas in the Park, Northwestern Energy right-of-ways, and development outside of the Park as well as for the 1992 Parkwide Road Improvement Plan. While wildlife mortality would not be expected from these projects, wildlife would be displaced. Invasive species could be introduced into the Park during these projects, reducing the amount of native plants found within the Park boundaries which provide food and habitat for fish and wildlife. Within the Park the Vegetation Management Guidelines for Construction Disturbance in Yellowstone National Park, the Non-native Vegetation Management Plan, and the Whitebark Pine Strategy plan would be followed to minimize adverse effects on wildlife species and habitat.

Erosion and sedimentation of surface water from construction during development of these projects could have adverse effects on surface water, and thus fish and aquatic habitat. Additional impacts could occur from erosion of hiking trails, runoff from the roads, and accidental fuel spills. There are also impacts on individual fish from the heavy recreational fishing; however, the fisheries are managed so as not to adversely affect overall fish populations.

Cumulative effects to fish and wildlife from such actions would be minor and both adverse and beneficial. While some individuals and groups would be displaced, overall wildlife populations would not be jeopardized. Alternative 2 would contribute minor, adverse cumulative impacts on fish and wildlife. Beneficial effects are also anticipated because vegetation would be managed to reduce hazard fuel within the Park. Combined with known past, current and future projects and actions, there would be minor, adverse and beneficial cumulative impacts on fish and wildlife.

Conclusion
Alternative 2 would have very similar impacts to wildlife species as Alternative 1. Overall effects on wildlife and fish would be negligible to minor, short-term and adverse due to fire

management activities and dependent on the nature and intensity of wildland fire. Direct mortality and wildlife displacement due to habitat loss and degradation would occur, though overall wildlife populations in the Park would not be jeopardized. Sedimentation increase in fish-bearing streams would occur, creating minor, short-term, adverse effects on fish populations. Long-term benefits to fish and wildlife from prevention of large scale, severe wildfires would be substantial, to the extent of long-term benefits from restoration and maintenance of natural habitat would occur through wildfire. Short-term benefits would also occur from managing wildfire for management objectives as wildlife habitat could be enhanced or created, increasing the population of some wildlife species.

3.9 THREATENED AND ENDANGERED SPECIES

3.9.1 Guiding Regulations and Policies

Federally listed species in national parks are protected by the Endangered Species Act (ESA). The ESA (16 USC 1531 et seq.) mandates all federal agencies consider the potential effects of their actions on species listed as threatened or endangered. If the NPS determines an action may affect a federally listed species, consultation with the U.S. Fish and Wildlife Service (USFWS) is required to ensure that the action would not jeopardize the species' continued existence or result in the destruction or adverse modification of critical habitat. NPS *Management Policies 2006* state the NPS will survey for, protect, and strive to recover all species native to NPS units that are listed under the ESA, and proactively conserve listed species and prevent detrimental effects on these species (NPS 2006a, sec. 4.4.2.3). NPS *Management Policies 2006* also state "[the NPS will] manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible" (NPS 2006a, sec. 4.4.2.3).

3.9.2 Status of Threatened and Endangered Species

The species listed below are either federally listed as endangered or threatened and information regarding their current status in the planning area is described below. Critical habitat has been designated for Canada lynx only.

Canada lynx (*Lynx canadensis*): The USFWS listed the Canada lynx as a threatened species in 2000. Lynx are considered rare in the Greater Yellowstone Area and are believed to use boreal or montane forests. Evidence of lynx in the Park comes from about 216 winter tracking surveys (conducted during winters of 2001-2004 and covering 1,043 total miles); from 118 lynx hair-snare transects deployed Park wide during the summers of 2001-2004; and from historic sightings. Park wide, only four lynx sightings have been reported by visitors in the last 10 years. Surveys have documented one possible, two probable, and two definite cases of lynx presence, including a female accompanied by a kitten. Population numbers are unknown. Lynx prefer upper elevation coniferous forests in cool, moist vegetation types, particularly those that support abundant snowshoe hares, the primary food source for lynx. The best evidence of lynx presence is along the east shore of Yellowstone Lake. Lynx critical habitat was designated in 2009, and in Yellowstone, it is congruent with all Lynx Analysis Units (LAUs) except the Bechler LAU in the southwest corner of the Park (Figure 3-1). There are four primary constituent elements of critical habitat essential to the survival and recovery of lynx: a) boreal forest landscapes supporting a

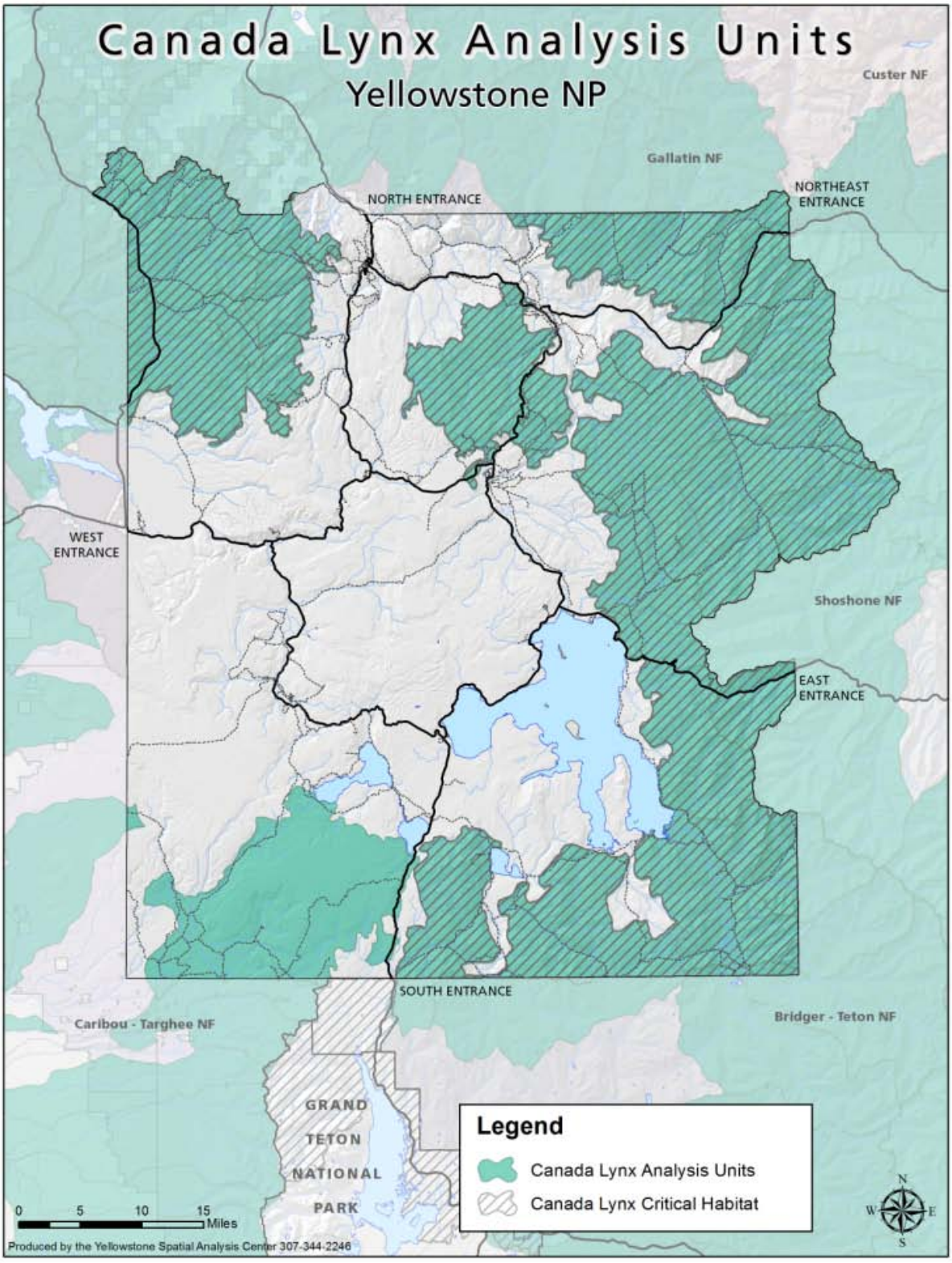

Figure 3-1. Lynx Analysis Units within Yellowstone National Park.

mosaic of differing successional forest stages that contain presence of snowshoe hares and their preferred habitat conditions, b) appropriate snow conditions, c) denning sites, and d) matrix habitat (e.g. hardwoods, dry forest, non-forest) providing connectivity between denning and foraging sites (50 CFR Part 17 [FWS–R6–ES–2008–0026]).

Gray wolf (*Canis lupus*): Gray wolves were native to the Yellowstone area when the Park was established in 1872. Historically hunted for their hides and as predators, they were eliminated from the ecosystem by the 1930s. The United States Fish and Wildlife Service released an environmental impact statement on wolf reintroduction in May 1994. In 1995 and 1996, 31 gray wolves from Canada were released in the Park. Fourteen wolves were released in the winter of 1994-1995; 17 additional wolves were released in 1996 (Phillips and Smith, 1996). On May 5, 2011 the USFWS removed gray wolves in a portion of the Northern Rocky Mountain Distinct Population Segment (DPS) encompassing Idaho, Montana, and parts of Oregon, Washington, and Utah from the Federal List of Endangered and Threatened Wildlife. Gray wolves in Wyoming remain on the List of Endangered and Threatened Wildlife and continue to be subject to the provisions of our experimental population regulations codified at 50 CFR 17.84(i) and (n). Wolves reintroduced into the Park and central Idaho were classified "nonessential experimental" according to section 10(j) of the ESA of 1973, as amended (16 U.S.C. 1531). In national parks and wildlife refuges, nonessential experimental populations are treated as threatened species, and all provisions of Section 7 of the ESA apply (50 CFR 17.83(b)). The Service is working closely with the state to develop a wolf management plan that would allow wolves in Wyoming to be removed from the list in the future. This direct final rule implements legislative language in the recently enacted, Fiscal Year 2011 appropriations bill. The Service and the states will monitor wolf populations in the Northern Rocky Mountain DPS and gather population data for at least five years.

At the end of 2011, at least 98 wolves (10 packs and 2 loners) occupied the Park. This is nearly the same size population as in 2010 (97 wolves) and represents a stable population. At the end of 2011, there were approximately 499 adult wolves consisting of 38 breeding pairs present in the Greater Yellowstone Area. At least one member of most packs is radio-collared, allowing Park and USFWS personnel to monitor the movements of all packs.

Grizzly bear (*Ursus arctos horribilis*): The Park is responsible for protecting grizzly bear populations and habitat as mandated by the Yellowstone Park Act (1872) creating the Park, the National Park Service Organic Act (1916), the National Environmental Policy Act (1969), the Endangered Species Act (1973) (ESA), and the National Parks Omnibus Management Act (1998). National Park Service policy mandates that the Park perpetuate native animal populations as part of the natural ecosystem and protect native animal populations against destruction, removal, harassment, or harm through human actions (NPS, 1998). In the late 1960's and early 1970's, garbage dumps in the Greater Yellowstone Ecosystem (GYE) where grizzly bears had fed for over 80 years were closed. Following the dump closures human-caused bear mortality increased significantly and the population declined from 312 to 136 bears. In 1975, due to the high levels of mortality combined with loss of habitat, the grizzly bear was listed as a threatened species under the authority of the Endangered Species Act (ESA). The grizzly bear population in the GYE increased from 136 bears in 1975 when it was listed as a

threatened species, to 571 grizzly bears in 2007. In April 2007, the U.S. Fish and Wildlife Service (USFWS) determined that the Greater Yellowstone Ecosystem (GYE) grizzly bear population was a distinct population segment that met all the population criteria for delisting and removed them from threatened species status. Several bear advocacy groups filed lawsuits challenging the decision. In September 2009, a Federal District Court in Missoula overturned the delisting ruling placing grizzly bears back on the threatened species list because in the judge's opinion: 1) the Conservation Strategy that guides management after delisting was unenforceable and non-binding on state and federal agencies, and 2) the USFWS did not adequately consider the impacts of the potential loss of whitebark pine nuts, a grizzly bear food source. On January 15, 2010, the Department of Justice and the U.S. Fish and Wildlife Service filed an appeal of judge Malloy's decision in the Ninth Circuit Court in San Francisco. The primary points made in the appeal were that 1) Judge Molloy's decision that the Conservation Strategy was unenforceable and therefore did not prove "Adequate Regulatory Mechanisms were in Place" made the Endangered Species Act un-workable, and 2) Judge Molloy was wrong on the whitebark pine issue, did not take into account information on whitebark pine provided in the USFWS legal briefing, and the judge should have deferred to the opinion of federal biologist experts because it is not the judges job to interpret biology. The appeal was heard in the Ninth Circuit Court on March 7, 2011. On November 22, 2011, the Ninth Circuit Court of Appeals ruled against the USFWS on the whitebark pine issue, resulting in the GYE grizzly bear population remaining on the threatened species list. The three judge panel ruled in favor of the USFWS on the issue of the Conservation Strategy, agreeing with the service that it provided adequate regulatory mechanisms to conserve bears after delisting. Management of grizzly bears in the Park has been successful in enabling grizzly bear recovery and reducing bear-human conflicts (e.g., property damage, incidents of bears obtaining human food, bear-inflicted human injuries) and human-caused bear mortalities in the Park (Gunther, 1994; Gunther and Hoekstra, 1998; Gunther et al., 2000).

As of 2011, the Yellowstone ecosystem grizzly bear population is estimated at 593 bears occupying over 12 million acres. There are more grizzly bears today, occupying a larger area, than there were in the late 1960's prior to the closure of the ecosystem garbage dumps (312 bears occupying 5 million acres). Grizzly bears now occupy areas they have been absent from for decades and are expanding into areas far outside of the recovery zone.

3.9.3 Methodology and Intensity Thresholds

Impacts to threatened species in Yellowstone National Park were evaluated by Park wildlife biologists. Federally-listed threatened and endangered species and critical habitat requiring special evaluation within the project area include: grizzly bear (*Ursus arctos horribilis)*, gray wolf (*Canis lupus*), Canada lynx (*Lynx canadensis*), and Canada lynx critical habitat. Impacts on two proposed candidate species in the project area, whitebark pine (*Pinus albicaulis*) and wolverine (*Gulo gulo*), are discussed previously (Sections 3.7.3 and 3.8.3) as they are not currently listed. Evaluations of threatened and endangered species were completed using records of sightings throughout the Park and knowledge of habitats. The evaluation of effects included direct, indirect, interrelated, interdependent, and cumulative impacts as defined by the Endangered Species Act (ESA). Consultation with the U.S. Fish and Wildlife Service (USFWS) will occur for this plan. Mitigation proposed by the Park for impacts on threatened or

endangered species could include avoidance, minimization, and conservation measures as agreed upon by the USFWS. The intensity of impacts to special status species are defined as follows:

Negligible: The action could result in a change to a population or individuals of a species or designated critical habitat, but the change would be so small that it would not be of any measurable or perceptible consequence.

Minor: The action could result in a change to a population or individuals of a species or designated critical habitat. The change would be measurable but small and localized and of little consequence. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: The action would result in some change to a population or individuals of a species or designated critical habitat. The change would be detectable and could be outside the natural range of variability. Mitigation measures, if needed to offset adverse effects, would be extensive and likely successful.

Major: The action would result in a substantial change to a population or individuals of a species or designated critical habitat. Impacts would be expected to be outside the natural range of variability and might affect the viability of at least some special-status species. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

3.9.4 Impacts of Alternative 1 (No Action)

Impacts Analysis
Under Alternative 1, fire management would continue under the 2004 Wildland Fire Management Plan. Management options with the potential to impact federally listed species within the Park would include suppression, wildland fire use incidents (fires), prescribed fire, and non-fire fuel management applications. A combination of these options could be used to promote natural fires.

