Bridger-Teton Fire Amendment

Environmental Assessment

United States
Department of
Agriculture

Forest Service
Intermountain Region
Bridger-Teton National Forest

January, 2004

Comments received in response to this solicitation, including names and addresses of those who comment, will be considered art of the public record on this proposed action and will be available for public inspection. Comments submitted anonymously will be accepted and considered; however, those who submit anonymous comments will not have standing to appeal the subsequent decision under 36 CFR Parts 215 or 217. Additionally, pursuant to 7 CFR 1.27(d), any person may request the agency to withhold a submission from the public record by showing how the Freedom of Information Act (FOIA) permits such confidentiality. Persons requesting such confidentiality should be aware that, under the FOIA, confidentiality may be granted in only very limited circumstances, such as to protect trade secrets. The Forest Service will inform the requester of the agency's decision regarding the request for confidentiality, and where the request is denied, the agency will return the submission and notify the requester that the comments may be resubmitted with or without name and address within 15 days.

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USDA Forest Service
Bridger-Teton National Forest

January 2004

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Chapter 1
Purpose and Need for Action

1.0 Introduction

The Bridger-Teton Land and Resource Plan Management (Forest Plan) was originally approved in 1990. Since that time, new information has provided managers with a greater understanding of fire's role on the Bridger-Teton landscape. Recent landscape scale assessments (LSAs), such as Upper Green River (1999), Commissary and Tunp Ridge (2001), and the Teton Division (2003) have identified fire-adapted ecosystems on the Bridger-Teton that are in a condition that threatens their long-term resiliency, integrity, and sustainability. These assessments, along with additional studies referenced in Chapter 3, document the importance of wildland fire as an important disturbance mechanism.

Fire suppression has become more complex and expensive. Wildland fire size, intensity, and severity have increased. These changes pose a greater threat to human life, including firefighters.

More people are recreating on national forests and building homes in wildland areas, increasing their exposure to the risks of wildland fires and requiring aggressive and complex suppression efforts. On the other hand, we are also spending large amounts of suppression funds to control fires in areas with low resource value with little risk to human and private property. In these cases, we may be suppressing fires that actually would actually benefit resources.

Since the Forest Plan was approved, there have been several changes in Forest Service fire management policy that allow for increased flexibility for management of naturally ignited wildland fires (Wildland Fire Use). This proposed amendment would allow the Bridger-Teton National Forest (BTNF) to take full advantage of these policy changes and provide better and more efficient management of the forest resources. Wildland fires managed as fire use can be managed to accomplish resource management objectives, versus a wildfire where Forest Service policy requires suppression strategies to minimize the total cost of suppression and values of resource loss.

If the proposed action is selected, a revised operational Fire Management Plan (FMP) would be implemented to meet the new direction. It is anticipated that this decision would be incorporated into the Forest Plan revision, scheduled for completion in 2008. If a no action alternative is selected, then it is anticipated that the Fire Management Plan would continue to be guided by current Forest Plan direction.

1.1 Background on Forest Plan Fire Direction

The current Forest Plan describes desired future conditions (DFCs), goals, objectives, standards and guidelines that provide fire management direction for the Bridger-Teton. Most direction is included in the "Forest-wide resource management prescriptions, standards and guidelines" while additional guidance may be specified for each DFC.

Since the Forest Plan was approved, there have been some changes to accepted fire terminology. Table 1.1 contains currently accepted Forest Service Manual (FSM) fire terminology used throughout this environmental assessment.

Table 1-1 Key Current Forest Service Fire Terminology (FSM 5105).

Wildland Fire	Any non-structure fire, other than prescribed fire, that occurs in the wildland.
Wildland Fire Use	The management of naturally ignited wildland fires to accomplish specific prestated resource management objectives in predefined geographic areas outlined in Fire Management Plans (FMPs). Operational management is described in the wildland fire implementation plan (WFIP).
Prescribed Fire	Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements must be met, prior to ignition.
Wildfire	An unwanted wildland fire

Unlike some forest plans, the BTNF Forest Plan does not address where prescribed fire is allowed or not allowed. The Plan provides a list of possible resource objectives that prescribed fire may be used to accomplish. The use or non-use of prescribed fire in specific areas is determined by project level NEPA.

The term wildland fire use was not in use when the Forest Plan was approved. At that time these fires were referred to as either prescribed natural fires, unscheduled ignitions or wilderness fires. Most fire managers and agency administrators considered wildland fire use fires as a variant of prescribed fire. When the Forest Plan was approved, both the Bridger and the Teton Wilderness already had approved stand-alone fire use plans. These two plans were developed following project level NEPA analysis.

Additionally, from 1987 to 1988 project level NEPA was competed for the Wyoming Range (non-wilderness) and a fire use plan was developed for this area. The plan was just coming online as the 1988 fire season occurred. Because of the severity of the fire season and the controversy surrounding wildland fire use, implementation of the Wyoming plan (along with the Bridger and Teton) was suspended in 1988. The Bridger and Teton plans were revised and brought back on line in 1991 and 1992 respectively, while the Wyoming plan has never been implemented.

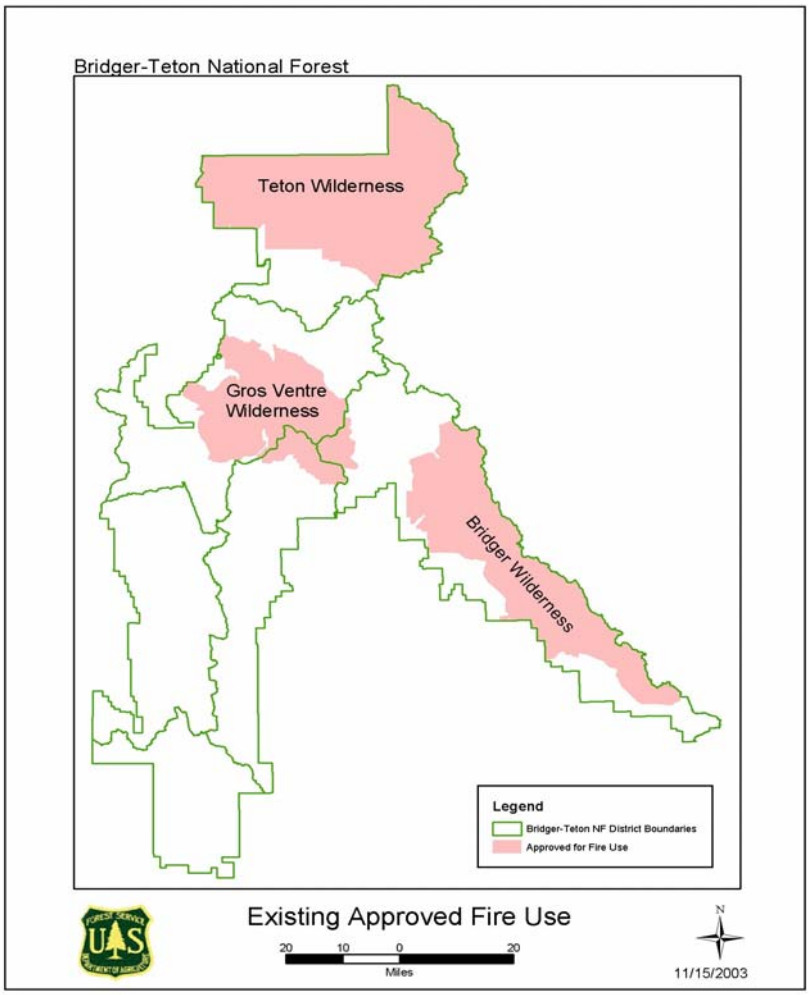
When the Forest Plan was approved, the two wilderness fire plans were considered “incorporated or made part of the Forest Plan” (Forest Plan p5). The guideline for wilderness DFCs stated, “Wildfires will be managed in accordance with approved wilderness plans for each wilderness area.” This guideline reinforced the wilderness prescription of “natural biological processes are not adversely or artificially changed over time by human use.” This guideline was used as the programmatic NEPA basis for development of the third wilderness fire plan covering the Gros Ventre Wilderness. The Gros Ventre plan also includes approximately 40,000 acres of non-wilderness lands that were added to the plan to establish more logical boundaries. To date, no wildland fire use fires have been managed in the non-wilderness part of the plan area.

Since the Forest adopted the first fire use plan, 32 wildland fire use fires have been managed in the three wildland fire use areas, with a total of 6,715 acres burned. An additional 10 fires were initially declared wildland fire use fires, but were declared wildfires within the first 24 to 48 hours, when further analysis determined that they would not meet the fire use criteria. Most notable was the 1988 Mink Fire, which was managed for approximately three days, but was declared a wildfire based on the lack

of funding and other social and political events associated with the 1988 fire season. The Mink Fire grew to over 120,000 acres by the end of the fire season.

Specific authorization of fire use through standards and guidelines is not addressed in the current Forest Plan. As with prescribed fire, fire use (or the other terms used at that time) was neither authorized nor limited.

Figure 1-1 Current Approved Fire Use Areas, Bridger-Teton National Forest.



1.2 Purpose and Need for Action

There is a need to clarify Forest Plan fire management direction for prescribed fire, wildland fire, fuels management, and to provide standards and guidelines that are consistent with current Forest Service policy and direction. Outdated fire terminology and direction in the current Forest Plan should be replaced to meet current Forest Service policy

Implementation of this amendment would provide Forest managers with a wide range of fire management tools while meeting social and economic goals, including human health and safety, and protection of private property. Increased flexibility would provide more opportunities to move at-risk ecosystems toward properly functioning conditions.

There is a need for a wider range of fire management strategies throughout the Forest. This would provide opportunities to lower the threat to human life, property, and natural and cultural resources, along with reducing suppression costs.

Current standards, guidelines, and prescriptions for some management areas have restrictive language that does not allow fire managers maximum flexibility to manage wildland fire efficiently and safely while maximizing resource benefits from acceptable wildland fires. Implementation of this proposed amendment would allow the Bridger-Teton greater flexibility and would enhance resource management.

1.3 Proposal

The proposed amendment would revise the Forest Plan standards and guidelines to authorize management of naturally occurring fires (wildland fire use) throughout the entire Forest.

The standards and guidelines would specify that naturally occurring wildland fires would be suppressed if there will be predicted negative effects to areas with important social, economic, and ecological values. Existing standards and guidelines for fire management would be modified or deleted if they were inconsistent with the intent of the proposed action.

Terminology in the standards and guidelines throughout the Forest Plan would be updated to meet current Forest Service fire terminology and policy.

The proposed action would meet the current Forest Service policy of suppression of all human-caused wildfires. In addition, Desired Future Conditions for each management area would not be changed.

Section 2.4 of this environmental assessment provides more details of the proposed actions. Specific wording of the current and proposed changes to the Forest Plan is located in appendix D.

1.4 Geographic Area and Scope

The proposal considers all lands within the 3.4 million acre Bridger-Teton National Forest, located in western Wyoming.

It is planned that this amendment would remain in effect until the projected 2008 revision of the Bridger-Teton Forest Plan.

The programmatic management direction adopted through this amendment would not change the desired future conditions and land allocations for the Bridger-Teton National Forest.

1.5 Decision to be made

Analyses and findings described in the environmental assessment will help the Forest Supervisor decide:

1. Whether to continue with current fire management direction (goals, guidelines, and standards) in the Forest Plan (no action), or change direction; and

2. What management direction is necessary and where should the direction be applied to address the purpose and need?

1.6 Public Participation and Consultation

Scoping began on January 4, 2001 and ended on February 5, 2001. Scoping letters were sent to approximately 400 individuals, organizations, tribes and federal agencies, including the US Fish and Wildlife Service. Local agencies including Teton, Sublette, Lincoln and Fremont Counties received scoping letters. A copy of the scoping was also sent to the Wyoming State Clearing House that coordinates NEPA responses for all state agencies.

Included in the scoping were all current grazing permitees, summer home owners, and special use permitees. News releases were distributed to local and regional news organizations. The project was listed on the Forest quarterly schedule of proposed actions, and the scoping letter was posted on the Bridger-Teton public website. Congressional field representatives for Senators Thomas and Enzi, and Representative Cubin were briefed on February 16, 2001. Briefings were also held with the Sublette and Lincoln County Commissioners.

Twenty-eight responses were received from individuals and organizations by the end of February 2001. Comments varied by the respondent's interests. The most comments concerned:

- Short- and long-term impacts to livestock grazing because of unavailability of allotments due to wildland fire use fires
- Emphasis on producing wood products versus allowing potential timber to burn. Several of these respondents supported prescribed burning if the burns were small and well controlled.
- Several summer home owners wanted more information on how the amendment would specifically affect them and how they need to manage their permitted land and

structures. Summer home owners are special use permitees that have long term-leases in designated summer home areas.

1.7 Forest Plan and Other Key Fire Documents

This section describes how Forest Plan direction is incorporated into fire management planning and on the ground actions and activities. This information is contained in Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide (1998), and Forest Service Manual (FSM) 5100, 5130, and 5140.

Land and Resource Management Plan

The Bridger-Teton National Forest's Land and Resource Management Plan (LMP, or Forest Plan) is a dynamic management plan that provides integrated direction reflecting decisions, plans, and assessments made at various scales and times. It describes desired future conditions, goals, objectives, standards, and guidelines--collectively referred to as management direction--for a specific national forest. Changes in management direction are incorporated in proposed amendments to the Plan that add, delete, and modify items of programmatic direction.

Forest Plan goals and desired future conditions provide a vision to move toward and consider in future landscape assessments and site-specific projects. Standards and guidelines provide reasonable assurance that adequate environmental safeguards are considered and incorporated in future site-specific projects.

Forest Land Management Plan creation or revision requires a programmatic environmental impact statement (EIS) and forest plan document incorporating applicable law, regulation, and policy; and a record of decision (ROD) signed. All future actions are to be carried out within the constraints of forest plan direction.

Fire Management Plan

The Fire Management Plan (FMP) is the primary tool for translating programmatic direction developed in the Forest Plan into on-the-ground action. It incorporates all relevant Forest Plan management direction (goals, guidelines, and standards) necessary to implement on-the-ground fire management actions. The FMP is updated annually to reflect changes in policy, Forest Plan direction, ground conditions, and other changes in the fire management program.

The FMP includes information on prescribed fire and wildland fire use, including a map of areas where they are authorized or prohibited by Forest Plan direction. The FMP may include resource inventory maps identifying sensitive ecological or cultural areas. Any mitigation or prescriptive measures required by law, policy, or Forest Plan standards and guidelines may also be identified to provide adequate environmental safeguards or to meet goals and desired conditions and associated resource objectives stated in the Forest Plan.

The intent is to provide the line officer and incident commander with information before planned and unplanned (emergency) fire management activities so that they can appropriately address resource and social concerns.

A site-specific NEPA document is not prepared prior to the approval of the Fire Management Plan because a Fire Management Plan does not propose, authorize, or permit site-specific federal actions. As stated earlier, the FMP incorporates relevant management direction from the Forest Plan decision combined with existing resource information.

Wildland Fire Implementation Plan

The wildland fire implementation plan (WFIP) is a progressively developed, site-specific assessment and operational plan that is prepared once a natural ignition is determined to be in an area approved for wildland fire use. The wildland fire implementation plan provides site-specific direction on resource objectives and effects to be accomplished, and describes the maximum manageable area for the fire, acceptable fire behavior parameters, any mitigation measures that may be needed, and the organization required to successfully manage the fire.

A site-specific NEPA document is not prepared and signed before development of the WFIP because, following an unplanned natural ignition, immediate emergency decisions regarding the appropriate management response are required. The WFIP incorporates relevant information from the Fire Management Plan (which includes relevant Forest Plan direction). It applies this knowledge to the ground, within constraints, to provide reasonable assurance that objectives are met.