Yellowstone conducted an informal programmatic Section 7 consultation under the ESA with the USFWS for effects from the 2004 FMP by providing a Programmatic Biological Assessment (PBA; dated January 31, 2005). The USFWS concurred with the Park's *May Affect, Not Likely to Adversely Affect* determinations for the threatened Canada lynx, grizzly bear, gray wolf, and bald eagle on March 28, 2005. The bald eagle has since been delisted, and critical habitat has been designated for Canada lynx. Under this alternative, the Park would follow the avoidance and minimization measures stated in the USFWS March 28, 2005 memorandum to the Park, the USFWS Conservation Measures to Minimize Fire Suppression Effects to Federally Listed Species, and the national minimum impact tactics for wildland fire. These measures are described below. In addition, fire management would submit an annual report to the USFWS that documents effects to listed species and their habitat from fires and non-fire fuels management during each fire season and any adverse effects determined under ESA Section 7 Emergency Consultations. This annual report would also identify any areas Park resource

management specialists determine may warrant suppression of a fire or avoidance of suppression activities for protection of a federally listed species.

The Section 7 consultation included the following components of the Park's fire management plan: wildland fire suppression, wildland fire use, and non-fire fuel management projects. The consultation did not include prescribed fire. Any future prescribed fire and non-fire fuel management projects would undergo separate Section 7 consultation if the Park determines a proposed project *May Affect* a federally listed species or critical habitat.

Impacts to federally listed species are similar to impacts on general wildlife species discussed in Section 3.7. The 2005 PBA indicated potential direct effects to lynx, grizzly bear, and gray wolf, that may occur during wildland fire suppression activities, wildland fire use, and non-fire fuels management projects include: 1) injury or mortality to these species from fire activities; 2) displacement from occupied habitat; and 3) temporary barriers to movements. However, anthropogenic activity associated with wildland fire suppression, monitoring wildland fire use incidents, and non-fire fuels treatment projects have a very low potential for injury/mortality, displacement, or modifying these species' movements because these fire activities would be temporary. The potential for project-related vehicle-strike mortality is discountable due to the low posted speeds of 15 mph and the slow speeds vehicles actually travel in developed areas. Potential indirect effects to Canada lynx, grizzly bear, and gray wolf that may occur from wildland fire suppression activities, wildland fire use incidents, and non-fire fuel management projects are potential changes in foraging habitat. The effects on these species are evaluated below and based on detailed information in the 2005 PBA. Additionally, the effects on Canada lynx critical habitat are addressed below.

Canada lynx: Direct effects of injury, or mortality, to lynx from wildland fire use incidents or associated smoke inhalation is highly unlikely. Wildland fires are typically small in size (less than 60 hectare; ha) and rates of fire spread would not likely exceed 0.5 miles per hour in forest habitats, a speed that a lynx could easily exceed, even through heavy deadfall. Maximum rates of spread for suppressed, high intensity fires in 1988 were typically greater than 1.25 miles per hour. Due to unfavorable moisture conditions, wildland fire use incidents would typically not occur during the May–July period when lynx use natal dens and kittens are relatively immobile. Prescribed fire and hazardous fuels treatment projects may be implemented within the next 20 years in critical boundary areas at the Northeast Entrance. Because the scope and details to assess prescribed fire project effects to listed species are currently unavailable, Section 7 consultation for prescribed fire actions would be conducted separately. Similarly, the Park would follow Section 7 Emergency Consultation procedures for determining adverse effects to listed species from wildland fire suppression on a separate basis.

Potential indirect effects that may result from wildland fire suppression activities, wildland fire use incidents, and non-fire fuels management projects include changes in denning and prey habitat. Wildland fire suppression activities would carry no significant direct effects to lynx habitat. Existing, natural fuel breaks (e.g. rock outcrops, water bodies) would be used where possible for suppression. Vegetation such as grass, shrubs, and conifers that are cut and removed to create fuel breaks would be moved back into fuel breaks post-fire to reduce establishment of new wildlife trails. Exotic vegetation introduced through wildland fire

suppression activities are unlikely to persist where overstory conifers and shrubs shade the forest understory. Indirect negative effects of routine fire suppression would occur if they prohibited natural disturbance of fires in boreal and subalpine forests that contributes to the diversity in vegetation composition and age-structure needed to sustain populations of snowshoe hares and other Canada lynx prey. Any future prescribed fire and non-fire fuel management projects would undergo separate Section 7 consultation if the Park determines that a proposed project *May Affect* lynx.

Wildland fire use incidents would not be considered a planned management activity; therefore the Park would not apply the 30 percent CLCAS threshold (Ruediger et al., 2000) in deciding whether or not to suppress a wildland fire use incident. Wildland fire use would provide significant long-term benefits to snowshoe hare and lynx habitat by promoting vegetation structure which favors both species. Forest stands aged 15–40 years that are of high value to snowshoe hares are unlikely to burn due to low flammability; mature forest stands that tend to support few hares are more likely to burn.

Canada lynx critical habitat: Naturally-ignited wildland fire is a primary natural disturbance agent in boreal and subalpine forests that contributes to the diversity in vegetation composition and age-structure needed to sustain populations of snowshoe hares and other Canada lynx prey (Agee, 2000; Ruediger et al., 2000). Consequently, wildfire is not thought to be pose significant direct or indirect threats to lynx critical habitat, and often results in beneficial effects when burned areas regenerate into lynx foraging habitat.

Direct effects to lynx critical habitat can occur when wildland fire eliminates snowshoe hare habitat immediately following a fire (Ruediger et al., 2000). Perennial herbs and grasses do reestablish very rapidly post-fire (< 2 years), as do forbs (< 4 years) and shrubs (< 12 years) (Ruediger et al., 2000; Turner et al., 2003). Large-scale fires could potentially reduce the habitat for their alternate prey, red squirrels, by eliminating mature conifers that both produce cones and that provide well-developed crowns for squirrel nesting.

On severely burned sites, lodgepole pine quickly regenerates due to the serotiny of their cones, leading to beneficial indirect effects to lynx habitat. Lodgepole pine may reach stem densities of 535,000 stems per acre two years after a fire (Turner et al., 1997). Preliminary data indicate that dense lodgepole pine regeneration is productive snowshoe hare habitat (K. Hodges, pers. comm.), although the density of post-fire lodgepole pine regeneration is highly variable, related to size of burn patch size, burn severity, and pre-fire serotiny (Turner et al., 1997; 2003). Where residual conifer density is high due to low fire intensity, post-fire regeneration may be dominated by shade-tolerant species such as Engelmann spruce and subalpine fir (Agee, 2000). Pre-fire coverage of stumps, logs, and roots useful to snowshoe hares for hiding cover and Canada lynx denning is not appreciably reduced by fire at ground level, but such coarse woody debris may increase to 60 percent coverage 50 years following a burn (Turner et al., 2003; Tinker and Knight, 2000). Wildland fire use incidents typically occur in mid-aged and mature forests which typically support few snowshoe hares, and seldom occur in 15- to 40-year-old forests (dense lodgepole pine regeneration) that may support high relative hare densities.

Indirect negative effects of wildland fire use incidents to lynx critical habitat are likely insignificant in Yellowstone. Because lynx are highly vagile, their foraging and den site selection patterns are flexible. Having evolved with disturbance agents such as fire, they are highly likely to locate and use alternative foraging and den sites in their home ranges that remain unburned. The post-fire landscape in Yellowstone is spatially heterogeneous (Turner et al. 1997, 2003). Burn perimeters often include up to 50 percent coverage of unburned and lightly burned forest patches (Perkins, 2004). These areas potentially provide temporary refuge for prey and natal dens for lynx (Agee, 2000). Canada lynx typically do not re-use the same natal den each year and distances between dens vary from several hundred meters to several kilometers (Squires, 2004).

Long-term beneficial effects of fire accrue to regeneration of conifer age classes that best support snowshoe hares and creation of woody downfall useable for lynx denning (Ruediger et al., 2000; Tinker and Knight 2000). Wildland fires and other natural disturbance processes promote snowshoe hare habitat because they encourage diversity in forest age structure and species composition (Ruediger et al., 2000). The role and importance of fire was also supported by the objectives discussed in the Northern Rockies Lynx Management Direction (NRLMD; USDA, 2007), which is currently the best available science regarding lynx. Specifically, under wildland fire management objectives of the NRLMD, Objective VEG O3 says “to use fire to restore ecological processes and maintain or improve lynx habitat (USDA, 2007).

It appears a long-term fire regime that maximizes the coverage of 13-40 year old burns is the most ideal for snowshoe hares. Burns of light or moderate intensity also enhance denning habitat for Canada lynx in the long-term because they ultimately improve woody debris such as fallen snags at ground level, while not consuming existing low-lying logs (Agee, 2000; Turner et al., 2003). Wildland fire may also increase propagation of aspen, chokecherry, and serviceberry, which are all forage used by snowshoe hares (Ruediger et al., 2000), and improve productivity of grass and forb communities, thereby improving conditions for other mid-sized small mammals and small ungulates that may serve as Canada lynx prey.

Wildland fires will not be considered a planned management activity; therefore the Park will not apply the 30 percent CLCAS guidance in deciding whether or not to suppress a wildland fire use incident. At this time, Yellowstone does not anticipate the necessity of suppressing a wildland fire use incident for protection of the lynx because of the long-term benefits to lynx from maintaining fire as a natural process. However, if future surveys, research or changes in Park resources indicate otherwise, Yellowstone will consider suppression of a wildland fire use incident to protect the lynx as a resource management objective provided that firefighter and public safety, available funding, and other Park resource objectives are met. If the Park makes a determination that specific lynx habitat warrants suppression of a wildland fire use incident, this information will be conveyed to FWS in an annual report.

Wildland fire suppression activities would carry no significant direct effects to lynx critical habitat. Existing, natural fuel breaks (e.g. rock outcrops, water bodies) will be used where possible for suppression. Disturbances to soils associated with newly-constructed fire lines and backcountry fire camps would be repaired when crews leave the area. Vegetation such as grass, shrubs, and conifers that are cut and removed to create fuel breaks will be moved back into fuel

breaks post-fire to reduce establishment of new wildlife trails. Indirect negative effects of routine fire suppression would occur if they prohibited natural disturbance of fires in boreal and subalpine forests that contributes to the diversity in vegetation composition and age-structure needed to sustain populations of snowshoe hares and other Canada lynx prey. Any future prescribed fire and non-fire fuels management projects would undergo separate Section 7 consultation if the Park determines that a proposed project *May Affect* lynx critical habitat.

All wildland fire use incidents, wildland fire suppression, prescribed fires, and non-fire fuels management projects will adhere to the minimum impact techniques and the USFWS Conservation Measures to avoid and minimize disturbances to soils. Areas burned or managed through non-fires fuels management may still contain the physical and biological features essential to lynx; those areas may still represent boreal landscapes supporting a mosaic of differing successional forest stages.

Fuels treatment projects will be monitored to detect and eradicate new exotic plant occurrences. Exotic vegetation could indirectly increase or decrease food and cover available for snowshoe hares if they became important components of forest understories (Whipple, 2004). However, exotic vegetation introduced through wildland fire suppression activities are unlikely to persist where overstory conifers and shrubs shade forest understories exist (Whipple, 2004). No extensive vegetation changes associated with suppression activity or burned acreage have been identified at this time in the park (Whipple, 2004). To minimize the introduction of exotic species and promote residual seed and sprouting from the surviving below-ground native plant parts, burned areas will not be reseeded.

Grizzly bear: The 2005 PBA indicated that temporary displacement to individual grizzly bears could occur during a large, stand-replacing fire; however, evidence shows some bears use newly burned areas. Evidence also indicates fire does not appear to affect denning sites, use of annual home ranges, or rates of movement before and after the fires. Large, stand-replacing fires could provide a short-term increase in grizzly bear food items such as ungulate carrion, thereby providing a temporary benefit to individual grizzly bears.

Because the grizzly bear is a generalist omnivore capable of successfully foraging for food over vast areas, negative impacts to grizzly bears due to fuels treatments would be discountable in areas and seasons containing only low to medium quality grizzly bear habitat. In areas with high-quality habitat, the Park would avoid implementing fuels treatments during the season(s) of highest habitat value to grizzly bears.

Temporary displacement to a grizzly bear from project-related noise and activity from equipment, vehicles, and work crews during hazardous non-fire fuels treatments is highly unlikely to occur. These activities typically occur in developed areas where the Park has a policy of hazing bears. In addition, project operations and equipment would not hinder grizzly bear movement through the project area. Thinning or burning operations would not occur during crepuscular or nocturnal time periods when grizzly bears are most likely to travel through developed areas.

The 2005 PBA stated changes in vegetative cover and composition as a result of wildland fire may affect grizzly bear foraging habitat quality; however, such effects are complex and difficult to predict. Depending on the vegetation species, fire severity and fire size, fire effects can be both positive and negative by reducing some species in the short-term but producing long-term benefit by creating a diverse habitat mosaic at different spatial scales. Wildland fire may stimulate understory species such as huckleberry and grouse whortleberry as well as increase the vegetative diversity in older lodgepole pine stands which could benefit bears in some areas. Depending on the fire severity, patch size, and other forage species factors, wildland fire may reduce the amount of whitebark pine seeds available to a grizzly bear in the short-term, but fire is important for the long-term reproduction of whitebark pine.

Frequent wildland fires may remove fir and spruce but not the more fire-resistant whitebark pine. Whitebark pine regenerates more successfully on burned sites than do other conifers, but less successfully on undisturbed sites. Wildland fire suppression may exacerbate blister rust infections and mountain pine beetle infestations in whitebark pines by inhibiting whitebark pine regeneration through increased competition with other conifers. Therefore, wildland fire suppression may result in fewer regeneration sites for whitebark pine.

There is a low potential for an increase in the establishment of forbs, such as the exotic Alsike clover, as a result of ground-disturbance and vegetation removal during hazardous fuel removal operations. Forbs could attract grizzly bears to developed areas and lead to bear-human conflicts. However, under current management within the Park, bear activity within and immediately adjacent to all developed areas is discouraged and bears that enter developments are hazed out.

Gray wolf: The 2005 PBA stated non-fire fuels management activities are unlikely to result in injury or mortality because wolves tend to avoid human developed areas. Currently no known den or rendezvous sites are within two miles of the developed areas to be treated. Thinning or burning operations would not occur during crepuscular or nocturnal time periods when wolves are most likely to travel through developed areas. Wildland fire use incidents can result in increased browse for ungulates post-fire, which would be beneficial for wolves. The Park does not anticipate the necessity of suppressing a wildland fire use incident for protection of the gray wolf because of the long-term benefits to gray wolves from maintaining fire as a natural process.

Avoidance and Minimization Measures

The PBA provided the following measures to avoid and minimize impacts to listed species during suppression activities, wildland fire use incidents, and non-fire hazard fuel treatments. Although lynx critical habitat had not yet been designated during the 2005 PBA, avoidance and minimization measures are similarly applicable to designated lynx critical habitat.

- Prior to and during the fire season, planning by fire management personnel would incorporate appropriate information on species' sensitive locations needing protection during suppression and wildland fire use incidents. Quantification of adverse effects from wildland fire use incidents to the species considered cannot be determined prior to each fire season; however

the types of effects can be predicted and areas identified that may warrant suppression of a wildland fire use incident in the future. Although Park biologists have not identified those locations or areas that warrant suppression of a wildland fire use incident to protect listed species at this time, the Park is aware resource conditions may change over time and/or research may demonstrate suppression of a wildland fire use incident is necessary to protect a listed species.

- The Park would conduct Section 7 emergency consultation with the Service in the event a fire management action may affect or is likely to adversely affect a listed species or critical habitat.

- The Park would submit a brief annual report to the Service after each fire season and prior to May 1 of the subsequent fire season that includes the following information: 1) number of acres of mapped Canada lynx suitable habitat within Lynx Analysis Units (LAU) affected by wildland fire suppression activities, wildland fire use incidents, non-fire fuels management, and Section 7 emergency consultations in the previous fire season; 2) proposed hazard fuel treatments for the upcoming fire season and quantification of impacts to habitat quality, if requested by the Service; and 3) any recommended locations/areas for suppression of a wildland fire use incident to protect listed species.

At this time, the Park does not anticipate the necessity of suppressing a wildland fire use incident for protection of the lynx, lynx critical habitat, grizzly bear, or gray wolf because of the long-term benefits to these species and habitat from maintaining fire as a natural process. However, if future surveys, research or changes in Park resources indicate otherwise the Park would consider suppression of a wildland fire use incident to protect these species as a resource management objective, provided that firefighter and public safety, available funding, and other Park resource objectives are met. If the Park has species' habitat concerns that warrant suppression of a wildland fire use incident, this information would be conveyed to the Service in an annual report.

Conservation Measures

The PBA provided the following conservation measures to avoid and minimize impacts to listed species during suppression activities, wildland fire use incidents, and non-fire hazard fuel treatments.