Prescribed Fire Burn Plan

The prescribed fire burn plan is a site-specific document prepared at the project level that describes implementation actions for a prescribed fire. The prescribed fire burn plan outlines objectives and the immediate effects desired for the project, and describes how the project would be accomplished. It includes resource objectives from the vegetation prescription as well as guidance on pre-ignition activities needed, and specific environmental and weather conditions under which the fire can be ignited and managed. It is prepared before ignition by individual(s) qualified as burn boss, and approved by the agency administrator.

A site-specific NEPA document incorporating relevant information from the Fire Management Plan (which includes relevant forest plan management direction) is prepared and signed before development of the vegetation prescription and prescribed fire burn plan. The burn plan applies information from the NEPA analysis and decision to the ground, within constraints, to provide reasonable assurance that objectives are met.

Wildland Fire Situation Analysis

The wildland fire situation analysis (WFSA) is a site-specific decision document that is prepared at the District or Forest level for all wildfires that exceed, or are expected to exceed, the initial planned response by local resources as outlined in the Fire Management Plan. Prescribed fires or wildland fire use fires that cannot be brought back into planned prescription limits within a specified time are also considered wildfires and a WFSA would be completed.

A WFSA is prepared to document the current fire situation, and help the decision making official determine the most appropriate future actions for management of the fire. Preparation typically involves the local fire management officer, the line officer, and any needed resource specialists (determined by the location of the fire). The document guides them through a process of determining objectives and constraints for the management of the incident, developing and comparing strategic management alternatives, evaluating expected effects of alternatives, selecting a preferred

alternative, and documenting the decision. The elements identified in the preferred alternative are revisited daily to determine if the WFSA is still valid for the current fire situation.

A site-specific NEPA document is not prepared and signed prior to the development of the WFSA because these situations require immediate emergency decisions on appropriate suppression response. The WFSA incorporates relevant information from the Fire Management Plan (which includes relevant forest plan management direction) and applies this knowledge to the ground, within constraints, to provide reasonable assurance that objectives are met.

Chapter 2
Alternatives

2.0 Introduction

Chapter 2 discusses the resource topics identified by public and internal scoping. The chapter describes the two alternatives analyzed in detail, and ends with a comparative synopsis of the alternatives based on the environmental consequences disclosed in Chapter 3.

2.1 Resource Topics

Based on public and internal specialist input, the Interdisciplinary Team recommended and the Forest Supervisor approved eight resource topics for analysis. Each topic contains a narrative statement with criteria to measure change (effects).

1. Fire Exclusion (Fire Ecology)
    - Describe the historic fire regimes and vegetation and changes in composition and structure of vegetation that have occurred because of fire exclusion.
    - Describe how each alternative would result in change of composition and structure of vegetation.

2. Soils, water and aquatic habitats
    - Describe how fire use or fire exclusion may change soil productivity, soil erosion, risk of flooding, and affect sensitive watersheds.

3. Air Quality
    - Describe expected changes to air quality and how State and federal air quality (Clean Air Act) requirements and procedures will be met.
    - Describe how predicted changes are consistent or inconsistent with direction in the Forest Plan.
    - Describe how public safety would be protected when fire and smoke are expected near major road corridors or communities.
    - Describe possible impacts of the alternatives to visibility in Class I areas.
    - Describe possible impacts of the alternatives to deposition in Class I areas.

4. Livestock Use
    - Describe how fire use or fire exclusion may change rangeland resources, including availability of forage. Describe anticipated changes to permits, allotment management plans, and annual use plans, including periods of rest.

5. Timber
    - Describe how each alternative would change the value of timber and the availability of personal use and commercial timber.
    - Describe if the changes are compatible with current Forest Plan direction.

6. Wildlife Habitat

- Describe historic and existing habitat characteristics for wildlife in general and Bridger-Teton Management Indicator Species (MIS) and how they have been shaped by fire or absence of fire.
- Describe how projected changes in habitat for these species vary between the two alternatives being considered.

7. Threatened, Endangered, Proposed, and Sensitive Species
    - Describe historic and existing habitat characteristics for threatened and endangered and Region 4 sensitive species and how habitats have been shaped by fire.
    - Describe how projected changes in habitat for these species vary between the two alternatives being considered.
    - Describe how previous alteration of the fire regime has altered habitat conditions for these species.
    - Describe the effects of habitat conditions from implementation of each alternative.

8. Recreation and Visual Quality
    - Describe potential changes in the recreation setting because of each alternative and their consistency with Forest Plan direction
    - Describe potential effects on scenic quality and the effects of the implementation of each alternative. Would they meet forest plan standards?

2.2 Alternatives Considered in Detail

Based on public input, the interdisciplinary team recommended and the Forest Supervisor approved two alternatives, including the no action alternative. Each alternative has specific programmatic impacts associated with how it achieves the purpose and need for the project.

Features common to all alternatives

Regardless of alternatives, future fire management actions will be consistent with applicable law, regulation, and Forest Service policy such as manuals and handbooks. For example, the Forest Service manual direction for wilderness provides direction for the use of prescribed fire within wilderness.

All alternatives assume the operational Fire Management Plan would identify and incorporate appropriate mitigation or prescriptive measures required by the Forest Plan.

None of the alternatives proposes change in Forest Plan desired future conditions, land allocations (land use emphasis), or management directions (goals, standards, guidelines) for resources other than fire management.

Alternative A—No Action

This alternative addresses the requirements of the National Environmental Policy Act (NEPA) and the National Forest Management Act (NFMA) to consider taking no action. Under this alternative, current Forest Plan direction for fire suppression, prescribed fire, wildland fire use, and fuels standards would remain in effect as currently worded. Individual projects would be evaluated consistent with NEPA and NFMA requirements.

Alternative B—Proposed Action

Alternative B is designed to address the purpose and need for action. A summary of the new or revised goals and standards for the Forest Plan is shown below. An appendix is included in this environmental assessment with the current and proposed wording of each change.

Summary of proposed changes:

- Outdated fire definitions would be replaced with current accepted fire terminology.
- Where feasible, all of the new standards and guidelines would be adopted Forest-wide. Standards include:
  - All human caused fires will be suppressed.
  - A full range of suppression tactics is authorized Forest-wide consistent with Forest Plan emphasis and direction.
  - Wildland fire use is authorized Forest-wide consistent with Forest-wide and individual Desired Future Condition emphasis and direction.
  - Cultural resources will be protected if feasible with priority given to sites on the National Historic Register.
  - Prescribed fire is authorized in all non-wilderness areas.
- Specific direction for fire suppression strategies and fuels strategies would be moved from the Forest Plan to the operational Fire Management Plan.
- Desired Future Conditions 6A, 6B, 6C, 6D (Wilderness) would have the following standards and guidelines:
  - Prescribed fire is authorized in wilderness areas only if they meet the criteria in the Forest Service Manual (2324.2).
  - Favored suppression actions on wildfires and any required fire use holding actions should be those that have the least long-term impact on wilderness values and resources.
- The wording regarding maintenance of "defensible areas" around all Forest Service capital improvements would be revised and clarified, and there would be minor wording changes for protection of improvements in Desired Future Condition 9B (Special-Use Recreation Areas)

2.3 Alternatives Considered But Not Analyzed in Detail

Exclusion of potential timber harvest emphasis areas from wildland fire use

Some respondents to the scoping letter believed that wildland fire use should be excluded from areas having potential commercial or personal use emphasis for timber resources. This potential alternative would not allow fire use in management areas with scheduled timber harvest. Management areas in DFC 1B, 7A, and 10 fit this criteria.

The theme of DFC 1B is "an area managed for timber harvest, oil and gas, and other commercial activities with many roads and moderate to occasionally substantial emphasis on other resources." Scheduled timber harvest is also allowed in DFCs 7A and 10. DFC 7A is "grizzly bear recovery through scheduled timber harvest," and DFC 10 is "Simultaneous development of resources, opportunities for human experiences, and support for big game and a wide variety of wildlife species." Timber harvest is also allowed in all other non-wilderness DFCs but is not considered "scheduled."

Although wildland fire use may not be routinely used in these areas, fire use may be appropriate at certain times of year or in specific areas where fire use would enhance the desired future conditions of this DFC. The Fire Management Plan would provide clear direction on when fire use should be considered in these areas. The FMP would also designate areas where fire use is not appropriate. Following discovery of a natural ignition, the line officer would immediately determine if the candidate fire meets these criteria for fire use. This is often referred to as the "go/no go" decision.

If fire use were excluded in all of timber harvest areas, the exclusion could hinder the development of logical maximum management areas (MMAs), where a small but strategic portion of the exclusion area may be required to effectively manage a fire use fire.

Exclusion of critical grazing allotments from wildland fire use

Comments received from scoping suggested that fire use could cause short-term (one to three year) impacts to livestock grazing. Permitees may be required to move livestock during ongoing fires. Depending on the severity of the fire, post-fire rest of one to three years may be required. Livestock operators are concerned that these requirements would adversely affect their operations.

A potential alternative excluding critical grazing allotments could address this issue, however this would prohibit fire use as a tool to enhance long-term range conditions and provide other resource benefits. Short-term impacts to grazing availability would be addressed during the site specific WFIP analysis to determine if a candidate fire would be managed as fire use. The approving line officer would determine on a case by case basis if these impacts are acceptable.

2.4 Comparison of Alternatives

This section compares the alternatives considered in detail. It is based on the presentation of alternatives earlier in this chapter, and the resource effects detailed in Chapter 3.

2.41 Comparison by Purpose and Need

To what extent will the alternative clarify management direction and provide more flexibility for management of prescribed fire and wildland fire while meeting social and economic goals, including human health and safety, and protection of private property?

Would outdated fire terminology and direction in the current Forest Plan be replaced to meet current Forest Service policy?

Alternative A, no action, does not address the purpose and need. The current Forest Plan does not provide clear direction allowing Wildland Fire Use Forest-wide. With the exception of incorporation of existing wilderness fire use plans, the Forest Plan is silent on wildland fire use. The Plan is also silent on authorization of prescribed fire. The no action alternative does not allow maximum flexibility allowed under current policy and direction for wildland fire management, and does not replace outdated fire terminology.

Alternative B affirmatively addresses the purpose and need. The alternative provides clear direction for use of prescribed fire and wildland fire use and maximizes the range of fire management tools available. Overall fire management program costs would decrease as more acres are allowed to

burn under fire use versus costly suppression efforts. (A comparison of costs for fire use and suppression for the 2003 fire season is located in the project record).

Redundant information would be removed and replaced with language consistent with Forest Service policy.

2.42 Comparison by Expected Number and Size of Wildland Fire Use, Prescribed Fire, and Suppression Actions

An estimate of the number of fires and acres burned under the two alternatives is problematic. Changes in climate, where and when human ignitions occur, along with uncertainty of the amount of future prescribed burning all could change the potential burned acres

Based on historical fire reports from 1953 to 2002, the 50-year average for detected lightning fires per year on the Bridger-Teton is eight ignitions in wilderness areas, and 23 ignitions in non-wilderness (non-fire plan) areas. Forest-wide during this time, 217,000 acres have burned from lightning ignitions (wildfire and fire use), with 145,000 acres attributed to human ignitions. Of note is that 75% (271,000 acres) burned in one year (1988).

The following estimates for each alternative are based on historical fire records and professional knowledge from Bridger-Teton fire managers.

Alternative A

This alternative would continue fire use in currently approved areas. Since approval of the three wilderness fire plans, the Forest has managed two to nine fire use fires per year or about 38 percent of candidate fires are declared fire use. Historically less than three fire use fires exceed five acres each year. Since the fire use program began, five wildland fire use fires have exceeded 100 acres, and they have all been managed within the last three seasons. To date the largest fire use fire managed under existing wilderness plans was the 2,700-acre Moss Ridge Fire (2003). Given these past figures, an estimate of future average yearly fire use acres burned would be 2,000 to 4,000 acres, with up to 10,000 acres burned during high fire years.

Under this alternative, long term it is expected the current trend of large uncontrolled wildfires would continue, as most fires are suppressed at small acres during mild burning conditions, but under severe burning conditions large and expensive to control fires would occur. Depending on the extent of prescribed burning implemented, most of the burned acres each year would be classified as wildfires.

Alternative B

A slightly lower estimate of 15 to 25% fire use approval of candidate fires for non-wilderness would be an appropriate estimate. The lower average is attributed to a higher likelihood of risks that could not be mitigated in non-wilderness areas. Utilizing this estimated percentage an average of five fire use fires in non-wilderness per year would be managed.

Alternative B would also likely support an increase of approved wilderness fires that currently are suppressed because they are adjacent to the approved wilderness plan boundary, and a logical Maximum Management Area (MMA) would include lands not covered by the current fire use plans.

With the implementation of fire use through out the Forest, average burned acres would likely increase with a gradual transition toward less acres burned in wildfires, and more acres burned in fire use fires. Based on this estimate, an increase in yearly wildland fire acres burned would be about 2,000 to 4,000 acres, for a Forest-wide fire use of 4,000 to 8,000 acres per year, with possibly 15,000 acres burned during active fires years.

Table 2-1 Summary of Estimated Burned acres under the Two Alternatives.

	Alternative A (no action)	**Alternative B (proposed action)**
Fire Use	Gradual increase in fire use acres in wilderness areas as managers become more comfortable managing fire use fires. Average 2,000 to 4,000 acres/year with possible 10,000 acre years.	More significant increase in fire use acres as areas outside of wilderness could be managed. Trend toward more fire disturbances of varying sizes and more heterogonous landscape. Increase in management of wilderness boundary fires. Average 4,000 to 8,000 acres/year with possible 15,000 acre years.
Wildfire (all causes)	Outside of wilderness during low to average fire years, most fires are suppressed at small acreage. . During high fire activity years, more fires escape initial attack and grow to large events. Overall, gradual increase in wildfire acres, trend toward more large and severe fires. Estimated average of 3,000 to 8,000 acres/ year with occasional larger years to 30,000 acres.	Short-term, a continued gradual increase in wildfire acres, until the longer-term effects of fire use offset the wildfire acres. Long-term gradual decrease in wildfire acres, and the size and intensity of these acres. Initially, average 4,000 to 8,000 acres/ year with occasional larger years to 30,000 acres. As fire use increases throughout the Forest, a gradual decrease in wildfires to 1,000 to 4,000 acres per year, although occasional 30,000 acre years would be still possible during extreme fire years.
Prescribed Fire	Moderate increase in prescribed fire, especially as emphasis moves back to landscape burning following completion of wildland urban interface projects. Short term average 2,000 to 7,000 acres/ year. Long term 7,000 to 12,000 acres/ year.	Gradual increase in prescribed fire, especially as emphasis moves back to landscape burning following completion of urban interface projects. Prescribed burns focused in areas where wildland fire use would not be appropriate because of risk or technical difficulty. Year to year prescribed burning would be influenced by the amount of fire use. During big fire use years, there would likely be a tendency to use less prescribed burning. Short term 2,000 to 7,000 acres/year. Long term 6,000 to 9,000 acres/year.

2.43 Comparison of Key Resource Differences among the Alternatives

The following table is based on the complete comparison of the effects in Chapter 3.

Table 2-2 Comparison of Key Resource Effects among Alternatives.

Resource Topic	Alternative A (no action)	Alternative B (proposed action)
Fire Ecology and vegetation	Unless use of prescribed burning (or mechanical treatment as surrogate) increases, there would be a continued degradation of ecological conditions outside wilderness.	Net ecological resource conditions would move toward desired future conditions and properly functioning condition.
Soils, Water, and Aquatic Habitats	There is increased potential for negatively impacting watersheds from the trend toward large and severe wildfires.	Increased fire on the landscape at different severity and sizes would eventually decrease potential fire severity and associated negative watershed impacts.
Air Quality	In terms of air quality, there is not a significant difference between alternatives. The laws are clear and must be met with all prescribed fire and wildland fire projects. Large, uncontrolled unwanted wildland fires would most likely produce the most air pollution over time as there is little or no control over what is emitted or the rate at which emissions occur. Prescribed burning allows control of what, when and how the burn is conducted and therefore much more control of the smoke amount, time of day and time of year it is emitted.	Impacts to air quality are not expected to increase beyond what is currently allowed under law, and would be consistent with the Forest Plan. Wildland fire as a source of emissions is occasionally unavoidable, relatively short duration and is expected to temporarily impact affected areas. Prescribed burning allows control of what, when and how the burn is conducted and therefore much more control of the smoke amount, time of day and time of year it is emitted.
Timber	Short term, areas of potential timber harvest are not affected by fire use. Long term, unless prescribed fire and timber harvest levels are increased there would be larger and more severe wildfires that could burn commercial timber areas.	Fire use could occur within timber emphasis areas after required WFIP analysis including the effects to available timber. Decision to implement fire use is expected to enhance ecological conditions, or have no adverse effect.
Livestock Use	Fire use would not be available as a tool to treat	Fire use could occur in active, non-use, and closed allotments after

	rangelands. Impacts from prescribed fire projects would be analyzed during project level NEPA.	required WFIP analysis during initial declaration of fire use. There could be short-term impacts to current livestock operators that would be mitigated during fire use management. Long term, decision to implement fire use in any allotment is expected to enhance ecological range conditions, or have no adverse effect. No change to project analysis for prescribed burning.
Cultural Resources	Under this alternative, fewer acres would be treated by wildland fire use. Long-term fuel loadings would continue to increase, leading to more severe fires that could damage susceptible cultural resources.	Long term, as more acres are burned through wildland fire use, protection of cultural sites would become easier. Information regarding susceptible known and potential cultural sites would be incorporated into Fire Management Plans and incorporated into the go-no go decision prior to approval of a wildland fire use fire.
Wildlife and TES species	Gradual increase in size and intensity of fires would lead to more fragmentation and a decrease in habitat connectivity	Still potential for large fires, but overall a gradual decrease in size and intensity, leading to a less homogenous landscape, leading to an increase in sustainability of wildlife habitat and populations
Recreation and Visual Resources	No change in recreation opportunities in short term. No opportunity to use fire use to help reduce risk of a large change to many sites due to large-scale wildfires—though we could still deal with risk through mechanical treatment. No opportunity for fire use to enhance aspen, shrublands and other non forest types that would add diversity to the scenery.	Increased scenic diversity with fire use, especially in large backcountry areas with little risk to facilities and the potential for increasing such species as aspen Depending on timing of fire use, backcountry use could be limited by area closures. Commercial outfitters may also be affected by the fires, and be required to use alternative sites.

Chapter 3
Affected Environment and Environmental Effects

3.0 Introduction

This chapter describes the affected environment and the potential consequences to that environment. Each resource potentially affected by the proposed action or alternatives is described by its current condition and uses. The environmental consequences section discloses programmatic direct, indirect, and cumulative effects that could result from future use of the management direction in each alternative.

Effects are quantified where possible, and qualitative discussions are included. The means by which potential adverse effects would be reduced or mitigated are described.

All fire management actions will comply with the other standards and guidelines in the Bridger-Teton Forest Plan.

The Fire Management Plan would incorporate relevant management direction for other resource topics and identify any mitigation or procedures relative to them, in response to meeting Forest Plan goals, standards and guidelines. The measures in the Fire Management Plan would then be available to the line officer and incident commander prior to future planned (prescribed) and unplanned (wildland fire) activities so that they can appropriately address resource and social concerns.

3.01 Cumulative Effects

Cumulative effects result from incremental effects of proposed actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over time.

In this programmatic environmental assessment the Bridger-Teton National Forest is considering changing fire related Forest Plan standards and strategies to address the purpose and need for action. These new standards and guidelines would provide additional tools to help achieve desired conditions in the current Forest Plan. Potential programmatic cumulative effects would be limited by the short time period in which this amendment direction (three to five years) would be in effect because of upcoming Forest Plan revision.

Prescribed fire projects require site specific NEPA that include a cumulative effects analysis.

Cumulative effects would be analyzed during individual wildland fire use authorization. Managers would consider the cumulative effects of allowing fire use in a site specific maximum management area (MMA) and potential effects on current or proposed projects. For example, if a potential fire use fire is located adjacent to a proposed timber sale, then the timber sale and associated mitigation such as lynx standards that were analyzed with the sale would be considered during

development of the MMA. If a MMA cannot be developed that mitigates the effects to the adjacent project, then the fire use will not be declared.

Future programmatic actions, such as the development of long-term strategies to be considered by the Forest during Forest Plan revision are future actions, but not reasonably foreseeable because the various alternatives to be considered are unknown at this time.

Other federal agencies within the Greater Yellowstone Area including the National Park Service, Bureau of Land Management and other national forests are also in the process or planning to revise operational direction for wildland fire management, including fire use. It is expected that future fire planning and implementation would include increased joint planning for all aspects of fire management.

3.02 Incomplete and Unavailable Information

There is less than complete knowledge about many of the relationships and conditions of forests, jobs, and communities. Future demands for resources such as timber, livestock grazing, and recreation would change and affect this present analysis.

The ecology, inventory and management of a large forest area is a complex and developing science. Unexpected insect and disease outbreaks may change the size and intensity of future fires.

It is also difficult to predict future climate and weather effects on potential wildland fires. The timing and location of future human caused fires is also impossible to accurately predict.

3.1 Fire Ecology

3.11 Affected Environment

Understanding the natural process of fire is difficult because the ecological outputs of any fire event are enormously variable. Vegetation composition and structure are often highly determined by fire disturbance under complex fire effects mechanisms so only a brief narrative of the fire ecology of the dominant vegetation across the Bridger-Teton will be included. Dominant vegetation is often referred to as the cover type and this assessment will be arranged as such.

The patterns associated with fire frequency, seasonality, size, and intensity are often simplified into fire regimes for ease in classifying and communicating the nature of fire in ecosystems (Utah Fire Amendment EA 2000). The most influential factors that determine burn patterns are vegetation, landform, weather, fuel accumulation, ignition source, and climate. Since the dominant vegetation (cover type) is a key factor in how a fire burns, this analysis will focus on how fire regimes relate to cover types.

An examination of the cover type existing condition relative to the Properly Functioning Condition (PFC) will attempt to address the sustainability, productivity, and diversity of the vegetation. Properly Functioning Condition is defined as “ecosystems at any temporal or spatial scale are in

PFC when they are dynamic and resilient to perturbations to structure, composition, and process of their biological or physical components (Properly Functioning Process 1996). The Bridger-Teton participated in a PFC assessment in September 1997. These conditions are important to contrast the changes that have occurred since European settlement. A short discussion of each cover type will follow under the Major Cover Type section.

Historical Setting

Pre-settlement Setting (Prior to 1870s)
Prior to European settlement of the area covered by the Bridger-Teton National Forest, fire occurred as a product of lightning with a minor contribution from human induced ignitions by indigenous peoples. The environmental conditions that provided summer lightning and dry fuel conditions were those in which most fires burned. This season was from mid-summer to fall, and heavily influenced by factors such as wind that determined fire size and pattern. Information regarding the extent of indigenous burning is not well represented in the literature, as these occurrences are difficult to quantify. Williams (1993) suggests that intentional Native American ignitions were normally outside the season of lightning fires where they commonly occurred in spring or fall after berry or other food harvesting had occurred. Pre-settlement Native American presence on the Bridger-Teton is known for areas around the Wind River Mountains and the Green River; however, the northern portion of the Forest likely saw only transitory visits (Upper Green LSA 1999, Teton LSA 2003.). Although there is little documented site specific evidence of Native American ignitions, it is likely that there were responsible for some fire starts.

Post-Settlement Conditions (1870 to present)

Timber Harvest
Change in forest structure was imposed with the introduction of tie hack logging in some areas of the forest as early as 1867 (Upper Green LSA 1999). Tie hacking was usually a small to large-scale timber harvest where tree sizes best suited for railroad ties were harvested. Other large early logging operations are documented on the Forest from the mid1800s to the 1880s where clear-cuts characterized most harvest activities (Commissary Ridge/Tunp Range LSA 2001, Ogle and Dumond 1997). Tie hack timber harvest had a short term (up to 40 year) change in forest structure, decreasing stand densities. Later clear-cut harvests have changed forest structure where even-aged stands have been created after harvest and lodgepole pine being favored. At a forest scale, clear-cuts have partially substituted stand-replacing fire in terms of patch existence (fuel breaks) although seral species within clear-cuts and location of harvested areas rarely mimic natural fire disturbance events. Clear-cutting has drastically decreased in the last 10 years, thus the promotion of younger age classes through clear-cutting has effectively been halted.

Grazing
The introduction of domestic cattle also occurred shortly after settlement with the earliest recorded grazing noted in the Upper Green when cattle allotments were mapped in 1857 (Upper Green LSA 1999). The late 1800s saw a big increase in grazing on areas of the Forest though the forest reserve was not created until 1904. Until this time there was little control over grazing on public lands and livestock numbers were considerably higher than current numbers.

The effects of moderate to heavy grazing on vegetation can be summarized as follows: 1) a break-up in fuel continuity and an associated decrease in fire occurrence and spread 2) a shift in dominance by graminoids (grass like plants) to woody vegetation and 3) a shift in plant cover and

composition favoring species that are less palatable to livestock and better adapted to compete under conditions of leaf removal and soil compaction.

Grazing directly reduces the fine fuels on the ground in grassland communities and therefore reduces the spread of fire. However, over time, livestock have indirectly caused the replacement of native bunchgrasses and sedges with annual grasses and agronomic perennials like Kentucky bluegrass, which in some cases actually increases fine fuel loading and continuity.

In shrub communities, grazing combined with fire suppression has caused a shift to dominance by woody vegetation. In some cases the herbaceous understory is significantly reduced as the shrubs become more and more dense. Depending on shrub spacing and density, this can lead to either very rapid fire spread or sparse ground fuels that cannot carry a fire under most circumstances. Plant communities affected by these factors include lower elevation mountain shrubs, sagebrush, juniper, and mountain mahogany.

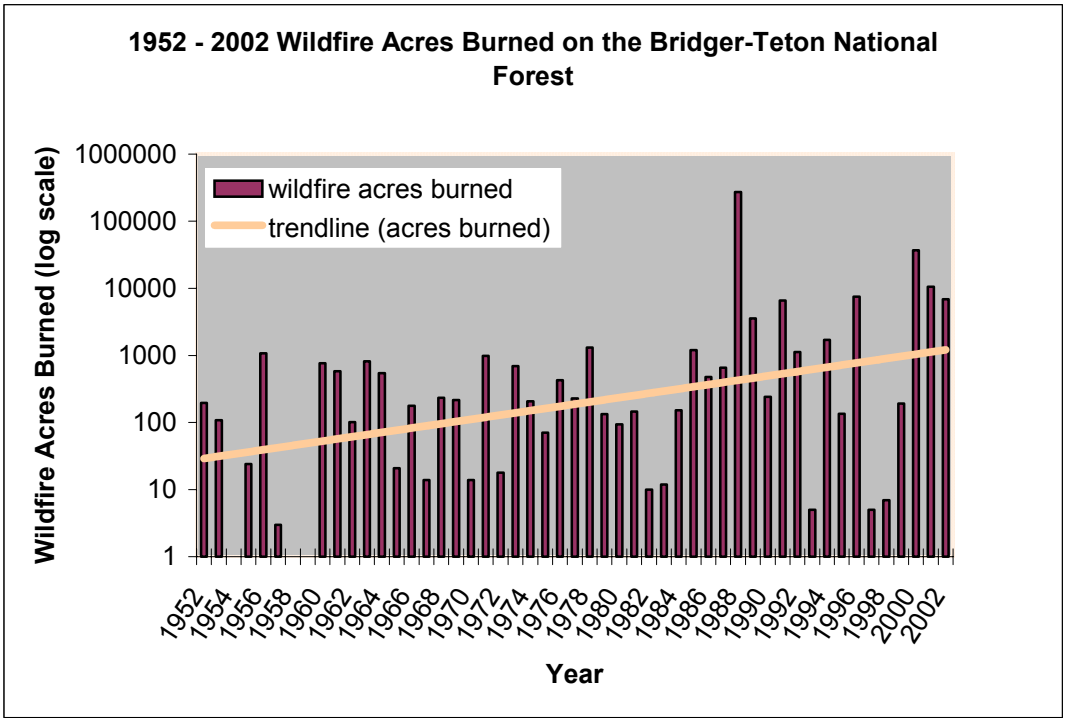
Fire Exclusion

Two separate entities, grazing and fire suppression, characterize fire exclusion. Because grazing removes the fine fuels that typically carry fire in grass, shrub, and some forest types, this disturbance alone can retard the spread and decrease the occurrence of fire. Active fire suppression also characterizes fire exclusion, but early fire suppression had been limited to those areas near developments and areas where fires were more likely to be reported. Effective fire suppression has occurred across the Bridger-Teton since around 1910. The result is a decrease in fire disturbance and a continuation of plant succession without the function of fire. As the density of vegetation increases, there is a shift in the composition of plant communities. A more complete discussion on these changes to individual cover types will follow.

Fire Size/Trends

Observations of acres burned on the Bridger-Teton National Forest from wildland fire have shown an increase in acres burned by human and naturally ignited wildfire in the last 49 years. Figure 3-1 shows this increase.

Figure 3-1 Wildfire Acres Burned on the Bridger-Teton National Forest



The trend of increasing acres burned may be attributable to several factors including change in dominant vegetation, prolonged drought, an increase in atmospheric temperature, and increased human ignitions. Severe weather (hot, dry, windy) does have a large effect on the size of fires in the subalpine forest types occurring on the Bridger-Teton (Bessie and Johnson 1995, Agee 1997, Agee 1998). The pattern of increasing number of acres burned is likely also a function of homogenization of age classes at a forest level. This low diversity of age classes causes a forest scale homogenization where continuous fuels and forest structure support large fire spread. Also, intensity and severity of recent fires have increased since an accumulation of vegetation and fuels leads to severe burning conditions in some cover types that historically burned under low to moderate severity (Utah Fire Amendment EA 2000, Agee 1997).

It is important to emphasize that much of the subalpine vegetation of the Bridger-Teton commonly burns in a large size with a mixed to high severity pattern. These large fires have increased of late, though large fire years have occurred on the Bridger-Teton prior to European settlement and before fire exclusion. A fire history study conducted on the Bridger-Teton in several drainages around the Gros Ventre Wilderness recorded major fire years in 1725, 1741, 1770, 1877, 1880 and 1882 where large acreages surrounding the present day wilderness burned (Gros Ventre Fire History Study 1993).

Major Cover Types of the Bridger-Teton

The classification of vegetation by cover type is limited to the existing dominant vegetation. These types may be climax or seral to a later successional cover type; however, only the existing vegetation and its relationship to fire disturbance will be discussed. Cover type acreage values are

reported using Gap Analysis Program (GAP) Geographic Information System (GIS) data produced by Utah State University in 1995.

Aspen
The aspen cover type is a unique forest component. It exists on 155,165 acres the Bridger-Teton. This tree species grows with a lattice-like root system that connects individual stems underground into a clone. Mid- to upper-elevational aspen is seral to subalpine fir or other conifers where sites provide sufficient moisture.

Fire plays an important role in rejuvenating seral aspen communities (Brown and DeByle 1989) since aspen's primary manner of regeneration is from disturbance-induced growth from clonal roots. Fire is the primary disturbance that renews aging clones, although other disturbance can play a role in rejuvenating aspen to a lesser extent. Regeneration from seed is considered negligible in maintaining this cover type at landscape scales, except in isolated cases (Doyle 1997).