- Avoid and/or minimize helicopter activity associated with suppression activities, wildland fire use monitoring, and non-fire hazard fuel reduction treatments within 1.6 kilometers (1 mile) of known active lynx den sites and/or suspected denning areas May 1-July 31.

- Avoid low-level aircraft flights in occupied grizzly bear habitat and open alpine meadows used by grizzly bears when possible and within 1.6 kilometers from known active wolf dens or rendezvous sites between April 15 and August 1.

- Locate backcountry firefighter camps greater than 1.6 kilometers (1 mile) from known active lynx dens and wolf dens or rendezvous sites. To minimize human-wildlife interactions, each

camp would be attended by a resource advisor who enforces camp protocols and a caretaker to maintain the camp in the absence of firefighters. Large firefighter camps (greater than 100 people) would be strictly limited to pre-existing disturbed sites (e.g., baseball fields) in the vicinity of developed areas and roads. Fire crews would be trained in and use *Best Management Practices* for reducing the chances of bear and wolf conflicts with fire suppression efforts, including training crews in food storage, actions to prevent encounters on the fireline, how to react to bear and wolf encounters, how to react to charging bears, use of bear spray, and placement and management of front-country fire camps and backcountry spike camps to avoid conflicts with bears and wolves. Bear-proof food storage boxes would be used for food and garbage storage in all backcountry fire camps. Bear-proof garbage cans and dumpsters would be used in all front-country fire camps. Best bear management practices are used on all wildland fire incidents within the Park.

- Avoid implementation of non-fire fuel treatments within 1.6 kilometer (1 mile) of known active lynx den sites and/or suspected denning areas between May 1 and July 31, known grizzly bear den sites between November 15 and April 15, and known active gray wolf den or rendezvous sites between April 15 and August 1.

<u>Additional conservation measures specific to Canada lynx and lynx critical habitat</u>
- Within LAUs, minimize size of linear openings created as fuel breaks and soil disturbances.
- Leave clumps of dense lodgepole pine, shrubs, and woody debris to the maximum extent possible to provide cover for snowshoe hares within fuels treatment sites.
- Incorporate seasonal timing of denning and kitten mobility, projected burn size, speed, pattern and intensity, terrain characteristics, fire history and existing vegetation structure in the area as they relate to requirements of lynx and snowshoe hares during planning for wildland fire use incidents.

<u>Additional conservation measures specific to grizzly bear</u>
- No firearms would be allowed except by specified personnel.
- All grizzly bear/human confrontations would be reported to the Yellowstone Center for Resources, Mammoth Hot Springs, Wyoming, and the Resource Advisor.
- Avoid removal/thinning of whitebark pine trees in hazard fuel reduction treatments.
- Design Burned Area Emergency Rehabilitation Plans to avoid and minimize attracting grizzly bears to reclamation areas in developed and high-risk areas.
- Monitor for occurrences and establishment of exotic vegetation invasions following fuels treatments and suppression activities, if sufficient funding is available.
- Continue with the Park's management practice of hazing bears out of developed areas to reduce the potential for conflicts with people, including bear attacks.
- All proposed hazard fuel treatment projects would adhere to the Park's Bear Management Area seasonal restrictions to avoid displacement of bears from prime food sources and minimize bear/human habituation and injuries.

Effects determination

Canada lynx: Under continuation of the 2004 Fire Management Plan, fire management actions *may affect, but is not likely to adversely affect* Canada lynx. Wildland fire use may have

temporary and localized negative effects on lynx, but these effects do not rise to the level of adverse with implementation of the proposed avoidance and minimization measures. Lynx have evolved in association with landscapes strongly influenced by fire, the primary forest disturbance agent within the Greater Yellowstone Ecosystem (GYE), are highly vagile, and are adaptable to changing ecological conditions. Lynx are readily able to locate alternative den and foraging sites if wildland fire use incidents burn through them.

By annually incorporating the best available survey and research information on lynx and snowshoe hares in decisions regarding fire management both during and outside of the fire season, any short-term, negative effects related to wildland fire use incidents would be avoided. Wildland fire use would provide significant long-term benefits to snowshoe hares and lynx habitat by promoting vegetation structure that favors snowshoe hares and lynx. Forests stands of 15–40 years age are often of high value to snowshoe hares are unlikely to burn due to low flammability; mature forest stands are more likely to burn, but support few hares.

None of the proposed hazard fuel treatments under the 2004 Fire Management Plan occurred within LAUs; therefore no adverse effects on lynx are expected.

Adverse effects to the Canada lynx from wildland fire suppression activities would be handled through Section 7 Emergency Consultation procedures.

Canada lynx critical habitat: Under continuation of the 2004 Fire Management Plan, fire management actions *may affect, but is not likely to adversely affect* Canada lynx critical habitat. Wildland fire use may have temporary and localized negative effects on critical habitat by eliminating snowshoe hare habitat immediately following a fire, but these effects do not rise to the level of adverse given the long-term benefits of fire for lynx and hare habitat, along with implementation of proposed avoidance and minimization measures. Lynx have evolved in association with landscapes strongly influenced by fire, the primary forest disturbance agent within the Greater Yellowstone Ecosystem (GYE), are highly vagile, and are adaptable to changing ecological conditions. Lynx are readily able to locate alternative den and foraging sites if wildland fire use incidents burn through them.

By annually incorporating the best available survey and research information on lynx and snowshoe hares in decisions regarding fire management both during and outside of the fire season, any short-term, negative effects related to wildland fir use incidents would be avoided. Wildland fire use would provide significant long-term benefits to snowshoe hares and lynx habitat by promoting vegetation structure that favors snowshoe hares and lynx. Forests stands of 15–40 years age are often of high value to snowshoe hares are unlikely to burn due to low flammability; mature forest stands are more likely to burn, but support few hares.

None of the proposed hazard fuel treatments under the 2004 Fire Management Plan occurred within LAUs; therefore no adverse effects on critical habitat are expected.

Adverse effects to the lynx critical habitat from wildland fire suppression activities would be handled through Section 7 Emergency Consultation procedures.

Grizzly bear: Under continuation of the 2004 Fire Management Plan, fire management actions *may affect, but is not likely to adversely affect* grizzly bear with implementation of the proposed avoidance and minimization measures. Wildland fire use may have a combination of both positive and negative effects, depending on burn severity, patch size, and habitat type, but these effects do not rise to the level of adverse with implementation of the proposed conservation measures. Grizzly bears have evolved in association with landscapes strongly influenced by fire, the primary forest disturbance agent within the GYE, are highly vagile, and are adaptable to changing ecological conditions. Wildland fire use incidents would provide long-term benefits to grizzly bears by maintaining natural ecosystem processes. Suppression of wildland fire use incidents in habitat important for grizzly bears would be considered if research and Park management determines it to be important for their protection. The Park would annually incorporate the best available survey and research information on grizzly bears in decisions regarding fire management both during and outside of the fire season. Adverse effects to the grizzly bear from wildland fire suppression activities would be handled through Section 7 Emergency Consultation procedures.

Under the 2004 FMP, hazard fuel treatments would occur within grizzly bear habitat. Impacts to high quality grizzly bear habitat in the hazardous non-fire fuel management project areas would not be quantified until actual treatment boundaries are determined closer to the implementation date of each project. If requested by the USFWS, the Park would include a quantification of the number of acres of grizzly bear habitat quality affected from any hazardous fuels treatments proposed for the following year in the annual report submitted to USFWS. The Park has determined even without this quantification of impacts to high grizzly bear habitat, the effects from fuel treatments in the 2004 proposed project areas are discountable with implementation of the avoidance and conservation measures.

Gray wolf: Under continuation of the 2004 Fire Management Plan, fire management actions *may affect, but is not likely to adversely affect* the gray wolf with implementation of the proposed avoidance and minimization measures. Gray wolves are adapted to landscapes strongly influenced by fire, the primary forest disturbance agent within the GYE, are highly vagile, and are adaptable to changing ecological conditions. Wildland fire use would provide significant long-term benefits to gray wolves by maintaining natural ecosystem processes. Effects from wildland fire suppression, wildland fire use, and non-fire fuels treatments do not rise to the level of adverse with implementation of the proposed avoidance and minimization measures.

Wildland fire suppression activities are not likely to adversely affect gray wolves with implementation of the proposed conservation minimum impact fire tactics (MIST) and USFWS conservation measures. Adverse effects to the gray wolf from suppression activities would be handled through Section 7 Emergency Consultation procedures. Under the 2004 plan, none of the proposed hazard fuel treatments are within two miles of known den sites. The best available survey and research information on gray wolves regarding denning and rendezvous sites would be incorporated in annual fire management decisions. Non-fire fuel management project activities would avoid known active den or rendezvous sites in the event new ones are established within one mile of a project area.

Cumulative Effects

Cumulative impacts for federally listed species and critical habitat are those future State, local or private actions that are reasonably certain to occur in the project area. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7(a)(2) of the Act.

The project area is entirely within Yellowstone National Park and there are no private in-holdings within the Park. The vast majority of the surrounding lands adjacent to the Park are federally owned by USFS, with the exception of the small gateway communities of West Yellowstone, Gardiner, Silver Gate, and Cooke City, and possible private in-holdings on USFS lands.

Ongoing administrative activities such as road reconstruction and maintenance, backcountry operations, hazing activities, and facilities maintenance would continue to have adverse effects on federally listed species in the Park. These would cause temporary displacement of species from generalized disturbance; feeding and resting behavior of wildlife species may be interrupted and some special status plant species may be adversely impacted from equipment working in construction areas. Use of trails and backcountry campsites and cabins could also temporarily displace or disrupt species. Effects from these activities would be direct, short-term, and negligible because of the limited duration of the activity. Hazing activities usually take place near developed areas where wildlife have become habituated to the presence of humans. The grizzly bear and wolf are the two species most likely affected by hazing activities. Most facilities maintenance would take place in developed areas where minimal impacts to listed species would occur. However, adverse impacts to some species may occur because they are disturbed by noise and people associated with maintenance activities. Park visitation is expected to increase each year as a result of population growth in nearby communities and elsewhere. Future recreational use, such as fishing, camping, and hiking would continue Park wide. These activities could lead to negligible to minor adverse impacts because special status species can become disturbed from human activity. Outside of the Park, future hunting regulations for gray wolves would have an adverse effect on the population, but compliance with the individual state's wolf management plans would ensure genetic viability and survival of the species.

Conclusion

Impacts under Alternative 1 would be negligible to minor, short- to long-term, and adverse or beneficial. It is unlikely that any federally protected species would be harmed by the fire management activities, and may benefit from post fire conditions. Some displacement due to fire management activity, habitat loss and degradation would occur, although impacts would be short-term and not jeopardize continued existence of species. Short-term benefits would also occur from managing vegetation and habitat for natural resource objectives. Habitat could be enhanced or created, and likely to have long-term benefits to listed species. Avoidance measures and mitigation would be used to protect federally listed species.

3.9.5 Impacts of Alternative 2 (Proposed Action)

Impacts Analysis
Impacts to federally listed species under Alternative 2 would be similar to impacts discussed under Alternative 1. Under this alternative, the 2004 FMP would be replaced with the 2012 FMP. Management options with the potential to impact federally listed species within the Park would include unplanned wildfire response strategies (i.e. monitor, point/zone protection, and suppression strategies), prescribed fire, and non-fire fuel management applications. A combination of these options could be used to promote natural processes.

As response to unwanted wildland fires would occur more quickly because of predetermined fire management suppression strategy zones under Alternative 2 than Alternative 1, the size of unwanted fires would likely be smaller within the strategy zones, burning less habitat area and displacing fewer species for shorter amounts of time. This could result in lower adverse impacts on species of concern under Alternative 2 than under Alternative 1. Unplanned wildfire response strategies, such as using a monitor strategy, would be managed for specific objectives, such as perpetuating natural processes and healthy ecosystems, also resulting in fewer adverse effects on species of concern and leading to long-term benefits on habitat quality.

Impacts to federally listed species under Alternative 2 are similar to those discussed under Alternative 1 (sec. 3.8.4). Specifically, as described in the 2005 PBA, there is potential direct effects to lynx, lynx critical habitat, grizzly bear, and gray wolf, that may occur during wildland fire suppression strategies, monitor strategy fires, and non-fire fuels management projects include: 1) injury or mortality to these species from fire activities; 2) displacement from occupied habitat, and 3) temporary barriers to movements. Similar effects would occur under prescribed fires proposed under Alternative 2. However, anthropogenic activity associated with wildland fire suppression, monitor strategy, prescribed fires, and non-fire fuel treatment projects have a very low potential for injury/mortality, displacement, or modifying these species' movements because these fire activities would be temporary. The potential for project-related vehicle-strike mortality is discountable due to the low posted speeds of 45 mph, and the slow speeds vehicles actually travel in developed areas. Potential indirect effects to Canada lynx, lynx critical habitat, grizzly bear, and gray wolf that may occur from wildland fire suppression strategies, monitor strategies, prescribed fires, and non-fire fuel management projects are potential changes in foraging habitat. Specific to lynx critical habitat, fire management actions promoting natural fire processes, such as monitor strategy fires, support objectives discussed in the Northern Rockies Lynx Management Direction (NRLMD; USDA, 2007), which is currently the best available science regarding lynx. Specifically, under wildland fire management objectives of the NRLMD, Objective VEG O3 says "to use fire to restore ecological processes and maintain or improve lynx habitat (USDA, 2007).

Any future prescribed fire and non-fire fuel management projects would undergo separate Section 7 consultation if the Park determines a proposed project *May Affect* a federally listed species or critical habitat.

The effects on each species were evaluated under Alternative 1, and based on detailed information in the 2005 PBA.

Canada lynx: Direct and indirect effects as described under Alternative 1

Canada lynx critical habitat: Direct and indirect effects as described under Alternative 1

Grizzly bear: Direct and indirect effects as described under Alternative 1.

Gray wolf: Direct and indirect effects as described under Alternative 1.

Avoidance and Minimization Measures

Similar to Alternative 1, the Park would follow the avoidance and minimization measures stated in the USFWS March 28, 2005 memorandum to the Park, the USFWS Conservation Measures to Minimize Fire Suppression Effects to Federally Listed Species, and the national minimum impact tactics for wildland fire. Measures described to avoid and minimize impacts to listed species during suppression strategies, monitor strategies, point/zone protection strategies, and non-fire hazard fuel treatments under Alternative 1 would also be applied to any prescribed fires proposed under Alternative 2. The Park's fire management would continue to submit an annual report to the USFWS that documents effects to listed species and their habitat from fires and non-fire fuel management during each fire season and any adverse effects determined under ESA Section 7 Emergency Consultations. This annual report would also identify any areas Park resource management specialists determine may warrant suppression of a fire or avoidance of suppression activities for protection of a federally listed species.

Conservation Measures

Similar to Alternative 1, the Park would follow conservation measures to avoid and minimize impacts to listed species and critical habitat during suppression strategies, monitor strategy fires, and non-fire fuel treatments. These measures would also be applied to any prescribed fires proposed under Alternative 2.

Effects determination

Canada lynx: Under Alternative 2, fire management actions *may affect, but is not likely to adversely affect* Canada lynx. Wildfire response strategies, such as using a monitor strategy, may have temporary and localized negative effects on lynx, but these effects do not rise to the level of adverse with implementation of the proposed avoidance and minimization measures. Lynx have evolved in association with landscapes strongly influenced by fire, the primary forest disturbance agent within the GYE, are highly vagile, and are adaptable to changing ecological conditions. Lynx are readily able to locate alternative den and foraging sites if a monitor strategy fire were to burn through them.

By annually incorporating the best available survey and research information on lynx and snowshoe hares in decisions regarding fire management both during and outside of the fire season, any short-term, negative effects related to a monitor strategy fire would be avoided. A monitor strategy fire would provide significant long-term benefits to snowshoe hares and lynx

habitat by promoting vegetation structure that favors snowshoe hares and lynx. Forests stands of 15–40 years age which are often of high value to snowshoe hares are unlikely to burn due to low flammability; mature forest stands are more likely to burn, but support few hares.

Any future prescribed fire and non-fire fuel management projects that would occur in LAUs would undergo separate Section 7 consultation if the Park determines that a proposed project *May Affect* lynx or lynx critical habitat.