The regular maintenance of clones by fire with a balanced range of age classes and only 15% or less of the type succeeding to other cover types defines the properly functioning condition of aspen (B-T PFC Assessment 1997). The existing condition of most aspen communities on the Bridger-Teton is not within properly functioning condition. A large portion (168,276 acres) of the aspen is rapidly being succeeded by conifer. This pattern is typical in the west where 55% of aspen has already been lost to conifer succession. In Wyoming, fire exclusion has largely led to this condition however it has been exacerbated through heavy browsing by wild ungulates (Bartos and Mueggler 1981) and domestic livestock.

Douglas-fir
Cover types on the Bridger-Teton with a dominant overstory of Douglas-fir represent 95,265 acres of the Forest. It grows in pure stands and mixed conifer stands with limber pine, lodgepole, subalpine fir, and aspen and is usually associated with sedimentary geologic formations.

Fires in Douglas-fir stands burn from high intensity, stand-replacing events to low intensity fires inflicting only interspersed mortality. The thick bark of mature Douglas-fir is an adaptation that allows these trees to survive low to moderate intensity fires. Fire's role during stand replacing fire events promote a seed bed for an even age replacement stand. Fire-free intervals documented in fire history studies indicate a range from five years (Gros Ventre Fire History Study 1993) to 100 years (Loope and Gruell 1973) around the Jackson Hole areas of the Bridger-Teton.

Properly functioning condition of Douglas-fir is represented by a balance and range of age classes with between 40% to 70% in the mature class and fire maintaining seral stands (B-T PFC Assessment 1997). Over 80 years of fire exclusion have led to a lesser extent of seral stands as the fire maintenance has been decreased. These seral stands on the Bridger-Teton are moving away from properly functioning condition; climax Douglas-fir is considered to be within properly functioning condition.

Engelmann Spruce
This cover type occurs on 99,148 acres of the Bridger-Teton. Engelmann spruce requires moist growing conditions; common sites where it is dominant are drainage bottoms or riparian areas. Upland stands are often seral to subalpine fir and at high elevations it can occur with whitebark pine.

Engelmann spruce historically burned at low to moderate intensity, often with severe effects because its shallow roots are easily burned out by creeping ground fire, resulting in tree collapse and canopy breakup. Fire return intervals of 50 to 200 years have been reported in spruce/fir types in the Rocky Mountains (Wadleigh and Jenkins 1996). Return intervals of 300 to 400 years for Engelmann spruce types in drainage bottoms and 300 years for the drier upland sites have also been noted (Bradley et al.1992). As fire return intervals are relatively long, the effects of fire exclusion are likely minimal to date. Single-tree lightning fires may be common in spruce types although these fires have little ecological impact (Gros Ventre Fire History Study 1993).

The properly functioning condition of Engelmann spruce is characterized by about 40% having a multiple canopy structure. Properly functioning condition also requires that succession to subalpine fir is balanced by fire or other disturbance (B-T PFC Assessment 1997). The existing condition on the Bridger-Teton is probably not far outside properly functioning condition as it is considered low for risk of being replaced by other cover types. The influences of fire exclusion have slightly increased homogeneity of age class structure and a promoted succession to subalpine fir within seral Engelmann spruce stands.

Limber Pine

Limber pine grows as dominant on dry, exposed ridges at mid elevations in open stands. This type occurs on about 53,978 acres of the Bridger-Teton. Seral stands are succeeded by Douglas-fir, subalpine fir, and Engelmann spruce.

The exotic white pine blister rust occupies some limber pine stands within the Bridger-Teton. The infected trees suffer from branch mortality with tree mortality under severe cases and often in conjunction with beetle attack. Infection is low with < 10% of acres infected.

Limber pine has a variable fire regime, where mean fire return intervals have been recorded from 74 to 100 years (Bradley et al. 1992). Surface fire causing mortality to younger stems is the norm with isolated torching under more severe conditions.

The properly functioning condition of limber pine stands is quantified by a balanced range of age classes, structures, and sizes. Fire should also be able to regenerate stands being succeeded by Douglas-fir, and Clark's nutcrackers should be playing a role in seed caching recently burned areas (B-T PFC Assessment 1997).

Existing limber pine is at high risk for loss across the Bridger-Teton and is moving away from properly functioning condition in terms of fire disturbance. Blister rust is decreasing densities and fire exclusion has accelerated establishment of Douglas-fir and subalpine fir within these communities.

Lodgepole Pine

This important type currently occupies 490,176 acres of the Bridger-Teton. Upper elevation lodgepole often occurs in a mixed species composition with limber pine and whitebark pine. Lodgepole may be seral to subalpine fir, Douglas-fir, Engelmann spruce in steep topography, or when sufficient moisture permits succession to another climax species.

Persistent lodgepole pine community types include the self-replacing stands and seral stands are classified in other fire groups.

Lodgepole pine has adapted to constant exposure of high intensity wildland fires by developing serotinous cones, where fire-generated heat is the major mechanism for cone opening and seed release. The seed bed requirements of lodgepole are mineral soil and an open canopy permitting sufficient light. Stand-replacing fires allow these conditions.

Historical fires in the lodgepole forest types were typically of a stand replacement type, with low intensity surface fires also contributing to the fire regime in between large fire events (Franklin and Laven 1989, Bradley et al. 1992, Agee 1993). Stand-replacing fire events led to even-aged stands; low severity fire events killed some trees but left others, creating an uneven-aged structure as new trees were established in the understory. Mixed-severity fires also played a role where stand-replacing fire burned with sur fire, with differences in fire behavior probably being dependent on diurnal changes in burning conditions. Lodgepole stands influenced by these fire disturbances are said to be in properly functioning condition if a balance of age classes exists in a mosaic composition (B-T PFC Assessment 1997).

The existing condition of lodgepole pine has been only slightly influenced by fire exclusion and is considered to be within properly functioning condition in terms of fire disturbance. Fire free intervals in some areas have increased though, because the successional trajectory has not been set back with fire disturbance. The landscape scale forest structure in these areas is more homogenous and the younger age classes are less represented. Seral lodgepole stands are being succeeded by shade tolerant species including subalpine fir, Douglas-fir, and Engelmann spruce; further conversion will ultimately lead to a different cover type and out of properly functioning condition. As lodgepole stands age and become denser, they are more likely to host outbreaks of insects such as mountain pine beetle.

Mountain Mahogany

This type, including curleaf mahogany, covers 1,816 acres of the Bridger-Teton. Sites are dry and rocky at lower elevations where mountain mahogany grows as shrubs or small trees and occasionally coexists with limber pine.

Mountain mahogany reproduces from seeds that have stringent seed bed requirements; high amounts of post-burn moisture have been considered critical to seedling establishment. For stands in western Wyoming, fire induced sprouting is rare and has not proven successful in regenerating stands to pre-burn densities.

The fire regime in this type is not well understood; fire scars indicate fire return intervals between 50 and 70 years. Fire does play a role in reducing surface fuels and impeding conifer encroachment.

The properly functioning condition of this type is a mosaic of age classes represented in patches of greater than 25 acres. Approximately 20% to 40% of mid-seral or later structural stages should be present on the landscape (B-T PFC Assessment 1997).

The existing condition of mountain mahogany is in decline and out of properly functioning condition in terms of fire disturbance. Stands have been browsed heavily to a reach-height of big game ungulates. Successful regeneration is not occurring and existing stands are transitioning to older age classes as fire occurrence has been minimal in these communities.

Riparian

Riparian communities occurs on 115,829 acres of the Bridger-Teton. These communities are characterized by a moist growing environment near a free flowing or other body of water (Utah Fire Amendment EA 2000). Sites are productive and support a rich composition of conifer and deciduous vegetation including willow, alder, and cottonwood.

Riparian vegetation has adapted to a hydric environment with little influence by fire. Little research has been conducted on fire in riparian areas, though fire intervals have been noted as longer than adjacent upland stands of the same vegetation type (Everett 2001, Bradley et al. 1992). Under severe weather patterns (drought and high winds) these types may burn. Severity of burn is usually low or moderate in these areas as high soil moisture protects below ground plant parts. Vegetative response to fire is variable within this type though most riparian tree species including willow, alder, and birch on the Bridger-Teton resprout after fire (Tart and Winward 1998).

Riparian areas on the Bridger-Teton are in properly functioning condition in relation to fire disturbance since this type is generally not considered fire dependent, yet small areas usually burn by wildfire during a regular fire year.

Sagebrush Communities

Sagebrush communities occupy 501,534 acres of the Bridger-Teton National Forest. Sagebrush ranges from the sagebrush steppe at lower elevations of the Forest to upper timberline meadows. Several subspecies and varieties occur over various sites where fire plays differing roles to each. Three B-T subspecies resprout after fire.

Historical fire regimes are variable within the sage types occurring on the Bridger-Teton. Mountain big sagebrush along with big sagebrush likely have a fire return interval of 10 to 30 years, with many studies reporting ranges beyond this span. Other forms including basin big sage and Wyoming big sage probably burned every 20 to 70 years (Brown and Kapler 2000).

The properly functioning condition of sage communities is defined by the presence of fire disturbance varying in frequency, size, and spatial area. Also, a balance of age classes (determined by canopy cover) should be represented with no more than 50% of the area with >15% canopy cover (B-T PFC Assessment 1997). The current condition of sagebrush on the Bridger-Teton does not meet properly functioning condition since age class diversity is not well represented and annual fire disturbance is minimal at an estimated treatment rate of < 1000 acres per year.

Subalpine fir

This type occurs on about 607,926 acres of the Bridger-Teton. Subalpine fir is dominant when it succeeds lodgepole, Engelmann spruce, Douglas-fir, aspen, and whitebark pine.

Large stand-replacing fires complemented by mixed severity and single tree fire events historically existed in this type. These fires would convert subalpine fir to shade intolerant species such as aspen and lodgepole. Barrett (1994) reports a mean fire interval of 54 years on the Caribou National Forest, yet other estimates of 50 to 300 years have been suggested (Bradley et al. 1992).

The subalpine fir types have been rated at low risk of loss and are currently at properly functioning condition. There is a current abundance of subalpine fir on the Bridger-Teton as a result of fire exclusion. It is important to note that with the recent increase in large, stand-replacing fire events,

large areas of the older age class subalpine fir will be converted to other seral species and young age classes under the current trend (B-T PFC Assessment 1997).

Tall Forb

Tall forb communities are usually found at high elevations near timberline; 68,159 acres of this type occur on the Bridger-Teton. Occasionally these communities grow in association with aspen at mid- to high elevations. The composition is characterized by a dominance of non-woody plants in meadows often adjacent to forested areas. These communities are rated high for risk of loss because of grazing damage and associated soil loss. Encroachment of conifer may also threaten this type.

The existing condition has not been largely influenced by fire suppression since historically these communities did not readily burn and the role of fire in this type is considered negligible (Utah Fire Amendment EA 2000). This qualifies the tall forb type to be at properly functioning condition in terms of fire disturbance.

Whitebark pine

Whitebark pine cover types grow at high elevations and occur on 53,978 acres of the Bridger-Teton. Climax stands typically grow near upper tree line on rocky, exposed sites. Stand structure is typically open with multiple stems originating from a common location.

Tree mortality from the exotic white pine blister rust has occurred and some stands are decreasing in density. This trend is likely to continue with the effects of mountain pine beetle (*Dendroctonus ponderosae* Hopkins) also contributing to mortality.

The historical fire regime in this type was small, low intensity fires occurring throughout the growing season with wind driven stand-replacing fire events occurring 200 to 350 years (Bradley et al. 1992). Limited fire history sampling on the nearby Shoshone National Forest resulted in a mean fire free interval of 33 years, however this interval was noted to be short for whitebark communities (Morgan and Bunting 1989).

Properly functioning condition of whitebark is defined by an open canopy structure, and a balanced range of age classes. The stand composition should be more than 70% whitebark and less than 20% spruce, subalpine fir, and Douglas-fir (B-T PFC Assessment 1997).

The existing condition of whitebark pine on the Bridger-Teton has been influenced by fire exclusion and is not within properly functioning condition in terms of fire disturbance. Seral stands have advanced with a heavy subalpine fir understory; decreased fire leaves little replacement of these stands to whitebark. Additionally, the decrease of fire-disturbed areas where Clark's nutcrackers are known to cache whitebark seeds (Tomback et al. 1989) leaves little regeneration to young age classes. Finally, white pine blister rust has influenced whitebark to decreased stand densities from interspersed mortality.

3.12 Environmental Consequences

The following discloses the effects of implementing each alternative on each cover type. The short and long-term effects to all cover types will be addressed for each alternative and shown in Tables 3-1and 3-2.

Alternative A (no action)

The short-term effects to Forest-wide cover type distribution, structure, and composition is expected to be very little over the next three to 10 years under the no action alternative. Any cover type conversion is expected to be similar to the trends of the last 10 years where conversion has occurred due to wildfire. All other disturbance would induce immeasurable effects to forest wide cover type composition. Immeasurable effects to vegetative structure are expected to occur over the short term due to plant succession under the current fire suppression policy. These changes however could be quantified long term (15 to 100 years), and cover type conversion due to natural succession would also be measurable within this time frame. Summarized effects to each cover type under the no action alternative can be seen in Table 3-1. A more detailed description of effects to cover type follows the table. The assumption is that the similar acreages burned each year in the last 10 years would continue through the projected time. Effects relating to Properly Functioning Condition account for disturbance only (i.e. factors not directly related to fire can move a type away from PFC, however are not considered here).

Table 3-1. Short and Long-term effects to vegetation cover types under Alternative 1.

	Short term (three to 10 years)	Long term (15 to 100 years)
Aspen	Immeasurable cover type conversion due to succession	• Continued loss of aspen to succession • Expected to move away from PFC*
Douglas-fir	Loss of older age classes by prescribed fire and wildfire	• Gain of young age classes in burned areas • Seral and climax Douglas-fir expected to move away from PFC*
Engelmann spruce	Small loss of older age classes by prescribed fire and wildfire	• Small gain of young age classes in burned areas • Upland seral stands expected to move away from PFC* • Climax stands expected to stay at PFC*
Limber pine	Immeasurable change	• Small gain of young age classes in burned areas • Expected to move away from PFC*
Lodgepole	Loss of older age classes by prescribed fire and wildfire	• Large gain of young age classes in burned areas • Expected to move away from PFC*
Mountain Mahogany	Immeasurable change	• Increased homogenization of age classes • Expected to move away from PFC*
Riparian	Immeasurable change	• Immeasurable change • Expected to stay at PFC*
Subalpine fir	Loss of older age classes by prescribed fire and wildfire	• Loss of older age classes balanced by succession/conversion of other types to subalpine fir • Expected to stay at PFC*
Sage	Small loss of older age classes by prescribed fire and wildfire	• Small gain of young age classes in burned areas • Increased homogenization of age classes • Expected to move away from PFC*
Tall forb	Immeasurable change	• Immeasurable change • expected to stay at PFC*
Whitebark	Small loss of older age classes by prescribed fire and wildfire	• Small gain of younger age classes in burned areas • Expected to move away from PFC*

* PFC – Properly Functioning Condition in terms of fire disturbance

Aspen

Aspen would continue to decline as it has in the past. The advanced succession brought about by grazing and fire suppression would continue to provide conditions for seral aspen to be succeeded by conifer. This pattern would be countered by burning of aspen by wildfires and management ignited fire (< 400 ac/yr total), however a continuation of the current treatment rate would not substantiate properly functioning condition in this type. Low elevation climax aspen are not affected by this alternative and are expected to persist with/without fire disturbance.

Douglas-fir

Under the no action alternative, seral Douglas-fir would continue its successional trajectory with low levels (< 400 acres per year) of burning by prescribed fire and wildfire. This small measure of

fire maintenance would not support properly functioning condition in this type. Climax Douglas-fir would move out of properly functioning condition only under a long-term scenario of the no action alternative.

Engelmann Spruce
The moist riparian/bottomland Engelmann spruce types would not be measurably affected by this alternative. Historically long fire-free intervals in this type (>300 years) resulted in a current condition that is at most marginally outside the properly functioning condition due to only 90 years of fire suppression. Upland seral stands are being succeeded by subalpine fir and current levels of fire in this type are not balancing this succession. This trajectory would continue with the no action alternative and seral Engelmann spruce cover types would move away from properly functioning condition.