Adverse effects to the Canada lynx from wildland fire suppression strategies would be handled through Section 7 Emergency Consultation procedures. Wildland fire suppression strategies are not likely to adversely affect lynx with implementation of the proposed conservation minimum impact fire tactics (MIST) and USFWS conservation measures.

Canada lynx critical habitat: Under Alternative 2, fire management actions *may affect, but is not likely to adversely affect* Canada lynx critical habitat. Wildfire response strategies, such as using a monitor strategy, may have temporary and localized negative effects on critical habitat by eliminating snowshoe hare habitat immediately following a fire, but these effects do not rise to the level of adverse given the long-term benefits of fire for lynx and hare habitat, along with implementation of proposed avoidance and minimization measures. Lynx have evolved in association with landscapes strongly influenced by fire, the primary forest disturbance agent within the Greater Yellowstone Ecosystem (GYE), are highly vagile, and are adaptable to changing ecological conditions. Lynx are readily able to locate alternative den and foraging sites if monitor strategy fires burn through them.

By annually incorporating the best available survey and research information on lynx and snowshoe hares in decisions regarding fire management both during and outside of the fire season, any short-term, negative effects related to unplanned monitor strategy fires would be avoided. A monitor strategy fire would provide significant long-term benefits to snowshoe hares and lynx habitat by promoting vegetation structure that favors snowshoe hares and lynx. Forests stands of 15–40 years age are often of high value to snowshoe hares are unlikely to burn due to low flammability; mature forest stands are more likely to burn, but support few hares.

Any future prescribed fire and non-fire fuel management projects that would occur in lynx critical habitat would undergo separate Section 7 consultation if the Park determines that a proposed project *May Affect* lynx critical habitat.

Adverse effects to the Canada lynx critical habitat from wildland fire suppression strategies would be handled through Section 7 Emergency Consultation procedures. Wildland fire suppression strategies are not likely to adversely affect lynx with implementation of the proposed conservation minimum impact fire tactics (MIST) and USFWS conservation measures.

Grizzly bear: Under Alternative 2, fire management actions *may affect, but is not likely to adversely affect* grizzly bear with implementation of the proposed avoidance and minimization measures. Wildfire response strategies, such as using a monitor strategy, may have a combination of both positive and negative effects, depending on burn severity, patch size, and

habitat type, but these effects do not rise to the level of adverse with implementation of the proposed conservation measures. Grizzly bears have evolved in association with landscapes strongly influenced by fire, the primary forest disturbance agent within the GYE, are highly vagile, and are adaptable to changing ecological conditions. A monitor strategy fire would provide long-term benefits to grizzly bears by maintaining natural ecosystem processes. Using a wildfire suppression strategy instead of a monitor strategy in habitat important for grizzly bears would be considered if research and Park management determines it to be important for their protection. The Park would annually incorporate the best available survey and research information on grizzly bears in decisions regarding fire management both during and outside of the fire season. Wildland fire suppression strategies are not likely to adversely affect grizzly bears with implementation of the proposed conservation minimum impact fire tactics and USFWS conservation measures. Adverse effects to the grizzly bear from wildland fire suppression strategies would be handled through Section 7 Emergency Consultation procedures.

Under Alternative 2, future hazard fuel treatments and prescribed fires are likely to occur within grizzly bear habitat. Impacts to high quality grizzly bear habitat in the hazardous non-fire fuels management and prescribed fires project areas would not be quantified until actual treatment boundaries are determined closer to the implementation date of each project. If requested by the USFWS, the Park would include a quantification of the number of acres of grizzly bear habitat quality affected from any hazardous fuels treatments proposed for the following year in the annual report submitted to USFWS. The Park has determined even without this quantification of impacts to high grizzly bear habitat, the effects from fuel treatments and prescribed fires under Alternative 2 are discountable with implementation of the avoidance and conservation measures.

Gray wolf: Under Alternative 2, fire management actions *may affect, but is not likely to adversely affect* the gray wolf with implementation of the proposed avoidance and minimization measures. Gray wolves are adapted to landscapes strongly influenced by fire, the primary forest disturbance agent within the GYE, are highly vagile, and are adaptable to changing ecological conditions. Monitor strategy fires would provide significant long-term benefits to gray wolves by maintaining natural ecosystem processes. Effects from wildland fire suppression, monitor strategy fires, and non-fire fuel treatments do not rise to the level of adverse with implementation of the proposed avoidance and minimization measures.

Wildland fire suppression strategies are not likely to adversely affect gray wolves with implementation of the proposed conservation minimum impact fire tactics (MIST) and USFWS conservation measures. Adverse effects to the gray wolf from suppression strategies would be handled through Section 7 Emergency Consultation procedures. Under Alternative 2, future hazard fuel treatments and prescribed fires are likely to occur within wolf habitat. The best available survey and research information on gray wolves regarding denning and rendezvous sites would be incorporated in annual fire management decisions. Non-fire fuel management and prescribed fire project activities would avoid known active den or rendezvous sites in the event that new ones are established within one mile of a project area.

Cumulative Effects

Cumulative impacts for federally listed species are those future State, local or private actions that are reasonably certain to occur in the project area. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7(a)(2) of the Act.

The project area is entirely within Yellowstone National Park and there are no private in-holdings within the Park. The vast majority of the surrounding lands adjacent to the Park are federally owned by USFS, with the exception of the small gateway communities of West Yellowstone, Gardiner, Silver Gate, and Cooke City, and possible private in-holdings on USFS lands.

Ongoing administrative activities such as road reconstruction and maintenance, backcountry operations, hazing activities, and facilities maintenance would continue to have adverse effects on federally listed species in the Park. These would cause temporary displacement of species from generalized disturbance; feeding and resting behavior of wildlife species may be interrupted and some special status plant species may be adversely impacted from equipment working in construction areas. Use of trails and backcountry campsites and cabins could also temporarily displace or disrupt species. Effects from these activities would be direct, short-term, and negligible because of the limited duration of the activity. Hazing activities usually take place near developed areas where wildlife have become habituated to the presence of humans. The grizzly bear and wolf are the two species most likely affected by hazing activities. Most facilities maintenance would take place in developed areas where minimal impacts to listed species would occur. However, adverse impacts to some species may occur because they are disturbed by noise and people associated with maintenance activities. Park visitation is expected to increase each year as a result of population growth in nearby communities and elsewhere. Future recreational use, such as fishing, camping, and hiking would continue Park wide. These activities could lead to negligible to minor adverse impacts because special status species can become disturbed from human activity. Outside of the Park, future hunting regulations for gray wolves would have an adverse effect on the population, but compliance with the individual state's wolf management plan would ensure genetic viability and survival of the species.

Conclusion

Impacts under Alternative 2 would be negligible to minor, short- to long-term, and adverse or beneficial. It is unlikely that any federally protected species would be harmed by fire management activities, and may benefit from post fire conditions. Some displacement due to fire management activity, habitat loss and degradation would occur, although impacts would be short-term and not jeopardize continued existence of species. Short-term benefits would also occur from managing vegetation and habitat for natural resource objectives. Habitat could be enhanced or created, and likely to have long-term benefits to listed species. Avoidance measures and mitigation would be used to protect federally listed species.

3.10 VISITOR USE AND EXPERIENCE

3.10.1 Affected Environment

Visitor Use

Recreational visitation to Yellowstone National Park has grown by more than 14 percent in the last 15 years, from 3,125,285 in 1995 to 3,640,185 in 2010 (NPS, 2010c). The summer months (June, July, and August) are the primary visitation season in Yellowstone, although the spring and fall have grown in popularity. Approximately 64 percent of visitation occurs in the peak seasons during these three months. During the peak season, facilities such as campgrounds, lodges, visitor centers, restaurants, service stations, and shops are used at or beyond capacity.

More than 75 percent of visitor use within the Park is concentrated in the major developed areas. The primary recreational activities that visitors participate in include viewing wildlife, photography, walking, and exploring visitor centers. Other activities include fishing, camping, hiking, horseback riding, and boating. Only nine percent of visitors take a backcountry trail, and only one percent uses the backcountry campsites (NPS, 2000).

More than 90 percent of the Park is considered backcountry and managed as wilderness. Much of the Park's backcountry has not been developed, with the exception of the 1,100 mile trail system, a network of 287 designated campsites, and 41 ranger patrol cabins and lookouts.

Visual Resources

Visual resources consist of landform (topography and hydrology) and land cover (vegetation, buildings, roads, etc.). Visual resources are centered on significant features and intrinsic features. Also included is visibility of the undertaking, such as exposure and location (NPS, 2007b).

The Greater Yellowstone Area is world renowned for its scenery, wildlife, wilderness, rivers, fishing, hunting, outdoor recreation opportunities, and geologic and thermal features. The natural landscape is rugged and formidable due to the rapid gains in elevation, and most of the area remains in a wilderness state. These visual resources within Yellowstone National Park fall into two general zones – the natural zone and the park development zone (NPS, 2007b).

Vehicle pullouts in the Park are designed for visitors to stop and experience the visual resources, and are placed in areas where visitors are inclined to stop to view valley lowlands off the main loop roads and other aesthetically pleasing features in the Park. Some locations include the open areas within Hayden Valley, Old Faithful/Firehole River area, the Madison River (past Seven-Mile Bridge), Indian Creek in the Mammoth area, the Norris Campground, Gibbon Meadows, Elk Park, and others (NPS, 2007b).

3.10.2 Methodology

Impact analyses on visitor experience and visual resources were based on recent assessments of the Park, by Park and other NPS staff, previous studies or projects conducted within the same area, and assessment of potential changes caused by fire management.

The thresholds of change for the intensity of an impact on visitor experience and visual resources are defined as follows:

Negligible: Changes in visitor use and/or experience would be below or at the level of detection. The visitor would not likely be aware of the effects associated with the alternative.

Minor: Changes in visitor use and/or experience would be detectable, although the changes would be slight. The visitor would be aware of the effects associated with the alternative, but the effects would be slight.

Moderate: Changes in visitor use and/or experience would be readily apparent. Some visitors to the Park would be affected. The visitor would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes.

Major: Changes in visitor use and/or experience would be readily apparent and severely adverse or exceptionally beneficial. Many visitors to the Park would be affected. The visitor would be aware of the effects associated with the alternative and would likely express a strong opinion about the changes.

3.10.3 Impacts of Alternative 1 (No Action)

Impacts Analysis
Under Alternative 1, wildland fire management would continue under the 2004 FMP. Impacts to visitor use and experience would occur as a result of wildfire intensity and location, as well as fire management activities including suppression, wildland fire use, prescribed fire, and non-fire fuel management. Wildfires would have short-term, adverse effects on visitor use and experience from smoke that reduces visibility and causes health problems and from closures of areas of the Park for safety.

Disruptions, such as temporary closures of roads, developed areas or backcountry areas could result in a decrease in visitor use due to limited accessibility. The extent of these disruptions would vary depending on the size, location, and duration of each fire. This could result in moderate, adverse, short-term, localized impacts to visitor experience.

Fires that would require a suppression response could disrupt recreational opportunities and visitation during the incident. These adverse impacts would likely be short-term and include such possibilities as certain areas being closed to public entrance, facilities being closed or inaccessible, and opportunities (such as wildlife viewing or hiking) being disrupted by the fire, smoke, or associated management activities. Fires would also require notification and possible evacuation of visitors. In the event of a wildfire, visitor protection rangers would attempt to locate any visitors in areas that might be affected by the wildfire.

Direct adverse impacts of wildland fire use incidents may include minor displacement of some visitor activities, but it would likely be limited to a few hours or days over the course of a year in total. There would be an incremental increase in smoke in scenic views, odor production,

temporary restrictions in access to some areas, and temporarily blackened vegetation. Smoke production would be of limited duration, usually lasting a few hours to a few days. Exceptions may occur when meteorological conditions, such as an inversion, exist and smoke may linger for a longer period of time.

Some visitors would be disappointed to see blackened areas following a wildfire. This would be a short-term, adverse, localized effect that would persist until vegetation regrows. Blackened areas usually green up within a few days to a few months. The visitor experience would improve when green vegetation grows back and wildflowers emerge in the spring.

Planned fires, or prescribed fires would generally be scheduled at times when visitation is lower, and visitors would be alerted to temporary closures during burns. Health hazards to visitors from smoke from prescribed fires would be negligible because visitors would not be in smoky areas long enough to suffer adverse effects and because visitors who are sensitive to smoke would be warned about the fires.

Whether a prescribed fire has a negative or a positive effect on visitors and their experience depends on the attitude of visitors and their knowledge and understanding of the role of fire in ecosystems. Some visitors would appreciate the ecological rationale for conducting prescribed burns and their experience would not be adversely affected by short-term closures, reduced visibility from smoke, and the appearance of burned vegetation following a prescribed fire. Other visitors would be opposed to prescribed fires because of the potential for a wildfire from an escaped prescribed fire, the effects of smoke on visibility and health, and the appearance of burned areas immediately after a fire. This effect would persist for different lengths of time depending on the vegetation type that was burned and the severity of the fire. The presence of fire, smoke, and blackened areas presents an opportunity for education and interpretation of natural values and processes which may provide a long-term, beneficial effect.

Limited visibility from smoke and fire damage would result in a decrease in visual quality. Smoke, particulate matter, and dust emissions would degrade visibility in the Park and surrounding area. Smoke particulates could remain suspended in the atmosphere for a few days to several months. Very small particulates can travel great distances and add to regional haze problems, but decreased visibility from smoke would be a short-term, localized, adverse effect. Blackened areas or landscapes could impact visual quality in the short-term following a fire; however, in the long-term effects would be beneficial as ultimately an area would be more natural in setting and viewscape.

Smoke events associated with prescribed burns would be short-lived, on the order of a few hours to a few days. Ignition design and timing can minimize smoke production and avoid periods where inversions are likely so burning would not generate much smoke. Prescribed burns would occur in only a small percentage of the Park, thus would not contribute more than a negligible amount of visual degradation.

Through careful application of manual and mechanical clearing to reduce hazard fuel, minor visual impacts may occur in the form of thinning vegetation. Manual and mechanical projects would take place during low visitation periods, therefore reducing impacts to visitors. Removal

of hazard fuel would be managed to create as little visual impact or change in scenic vistas as possible.

Cumulative Effects

Facilities and development that have been established in the past within Yellowstone have had beneficial effects on the visitor experience as they have provided access to the Park and allowed visitors to enjoy amenities while in the backcountry. There are several ongoing projects taking place in and around the Park. Projects that could potentially impact visitor use and experience include road and housing construction, as well as actions to protect developed areas from fires through hazard fuel removal. Although several construction and maintenance projects are planned over the next 20 plus years, the major emphasis of these projects is to replace, repair, and rehabilitate existing facilities that are approaching the end of their service life. Where new facilities are proposed, they would be concentrated in, and adjacent to existing developed areas to minimize the creation of new, isolated developments. Because there are no future development actions planned for backcountry areas, negligible cumulative effects to visitor use and experience at backcountry sites would be anticipated.

The cumulative impact on visitor use and experience from such actions would result in minor, adverse and moderate beneficial impacts. Alternative 1 would contribute minor to moderate, adverse cumulative impacts on visitor use and experience. Combined with known past, current, and future projects and actions, there would be minor, adverse and moderate beneficial cumulative impacts on visitor use and experience.

Conclusion

Impacts of Alternative 1 on visitor use and experience would be negligible to moderate, short-term, localized, and adverse due to short episodes of decreased visibility, from closures of areas of the Park for safety, and from burned vegetation. Longer-term adverse impacts would include contributions to regional haze and the possibility of wind-blown dust near the burned areas. Areas blackened by fires would have short-term, adverse impacts on visual quality, but long-term, beneficial effects as vegetation recovers.

3.10.4 Impacts of Alternative 2 (Proposed Action)

Impacts Analysis

Under this alternative, the 2004 FMP would be replaced with the 2012 FMP. Impacts to visitor use and experience under Alternative 2 would be similar to impacts discussed for Alternative 1.

Although there would be automatic wildfire suppression in the suppression strategy zones under this alternative, until fires could be extinguished, smoke, particulate matter, and dust emissions would degrade visibility in the Park and surrounding area. A quicker response under this alternative due to predetermined strategy zones would result in decreased adverse effects on visitor use as the duration that areas are closed, and other impacts described under Alternative 1, would decrease. Impacts on visual resources would decrease as well with a faster response time to unwanted fire within the suppression strategy zones, leading to reductions in smoke and particulate matter as fires would be suppressed more quickly.

Under Alternative 2, the IDT process would be more streamlined and efficient. All non-emergency projects (i.e. prescribed fire, fuel reduction) would be planned by the IDT, resulting in benefits to visitor use and experience as all efforts would be made to implement projects during low visitation and as expeditiously as possible so as to cause minimal disruptions.

Using a wildfire management strategy, such as a monitor or point/zone protection strategy under this alternative would be managed according to goals and objectives rather than specific prescriptions as in Alternative 1. This approach may allow for more acres of wildfireto burn and perpetuate natural processes. Additional burned acreage could lead to more frequent and/or longer duration of fire management activities, in turn adversely affecting visitor use and experience due to more smoke that reduces visibility and causes health problems, longer closures of areas of the Park for safety, and more acreage of burned vegetation than under Alternative 1. However, the ecological benefits of wildfires would be appreciated and welcome by some visitors.

Cumulative Effects

Facilities and development that have been established in the past at Yellowstone have had beneficial effects on the visitor experience as they have provided access to the Park and allowed visitors to enjoy amenities while in the backcountry. There are several ongoing projects taking place in and around the Park. Projects which could potentially impact visitor use and visual resources include road and housing construction, as well as programs to protect developed areas from fires through fuel removal. Although several construction and maintenance projects are planned over the next 20 plus years, the major emphasis of these projects is to replace, repair, and rehabilitate existing facilities that are approaching the end of their service life. Where new facilities are proposed, they would be concentrated in and adjacent to existing developed areas to minimize the creation of new, isolated developments. Because there are no future development actions planned for backcountry areas, negligible cumulative effects to visitor use and experience at backcountry sites would be anticipated.

The cumulative impact on visitor use and experience from such actions would result in minor, adverse and moderate beneficial impacts. Alternative 2 would contribute negligible to moderate, adverse cumulative impacts on visitor use and experience. Combined with known past, current, and future projects and actions, there would be minor, adverse and moderate beneficial cumulative impacts on visitor use and experience.

Conclusion

Impacts of Alternative 2 on visitor use and experience would be negligible to minor, short-term, localized, and adverse due to short episodes of decreased visibility, from closures of areas of the Park for safety, and from burned vegetation. Longer-term adverse impacts would include contributions to regional haze and the possibility of wind-blown dust near the burned areas. Areas blackened by fires would have short-term, adverse impacts on visual quality, but long-term, beneficial effects as vegetation recovers. Overall, impacts under this alternative would be reduced as compared to Alternative 1 with a quicker response time to unwanted wildfires within the predetermined suppression strategy zones, and an IDT process approach for all hazard fuel and prescribed fire projects.

3.11 CULTURAL RESOURCES **(Archeological Resources, Historic Resources, Cultural Landscapes, Ethnographic Resources)**

3.11.1 Affected Environment

Archeological Resources

Humans have occupied the GYA for more than 11,000 years. Currently archeological evidence indicates the majority of the use of the Park occurred during non-winter months, and was less intense during the recent Little Ice Age (A.D. 1400-1860) than in the previous millennia. At least 12,000 years before present, during what is now known as the Paleoindian Period, small, highly mobile human groups were present in the Yellowstone region. These groups crafted stone weapons and tools to pursue and utilize large game. Left behind are Clovis, Folsom, and Cody Complex sites. These sites consist of remains of camps, quarries and sites where animals were killed.

The Archaic Period in Yellowstone was characterized by mobile groups who utilized a greater variety of plant foods and small game. The Park area was most heavily used by these groups during the Late Archaic, from 1000 B.C. to A.D. 200. Later sites in the Park may be related to small groups who resided in lower valleys outside the Park but who sent parties into the area to hunt game and gather plant materials and other subsistence items. The Obsidian Cliff Plateau, an extruded lava flow that is approximately 180,000 years old, was of special importance to prehistoric peoples. Obsidian obtained from this site was widely used in not only the region, but was traded as far as Ohio and Canada.

More than 2,000 prehistoric and historic sites have been documented in Yellowstone, although less than five percent of Yellowstone's 2.2 million acres have been intensively inventoried for archeological resources. Included within the historic archeological sites are those of Euro-American origin such as solider stations, hotels, and can dumps. Approximately one-third of the archeological sites have been evaluated for eligibility to the National Register of Historic Places. Obsidian Cliff, a prehistoric obsidian quarry, has been named a National Historic Landmark. Approximately 100 sites are added each year to the NPS Archeological Sites Management Information System database, and Determinations of Eligibility are completed when needed or when time permits.

Historic Resources

The Park's historic resources relate to European-American exploration and occupation, military administration, NPS administration, and early concessions operations. These resources include roads, bridges, backcountry cabins, museums, entrance stations, residences, and hotels.

Yellowstone has 1,030 historic structures entered on the List of Classified Structures as of September 30, 2004. Of these structures, 375 are listed on the National Register of Historic Places and 351 have been determined eligible for listing. The remaining 304 structures and buildings still need to be evaluated for eligibility to the National Register. National Historic Landmarks include the Fort Yellowstone National Historic Landmark District which has 47

buildings, structures and historic landscape features, and five individual NHL structures, including the Northeast Entrance station, the Norris, Madison, the Fishing Bridge Trailside Museums, and the Old Faithful Inn. Historic Districts which have had Consensus Determinations of Eligibility (versus formal determinations) are the Canyon Village Historic District (Mission 66), the Blister Rust Camp at Canyon Administrative Area, the Old Faithful Visitor Center Historic District (Mission 66), Tower Junction Historic District, Stephens Creek Administrative Area in Montana, and the Fishing Bridge Historic District.

Some of the structures and buildings are located outside of the historic districts or are discontiguous contributing properties to existing historic districts and developed areas. Examples of these include backcountry patrol cabins, fire towers, interpretative kiosks, roadside features, bridges, stone guardwalls and retaining walls, and other structural elements.

Cultural Landscapes

Cultural landscapes consist of "a geographic area associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values." They provide a living record of an area's past, and a visual chronicle of its history. The character defining features and patterns of a cultural landscape may include, as appropriate: natural systems and features, spatial organization, topography and landforms, vegetation, circulation systems and features, land use, buildings and structures, building cluster arrangement, water features, small scale features, archeological sites, and views and vistas.

Cultural landscape inventories (CLI) have been developed for some areas, including Artist Point, Apollinaris Springs, Game Ranch (Stephens Creek), Roosevelt Lodge, Tower Ranger Station, and Old Faithful. These have received consensus determinations of eligibility. Other CLIs that are in draft form, and have not yet received consensus determinations include Lake, Fishing Bridge, Lake Fish Hatchery, North Entrance area, and YPTCo historic districts. It is anticipated that consultations with the Wyoming and Montana SHPOs for the determination of these landscapes will occur within the following calendar year. All of the above listed CLIs have been developed according to the NPS Cultural Landscape Inventory Professional Procedures Guidance (NPS PPG). A Cultural Landscape Report (CLR) is also underway for Mammoth Hot Springs Historic District by the Olmsted Center for Cultural Landscape Preservation. Some backcountry cabins, soldier stations, and historic districts have previously had preliminary assessments to inform past fire management activities and assist with § 106 consultations for those projects, however, these have not yet been determined eligible. Additionally, not all potentially eligible cultural landscapes within the area of effect have been inventoried. For the purposes of a Park wide area of effect, those historic properties listed under the *Historic Resources* section above may contain potentially eligible associated cultural landscape resources. CLIs and CLRs identify vegetation and vegetation patterns which are significant to cultural landscapes, and should inform each specific hazard fuel project's implementation.

Ethnographic Resources

The NPS defines ethnographic resources as "the cultural and natural features of a park that are of traditional significance to traditionally associated peoples." Native Americans occupied the

Greater Yellowstone Area for at least 11,000 years. There are 26 associated American Indian tribes, each having particular historical traditions associated with what is now Yellowstone. Consequently, places and resources inside the Park continue to hold both historical and contemporary traditional significance. Native Americans often passed through the Park for hunting and foraging, migration, or for religious or other cultural endeavors.

Today, the tribes that are associated with Yellowstone National Park and with whom consultation occurs are: Assiniboine and Sioux Tribes, Cheyenne River Sioux Tribe, Cour d'Alene Tribe, Crow Creek Sioux Tribe, Flandreau Santee Sioux Tribe, Gros Ventre & Assiniboine Tribes, Lower Brule Sioux Tribe, Northern Arapaho Tribe, Northern Cheyenne Tribe, Oglala Sioux Tribe, Rosebud Sioux Tribe, Sisseton- Wahpeton Sioux Tribe, Spirit Lake Sioux Tribe, Standing Rock Sioux Tribe, and Yankton Sioux Tribe.

Places within the Park are associated with the development and maintenance of ethnically distinctive peoples, and are closely linked with peoples' own sense of community. To date, over 600 ethnographic resources have been recorded for Yellowstone. These resources include animals such as bison, plants, thermal areas, mineral paint and obsidian sources, Yellowstone Lake, vision questing sites, and rendezvous and hunting sites. Yellowstone continues to collect data on ethnographic resources through consultations and oral history interviews with the 26 currently associated tribes.

Representatives of Yellowstone's affiliated tribes participate in periodic consultation meetings with Park managers. Each of the affiliated tribes was contacted regarding this FMP EA process.

3.11.2 Methodology

Federal land managing agencies are required to consider the effects of their proposed actions on properties listed in, or eligible for inclusion in, the National Register of Historic Places (i.e., Historic Properties), and allow the Advisory Council on Historic Preservation a reasonable opportunity to comment as per the National Historic Preservation Act, as amended and its implementing regulations found at 36 CFR Part 800. Agencies are required to consult with Federal, state, local, and tribal governments/organizations, identify historic properties, assess adverse effects to historic properties, and negate, minimize, or mitigate adverse effects to historic properties while engaged in any federal or federally assisted undertaking (36 CFR Part 800).

Adverse effects to historic properties are those which may "alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association" (36 CFR 800.5). It is important to note the definition for adverse impacts per the National Environmental Protection Act (NEPA) is not strictly correlated with the definition of adverse affects in the National Historic Preservation Act. Therefore, it is possible to have adverse impacts for the purposes of NEPA review which do not rise to the level of adverse affect per 36 CFR Part 800.

Archeological Resources

The thresholds of change for the intensity of an impact on archeological resources are defined as follows:

Negligible: Impact(s) is at the lowest levels of detection with neither adverse nor beneficial consequences. The determination of effect for §106 would be no adverse effect.

Minor: Disturbance of a site(s) results in little, if any, loss of integrity. The determination of effect for §106 would be no adverse effect.

Moderate: Disturbance of a site(s) results in loss of integrity. The determination of effect for §106 would be adverse effect. A memorandum of agreement (MOA) is executed among the National Park Service and applicable state historic preservation officer and, if necessary, the Advisory Council on Historic Preservation in accordance with 36 CFR 800.6(b). Measures identified in the MOA to minimize or mitigate adverse impacts reduce the intensity of impact under NEPA from major to moderate.

Major: Disturbance of a site(s) results in loss of integrity. The determination of effect for §106 would be adverse effect. Measures to minimize or mitigate adverse impacts cannot be agreed upon and the National Park Service and applicable state historic preservation officer and/or Advisory Council are unable to negotiate and execute a memorandum of agreement in accordance with 36 CFR 800.6(b).

Historic Resources

The thresholds of change for the intensity of an impact on historic resources are defined as follows:

Negligible: Impact(s) is at the lowest levels of detection – barely measurable with no perceptible consequences. The determination of effect for §106 would be no adverse effect.

Minor: Alteration of a feature(s) would not diminish the overall integrity of the resource. The determination of effect for §106 would be no adverse effect.

Moderate: Alteration of a feature(s) would diminish the overall integrity of the resource. The determination of effect for §106 would be adverse effect. A MOA is executed among the National Park Service and applicable state historic preservation officer and, if necessary, the Advisory Council on Historic Preservation in accordance with 36 CFR 800.6(b). Measures identified in the MOA to minimize or mitigate adverse impacts reduce the intensity of impact under NEPA from major to moderate.

Major: Alteration of a feature(s) would diminish the overall integrity of the resource. The determination of effect for §106 would be adverse effect. Measures to minimize or mitigate adverse impacts cannot be agreed upon and the National Park Service and applicable state

historic preservation officer and/or Advisory Council are unable to negotiate and execute a memorandum of agreement in accordance with 36 CFR 800.6(b).

Cultural Landscapes

Negligible: Impact(s) is at the lowest levels of detection – barely measurable with no perceptible consequences. The determination of effect for §106 would be no adverse effect.

Minor: Alteration of a pattern(s) or feature(s) of the landscape would not diminish the overall integrity of the landscape. The determination of effect for §106 would be no adverse effect.

Moderate: Alteration of a pattern(s) or feature(s) of the landscape would diminish the overall integrity of the landscape. The determination of effect for §106 would be adverse effect. A MOA is executed among the National Park Service and applicable state historic preservation officer and, if necessary, the Advisory Council on Historic Preservation in accordance with 36 CFR 800.6(b). Measures identified in the MOA to minimize or mitigate adverse impacts reduce the intensity of impact under NEPA from major to moderate.

Major: Alteration of a pattern(s) or feature(s) of the landscape would diminish the overall integrity of the landscape. The determination of effect for §106 would be adverse effect. Measures to minimize or mitigate adverse impacts cannot be agreed upon and the National Park Service and applicable state historic preservation officer and/or Advisory Council are unable to negotiate and execute a memorandum of agreement in accordance with 36 CFR 800.6(b).

Ethnographic Resources

Negligible: Impacts would be at the lowest levels of detection and barely perceptible. Impacts would not alter resource conditions, such as plant and animal abundance, nor alter the relationship between the resource and the associated group's body of practices and beliefs. For purposes of Section 106, the determination of effect would be no adverse effect.

Minor: Impacts would be slight but noticeable and would slightly alter resource conditions, such as plant and animal abundance, and slightly alter the relationship between the resource and the associated group's body of practices and beliefs. For purposes of § 106, the determination of effect would be no adverse effect.

Moderate: Impacts would be apparent and would alter resource conditions such as plant and animal abundance, or the relationship between the resource and the associated group's beliefs and practices, even though the group's practices and beliefs would survive. For purposes of Section 106, the determination of effect would be adverse effect.

Major: Impacts would alter resource conditions. Proposed actions would make a significant impact to resource condition such as plant and animal populations or the relationship between the resource and the associated group's body of beliefs and practices to the extent that the survival of a group's beliefs and/or practices would be jeopardized. For purposes of § 106, the determination of effect would be adverse effect.

3.11.3 Impacts of Alternative 1 (No Action)

Impacts Analysis
The locations of some cultural resources are known precisely (e.g. historic structures). Some resources that have not been documented might be present in areas where prescribed fires are planned or where unplanned wildfires start (e.g. archeological sites that have become overgrown by vegetation, are in areas that have never been surveyed, or ethnographic resources which have not yet been identified). Potential impacts on cultural resources that are described here are more likely to result from a wildfire and subsequent suppression actions, rather than from prescribed fires that are planned for a specific area where cultural resources can be located prior to ignition and protected.

In the event of a wildland fire, measures would be taken to limit damages to cultural resources. Unplanned events would be conducted in coordination with the Park Cultural Resources staff. If cultural resources are threatened by an unplanned event, Cultural Resources staff would be consulted to help mitigate the impacts of fire management activities.

Section 106 compliance would be completed for fuels and prescribed fire projects either through project by project basis or via a process prescribed in a Programmatic Agreement.

Archeological Resources

All of the Park's treatment areas contain archeological resources (both buried and on the surface) that may be placed at risk from wildland fires and associated fire management activities. The effects of fire on surface and subsurface artifacts vary with fuel loading and fire behavior. More intense fire on surface artifacts may cause scorching, fracturing, charring, and spalling. The effects are far less if artifacts are buried under as little as one centimeter of soil. Besides losses directly attributed to fire, heating associated with wildland fire can cause smudging, cracking or other damage to artifacts or ruins. The glaze on historic and prehistoric ceramics could be altered by fire and heat, and other inorganic artifacts such as flakes and ground stone could be badly damaged. Pictographs and petroglyphs could be burned or lost as heated stone spalls away.