Limber pine
Properly functioning condition in this type is likely to continue to decline under the no action alternative. Fire induced openings for limber pine regeneration would continue at the current low levels (< 30 acres/yr) and succession by Douglas-fir would continue to convert this type at a slow rate.

Lodgepole Pine
The existing trend of homogenization of lodgepole across the landscape would continue under this alternative. Fire regimes within this type range from within the historical range of variability to moderately altered. The lodgepole cover type at the landscape scale is not far outside the properly functioning condition since the historic range of variability has great magnitude. Over another 50 to 100 years of fire suppression in this type, fire intervals would continue to be skipped and lodgepole condition would move away from properly functioning condition.

Mountain Mahogany
This type, including curleaf mahogany, is expected to decline and move away from properly functioning condition under the no action alternative. This is due to the current low level of fire in this type that is not enough to provide regeneration. Age classes are expected to move to an older condition over the next 10 to 30 years without replacement by younger age classes.

Riparian
This type is not expected to be measurably affected by the no action alternative. Current levels of fire in this type are very low and only associated with minimal prescribed fire and extreme wildland fire events.

Subalpine Fir
This type is expected to increase in the short and long term as it succeeds seral lodgepole, Engelmann spruce, whitebark, limber pine, Douglas-fir, and aspen types. This increase in acres by subalpine fir would likely be counteracted by the current trend of large wildfires burning in this very flammable type. These fires are often stand-replacing providing post-burn conditions that favor lodgepole, whitebark, limber pine, aspen, and to Douglas-fir type in isolated cases. High elevation burned areas may favor Engelmann spruce or subalpine fir (Doyle 1997).

Sagebrush Communities
The average number of sagebrush acres burned per year via prescribed and wildfire and under the no action alternative is < 1000 acres. This level of treatment at a landscape scale does not

substantiate properly functioning condition. Sage structure is expected to increase in homogeneity as it has in the last 50 years.

Tall Forb
Tall forb communities are within or close to properly functioning condition on the Bridger-Teton and the no action alternative would not measurably affect this condition. There is speculation that fire adjacent to this type would provide mortality to encroaching conifers.

Whitebark
The no action alternative would support long-term regeneration of aging whitebark Forest-wide. This would help move this type toward properly functioning condition however with a short to long-term loss of existing whitebark.

Alternative B (proposed action)

The short-term effects to vegetative cover types of the Bridger-Teton under adoption of Alternative B would increase the number of acres burned on the Forest under fire use. The increased number of acres burned could likely reach 10,000 acres per year over the next three to 10 years. The effects of increased fire occurrence and distribution to each cover type follows. The assumption is that each type would burn more frequently (more acres/year) in the short term but long-term average annual acres burned would remain at a lower level.

Table 3-2 Short and long-term effects to vegetation cover types under Alternative B.

	Short-term (three to 10 yrs)	Long term (15 to 100 yrs)
Aspen	• Gain of young age classes in burned areas • Loss of older age classes by prescribed fire, wildfire, and fire use	• Increase in clone size, vigor, and extent • Seral stands expected to move toward PFC* • Climax stands expected to stay at PFC*
Douglas-fir	• Loss of older age classes by prescribed fire, wildfire, and fire use • Small gain of young age classes in burned areas	• Gain of young age classes in burned areas • Seral stands expected to move toward PFC* • Climax stands expected to stay at PFC*
Engelmann spruce	Loss of older age classes by prescribed fire, wildfire, and fire use	• Small gain of younger age classes in burned areas • Climax stands expected to stay at PFC* • Upland seral stands expected to move toward PFC*
Limber pine	Immeasurable change	• Small gain of younger age classes in burned areas • Expected to move toward PFC*
Lodgepole	• Loss of older age classes in areas burned by prescribed fire, wildfire, and fire use • Gain of young age classes in burned areas	• Large gain of young age classes in burned areas • Seral and climax stands expected to stay at PFC*
Mountain Mahogany	Small loss of older age classes in areas burned by prescribed fire,	• Small gain of younger age classes in burned areas

	wildfire, and fire use	• Expected to move toward PFC*
Riparian	• Small loss of older age classes in areas burned by prescribed fire, wildfire, and fire use • Small gain of young age classes in burned areas	• Small gain of young age classes in burned areas • Expected to stay at PFC*
Subalpine fir	Large loss of older age classes in areas burned by prescribed fire, wildfire, and fire use	• Loss of older age classes balanced by succession/conversion of other types to subalpine fir • Small gain of young age classes in burned areas • Expected to stay at PFC*
Sage	• Loss of older age classes in areas burned by prescribed fire, wildfire, and fire use • Small gain of young age classes in burned areas	• Gain of younger age classes in burned areas • Expected to move toward PFC*
Tall forb	Immeasurable change	• Immeasurable change • Expected to stay at PFC*
Whitebark	Loss of older age classes by prescribed fire, wildfire, and fire use	• Small gain of younger age classes in burned areas • Expected to move toward PFC*

* PFC – Properly Functioning Condition in terms of fire disturbance

Aspen
An increase in fire within aspen types would promote suckering in degenerating clones and maintain currently regenerating clones. Clone response to fire is usually an increase in stem density, growth rate and an expansion of clone size. This would likely narrow the gap between existing condition and properly functioning condition.

Douglas-fir
Increased fire in the Douglas-fir type would convert older age classes to younger classes in the short and long term. Since climax stands are currently close to properly functioning condition, they are expected to remain there under this alternative. Seral stands would move toward PFC with increased fire.

Engelmann Spruce
The proposed action would allow maintenance of climax Engelmann spruce at properly functioning condition. Seral stands at or close to being succeeded by subalpine fir may regenerate to spruce when burned, a condition that would move this type toward PFC. Old age stands comprised of large trees (> 30” diameter) are very susceptible to fire and these would decrease in the short term.

Limber Pine
Since the area of limber pine burned annually is usually low, short-term effects are expected to be immeasurable. However, properly functioning condition in relation to fire may be attained in the long term with sustained increased fire. Fire induced openings and promotion of young age classes would help this type move toward PFC.

Lodgepole Pine

The increase of fire in the lodgepole type would provide conditions for higher age class diversity at the landscape level, maintaining properly functioning condition in this type. Seral lodgepole being replaced by shade-tolerant Douglas-fir, subalpine fir, and Engelmann spruce would largely be converted to young lodgepole stands. Also, persistent (climax) lodgepole would be maintained.

Mountain Mahogany
This type would face short-term loss on the landscape under Alternative B. Long term, however, this fire disturbance would promote younger age classes which would help move mountain mahogany toward properly functioning condition.

Riparian
These communities would maintain their properly functioning condition long-term under the proposed action. Small amounts would burn with increased fire and would quickly regenerate in the short and long term.

Subalpine Fir
Alternative B would maintain properly functioning condition in this type. Large amounts of acres are expected to burn under prescribed fire, wildfire, and fire use. Much of this burned area would be converted to aspen, lodgepole pine, Douglas-fir, and whitebark. Higher elevation and wetter sites may promote subalpine fir and Engelmann spruce as colonizing tree species.

Sagebrush Communities
The current condition of a homogenous age class landscape pattern would be broken up under Alternative B. Rapid resprouting and regeneration (< 10 years) in burned areas would provide for increased age class diversity. This and increased grass and forb diversity in burned areas would help move this type toward properly functioning condition.

Tall Forb
These communities would not be measurably affected by the proposed action.

Whitebark
An increase of fire in whitebark types would lead to a short-term loss of older age classes and since regeneration is slow, young age classes would not be prevalent until the long-term (20 to 60 yrs). Old, large trees would burn since fire use generally lends itself to high elevation habitats where whitebark grows. Long-term effects would likely lead to movement toward properly functioning condition.

3.13 Cumulative Effects

This section describes the impact of past, present, and reasonably foreseeable future actions that have effects on cover types found on and immediately adjacent to the Bridger-Teton National Forest. The cumulative effects described below are broken down within the narrative in relation to each alternative.

Fire Ecology and Fuels

Over 80 years of fire suppression have led to a reduced spread of fire across the Bridger-Teton landscape. The effects of this change in disturbance dynamics at a landscape (Forest-wide and slightly beyond the Bridger-Teton forest boundary) scale are characterized by a more homogenous patchwork of forests and stands where age class diversity has decreased. Cover types (such as

aspen) usually promoted by fire and other disturbance have decreased, and cover types promoted by non-disturbance (such as subalpine fir) have increased. The resulting fire resiliency of today's condition is less; the fire severity in some cover types has increased; and larger fires are now able to move across the Forest as the now-continuous fuel condition allows.

Fuels are composed of dead and downed woody and herbaceous material in addition to living vegetation. The dead and downed woody components have increased in loading (mass/unit area) in unburned areas as a result of fire suppression and have also become more homogenous. This condition allows fire to spread easily across the landscape, promoting larger fires.

This pattern of fuels homogenization is expected to continue under the no action alternative. Alternative B would increase the fine grained distribution of small burned areas across the forest and break up cover type and downed woody fuels continuity.

Insects and Disease

Insect disturbance at pre-settlement times was similar to pre-settlement fire disturbance in that infestations were numerous and small, yet only occasionally reached large epidemics. The buildup of vegetation due to fire exclusion for the past 80+ years has led to a homogenous forest structure of old age classes that are susceptible to large insect epidemics. This phenomenon is exacerbated by drought and has surfaced in the last few years on the adjacent Shoshone National Forest (Carter Mountain Vegetation Treatment EA 2003). This mechanism is expected to continue and increase under the no action alternative and decrease under the proposed action.

Exotic Plants

The presence of exotic plants has greatly increased on the Bridger-Teton National Forest in the last 10 years, with most species being efficient colonizers of disturbed areas. The conversion of native vegetation to exotic species is the biggest change affected by introduction and spread of exotic species. The occurrence of off-road travel, high road densities, domestic livestock use, fire, and firefighting disturbance are the major historical activities that have promoted exotics. Future spread of most exotic species would increase under the no action alternative as it has in the past 10 years. The proposed action would also increase spread of exotic species since there would be more fire on the landscape in the short term. As exotics are established in an area, they would most likely persist into the long term. Biodiversity would decrease as exotics replace native vegetation.

Specific exotics likely to increase under the no action and the proposed action are: Canada thistle , Musk thistle and possibly and spotted knapweed.

3.2 Soil and Water

3.21 Introduction

The Bridger-Teton Forest Plan has specific language that states that state and federal water quality standards will be met, and that the Forest will comply with the requirements of the Clean Water Act (CWA). The CWA directs federal agencies to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." USDA and Forest Service Non-point Source Water Quality Policy are directed to prevent or control pollution from non-point sources and to protect and maintain water quality and beneficial uses. In relation to prescribed burns and

wildland fire use, this would be accomplished in part, through the implementation of Best Management Practices (BMPs). BMPs are outlined in the R1/R4 Soils and Water Conservation Practices Handbook commonly referred to as SWCPs (FSH 2509.22). This handbook contains several BMPs designed for prescribed fire, fire suppression, and fuels reduction.

Desired Future Condition

The Bridger-Teton Forest Plan sets out specific Desired Future Conditions (DFCs) that could be affected by changes in fire management activities. Under DFCs 4 (Special Emphasis Area for Municipal Water Supply) the management emphasis is to protect or improve the quality of municipal water supplies. Additionally, the Forest Plan has identified future Forest Challenges under the Land and Resources Management Goals and Objectives. The direction stated is to "protect municipal, agricultural, and other potable water supplies and ensure that management activities do not cause deterioration in quality, quantity, and timing." To ensure compliance with the Forest Plan, these Forest Challenges and DFCs must be considered before any change in fire management activities occurs.

3.2.2 Affected Environment

The Bridger-Teton National Forest holds the headwaters of three major rivers of the western US: the Snake-Columbia, Yellowstone-Missouri, Green-Colorado, and a portion of the Bear River Watershed. There are both consumptive (agricultural, municipal, industrial etc.) and non-consumptive (fisheries, recreation, water quality maintenance, hydropower generation etc.) uses of water on the Forest. Thirteen active impoundments exist within the Bridger-Teton National Forest with a total reservoir capacity of 70,240 acre feet. Soil and water resources are grouped together in this section because of inherent relationships to watershed function and health.

The climate of the Bridger-Teton Forest is typical of the intermountain west. It is strongly influenced by elevation and varies considerably by location with yearly precipitation totals ranging from 14 inches in the southeastern corner of the Pinedale Ranger District to nearly 50 inches in the higher mountains of the Jackson and Buffalo Ranger Districts. Snow is the primary precipitation that occurs October through April. Spring and summer precipitation is commonly in the form of thunderstorms, which can account for much of the yearly precipitation. High stream flows are usually the result of melting snow or convective thunderstorms in the summer months. Streams that occur in the higher elevation are usually perennial in nature while those in the lowlands and rangelands vary from ephemeral to perennial.

Because wildland fire and fire-related management activities affect watersheds to varying degrees, it is important that the effects are understood, so that actions that influence the timing, severity, and pattern of wildland fires can be used to achieve land, water, and ecological management goals. Among the most important effects on watersheds from fire are the influences on water chemistry, water quantity, and channel stream structure through changes in transpiration, infiltration, ground water and recharge, runoff, erosion and mass wasting, riparian shading and the recruitment and delivery of coarse debris. (Rieman et al. 2003.) These influences can result in increases in peak stream flows and flooding, increases in the movement of debris such as wood, gravel, boulders and fine sediment, and a decrease in water quality. Immediate impacts to soils and vegetation depend on various conditions including 1) the nature of the fire (e.g. severity, patchiness) 2) prior conditions of riparian communities and watershed and 3) magnitude, frequency, duration, and timing of subsequent rainfall events.

Role of Vegetation

One of the most important factors governing how a watershed would respond after fire is the extent to which fire kills vegetation and burns organic layers on the soil surface. Vegetation is key to watershed function because it 1) intercepts a portion of the precipitation which might otherwise reach the ground, 2) decreases the energy with which rainfall impacts the ground, and 3) influences the rate at which water infiltrates the soil (Utah Fire Amendment 1999). Wildland fires that occur in historically fire suppressed areas that have uncharacteristically high vegetation growth and fuels loading can result in higher severity burns. For this reason wildland fires tend to accelerate surface erosion more than prescribed burns because the potential is greater for higher severity burns that destroy more protective surface litter and vegetation canopy (DeBano et al. 1998).

Effects of Fire on Soils

During fire, the consumption of ground cover exposes mineral soils that can be subject to overland flow and raindrop soil compaction. The amount of vegetation consumed and soil heating caused by a fire determines the extent to which soil properties are altered. The impacts to soils are quite variable and depend on numerous factors such as fire intensity and duration, ambient soil moisture conditions, presence or absence of organic layers in soil, and the type of fuels being consumed.

Areas that experience high severity burns could potentially have higher soil erosion rates and peak flows. A decrease in soil nutrient levels is also possible because of changes in the chemical and biological properties of the soil. Burn areas where fire has consumed the organic layer and exposed mineral soil could reduce water storage capacity and soil infiltration, which can lead to water repellent hydrophobic soils. Such impacts may last weeks or decades, depending on the fire's severity and intensity, any remedial measures, and rate of vegetative recovery. (Robichaud 2000)

Fire is a natural disturbance that is integral to the functioning dynamics of watersheds. Fire management that has reduced or excluded fire occurrence can alter watersheds by altering soil dynamics in a variety of ways. Organic matter generally increases with decreased fire frequency, which increases pore space, water holding capacity, soil aggregation, and decreases soil temperatures. When fires eventually do occur and the thick organic horizons are burned, there is a potential to form hydrophobic soils which can impede infiltration and cause massive erosion

Fire exclusion can decrease soil nutrient availability. Most fires generally increase soil pH due to ash accretion, which directly affects availability and cycling of many important nutrients. Because of fire exclusion or reduction, nitrogen is abundant in the accumulated organic matter but only a small amount is made available from the yearly decomposition by soil organisms. This phenomenon has the potential to make nitrogen a limiting nutrient in soils where fire occurrence has been reduced.