Artifacts can be damaged and soils compressed by heavy equipment. Adverse impacts also may result from human activities such as fireline and helispot construction, establishment of field camps or first aid stations, slurry drops, hazard fuel thinning, and artifact collecting by fire crews or visitors. Soil disturbance if not rehabilitated can channel rain runoff resulting in increased soil erosion that may expose, displace, or destroy archeological features or artifacts. Activities following a fire, including removal of hazard trees, reconstruction of campgrounds, building water bars and trail repair, habitat rehabilitation, and removal of firelines also may disturb buried resources. Wildland and prescribed fire may also result in an increase of post fire vegetation growth which may slow erosion and make sites less susceptible to looting.

Mitigation measures would be executed under the supervision of a qualified cultural resource specialist. A plan would be developed to ensure site stabilization or information retrieval, and, during rehabilitation of fire control lines and other post-fire activities, care would be taken to

avoid damage to archeological resources. Resources identified following a fire have sometimes been damaged, resulting in a loss of site integrity. For large unplanned wildfires, the incident management team would request red carded (i.e. fully qualified wildland fire personnel) cultural resource specialists if available and coordinate action with the cultural resources staff in Yellowstone.

Wildland fires would be suppressed in areas containing vulnerable sites, and firelines would not be constructed through known archeological sites. Hazard fuel would be carefully removed within and immediately adjacent to cultural sites to reduce fire danger. Protective measures such as application of fire shelters to archeological sites would be used where appropriate. These measures would reduce the potential for resource loss or damage.

Hazard fuel reduction and other fire management activities, particularly along trails, could make surface artifacts and site features more visible. While increased visibility would allow archeologists to more easily identify previously unknown sites, exposed artifacts also would be more vulnerable to unauthorized collection. To reduce these losses, work crews would be briefed about the need to protect cultural resources, and would be instructed regarding the illegality of collecting artifacts on federal lands to avoid any potential violations of the Archaeological Resources Protection Act of 1979 as amended (16 USC 470aa-mm). This would include instructions for notifying appropriate personnel if human remains were discovered.

Fire management activities, such as fuel removal and construction of fireline, could leave exposed surface resources vulnerable to erosion, causing loss of artifacts and site integrity. Damage to sites would be reduced by careful design of project work and by archeological monitoring. Monitoring would include examination of ground exposed during fire management activities to identify previously unidentified cultural resources, such as shallow archeological sites, and to identify areas requiring protective measures. If unanticipated archeological site discoveries were made, the archeologist would halt work in the area of the find, and protect the area until further investigation can be made. If necessary, mitigation would be developed in consultation with the Wyoming, Idaho, and Montana State Historic Preservation Officers. These procedures and other mitigating measures would help ensure fire management activities would not damage or destroy cultural resources.

Some resources that have not been documented may be present in areas where wildfires burn vegetation (e.g. archeological sites that have become overgrown by vegetation or in areas that have never been surveyed). Potential impacts on archeological resources are more likely to result from a wildfire and subsequent suppression actions, rather than from prescribed fires that are planned for a specific area where cultural resources can be located prior to ignition and protected. It is possible a wildland fire use incident could have adverse impacts on archeological resources, as described above, particularly if unknown sites are located where fires are allowed to burn. However, Park managers would have the option of suppressing fires near known archeological sites to protect them.

Impacts which can occur from prescribed burns include equipment and personnel staging, construction of fire control lines by hand, vegetation thinning, burning out from control lines and igniting the interior of units, and post-burn mop-up and rehabilitation. Construction of firelines

in prescribed fire units would have the greatest potential for adversely affecting unknown archeological resources. Minimum impact tactics and surveys completed prior to fireline creation for prescribed fires would reduce the probability that unknown resources would be damaged.

Planned fire prescriptions would be designed to minimize soil heating and thus avoid impacts to buried archeological resources. Prescribed fires would generally be designed to avoid cultural resources which would require inventory and evaluation of archeological resources consultation with the appropriate SHPO prior to implementation. If a prescribed burn was proposed near archeological resources, the prescribed burn plan would specify actions to avoid or mitigate potential adverse impacts to known features. Heat from typical surface fires would be insufficient to damage artifacts and other archeological materials in subsurface settings even if they are buried only a few centimeters below the ground surface. Fire may also expose archeological resources as vegetation is removed. Most burned areas would "green up" within the same season or, at the latest, the next spring. Regrowth would then diminish the possibility of artifacts being eroded or stolen.

Historic Resources

The historic patrol cabins and other structures and sites with flammable wooden elements are especially vulnerable to wildfires and fire suppression activities. Woody materials immediately adjacent to historic buildings would be carefully removed with hazard fuel reduction projects, using hand tools and, as appropriate, chainsaws or brushcutters. Damage to adjacent buildings during vegetation removal and disposal would be minimized by taking care to avoid disturbance of foundations or walkways, felling trees away from buildings, and by sawing the limbs and logs into transportable small pieces. Hazard fuel reduction around historic structures and sites would reduce the potential for loss of or damage to the structure during a wildland fire.

Fire can directly affect historic properties by damaging or altering elements or attributes of cultural materials that make them significant. Direct damage from fire can be the result of burning, heat, or smoke. Fire intensity and burn severity vary with fuel type and fuel loading and are generally greater under conditions with heavier fuel fuel loads. While fire intensity and burn severity generally increase with heavier fuel loads, fuel arrangement plays a significant role in fire behavior as the presence or absence of ladder and intermediary fuels would allow or prevent fire from entering the tree crowns or igniting large heavy fuels such as down logs. Ground fires with high burn severity can even damage subsurface cultural materials.

The weight of water or retardant drops can damage the structural integrity of a historic structure if the full weight of the drop lands on the structure. Retardants may stain historic fabric such as wood and stone. The potential short and long term effects of retardants on chemical composition of various cultural materials is not clearly understood.

In the case of some wildland fires, buildings could be badly damaged or lost to fire. Damaged structures are more likely to be vandalized. During suppression of wildland fires, mitigation measures would be implemented.

Loss of vegetation and soil heating may induce hydrophobicity in soils, resulting in sheet wash that may destabilize soils around structures. Soil disturbance near structures can channel water and possibly erode footings and base supports for structures. Occasionally, trees may also become weakened and pose a threat to historic structures as a hazard tree.

Wildland fires occurring near known historic sites may be suppressed rather than managed as a wildland fire use incident to protect historic structures.

Most prescribed burning would not be conducted near historic structures. When prescribed burning is proposed near historic structures, one or more mitigation measures would be included in the prescribed fire plan and implemented prior to ignition. With mitigations in place, there should be no direct adverse impacts to historic structures.

Cultural Landscapes

Fire can be both a positive and negative influence on cultural landscapes. Planned and unplanned fire events or fuel treatments all occur on a landscape level. In all instances impacts such as vegetation removal, fire control line construction, and ignition activities impact the landscape. Fire control lines result in visible scars on the landscape and can contribute to erosion. Vegetation removal can be beneficial since the historic scene can be maintained or restored by removing encroaching vegetation, but care is needed when thinning near historical habitation areas to ensure the important vegetation which was a part of the historical landscape scene is retained. Staging of equipment and fire control line construction have the potential to create disturbance in sensitive areas. Use of retardants may affect cultural features and contributing elements to cultural landscapes.

Wildland fires could leave charred areas, and burned trees and stumps, creating a short-term visual impact on the viewsheds surrounding the cultural landscapes. To avoid these impacts, wherever possible, fire lines around developed areas and cultural landscapes would be created some distance outside of the visual perimeter, resulting in little or no effect on the viewshed. Fuel buildups near known cultural resources would be reduced, enhancing resource protection for structures while retaining a backdrop of trees that form part of the historic scene. Fuel removal would be consistent with cultural landscape mitigation measures.

Cultural landscapes could be disrupted by equipment use in fire suppression associated with soil compaction and ground disturbance, but equipment use would be limited, and the minimum requirement analysis and other Park use restrictions would be followed.

Sheet wash erosion may occur as the result of fire if high burn severity results in a slope being denuded of vegetation. Reduced competition for sunlight, water, and nutrients may be beneficial for retained culturally significant vegetation. However, hydrophobicity, soil sterilization, and loss of vegetation may result in sheet-wash erosion and in extreme cases loss of top soil that substantially alters what vegetation can grow.

Fence lines with wooden fence posts are small-scale cultural landscape features that can also be affected by the presence or absence of intermediary fuels.

Ethnographic Resources

Resources valued by tribes could be adversely impacted, both short-and long-term, by fire management activities. Yellowstone would untilize the enthographic resources inventory and other information gained through consultation to protect these special areas. Where appropriate, non-cultural woody fuels adjacent to known ethnographic resources would be removed to reduce the fire danger during wildland fires.

Ethnographic resources are vulnerable to wildfires and suppression activities. These resources may not be easily identified by fire crews, so could be lost during wildland fires. American Indian tribes often are reticent about identifying locations of sensitive sites, so some ethnographic sites remain undocumented.

Fire management actions such as fire control line construction, vegetation thinning, ignition activities during prescribed fires and wildfire burnouts, and water or retardant drops can impact plants or trees traditionally used by American Indians. Plants or trees can also be impacted by equipment and crew staging, pile burning, and post-burn mop-up and rehabilitation. However, many ethnographic resources are ubiquitous on the landscape and would either regrow or repopulate after a wildland fire. Certain locations hold ethnographic significance and can be impacted by any fire management activities either directly at the location, visually by impacting the viewshed, or if timing of the fire event occurs during a time when the spiritual site is traditionally used.

Fire can be beneficial in some instances as some culturally important plant species benefit from the proper application of fire.

Cumulative Effects

Yellowstone contains historic, archeological, and ethnographic sites and cultural landscapes which evidence rich cultural histories of prehistoric habitation and European-American exploration and occupation. Impacts to historic and prehistoric resources associated with human activities in the Park include exposure of buried sites, changes in artifact condition, destruction of artifacts or structures, loss of context of artifacts, site covering, and contamination of sites. Some looting and vandalism of cultural sites have occurred. Other actions that affect cultural resources are visitor use (e.g. hiking, camping), construction projects, and maintenance and repairs to roads, trails, and other facilities. All of these activities are conducted under the same general guidelines for identifying and protecting cultural resources so long-term adverse effects are avoided to the greatest extent practicable. Wildland fires also contribute to cumulative losses of cultural resources available for scientific study, the practice of traditional tribal activities, and visitor enjoyment. Additionally, natural erosion, and exposure over time contribute to cumulative effects on cultural resources.

Cumulative effects to cultural resources from such actions would be adverse and minor to moderate. Alternative 1 would contribute minor, adverse and minor, beneficial cumulative impacts on cultural resources. Combined with known past, current and future projects and actions, there would be minor, adverse cumulative impacts on cultural resources.

Conclusion

Adverse impacts to cultural resources would be overall minor to moderate, short- to long-term, adverse or beneficial and local depending on the nature and intensity of any wildfire and subsequent fire management response and rehabilitation activities.

Adverse effects on cultural resources from planned fire management actions would be avoided or minimized through identifying the resources prior to disturbance and protecting the resources.

However, because during wildfire management activities unidentified archeological sites sometimes cannot be protected, and because professional expertise and many of the mitigation measures listed may be unavailable for some areas, archeological resources could suffer direct, minor, long-term, adverse impacts.

Direct damage to or loss of historic structures and sites from wildfire and wildfire suppression activities would result in long-term, adverse impacts of minor to moderate intensity to these resources. The effects on historic structures from fuel reduction projects would be localized, short-term to long-term, minor to moderate, and beneficial as it would reduce the risk of fire around structures.

Fire or suppression activities could have short and long-term, minor to moderate adverse impacts on cultural landscapes as viewshed changes could result in loss of trees and structures, burned vegetation and stumps, exposed soils in fire lines altering the character of the landscape. Some impacts would be minor because vegetation could be replanted or may regenerate. Alternatively, fire can also have long-term, minor to moderate beneficial impacts on cultural landscapes as vegetation composition can be altered beneficially on a large scale with fire resulting in maintaining and even partially restoring the historic extent of native plant communities.

If ethnographic resources are lost or damaged by wildland fires or fire suppression activities, long-term, minor to moderate, adverse impacts would occur. There could also be long-term, minor to moderate, beneficial impacts on ethnographic resources as fire can be beneficial to culturally important plant species and animal populations.

3.11.4 Impacts of Alternative 2 (Proposed Action)

Impacts Analysis

Impacts on cultural resources under Alternative 2 would be essentially the same as those described for Alternative 1 and result from suppression of wildland fire, appropriate response strategy to wildlfire, prescribed fire, and manual and mechanical fuel reduction activities.

Archeological Resources

As response to unwanted fires would occur more quickly within the strategy zones under Alternative 2 than under Alternative 1, the size of wildfires that would need to be suppressed would likely be smaller, potentially requiring less maintenance of roads, construction of fireline,

installation of water tanks, installation of fire camps, and disturbance of soils by personnel and equipment. This would result in lower adverse impacts on archeological resources from reduced contact with fire, exposure of artifacts, and other effects as described above.

Under Alternative 2, the IDT process would be more streamlined and efficient. All non-emergency projects (prescribed fire, fuel reduction) would be planned by the IDT, resulting in benefits to archeological resources as all efforts would be made to avoid or protect know archeological sites.

The appropriate wildfire response strategy, such as a monitor strategy, under this alternative would be managed according to goals and objectives rather than specific prescriptions as in Alternative 1. This approach may allow for more acres to burn naturally, which could result in more exposure of archeological sites to fire and have greater impacts than under Alternative 1.

Historic Resources

Fire management suppression strategy zones under Alternative 2 would assist managers in quickly determining the correct management strategy to use when an unplanned wildfire event occurs. Thus the adverse effects on historic resources from management of wildfires under Alternative 2, especially suppression strategies, would be lower than the effects under Alternative 1 because fire response would occur more quickly. It is expected under this alternative, unwanted fires within the suppression strategy zones would be of smaller size, would result in less contact of historic structures with fire, and produce less smoke damage to historic structures before fires are extinguished.

Hazard fuel management activities would be planned and coordinated with an IDT approach and process in such a way as to not adversely affect historic resources. Such pre-planning that is more streamlined and efficient would allow for historic sites to be avoided and/or protected.

The appropriate management strategy response, such as a monitor or point/zone protection strategy, under this alternative would be managed according to goals and objectives rather than specific prescriptions as in Alternative 1. This approach may allow for more acres to burn naturally, which could result in more exposure of historic structures to fire and have greater impacts than under Alternative 1.

Cultural Landscapes

As response to unwanted fires would occur more quickly under Alternative 2 because of predetermined suppression strategy zones than under Alternative 1, the size of wildfires that would need to be suppressed would likely be smaller, potentially requiring less maintenance of roads, construction of fireline, installation of water tanks, installation of fire camps, and disturbance of soils by personnel and equipment. This would result in lower adverse impacts on cultural landscapes from reduced visible scars on the landscape, reduced erosion, changes to viewsheds, and other effects as described above.

Under Alternative 2, the IDT process would be more streamlined and efficient. All prescribed fire and fuel reduction projects would be planned by the IDT and follow mitigation measures, resulting in benefits to cultural landscapes as all efforts would be made to minimize adverse effects as described under Alternative 1.

Using a monitor management strategy under this alternative would be managed according to goals and objectives rather than specific prescriptions as in Alternative 1. This approach may allow for more acres to burn and perpetuate natural processes. Although adverse impacts could still occur, as described under Alternative 1, greater flexibility to manage wildfires for resource benefit and goals and objectives would promote the natural role of fire across the landscape, maintaining and even partially restoring the historic extent of native plant communities, overall benefiting cultural landscapes.

Ethnographic Resources

Fire management suppression zones under Alternative 2 would assist managers in quickly determining the correct management strategy to use when an unplanned wildfire event occurs. Thus the adverse effects on ethnographic resources from management of wildfires under Alternative 2, especially suppression actions, would be lower than the effects under Alternative 1 because fire response within the suppression strategy zones would occur more quickly. It is expected under this alternative unwanted fires would be of smaller size, having less impact on vegetation significant to American Indians and sites of spiritual significance.

Fuel management activities would be planned and coordinated with an IDT approach and process in such a way as to not adversely affect historic resources. Such pre-planning is more streamlined and efficient, and would allow for ethnographic resources and sites to be avoided and/or protected.

Using a monitor management strategy under this alternative would be managed according to goals and objectives rather than specific prescriptions as in Alternative 1. This approach may allow for more acres to burn and perpetuate natural processes. Additional burned acreage could lead to more frequent and/or longer duration of fire management activities, in turn adversely affecting ethnographic resources such as if timing of fire coincides with when a spiritual site is traditionally used, and other effects as described under Alternative 1.

Cumulative Effects

Yellowstone contains historic and archeological sites which evidence rich cultural histories of prehistoric habitation and European-American exploration and occupation. Impacts to historic and prehistoric resources associated with human activities in the Park include exposure of buried sites, changes in artifact condition, destruction of artifacts or structures, loss of context of artifacts, site covering, and contamination of sites. Some looting and vandalism of archeological sites have occurred. Other actions that affect cultural resources are visitor use (e.g. hiking, camping), construction projects, and maintenance and repairs to roads, trails, and other facilities. All of these activities are conducted under the same general guidelines for identifying and protecting cultural resources so long-term adverse effects are avoided to the greatest extent practicable. Wildland fires also contribute to cumulative losses of cultural resources available

for scientific study, the practice of traditional tribal activities, and visitor enjoyment. Additionally, natural erosion, and exposure over time contribute to cumulative effects on archeological and paleontological resources and historic structures.

Cumulative effects to cultural resources from such actions would be adverse and minor to moderate. Alternative 2 would contribute minor, adverse cumulative impacts on cultural resources. Combined with known past, current and future projects and actions, there would be minor to moderate, adverse cumulative impacts on cultural resources.

Conclusion

Adverse impacts to cultural resources would be overall negligible to moderate, short to long-term, adverse or beneficial, and local depending on the nature and intensity of any wildfire and subsequent fire management response and rehabilitation activities.

Adverse effects on cultural resources from planned fire management actions would be avoided through identifying the resources prior to disturbance and protecting the resources, along with implementing mitigation measures.

However, because during wildfire management activities unidentified archeological sites sometimes cannot be protected, and because professional expertise and many of the mitigation measures listed may be unavailable for some areas, archeological resources could suffer direct, minor to moderate, long-term, adverse impacts. These effects would be mitigated by implementing appropriate strategies according to the scale and scope of the incident.

The effects on historic structures from fuel reduction projects would be localized, short-term to long-term, minor to moderate and beneficial as this alternative would reduce the risk of fire around structures. Direct damage to or loss of historic structures and sites from wildfire and wildfire suppression activities would result in long-term, adverse impacts of minor to moderate intensity to these resources.

The use of suppression strategies could have short and long-term, minor to moderate adverse impacts on cultural landscapes as viewshed changes could result in loss of trees and structures, burned vegetation and stumps, exposed soils in fire lines altering the character of the landscape. Some impacts would be minor because vegetation could be replanted or may regenerate. Alternatively, fire can also have long-term, minor to moderate beneficial impacts on cultural landscapes as vegetation composition can be altered beneficially on a large scale with fire resulting in maintaining and even partially restoring the historic extent of native plant communities.

If ethnographic resources are lost or damaged by wildland fires or fire suppression strategies, long-term, minor to moderate, adverse impacts would occur. There could also be long-term, minor to moderate, beneficial impacts on ethnographic resources as fire can be beneficial to culturally important plant species and animal populations.

Adverse impacts on cultural resources would be overall lower under Alternative 2 than Alternative 1 with a faster response to unwanted wildland fires because of predetermined

suppression strategy zones, and an IDT process used for all non-emergency fire management treatments that would help in identifying and avoiding or protecting cultural resource sites.

3.12 SOCIOECONOMIC RESOURCES

3.12.1 Affected Environment

Concessions

Private companies have promoted the Park and served visitors since Yellowstone National Park was designated in 1872. The present day Concessions Management Program is mindful of this legacy, ensuring visitors have access to high-quality visitor services in order to fully appreciate our natural and cultural treasures (NPS, No date).

Private companies hold contracts with the Department of the Interior to provide park visitors with services that the Government does not offer (i.e. lodging, food, beverage, retail, etc.) Concessioners specialize in these operations and are thus able to provide quality services at reasonable prices. By welcoming the private sector as a partner in park operations, the NPS broadens the economic base of the region and communities surrounding the parks (NPS, No date). In 2011, concessioners in Yellowstone had approximately $121 million in gross receipts (Helfrich, 2012).

Xanterra Parks and Resorts, Delaware North Parks and Resorts, Yellowstone Park Services Stations, and Medcor manage Yellowstone National Park's concessions. Xanterra offers lodging, food and beverage, retail, campgrounds, and a number of other services; Delaware North Parks and Resorts offers retail, food and beverage services; and Yellowstone Park Services Stations offers gasoline, car repair, and some retail services. Medcor offers emergent and some primary care medical services. In addition, 12 companies offer guided interpretive snow coach tours, 46 companies offer guided saddle and pack stock tours, and 179 companies hold commercial use authorizations for a variety of services. Xanterra, Delaware North Parks and Resorts, and Yellowstone Park Services Stations have operations in all or most of the developed areas. Medcor has operations in three of the developed areas. Guided saddle and pack stock outfitters operate throughout the Park's backcountry. According to the Yellowstone National Park summer 2011 visitor study, 75 percent of the visitor groups surveyed purchased gifts or souvenirs, and 75 percent ate at a restaurant or used another food service (Kulesza et al., 2012).

Gateway Communities

Yellowstone National Park is a prominent feature in the social and economic life of the surrounding area. The popularity of recreation and tourism in the area make the communities in the greater Yellowstone area dependent upon federally-managed lands. These communities and their businesses receive significant income by providing goods and services to Park visitors.

The majority of Yellowstone National Park lies within the state of Wyoming. The northern boundary of the Park crosses into Montana in Park County. The western boundary of the Park extends into Fremont County, Idaho. The Park has five gateway communities – one for each

boundary line, except on the east side of the Park where there are two. The most heavily used entrance is West Yellowstone on the western boundary in Montana. This station records over one million entrances each year. From the south, visitors enter through Jackson, Wyoming and the Grand Teton corridor. This entrance is used by approximately 700,000 visitors each year. On the northern boundary, the park entrance at Gardiner, Montana records over 500,000 entrances each year. Over 200,000 visitors arrive annually at the Northeast Entrance, through the Cooke City, Montana corridor, and over 400,000 enter through the East Entrance near Cody, Wyoming (NPS, 2011h).

With over three million visitors to the Park each year (NPS, 2010c), Yellowstone serves as a major contributor to the local and regional economy. Recreational use of the Park contributes an average of $416 per visitor during summer months (Kulesza et al., 2012). During winter months, visitors spend an average of $1,129 during their stay. Retailers that provide services to Park visitors are among the largest employers in the region (NPS, 2002).

Two boundary counties have experienced rapid growth over the past decade, shown in Table 3-2. Gallatin County in Montana and Teton County in Wyoming have grown at rates much greater than their state averages of 9.7 and 14.0 percent, respectively. The average household income of Teton County ($68,777) varies substantially from the national average of $50,046. In each of the five counties, the majority of the 2010 Census respondents responded that they were white and non-Hispanic, with Teton County in Wyoming having the lowest at 88.4 percent (U.S. Census Bureau, 2010a-i).

The Park is surrounded largely by lands managed by the U.S. Forest Service. Wilderness areas have been designated along large portions of the western and southern boundaries within the state of Wyoming. Development near the Park is largely limited to corridors adjacent to established roads and highways. These travel corridors are the paths used by visitors to access the Park. Economic uses of the Forest Service lands include grazing by permittees, timber harvest, recreation, hunting, and fishing (NPS, 2002).

3.12.2 Methodology

Impact analyses on socioeconomics were based on recent assessments of the Park and surrounding communities by Park and other NPS staff, the U.S. Census, previous studies or projects conducted within the same area, and an assessment of potential changes to the local economy caused by fire management. These analyses were conducted in the context of the project area and gateway communities.

The thresholds of change for the intensity of an impact on socioeconomics are defined as follows:

Negligible: Little or no noticeable change in economic activity, employment and income levels, or population migration or immigration.

Minor: Local changes in economic activity, employment and income levels, or population migration or immigration.

Moderate: Regional changes in overall economic activity, employment and income levels, or population migration or immigration.

Major: Widespread, significant changes in overall economic activity, employment and income levels, or population migration or immigration.

Table 3-2. Economic outline of the five counties bordering Yellowstone National Park.

State/County	2010 Population	Population Change (2000 – 2010)	Average Household Income (2009 model estimate)	Major Economic Activities
Idaho				
Fremont County	13,242	12.0%	$41,316	Educational services, health care and social assistance
Montana				
Gallatin	89,513	32.0%	$47,065	Educational services, health care and social assistance
Park County	15,636	-0.4%	$39,525	Arts, entertainment, recreation, and accommodation and food services
Wyoming				
Park County	28,205	9.4%	$47,264	Educational services, health care and social assistance
Teton County	21,294	16.7%	$68,777	Arts, entertainment, recreation, and accommodation and food services

Source: (U.S. Census Bureau 2010a-i)

3.12.3 Impacts of Alternative 1 (No Action)

Impacts Analysis
Under Alternative 1, fire management would continue under the 2004 FMP. Effects associated with this alternative would be expected to be generally minor and may be both beneficial and adverse to local and regional businesses located outside the Park and to commercial services operating within the Park. Fires can affect the local and regional economy in two primary ways. Fire events can provide additional opportunities for businesses in the regional economy, but may also deter visitors to the Park, thereby reducing income to local businesses from visitor spending. A direct effect may be associated with expenditures for labor, equipment, and other goods and services purchased directly from the local economy as part of the effort to manage fires. These effects would be, for the most part, temporary and limited to the duration of any particular fire event.

A second source of effect is associated with the indirect impact of spending by Park visitors in both the local economy and in the larger regional economy. These expenditures may include food and lodging, fees, rentals, guide and outfitting services; transportation, scenic and sightseeing tours and other retail purchases. Visitor spending contributes to a substantial impact on the local economy, supporting direct Park employment, as well as local and regional businesses located outside the Park and commercial services provided by private concessioners inside the Park. Other induced effects to the local economy include additional spending of income earned directly or indirectly from employment in businesses benefiting from visitor spending associated with Yellowstone.

The potential for Yellowstone visitation rates and associated visitor spending to be affected by a wildland fire event depends on the size, location, and extent of the fire. Losses to the local economy are somewhat offset by additional spending associated with fire personnel and associated material and equipment purchases necessary to manage the fire. Labor, equipment and materials required for repair and restoration following a fire event may also partially offset any losses experienced in the local economy by reduced visitor spending. However, wildland fires would have a minor adverse effect on visitation and visitor spending that may result from temporary area closures during fire events and longer term effects associated with the damage, destruction or loss of access to Park resources.

Visitation rates could be impacted by wildland fire use incidents in the short-term. Where natural ignitions are managed for wildland fire use, these conditions may contribute to some minor, adverse impacts. Short-term impacts would be experienced as the result of management actions such as visitor evacuations, entry restrictions, and other strategies removing visitors from affected areas. However, any fire posing a threat to life or property would be immediately suppressed and hopefully of short duration, thereby reducing the potential for adverse economic effect. Temporary disruptions during fire events such as smoke, increased activity of fire personnel, and possible closures may also result in temporary inconvenience to visitors, but would not be expected to perceptibly alter visitor spending in the local economy over the longer term. The potential effects of wildland fire use incidents would be expected to occur most frequently during the warmer and dryer part of the season. This period also represents the peak tourist season, as well as the period of peak employment in the local economy.

Although manual and mechanical hazard fuel reduction can be expensive and labor intensive, the additional costs associated with such treatments could benefit local economies through increases in local spending to support work crews as well as higher incomes to local contractors. However these expenditures, while beneficial, would be limited to the duration of individual fuel reduction projects and would not be expected to substantially contribute to increased indirect and induced employment or income in the regional economy.

The effects associated with prescribed fire would be generally beneficial to local and regional businesses located outside the Park and to commercial services occurring within the Park. Expenditures for labor and equipment, supplies and other materials necessary to manage prescribed fire events would be expected to contribute a negligible to minor, short-term, beneficial effect to the local economy. Short-term, adverse impacts would include restrictions of use by visitors in areas of prescribed burns, visitor evacuations, temporary closures, and other strategies. A corresponding short-term, adverse effect on visitor spending, and indirectly on income to Park concessioners and local and regional businesses, may be experienced. However, the majority of prescribed burns are not expected to result in major Park closures. Prescribed burns would also be limited in size and duration and scheduled outside of the peak tourist season to minimize disruption. As a result, any adverse impact to visitor spending would be expected to be negligible and of temporary duration.

Fire management programs would affect the local and regional economies through increased spending for personnel, equipment and materials employed in managing unplanned wildfire or prescribed burns. Additional indirect and induced income to the local community may be derived for spending by NPS and contractor personnel during fire events. Given the relatively sparse populations and small number of communities in the immediate vicinity of the Park, these expenditures would be expected to have a negligible overall effect on the local or regional economy.

Cumulative Effects

There are several ongoing projects taking place in and around the Park. Projects which could potentially impact socioeconomic resources include road and housing construction as well as programs to protect developed areas from fires through hazard fuel removal. The cumulative impact on the local economy would be generally beneficial and minor. Alternative 1 would contribute minor, temporary benefits to socioeconomic resources with some potential for minor, adverse effects. Combined with known past, current, and future projects and actions, there would be minor, adverse or beneficial impacts.

Conclusion

Visitation rates, and corresponding visitor spending, would not be expected to change perceptibly under this alternative. Some increase in local spending for labor, equipment and supplies for fire management activities may be expected to offset any decreases in visitor spending experienced in the local economy. Economic impacts associated with this alternative would be expected to be generally negligible to minor, beneficial and of short duration, with some potentially negligible, adverse impact associated with temporary disruptions of visitor activity and corresponding business activity inside the Park and in gateway communities.

3.12.4 Impacts of Alternative 2 (Proposed Action)

Impacts Analysis
Under this alternative the 2004 FMP would be replaced with the 2012 FMP. Impacts on socioeconomic resources under Alternative 2 would be similar to those described for Alternative 1. A faster response time to unwanted wildfires within the suppression strategy zones would decrease disruption of visitor activity and corresponding visitor spending inside and outside the Park, reducing the adverse impacts on concessions and gateway communities. A faster response time would also likely shorten the extent and duration of an unwanted wildfire, thus decreasing spending on suppression and associated activities.

Under Alternative 2, the IDT process would be more streamlined and efficient. All non-emergency projects (prescribed fire, fuel reduction) would be planned by the IDT. It is possible that some projects could be planned during periods of lower visitation, resulting in lower adverse impacts on the local economy as fewer visitors would be displaced due to fire management activities.

Wildfire response strategies, such as using a monitor or point/zone protection strategy, under this alternative would be managed according to goals and objectives rather than specific prescriptions as in Alternative 1, allowing for more acreage burned. Although impacts would be similar to those for wildland fire use incidents described in Alternative 1, adverse impacts of decreased visitor spending could be greater and last longer as it would take longer to manage larger and/or more frequent monitor strategy fires. On the other hand, Park expenditures to manage using a monitor strategy could be greater as well, imparting a benefit to the local economy.

Cumulative Effects
There are several ongoing projects taking place in and around the Park. Projects that could potentially impact socioeconomic resources include road and housing construction as well as programs to protect developed areas from fires through hazard fuel removal. The cumulative impact on the local economy would be generally beneficial and minor. Alternative 2 would contribute minor, temporary benefits to socioeconomic resources with some potential for minor, adverse effects. Combined with known past, current, and future projects and actions, there would be minor, adverse or beneficial impacts.

Conclusion
Visitation rates, and corresponding visitor spending, would not be expected to change perceptibly under Alternative 2. Some increase in local spending for labor and equipment and supplies for fire management activities may be expected to offset any decreases in visitor spending experienced in the local economy. Economic impacts associated with this alternative would be expected to be generally negligible to minor, beneficial and of short duration, with some potentially negligible, adverse impact associated with temporary disruptions of visitor activity and corresponding business activity inside the Park and in gateway communities.

4.0 CONSULTATION & COORDINATION

4.1 AGENCIES/TRIBES/ORGANIZATIONS/INDIVIDUALS CONTACTED

Tribes. On December 12, 2011 a letter was sent to 103 representatives of the Park's affiliated tribes announcing the proposed rewrite of the FMP and associated EA. The letter invited tribes to contribute comments on the project during the scoping process and announced the public scoping meeting. The tribes will be sent a copy of the EA for review and comment.