Timing and Quantity of Flows

There exists a definite relationship between vegetation manipulation and water yield and peak flow within a watershed. Areas with soils that exhibit water repellent characteristics and vegetative cover loss as a result of fire may cause flood peaks to arrive faster and rise to greater levels. This potential increase in flood magnitude will entrain substantially greater amounts of bedload and suspended sediments. The magnitude of measured water yield increases the first year after fire but

can vary greatly within a location or between locations depending on fire severity, precipitation, geology, topography, vegetation, and proportion of the vegetation burned.(Robichaud, Peter R. 2000). While both the frequency and size of storm peak flows may be increased by forest cover removal, the specific effects of fire disturbance are highly variable and complex and the impacts on hydrology and sediment can be minimal in the absence of precipitation.

Wildfire exclusion can increase leaf area, which can increase evapotranspiration, rainfall interception, autotrophic and heterotrophic respiration, and increase snow sublimation. The resulting effect is lower stream flows and the drying of springs. Fire excluded landscapes are especially vulnerable to adverse changes in the hydrology when stand-replacing fires inevitably occur. Fire exclusion generally reduces soil water and overland flow thereby reducing surface erosion, mass movement, and sediment yield, depending on geomorphic landforms (Keane et al. 2002). Fire-excluded watersheds may have increased vegetation cover near streams, which tends to decrease stream water temperatures, increase long-term inputs of coarse woody debris, and delay or reduce peak runoffs. In the long term, wildland fire is an essential ecological process and natural change agent that is important for the structure and maintenance of properly functioning watersheds.

Sediment and Channel Processes

The potential for large woody debris and sediment to enter a stream channel increases with the occurrence of fire within a watershed. Fire related sediment yields vary, depending on fire frequency, climate, vegetation, and geomorphic factors such as topography, geology, and soils. In some regions over 60 percent of the total landscape sediment production over the long term is fire-related. Much of that sediment loss occurs in the first year after a wildfire (Robichaud 2000).

Changes in flows or sediment inputs (or both) can change channel morphology. Increased stream flows may mobilize material within the stream channel. Watersheds that have a high potential to transport boulders, cobbles, gravel, sediment and woody debris have the greatest likelihood of modifying the longitudinal profile, shape, pattern, bedforms and subsequent aquatic habitat present in stream. Over time, wood and sediment are routed downstream by fluvial processes that form aquatic habitats. Ultimately, watershed disturbances from fire-related flooding, sedimentation, and woody debris inputs may be as important to aquatic ecosystem integrity as fire itself is to forested landscape (Bisson, et al. 2003).

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Water Quality

With a loss of vegetation and increase in water yield within a watershed following a fire, the movement and cycling of nutrients is directly affected. Nutrient losses from a watershed usually increase following a wildfire. Nitrate, organic nitrogen, potassium, calcium, and magnesium are the most common nutrient concentrations that are found to increase following a fire. Ammonium nitrate and phosphorous concentrations can increase an order of magnitude after wildfire and organic-nitrogen can double (Bitterroot National Forest Burned Area Assessment 2000).

Increased nutrient concentrations are generally temporary or transitory and vary between watersheds, flow regimes, burn intensities, and erosion rates. They are usually brought in by pulses of delivered sediment from hillslope erosion which is generally greatest during the first few storms or snow melt events following a fire. Most intermountain forest watersheds are relatively nutrient-poor. Indications are that these nutrients are rapidly taken up by micro biota in the streams, enriching the food base for recovering aquatic life (Bitterroot National Forest Burned Area

Assessment 2000). Although fire does have the potential to change the chemical constituents of water, especially with respect to nutrients, in general it is not felt that the changes would be large enough to impair municipal water sources (Utah Fire Amendment 1999). With regards to fire's effects on water quality, sedimentation is probably the biggest concern.

Excess sediment delivery to the stream system may adversely affect water quality and aquatic habitat. High sediment loading is a parameter for which a stream or water body may be added to Wyoming's list of impaired waters pursuant to Section 303 (d) of the Clean Water Act. Sediment and turbidity can greatly increase during snowmelt and rain runoff from hillslope erosion and bank erosion after a fire or a severe storm event. Suspended fine sediment and ash detritus can be carried long distances during high stream flows and may not settle out until stream flows diminish or slow (Utah Fire Amendment 1999). With the possible removal of streamside vegetation following a fire, there is a greater ability for sunlight to reach the stream water which may increase the water temperature. These changes in the physical and chemical quality are generally short lived. Lack of wildfires generally results in an increase in water quality, and a decrease in stream sediment.

3.21 Environmental Consequences

Alternative A Effects

Soil/Water This alternative would probably not drastically affect soil and water resources and the overall watershed conditions in the short term. If the current trend of wildland fires on the Bridger-Teton continues with increasing acres burned with increased intensity and severity, Alternative A has the highest risk of adversely impacting watersheds over the long term (the next several decades) because of the increased risk of high severity fires. Suppression of all naturally ignited wildland fires would continue the increase in the accumulation of vegetation and fuels leading to increasing frequency of uncharacteristically large, high severity fires where impacts on the soil and water resources within the watershed are potentially the greatest.

High severity fires have the greatest risk of affecting the physical, chemical, and biological properties of the soils within a watershed. This could directly affect the site productivity and lead to water repellent soils. High severity fires generally cover a larger area of the watershed and an increased potential for soil erosion rates, peak flows, and impacts to the watershed. An increased frequency of large, high severity fires increases the threat to human life and property, changes the hydrologic characteristics, and decreases the water quality and soil productivity within a watershed. These effects are still largely driven by topography, climate, and the pattern of fire disturbances.

Alternative B Effects

Soil/Water In the short term, wildland fire use may initially increase the number of acres burned per year. In the long term, the combined use of naturally occurring wildland fires and prescribed fires has the potential to reduce the frequency, size, intensity, and severity of wildfires at a watershed scale, assuming the combined applications can keep pace with the accumulation of vegetation and fuels loading. Over the long term, the combined efforts may be able to approach the historic fire frequency which could potentially result in a higher occurrence of low to moderate severity fires.

Low to moderate severity fires present limited adverse impacts to a watershed in the absence of immediate large storm events. Typically, there is little change in the hydrologic function of the watershed concerning water yield and peak flow, water quality, erosion rates, and mass wasting

potential. Low severity fires may result in temporary increases in nutrient availability and may have minimal effects on soil productivity.

Cumulative Watershed Effects Analysis

The determination of the cumulative effects on soil and water resources associated with the use of wildland fire requires that past, present, and reasonably foreseeable future actions within a watershed be evaluated relative to undisturbed conditions. Because the proposed fire amendment is a programmatic document, cumulative effects associated with wildland fire use are not easily quantified from a watershed perspective. This inherent difficulty in assessing cumulative effects caused by individual impacts over time and space restricts the analysis to a qualitative discussion of potential impacts. The potential cumulative effects associated with the proposed fire amendment on the Forest would be analyzed in detail through site specific preparation of wildland fire implementation plan for each proposed wildland fire use project. Until site-specific information is obtained, environmental effects will be discussed at a broad, Forest-wide scale.

The delivery rates of both sediment and runoff are influenced greatly by the pre-fire condition of a watershed. Road densities, grazing activities, previous timber harvests, fire history, and landslide potential are all cumulatively linked through their additive effects on watersheds. These activities can increase water runoff rates and sediment delivery from burned areas to local streams. Potential increases in peak flows from fire have the cumulative effect of eroding stream banks already destabilized by grazing and road encroachment. While erosion after fire may be within the historic range of variation, impacts could be serious and undesirable if 1) erosion rates in a watershed are already elevated and accelerated by other management activities, 2) streams are already nonfunctioning or functioning at risk, or 3) important developments such as towns, reservoirs, and facilities exist in a floodplain, at a canyon mouth, or in other high risk locations (Utah Fire Amendment 1999).

The decision to allow wildland fire use is made on a case by case basis by an interdisciplinary team during development of the WFIP. Standards and guidelines for protection of soil and water resources are more appropriately addressed in the Fire Management Plan (FMP). FMPs are updated yearly to allow for the most current assessment of watershed conditions to be used in the decision making process. Guidance for direction in the FMP can be developed from watershed condition determination rating, such as the Inland West Watershed Initiative assessment, which is currently in development on the Forest. These condition ratings are regularly updated and could give us the current condition of a watershed on the Forest. Current conditions could then be used to recommend which particular watershed could benefit from wildland fire use or indicate areas where fire would not be beneficial at this time. In addition to these assessments, direct consultation with the watershed program manager regarding the specific watershed of concern should be incorporated into the decision process for fire use.

3.3 Air Quality

3.31 Affected Environment

Overview of the Clean Air Act

Congress passed the Clean Air Act (1967) and amendments to the Act (1972, 1977) to protect and enhance the quality of the nation's air resources and to protect public health and welfare. Section 118 of the Clean Air Act requires that the federal government comply with all federal, state, tribal, interstate, and local air quality standards and requirements (Integration of Air Quality Management into Land Management Planning). The Act established National Ambient Air Quality Standard (NAAQS) and gave the states primary responsibility for air quality management. States carry out this responsibility through development of a State Implementation Plan (SIP). Federal and state land managers must be certain that their actions comply with all procedural and substantive requirements contained in federal, state, and local air pollution control regulations.

The Clean Air Act requires states to identify non-attainment areas (areas which do not meet national ambient air quality standards) and to take action to bring those areas into compliance. Specific plans to reduce emissions and bring the area into compliance become part of the State Implementation Plan. Through this mechanism to achieve compliance, states and local air quality authorities can reduce or eliminate the use of prescribed burning in an area designated as non-attainment for particulates. This requirement could also restrict the use of prescribed fire outside a non-attainment area if such fires would contribute to the particulate load within a non-attainment area (Prescribed Fire Smoke Management Guide 1985)

Under the 1977 Clean Air Act Amendment (42 U.S.C. & 7401 et seq), areas of the country were designated as Class I, II, and III areas for the Prevention of Significant Deterioration purposes. Class I areas include national parks and wilderness areas designated before 1977 and over 5,000 acres in size. Class I provides protection to pristine lands by severely limiting the amount of additional human-caused air pollution that can be added to these areas. There are seven federally designated Class I areas in Wyoming; Yellowstone and Grand Teton National Parks, and Bridger, Teton, Fitzpatrick, Washakie and North Absoraka wilderness areas. In addition to these, there is one state designated Class I area which is the Savage Run Wilderness area. The rest of the state, including all other Forest Service wilderness areas, is classified as Class II. The Wind River Reservation also treats the Wind River Roadless Area as a sensitive Class II area, and this should be considered in any fire analysis.

Presently, there are no haze (visibility) criteria that are enforced in Wyoming, though federal land managers have determined that a 10% change in visibility in Class I areas is unacceptable (FLAG), and federal land managers commonly use a 5% change as a threshold of concern to evaluate if mitigation measures should be imposed. The State of Wyoming has only one nonattainment area, and that is Sheridan, WY which is in nonattainment for PM-10. It is not expected that any particulate emissions from the Bridger-Teton NF related to wildland fires or wildland fire use would affect this nonattainment area (Sheridan, WY) unless it was related to a very large scale event.

Interim Air Quality Policy on Wildland Fire and Prescribed Fires

This EPA interim policy addresses public health and welfare impacts caused by prescribed fires and wildland fires managed to meet resource objectives. This policy complements the Natural Events Policy that addresses public health impacts caused by wildland fires. The Interim Air Quality Policy urges states and tribal managers to collaborate with land owners and managers to

mitigate the air quality impacts that could be caused by the increase of prescribed fires and wildland fire use (Integration of Air Quality Management into Land Management Planning).

Wyoming State Smoke Management Plan

On July 30, 2003, Wyoming Governor Dave Freudenthal announced that the State of Wyoming is developing a long-range State Implementation Plan (SIP) to improve visibility and related air quality in the state by following the provisions of Section 309 of the Federal Regional Haze Rule. One portion of the SIP requires the development of an Enhanced Smoke Management Plan (SMP) and the Smoke Management Regulations (SMR). The provisions of Section 309 require the SIP to be developed by December 31, 2003. The Air Quality Division has been actively participating in the stakeholder based Western Regional Air Partnership (WRAP), Fire Emission Joint Forum (FEJF) to develop several policies for the WRAP to assist WRAP states and tribes in addressing emissions from wildland and agricultural fire sources. Because of the short timeframe for development of the SMP, it is the Division's intent to build upon the consistent framework for the FEJF work products to efficiently develop programs related to fire for inclusion in Wyoming's Regional Haze SIP, long term strategies and periodic progress reports. The Division would take into consideration the EPA Interim Policy, Agricultural Air Quality Task Force (AAQTF) Air Quality Policy, and WRAP Policies regarding fire during the development of a smoke management program to address public health, nuisance and visibility. The State of Wyoming, Air Quality Division is currently working with federal, state, and local and private land managers and burners from around the state to develop the SMP.

The current federal and Wyoming standards for particulates greater than 10 microns (PM-10) are: (1) the concentration of PM-10 must not exceed 150 micrograms per cubic centimeter over a 24 hour period; or (2) the annual arithmetic mean must not exceed 50 micrograms per cubic meter at the monitoring equipment site. There have been no measured National Ambient Air Quality Standards exceeded due to prescribed fires in Wyoming (personal communication Darla Potter June 13, 2003).

As land managers increase prescribed burning on our nation's wildlands, areas affected by the smoke from these fires must still meet the federal air quality standards to protect public health. The U.S. Environmental Protection Agency (EPA), land management agencies in the U.S. Departments of Agriculture and the Interior; and state and tribal land and air quality managers are working in partnership to reconcile these seemingly contrasting goals: healthier wildland ecosystems through the increased use of prescribed fire and cleaner air (EPA, February 1999). Best management practices (BMPs) are already limiting smoke's impact. These practices will continue to be refined and updated by fire managers and implemented when appropriate.

EPA's Natural Events Policy treats unwanted wildland fires as a natural event. If the state has implemented a smoke management plan that addresses smoke impacts to health due to a natural event, the EPA will not redesignate an area nonattainment because of that natural event. This means that once Wyoming has a SMP in place, when areas in Wyoming violate the PM 10 NAAQS because of a natural event, the agency will not be cited as contributing to nonattainment.

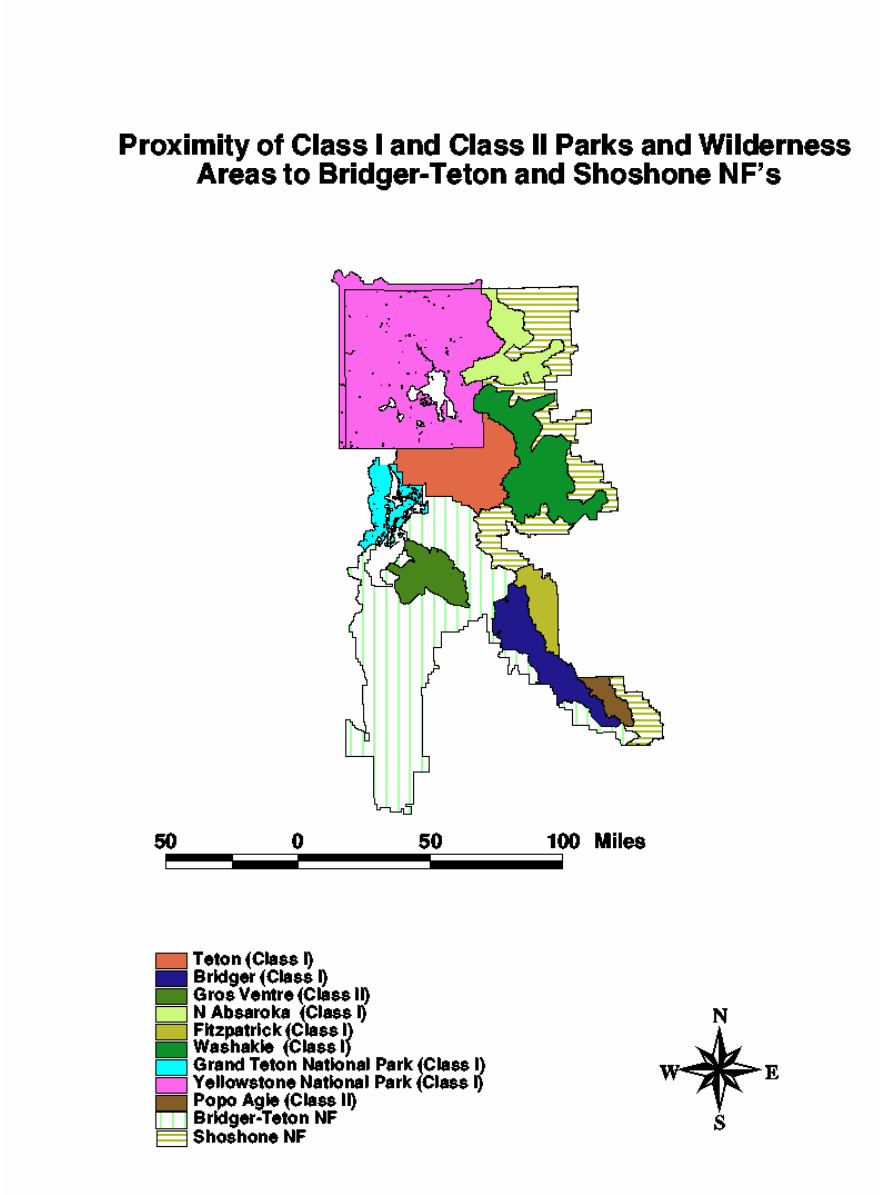
Air Quality

Air quality is affected by both natural and human-caused events on many different scales. Natural events include smoke from volcanoes, wildland fires, wildland fire use, and dust from large-scale storms around the world. Human-caused impacts are related to emissions from industrial,

agricultural and urban development, and localized events such as smoke from prescribed burning, recreational campfires and fugitive dust from unpaved roadways and timber sales.

There are seven federally designated Class I areas in Wyoming; Yellowstone and Grand Teton National Parks, and Bridger, Teton, Fitzpatrick, Washakie and North Absaroka wilderness areas. In addition to these, there is one State designated Class I area which is the Savage Run Wilderness area. The rest of the state including all other Forest Service wilderness areas, are classified as Class II. In close proximity to the Forest there are also two Class II Wilderness Areas which need to be considered in any air quality analysis. These include the Gros Ventre Wilderness on the B-T and the Popo Agie Wilderness on the Shoshone NF. The Wind River Reservation also treats the Wind River Roadless Area as a sensitive Class II area. Figure 3.-2 shows the relative proximity of the sensitive Class I and Class II areas in relation to the Bridger-Teton NF.

Figure 3-2 Proximity of Class 1 and Class II Parks and Wilderness Areas.



In general, the air quality in the area of the Bridger-Teton NF is some of the best in the United States. Monitoring conducted by the USFS, BLM, Wyoming DEQ-AQD, ExxonMobil and SF Phosphates through national programs (IMPROVE and NADP) in or near the Wind River Range indicate that deposition of nitrates and sulfates is fairly low, particulates in the air are fairly low and that visibility ranges from 114 (lowest 10%) to 240 (highest 10%) km. Long-term monitoring is being conducted to determine if acid deposition, visibility, particulates or lake chemistry changes over time due to changes in air quality.

Air quality around the Bridger-Teton NF is affected by a wide variety of sources. There are global impacts related to large scale dust storms and fires originating in China and Russia, and volcanoes erupting worldwide. There are regional sources, such as haze and emissions generated in large

urban and industrial areas and states to the west of Wyoming, and moved into the area by winds and storm fronts. And, there are local sources that include coal fired power plants, industrial development, mining, oil and gas development and agricultural impacts. Though land managers have no control over the global and regional emissions and impacts, we must consider their impacts in our management decisions. For example, in 2001, large scale dust storms originating in Russia effectively put a ban on any prescribed burning in NW US due to the high concentration of particulates. Besides not having control over global and regional emissions, managers do not know that things are occurring that would affect local fire decision making in a few hours or days, so we must make a conscious decision to evaluate these possible sources prior to making any decisions that could be adversely affected by such events.

We as land managers also have little control over local emission sources, and as such need to work with and coordinate with regulatory agencies (WY-DEQ-AQD, EPA) to ensure our activities do not adversely affect others. We also need to be aware of what is occurring and determine how we can achieve our land management goals while not limiting others. This is a particularly sensitive issue in the SW part of WY where there are large coal-fired power plants, natural gas development is booming, and due to the volume of emissions and close proximity to sensitive Class I areas potential negative impacts are being modeled.

During the summer months in Western Wyoming, there is a prevailing southwest wind pattern. This means that on a typical summer day in Western Wyoming, the major air movement will be from the southwest to the northeast. Based on this information it is easy to assume that the smoke and emissions from a fire would generally flow to the north-east of an ignition point affecting sensitive areas and communities upwind. This is not always the case, because local weather patterns and the relative location of the mountains to the fire may alter the wind flow and concentrate emissions (including smoke) in other areas. These considerations must always be evaluated when considering a go/no go option on a fire.

In most fire-adapted ecosystems, there is ample evidence of historic fires that occurred in forests. In the past 200 to 400 years fire had a much more active role in ecosystem function than today. It then follows that much more smoke would have been present and probably more days with smoke visible than in the current time. Smoke from wildfires (pre-European settlement) is described in Ogle and DuMond, where Utah explorer John Wesley Powell's 1879 report is excerpted. He wrote "...wildfires in timber are on a scale so vast that the amount taken for industrial purposes sinks by comparison into insignificance." He further reports that "in seasons of great drought the mountaineer sees the heavens filled with clouds of smoke" (Ogle and DuMond 1997). Based on this historical perspective, smoke has probably been present in our natural ecosystems, and will probably continue into the future. The challenge presented to land managers today, is to determine the best way to allow it to continue (mimicking nature) while minimizing impacts on human health and the environment.

3.32 Environmental Consequences

Effects Common to All Alternatives (Alternatives A and B)

Air Quality In terms of air quality, there is not a significant difference between alternatives. The laws are clear and must be met with all prescribed fire and wildland fire projects. Any unwanted wildland fire will be suppressed to the best of the local unit's abilities, limiting smoke as much as possible in an emergency. All wildland fire use and prescribed fires would be cleared through the State of Wyoming Division of Air Quality before being implemented.

Impacts to air quality are not expected to increase beyond what is currently allowed under law, and will be consistent with the B-T Forest Plan. Wildland fire as a source of emissions is occasionally unavoidable, of relatively short duration, and is expected to temporarily impact affected areas. Large, uncontrolled, unwanted wildland fires would most likely produce the most air pollution over time as there is little or no control over what is emitted or the rate at which emissions occur. In contrast, prescribed burning allows control of what, when and how the burn is conducted and therefore much more control of the smoke amount, time of day and time of year it is emitted. The distinct benefit of prescribed fire and wildland fire use is that fires would generally be smaller in scale and impact, though they may be more frequent than unwanted wildland fires. When planning and conducting prescribed fires, the prescribed fire manager and prescribed burn boss would exercise their responsibilities in a way that meets Clean Air Act standard (Public Law 95-95) and best serves the public interest (Prescribed Fire Smoke Management Guide 1985).

All types of fire emit smoke, particulates, and gases into the air. This could impact the health of people in adjacent and downwind communities, and impair visibility along roadways. The smoke from fire contains a number of pollutants, including fine particles called particulate matter (PM). Exposure to particulate matter can cause health problems, especially for people suffering from respiratory illnesses; including aggravated respiratory symptoms, poor lung function, and even premature death.

Smoke also affects the clarity of our air, also known as visibility. Smoke can impair our views and diminish the appreciation on scenic vistas in national parks, forest, and wilderness areas. As stated earlier, the National Ambient Air Quality Standards (NAAQS) would not be violated by prescribed fire or wildland fire use. All ignitions of prescribed fire and decisions to use wildland fire use, must notify the State's Division of Air Quality. If conditions are deteriorating to a point where the NAAQS could be violated, the prescribed fire manager or the burn boss has the ability to stop any new ignitions and/or require ongoing fires to be put under full suppression (in the case of prescribed and wildland fire use). Due to the nature of prescribed and wildland fire use fires, any impacts to visibility in Class I and sensitive Class II areas would be fairly short term, and would likely not exceed any standards. These smoke intrusions may be considered as a trade-off for larger scale Wildland fires that would occur with much larger impacts if these other fires were not allowed to burn.

The effects of deposition of particulates in Class I and sensitive Class II areas related to prescribed fire and wildland fire use is not expected to be widespread or entirely negative. This is due in part to the fact that if allowed to occur, these fires would have fewer emissions and impacts that a large scale wildfire burning the same areas in a time period.

Typical mitigations for burning near a busy road consist of three strategies: avoidance, dilution, and emission reduction. Avoidance would include considering not burning the area and burning when the wind would keep the smoke away from the road. Dilution requires an unstable atmosphere and higher winds to keep visibility from being limited. Emission reduction utilizes techniques to limit the total amount of smoke produced; for example, burning smaller areas at a time, using a hotter prescription and reducing fuel loads before burning. Smoke levels along roadways would be monitored during any project that might possibly affect visibility, and therefore public and firefighter safety. If smoke does create a safety problem on or near roadways, actions would be taken with the appropriate authorities to close the roads or add appropriate restriction on travel on those roads until the hazardous conditions no longer existed.

Based on recent health research, EPA revised the air quality standards for both particulate matter (PM 2.5) and ground-level ozone in July 1997. These standards are currently being studied, and will be implemented after enough baseline data has been collected. The new standards will provide better health protection for millions of Americans through limiting the amounts of particulates allowed in populated areas even more. As new (more restrictive) standards are implemented, land managers must consider using techniques that minimize prescribed fire emissions and the adverse impacts of smoke on public health and the environment. (Fighting Fire with Fire: Keeping Forests Healthy and Protecting Air Quality, U.S. EPA, February 1999, EPA-452/F-99-001). As with the current standards, these will also be met while using prescribed fires and wildland fire use on the B-T, in full compliance with the Forest Plan, and the State SMP.

3. 33 Cumulative Effects

Human Health and Safety
Short-term impacts of smoke to local areas from wildland fires and prescribed fire are expected to continue. For all alternatives, in the long term, impacts to air quality are not expected to increase beyond what is currently allowed under law, and are consistent with the Forest Plan.

It is expected that by the use of prescribed and wildland use fires (Alternative B) that though the frequency of fire emissions may increase, they would be of smaller intensity (concentration) and duration than a large scale wildfire, and would have a smaller impact on human health and safety when compared to possible impacts from Alternative A.

Environmental Effects
Short-term impacts of smoke to visibility and deposition in sensitive areas from wildland fires and prescribed fire are expected to continue. For all alternatives, in the long term, impacts to air quality are not expected to increase beyond what is currently allowed under law, and are consistent with the forest plan.

It is expected that by the use of prescribed and wildland use fires (Alternative B) that though the frequency of fire emissions may be more frequent, they would be of smaller intensity (concentration) and duration that a large scale wildfire, and would have a smaller impact on visibility and deposition in sensitive areas when compared to possible impacts from Alternative A.

A cumulative effect analysis will need to consider the effects of increasing natural gas development in SW Wyoming, large coal fired power plants as well as regional emissions (beyond the state lines) that affect air quality and visibility in SW Wyoming.

For all alternatives, all state and federal Air Quality Standards will be met. This would be accomplished in part, through coordination with others and the implementation of Best Management Practices designed for prescribed fire, fire suppression, and fuels reduction.

3.4 Livestock Use

3.41 Affected Environment

Range vegetation on the Bridger-Teton National Forest is typical of those found throughout the Intermountain Region. The various vegetation types represented include sagebrush, coniferous forest, aspen, perennial forb meadows, mountain brush, dry and wet meadows, and grasslands (Forest Plan). 2,164,000 acres of Bridger-Teton are contained within livestock allotments, with 908,000 acres classified as suitable for livestock grazing.

Application of fire has been used for many years to improve forage for both domestic livestock and wildlife. Fire reduces the percent cover of woody dominants and their competition with existing herbaceous plants. A more detailed description of the ecological effects of fire is addressed in the fire ecology section.

3.42 Environmental Consequences

Effects common to both alternatives

Generally after a fire (wildfire, prescribed fire, or fire use), a one- to three-year period of rest or light use from grazing is recommended and implemented. Actual rest recommendations are determined on a site specific case for each burn based on vegetation response to fire. These rest adjustments would be addressed in annual operating instructions without adjustments in 10 year grazing permits. Short-term actions such as temporary fencing or adjustment of pasture rotation can be employed to prevent overuse of recently burned areas, while minimizing adverse effects to the livestock operator. Occasionally adjustments in grazing permits may be required.

For prescribed burns, burn units are also normally rested the season before ignition to provide adequate fine fuels to carry the burn. No pre-burn rest occurs for wildfire or wildland fire use, since the ignition point and time of ignition is unknown.

Because prescribed fires are planned events, livestock operators would have advance notice of any proposed burns and would be able to plan for these events. There would still be unscheduled changes in post-fire livestock management due to wildfires

Alternative A (No action)

Under this alternative, prescribed fire would be allowed but wildland fire use would not. All unscheduled ignitions would be suppressed, even if they could potentially benefit rangeland resources. Resource benefits could not be considered during analysis of different strategies for management of wildfires.

Long term, barring a dramatic increase in the number of prescribed burn acres treated each year, a large percentage of rangelands would continue to see an increase in sagebrush and other shrubs, and a decrease in grasses and forbs. The quality and amount of forage would be less.

There would be a trend to large areas of homogeneous older rangelands. While ignitions during low moderate burning conditions would be controlled at a small acreage, ignitions during peak fire weather conditions could burn large areas under severe burning conditions, possibly covering

several allotments. Older rangelands with high loadings of sagebrush and other shrubs may experience unusually high severity burns that would take longer to recover.

In addition, these large wildfires could cause significant displacement of livestock following the fire.

Alternative B (Proposed Action)

Long-term employment of a combination of prescribed fire and wildland fire use would reduce the size and number of large unwanted wildland fires. The quality and amount of forage should increase.

Where fire use is employed, the impacts to livestock operations would be considered and the maximum management area would reflect these considerations. Monitored and mitigated wildland fire use would provide for protection or reduced impacts to fences and other range improvements.

Prescribed fire would be emphasized in areas where wildland fire use is not likely to be approved or where specific areas are significantly outside properly functioning condition and require immediate treatment.

3.5 Timber

3.51 Affected Environment

Analysis of the ecological effects to vegetation is covered in the fire ecology analysis. This section addresses the social and economic issues of availability of harvestable timber to the Forest.

Three DFCs specify scheduled timber harvest. DFC 1B (substantial commodity resource development with moderate accommodation use with moderate accommodation of other resources) is the most common area where timber harvest occurs. Scheduled timber harvest is also allowed in DFC 7A and 10. DFC 7A is described as "grizzly bear recovery through scheduled timber harvest," and DFC 10 is "Simultaneous development of resources, opportunities for human experiences, and support for big game and a wide variety of wildlife species." The combined acreage for these three DFCs is 993,000 acres, with 279,000 of these acres classified as "tentatively technically suitable" for timber harvest.