State Historic Preservation Office. An informal consultation letter is being sent to the Montana, Wyoming, and Idaho State Historic Preservation Offices for Section 106 compliance in conjunction with this public review EA. This EA is being sent to the Montana, Wyoming, and Idaho State Historic Preservation Offices for review and comment as part of the on-going Section 106 compliance for the Fire Management Plan.

U.S. Fish and Wildlife Service. Park staff is requesting endangered and threatened species verification from the U.S. Fish and Wildlife Service in conjunction with this public review EA. This EA is being sent to the USFWS for review and comment as part of the on-going Section 7 compliance for the FMP.

A list of agencies, tribes, organizations, and individuals that received the scoping letter and that are notified of the availability of the EA is located in the project file at Yellowstone National Park.

This environmental assessment is available for public review and comment until midnight EST October 19, 2012. It is available online at the National Park Service Planning, Environment, and Public Comment (PEPC) website. Go to http://parkplanning.nps.gov/ynpfireplan to access the PEPC site. Public comments on this environmental assessment can also be provided on the PEPC website.

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APPENDIX A: PUBLIC SCOPING REPORT

2012
Wildland Fire Management Plan

Summary of Scoping Comments and Issues

November 21 through December 22, 2011

1.0 INTRODUCTION

Yellowstone National Park proposes to update and improve its Fire Management Plan (FMP) as recent fire program management guidance and policy has changed. Fire management policy has evolved since the last FMP Environmental Assessment (EA), which was prepared in 1992, and the last FMP in 2004. An updated FMP is required for Yellowstone to manage wildland fire in accordance with the 2009 Guidance for Implementation of Policy, NPS *Management Policies 2006*, Interagency Standards and Fire Aviation Operations Manual NFES 2724 (Red Book), and guidelines under NPS DO-18 and RM-18. These policies and directives require an approved FMP for any national park with burnable vegetation.

The 2012 FMP incorporates the following components:

- Annual updates from the Interagency Standards for Fire and Aviation Operations (Red Book).
- Revised decision-making process, terminology, and format based on the Guidance for Implementation of Federal Wildland Fire Management Policy (Feb. 2009).
- Fire management suppression strategy zones to facilitate fire management actions for unplanned fire.

The FMP is a comprehensive document that outlines the Park's fire management goals and describes the policies and actions by which these goals would be realized. The purpose of the plan is to provide consistent operational guidance to management as to questions arising in the inevitable event of a wildfire within its jurisdictional boundary. It also formalizes Park specific fire management decision making process and procedures, redefines fire management strategies, articulates the park's fire management organization and responsibilities, and establishes the direct linkage between resource management goals and fire management strategies.

The National Park Service (NPS) must follow the National Environmental Policy Act (NEPA) of 1969 to assure consideration of important issues. As part of the NEPA process, the proposed FMP update will be evaluated in an EA which will analyze the potential environmental effects of

fire management activities. The EA will describe the alternatives and their consequences relative to implementation of a comprehensive fire program including wildland fire response, fire prevention and fuels management utilizing prescribed fire and mechanical treatments. The analysis will consider impacts to topics such as air quality, water quality, special status species, cultural resources, visitor use, and socioeconomics.

This Scoping Report summarizes and categorizes the input received during the scoping period.

2.0 THE SCOPING PROCESS

The public scoping period is designed to help the NPS determine the appropriate scope of its environmental study of the cave trail rehabilitation project by identifying concerns the public has with the proposed project:

- What alternatives should be considered?
- What other actions should be considered?
- What environmental effects should be considered?
- What steps to reduce potential adverse impacts should be considered?

The period for public input, normally 30 days, began on November 21, 2011. The final deadline for comments to be fully considered in the project analysis was December 22, 2011.

The NPS' Planning, Environmental, and Public Comment (PEPC) website was made available to provide copies of the scoping documents: http://parkplanning.nps.gov/

2.1 Direct Mail

A scoping letter (Attachment A) was mailed to 271 individuals, agencies, tribes, and organizations.

2.3 News Media Press Releases

A press release was sent to over 400 contacts with media (i.e. newspaper and radio), federal, state, and local agencies, chambers of commerce, concessioners, organizations, friends of the park, and local businesses (Attachment B).

2.2 Inputs

Both a postal mail address (Yellowstone National Park, P.O. Box 168, Yellowstone National Park, WY 82190) and the PEPC website (http://parkplanning.nps.gov/) were established for accepting comments.

3.0 SCOPING COMMENTS

3.1 Comments Received

For the purposes of this report, a "comment" is defined as a position or question stated within a comment letter. A "comment letter" is defined as any single piece of correspondence. There may be several comments within one comment letter.

Individuals

There were six comment letters received from individual members of the public.

Organizations

One comment letter has been received at this time from organizations.

Agencies

There were two comment letters received from agencies.

Tribes

There was one comment letter received from tribes.

3.2 Public Scoping Meeting

A public scoping meeting was held on December 6, 2011 in Cody, WY. Three members of the public attended. Joe Krish, Fire Management Officer for Yellowstone, gave a brief presentation then opened the floor to question and comments.

3.3 Summary of Comments

Specific issues and concerns were brought up in comment letters and at the public meeting:

Issue or Concern	Number of Comments
Support for prescribed burning	1
Allow fires to burn freely	2
Suppression only around structures	1
More fire suppression needed	1
Remove excess fuels	1
Opposition of greater emphasis on fire suppression	2
Size of suppression zones	2
Cooperation of adjacent land owners	1
Thinning for reduction of fire intensity	1
Area of fuel reduction should be adjustable based on intended purpose	1
Unnecessary resources should not be exerted in protecting backcountry cabins	1
Bark beetle-kill effects on fire behavior	1
Harm to aquatic systems from chemical retardants	2
Destruction of watershed important to cutthroat spawning area	1
Spread of aquatic invasive species	2
Mitigation measures suggestions to avoid spread of aquatic invasive species	5
Ability of NPS to manage fire at the Park	1

There were also several recommendations on what the EA should analyze:

Topic	Number of Comments
Ecological impacts of protecting backcountry cabins	1
Compliance with the Wilderness Act, NPS regulations and policies, NHPA	1
Alternative means of emergency fire-proofing backcountry structures	1
Structural consequences of thinning various forest types	1
Trade-off between thinning and increased risk of toppling in heavy windstorms	1
Condition of whitebark pine in Yellowstone	1
Alternative approaches to responding to fire in whitebark pine stands	1
Validity of the proposed 300-foot buffer around water bodies	1
Impacts to wildlife populations	1

Total number of comments: 35

Attachment A: Scoping Letter

United States Department of the Interior
NATIONAL PARK SERVICE
Yellowstone National Park
P.O. Box 168
Yellowstone National Park, WY 82190

D18 (YELL)
xY1419

NOV 2 2 2011

Dear Interested Party:

Yellowstone National Park proposes to update and improve its Fire Management Plan (FMP) as recent fire program management guidance and policy has changed. Fire management policy has evolved since the last FMP prepared in 2004 and the last Environmental Assessment (EA) prepared in 1992.

The 2012 FMP EA will describe the alternatives and their consequences relative to implementation of a comprehensive fire program including wildland fire response, fire prevention, and fuels management utilizing prescribed fire and mechanical treatments.

Natural systems contain communities that are fire adapted or fire dependent and may require periodic fire to retain their ecological integrity. Loss of fire (suppression) can result in diminished integrity including unnatural succession, loss of species, and vulnerability to intense wildland fire based on fuel loading. To comply with NPS policy, Yellowstone needs to have a comprehensive fire management program that protects natural and cultural resources, the public, and employee and park facilities.

An Environmental Assessment will be prepared in compliance with the National Environmental Policy Act (NEPA) to provide the decision-making framework that: 1) analyzes a reasonable range of alternatives to meet project objectives; 2) evaluates potential issues and impacts to park resources and values; and 3) identifies mitigation measures to lessen the degree or extent of these impacts.

Two alternatives are currently being proposed for the 2012 FMP EA. Both alternatives would be a continuation of active management of fire and fuels within Yellowstone. The main difference between the proposed alternatives would be the inclusion of one-half mile diameter fire suppression zones centered over frontcountry developed areas to help manage and mitigate risk to values.

The National Park Service encourages public participation throughout the NEPA process during which the public has two opportunities to formally comment on the project; once during initial project scoping, and again following release of the Environmental Assessment. We are currently in the scoping phase of this project, and invite you to submit your written comments online at the NPS Planning, Environment, and Public Comment website at http://parkplanning.nps.gov/.

A public scoping meeting will be held on December 6, 2011, at 6:30 p.m. place in the Barling Room at the Park County Courthouse in Cody, Wyoming. There will be a brief presentation about the project followed by questions and comments.

If you are not able to submit comments electronically through the website or attend the public meeting, then you may also submit written comments to Doug Madsen, Fire Management Plan, at the address on the letterhead. Please provide all comments by December 20, 2011. These comments will be considered during preparation of the Environmental Assessment. We look forward to hearing from you!

Sincerely,

for Daniel N. Wenk
Superintendent

Attachment B: Press Release

National Park Service
U.S. Department of the Interior

Yellowstone National Park

PO Box 168
Yellowstone National Park, WY 82190

Al Nash or Dan Hottle
307 344-2015

FOR IMMEDIATE RELEASE
November 23, 2011 11-116

Yellowstone National Park News Release

Yellowstone Begins Effort To Update Fire Management Plan

Fire is an important natural force which continues to shape and impact Yellowstone National Park. But it also has the potential to impact visitors, area residents, and historic structures.

Decisions on how to manage wildland fires in Yellowstone are guided by the park's Fire Management Plan.

The park is seeking to update its Fire Management Plan to reflect recent changes in federal fire policy.

The first step in updating the plan and creating a new Environmental Assessment is to ask the public to help identify issues that the park staff should consider. This process, known as public scoping, is now open and runs through December 20, 2011.

Under consideration is an approach where a greater emphasis on fire suppression might be placed in park developed areas, while leaving managers a broader range of fire management strategies in order to meet park objectives across most of Yellowstone.

Additional details on the proposal and an electronic form to submit comments on the internet can be found at the National Park Service's Planning, Environment and Public Comment (PEPC) website at http://parkplanning.nps.gov/yell, or by writing to Fire Management Plan, P.O. Box 168, Yellowstone National Park, Wyoming 82190.

In order to answer questions about the proposed Fire Management Plan update and the process of creating an Environmental Assessment, park staff members will host a public meeting during the scoping period. The meeting is set to begin at 6:30 p.m. on Tuesday, December 6, 2011. It will be held in the Barling Room of the Park County Courthouse in Cody, Wyoming. The park is considering holding additional public meetings during this planning process.

Park staff members will analyze the scoping comments and spend the coming months writing the Environmental Assessment, which is expected to be released for public review and comment sometime during spring 2012. A final decision and plan is expected to be completed during summer 2012.

Written comments may be submitted through the PEPC website, in person, or by mail. Comments will not be accepted over the phone, by fax, or e-mail. All public comments must be received or postmarked by midnight MST, December 20, 2011.

- www.nps.gov/yell -

@YellowstoneNPS http://www.nps.gov/feeds/getNewsRSS.htm?id=yell

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APPENDIX B: FUEL REDUCTION PROJECTS

Developed Areas and Park Structures (list is not all inclusive and is not prioritized)

Proposed Project Name	Proposed Estimate of Acres	Proposed Treatment Type (Rx, Mech, Manual, Pile Burn)
Bechler Developed Area	30	Rx, Mech, Manual
Bridge Bay Developed Area	100	Rx, Mech, Manual
Canyon Developed Area	100	Rx, Mech, Manual
East Entrance Developed Area	20	Rx, Mech, Manual
Fishing Bridge Developed Area	50	Rx, Mech, Manual
Grant Village Developed Area	48	Rx, Mech, Manual
Lake Developed Area	54	Rx, Mech, Manual
Lake Utility Developed Area	7	Rx, Mech, Manual
Madison Developed Area	50	Rx, Mech, Manual
NE Entrance Developed Area	70	Rx, Mech, Manual
Nez Perce Cabin and Road	15	Rx, Mech, Manual
Norris Developed Area (includes campground, ranger museum, and geyser basin museum)	30	Rx, Mech, Manual
Old Faithful Developed Area	22	Rx, Mech, Manual
Soda Butte Hazard Fuels Rx Burn	2485	Rx, Mech, Manual
South Entrance Developed Area	25	Rx, Mech, Manual
Tower-Roosevelt Developed Area	20	Rx, Mech, Manual
Tower Falls Developed Area	25	Rx, Mech, Manual
West Entrance Developed Area (includes entrance station)	25	Rx, Mech, Manual
Buffalo Lake Cabin	5	Rx, Manual
Buffalo Plateau Cabin	8	Rx, Manual
Cabin Creek Cabin	5	Rx, Manual
Cache Creek Cabin	5	Rx, Manual
Calfee Creek Cabin	5	Rx, Manual
Cold Creek Cabin	5	Rx, Manual
Cougar Creek Cabin	5	Rx, Manual
Cove Cabin	5	Rx, Manual
Crevice Cabin	16	Rx, Manual
Daly Creek Cabin	10	Rx, Manual
Elk Tongue Cabin	5	Rx, Manual
Fawn Pass Cabin	9	Rx, Manual
Fern Lake Cabin	9	Rx, Manual
Fox Creek Cabin	12	Rx, Manual
Harebell Cabin	15	Rx, Manual

Heart Lake Cabin	5	Rx, Manual
Hellroaring Cabin	5	Rx, Manual
Howell Creek Cabin	6	Rx, Manual
Lamar Mountain Cabin	5	Rx, Manual
Lost Creek Cabin	5	Rx, Manual
Lower Blacktail Cabin	5	Rx, Manual
Lower Slough Creek Cabin	5	Rx, Manual
Mary Mountain Cabin	14	Rx, Manual
Mt. Holmes Lookout	10	Rx, Manual
Mt. Sheridan Lookout	10	Rx, Manual
Mt. Washburn Lookout	10	Rx, Manual
Observation Peak Lookout	5	Rx, Manual
Outlet Cabin	5	Rx, Manual
Peale Island Cabin	5	Rx, Manual
Pelican Cone Lookout	10	Rx, Manual
Pelican Springs Cabin	5	Rx, Manual
South Riverside Cabin	7	Rx, Manual
Sportsman Lake Cabin	5	Rx, Manual
Thorofare Ranger Station	8	Rx, Manual
Three River Junction Cabin	5	Rx, Manual
Trail Creek Cabin	8	Rx, Manual
Union Falls Cabin	10	Rx, Manual
Upper Blacktail Cabin	5	Rx, Manual
Upper Miller Creek Cabin	5	Rx, Manual
Winter Creek Cabin	7	Rx, Manual

Resource Enhancement and Research (list is not all inclusive and is not prioritized)

Proposed Project Name	Proposed Estimate of Acres	Proposed Treatment Type (Rx, Mech, Manual, Pile Burn)
Gardiner Basin Non-native Plant Research	200	Rx
Gardiner Basin Plant Biomass Removal	50	Rx
Northern Range Ecosystem Research	500	Rx

APPENDIX C: THE PARK GO NO-GO FIRE STRATEGY DECISION TOOL

Unplanned Wildfire Recommended Action and Re-evaluation Decision Tool

Circle Best Response to each category

Current or forecasted fire weather watches and warnings	none or watch Favorable	warning Unfavorable
Yellowstone NP Staffing Level (based on Quadrant RAWS ERC)	ERC 0-51 SL1,2,3 Favorable	ERC 52-Max (SL4 & SL5) Unfavorable
Time of year	Except July and August Favorable	July and August Unfavorable
National Preparedness Level	1, 2, 3 Favorable	4,5 Unfavorable
1000 hour fuel moisture at nearest representative log weighing station	> 12 Favorable	≤ 12 Unfavorable
Drought intensity http://www.drought.unl.edu/dm/monitor.html	none, abnormally dry, moderate Favorable	severe, extreme, or exceptional Unfavorable
Live fuel moisture of fire carrier (whortleberry, sedge, grass, sage, timber)	Above Average to average	Below average

	Favorable	Unfavorable	
Anticipated Incident Complexity Level	3,4, and 5 Favorable	1 and 2 Unfavorable	
Recommended actions are as follows: *Suppression strategy: > or = 3*			**Total # Unfavorable Conditions**
The recommended action for this fire is:			
Print Name_____		**Title**_____	
Signature_____		**Date**_____	