Timber harvest, including personal use such as firewood collection, is also allowed in all other non-wilderness DFCs as a tool to accomplish resource objectives in each DFC, subject to Forest Plan standards and guidelines. For example in DFC 12, "backcountry big game hunting, dispersed recreation, and wildlife security areas" timber harvest is "available, but only as required to achieve big game objectives.".

In fiscal year 2002, approximately one million cubic feet of timber were offered for sale, split equally between green and dead.

3.52 Environmental Consequences

Effects common to all alternatives

Depending on the severity and intensity of a wildland fire (prescribed fire, wildland fire use, or wildfire), and the type of tree within the stand, the commercial value of the timber is often reduced or might be lost.

With the exception of Douglas-fir, commercial timber species on the Bridger-Teton are thin barked and easily killed by a moderate or greater intensity fire. Killed trees would dry quickly and develop radial cracks (checks) that may preclude the opportunity to produce dimensional sawmill lumber. If the fire killed trees are going to be salvaged for dimensional lumber they must be sold within two to three years after the fire.

Fire killed trees could be also sold as house logs or firewood, but their value would normally be less than that of green saw timber.

While low to moderate intensity fires may not kill less fire resistant trees, they can cause stress and or damage that may leave the tree vulnerable to insect or disease. Susceptibility is dependent on trees species and the age and structure of the stand.

Alternative A (No action)

Under this alternative, prescribed fire would be allowed but wildland fire use would not. All unscheduled ignitions would be suppressed, even if they have potential resource benefits. In areas within these DFCs that are suitable for timber harvest, mechanical treatment could be utilized to treat areas that are outside the range of historic variability. For lands within this DFC that are not suitable, prescribed burning could be implemented.

For prescribed burn projects, impacts from the burn to timber availability would be analyzed during project level NEPA.

If the prescribed fire and timber program keeps pace with vegetative growth, then the risk of larger and uncharacteristically intense and severe unwanted fires would be reduced. The threat to commercial timber would also be reduced. If these two programs do not keep pace, then stands would continue to move toward older more homogenous stands susceptible to uncontrolled wildfires.

Alternative B (Proposed Action)

This alternative would allow appropriate use of wildland fire under specific conditions. Under certain conditions fire use in timber emphasis areas may be desirable. When a lightning fire is allowed to burn as wildland fire use fire, an interdisciplinary team of resource professionals including silviculturists and other professionals must recommend that the fire would be beneficial. For example, in dry Douglas-fir types a low intensity underburn could be used to reduce potential for stand-replacing fires. During milder burning seasons, fire use may also be appropriate during late season. In other non suitable areas where timber harvest is not an option, fire use could be allowed to provide buffers around higher value timber. Fire use may also be used to enhance other resource values, such as wildlife or range.

Personal firewood use availability would remain the same or could increase following fire use in some areas.

There is always a risk of fire exceeding the parameters in the fire use plan because of unexpected fire behavior. If the parameters are exceeded, the fire would be declared a wildfire and actions taken to minimize any unwanted burned acreage and commercial timber.

3.6 Wildlife Habitat

3.6.1 Affected Environment

There are six species of amphibians, six species of reptiles, 74 species of mammals, 208 species of birds, and 25 species of fish known to be present within the Bridger-Teton National Forest (Forest Service 1987). There are an additional five species of mammals and 71 species of birds that are listed as rare or incidental visitors to the Forest.

Habitat use by a species is dependent on many factors including elevation, latitude, topography, soils, precipitation, and vegetative structure, composition, patterns and disturbance regimes. Important internal components of forests on the Bridger-Teton include snags, down woody debris, and multiple canopies. These components tend to vary across forest types. Spruce/fir forests have a complex structure with multiple canopies and large amounts of standing dead and down coarse, woody debris. Lodgepole pine forests have a simple structure, a single canopy, and small amounts of down woody debris, except when very old. Non-forested areas such as alpine, grassland, meadow, and sagebrush, like forested areas, exhibit a variety of structure, composition, and age classes.

It is the policy of United States Department of Agriculture (USDA) to provide habitat to maintain "the number and distribution of reproductive individuals to ensure the continued existence of a species throughout its geographic range" (USDA Departmental Regulation 9500-4,1983). Vegetative communities, including structure, composition, patterns, and disturbance regimes must be provided across the forest where they have historically existed. In general, this condition exists, although some elements may be out of balance in regards to a natural range of variation.

Precisely defining the natural range of variation in habitat conditions is difficult during an era of what might be accelerated climate change. Historical benchmarks, such as pre-Euro/American settlement vegetative conditions, remain useful as a means of understanding the effects of changes in climate and human influences. However, historical benchmarks cannot serve as a precise target or model for restoration because the environment has changed. It is important for that reason to allow natural processes, especially fire, to operate as freely as possible. This would help promote the development of forest structure and composition that are consistent with current environmental conditions and sustainable over time.

Some elements of vegetative communities are out of balance due in varying degrees to human-induced alterations in the fire regime. Statewide, Wyoming has lost half or more of its aspen forest and this decline is quite evident on the Bridger-Teton National Forest. Plant communities at risk present special opportunities for improvement in reintroducing fire as a natural ecological process.

Management Indicator Species

It is neither practical nor possible to monitor all species of wildlife, so planning regulations in the first round of forest planning directed national forests to identify management indicator species

(MIS). The Committee of Scientists report (Sustaining the People's Land 1999) explains the concept of management indicator species and expands it for the next round of forest planning. The report states, "Because monitoring the status and assessing the viability of all species is impossible, studies must focus on a smaller subset of species." The Committee of Scientists proposes in the report that forests use the generic term "focal species" to describe this subset of species. The Committee states that, "The key characteristic of a focal species is that its status and time trend provide insights to the integrity of the larger ecological system." Focal species fall into six categories that already exist in the literature. These are indicator species (MIS), keystone species, ecological indicators, umbrella species, link species, and species of concern.

All existing forest plans have identified MIS. Under the planning regulations in effect when present plans were written, MIS included representatives from several if not all of the categories discussed by the Committee of Scientists. The thought of some forests is that to monitor the effects of management through the monitoring of focal species, the first five categories could provide species appropriate for the purpose. The sixth category, species of concern, "…includes some threatened and endangered species, game species, sensitive species, and those that are vulnerable because they are rare" (Committee of Scientists 1999). In the case of threatened, endangered, sensitive, and rare species, many are narrow endemics or are not spread evenly across the landscape and thus are not capable of determining the effects of management. They may be used on a particular project to monitor effects, if appropriate.

MIS on the Bridger-Teton National Forest include threatened and endangered, Region 4 Sensitive, harvested fish and big game species, and two ecological indicator species, pine marten (old growth) and Brewer's sparrow (sagebrush). At the project level, it is often difficult to identify applicable MIS from this group. Most are in the species of concern category and are either not well represented across the landscape, at the periphery of their range, or otherwise not effective indicators for the projects being considered.

An example of difficulties in MIS selection is the pine marten. The pine marten is not evenly distributed across old growth forest types; it is most commonly associated with larger blocks of mesic forest, primarily spruce/fir. Where spruce/fir stands are small and discontinuous, such as much of the Kemmerer Ranger District, the species may be largely absent. Some areas of the Forest were subject to heavy cutting during the tie hack era from the late 1860s to the1950s. It is difficult to say if scarcity of pine marten in those areas is due to the second growth characteristics of the forest or natural lack of mesic forest types with suitable structure.

Virtually all species benefit from fire at the landscape scale and over a long period of time. There is much more variation in impacts relating to short-term effects. In regards to fire use, cutthroat and rainbow trout can be susceptible to sedimentation and changes in shade, coarse woody debris, water temperature, and water chemistry. Elk are influenced by cover/forage ratios and can either benefit or be harmed by fire in the short term.

Fire can increase forage for moose, but the loss of forest cover that is winter range can be a significant adverse long-term effect. Bighorn sheep can be adversely affected by forest encroachment and therefore fire is usually beneficial. One advantage of the game species is that the Wyoming Game and Fish Department maintains long-term harvest and other survey data.

3.6.2 Environmental Consequences

Effects Common to Both Alternatives

Natural disturbances, such as fire, have occurred in the past and will continue to occur in the future. Over time, wildlife has adapted to, and been sustained by, natural disturbances in their habitat. Many species suffer ill effects to habitat in the prolonged absence of disturbance. Disturbance intervals may vary due to a number of natural and human-induced influences, but these events will continue to alter habitat and sometimes kill individuals or groups of individuals when they occur. Often, the longer the disturbance interval, the more severe and extensive the effects when such events do occur.

Fires have the potential to directly and indirectly affect wildlife. These effects are dependent on the location, extent, and intensity of the fire, as well as elevation, soil types, and other site characteristics. Additionally, the amount and distribution of vegetation remaining compared to that which is consumed, the amount of ground cover remaining, and the timing and intensity of precipitation events following a fire affect habitat and wildlife populations. It must be remembered, however, that these natural systems are dynamic, resilient, and have evolved with fire.

The difficulty in assessing disturbance effects on wildlife or habitat lies in the fact what is good for one species may be bad for another. Also, for any species, what is good or bad can vary dramatically between short-term and long-term periods. The key to such issues is scale. As long as enough suitable habitats are appropriately distributed across properly functioning landscapes, then individuals or habitat lost in a localized disturbance event will generally not be limiting relative to sustaining populations across the larger landscape. In general, if a vegetation type is in properly functioning condition, the structure, composition, and pattern of the habitat provided would be such that the majority of dependent species will be represented.

Fires can have important direct and immediate effects on native fishes or their habitats but the ultimate effects of fire on aquatic organisms and fishes in particular may be apparent some time after the fire has occurred. Those effects would depend on a variety of conditions including: 1) the nature of the fire (patchiness, intensity) and subsequent precipitation, 2) the prior conditions of the watershed and riparian communities, 3) the potential for fish communities to recolonize an area. 4) the overall health of the fish population and strength overlapping generations (Warren and Liss 1980, Rieman and Clayton1997), and 5) the nature of fire suppression and post-fire management (Gresswell 1999, McIver and Starr 2000). Given the many factors involved, accurately predicting the effects of fire at any particular site is not possible. Existing experience and theory, however, provide some perspective on the relative magnitude of the threats that exist.

Where populations can still express the full range of life histories and remain connected to a range of habitats, even large fires may pose little threat. Fire may be critical to the long-term maintenance of aquatic habitat. Where populations have been constrained by habitat loss, fragmentation, and the expansion of exotic species, the probability for local extinctions linked to any disturbance has probably increased. If changes in fire patterns lead to larger, more severe fire disturbances that lead to habitat fragmentation or degrade habitat, risk to sensitive fish species are likely to increase.

Under both alternatives, fire will continue to shape wildlife habitat and affect populations. The existing condition of the national forest is such that fire is not only inevitable, but it is very likely to occur at numerous locations and over an extensive area in the near future. How fire affects the landscape would be shaped over time by the selected alternative.

Alternative A

This would continue attempted suppression of all fires. It represents an effort to extend the existing condition into the future. This is essentially impossible. Due to the effects of past fire suppression, live and especially dead fuels continue to accumulate. The longer major conflagrations are avoided, the more likely they are to occur.

Under this alternative, most natural fires would be kept very small by successful initial attack efforts. Small and medium sized fires, and those of low or mixed intensity, are largely eliminated. What this alternative does is promote a fire regime that emphasizes effects associated with large, severe wildfires of stand-replacing intensity that have escaped initial attack. These usually occur under the most active burning conditions at the peak of the fire season and often after extended drought. This alternative selects for infrequent, severe fire effects.

This alternative attempts to store unsustainable quantities of old forest. It promotes a homogenous rather than a diverse landscape, skewed to either large areas of old forest, or large areas affected by major conflagrations. It sets up a boom and bust cycle for species closely associated with either early seral or late seral forest structure. This is a high-risk situation for some species because they may be eliminated from expansive areas and not able to re-colonize.

Fire suppression has altered the natural process of periodic burning, resulting in an increase in understory and stand density ultimately leading to fuel load buildup. The factors that create this condition often lead to large fires that have a potential to kill fish and cause local extinctions (Utah Fire Amendment EA).

There is a high degree of natural fragmentation in forested habitats in this region of the country. The human population and human presence continues to increase. Developments such as highway projects and housing subdivisions, both inside and outside the Forest, continue to affect landscape scale habitat connectivity. Large fires can be an additive to these fragmentation effects. Wildlife populations may be eliminated from large areas, or residual populations that become isolated may lose viability. This effect can be long lasting, or even permanent for rare species.

Alternative B

Although it is not possible to predict future events with a great deal of detail, some reasonable generalizations can be made. An important effect of the proposed amendment would be the widespread reintroduction of low intensity and mixed intensity fire on the landscape. There would also be a much wider range in fire size. Under the existing suppression rule, most fires are caught when either they are small or conditions are such that initial attack fails and the fire become large, sometimes very large.

Over time, the reintroduction of fire would begin to break up fuel continuity across the landscape. Fire would tend to limit fire. There would still be potential for very large fires under suitable conditions, but the interval between major conflagrations should lengthen. Such effects may develop over many decades to a century or more. The net result would be a more natural, less homogenous landscape than we see today after all these decades of fire suppression. Overall, this would represent a decisive improvement in prospects for the long-term sustainability of wildlife habitat and wildlife populations. Due to past, present, and future human-induced impacts on the greater landscape, care would still have to be taken at some times and locations to avoid adverse

effects on some species. These would include populations that are limited in number, low density, poorly or unevenly distributed, or otherwise under threat of genetic isolation and loss of long-term viability. Fire use would not solve all wildlife population problems, but it would be a significant improvement over the existing condition.

3.7 Threatened, Endangered and Sensitive Species

Introduction

Conservation and recovery of federally listed species are the goals of the Endangered Species Act 1973 (ESA), as amended, 1988. Federal agencies are directed to "implement a program to conserve fish, wildlife and plants" and to ensure their actions do not jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of critical habitat. The National Forest Management Act (NFMA) 1976, (36 CFR 219.19) goes further with the requirement that national forests maintain viable populations of species "well distributed in the planning area."

The Secretary of Agriculture's Policy on Fish and Wildlife (Department Regulation 9500-4) directs the Forest Service to manage habitats for all native and desired nonnative plants, fish, and wildlife species to maintain viable populations of each species; identify and recover threatened and endangered plant and animal species and to avoid actions that may cause species to become threatened or endangered.

In addition to federally listed species, the Regional Forester maintains a list of sensitive species for which population viability is a concern due to significant or predicted downward trends in population numbers, density, or habitat capability that would reduce the distribution of the species. Forest Service Sensitive Species Policy (FSM 2670.32) directs national forests to assist states in achieving conservation goals for endemic species; to complete biological evaluations of programs and activities; avoid and minimize impacts to species with viability concerns; analyze significance of adverse effects on populations or habitat; and coordinate with states and the U.S. Fish and Wildlife Service (USFWS).

3.71 AFFECTED ENVIRONMENT

The USFWS includes five terrestrial species and one fish species on the current list of threatened, endangered, and candidate species which may occur within the Bridger-Teton National Forest (U.S. Fish and Wildlife Service 2003). In addition, if a proposed action would lead to water depletion in the Colorado River system, four listed fish species are downstream residents of the Green River system.

There are 14 terrestrial species on the Intermountain Region sensitive species list, along with three species of cutthroat trout, present on the Bridger-Teton National Forest. There are 18 species of plants on the sensitive list. *(See Biological Assessment for terrestrial species in section 3.0.2 and fisheries report.)*

Projects that might affect species listed as endangered or threatened under ESA are subject to consultation with the U.S. Fish and Wildlife Service (FSM 2671.45). In cooperation with the Forest Service and other local, state, and federal agencies, recovery plans and objectives for federally listed species are developed. Proposed projects must be consistent with recovery plan objectives (FSM 2672.2). In addition, biological assessments and biological evaluations are used to review all

Forest Service projects for possible effects on threatened and endangered and R4 sensitive species (FSM 2672.4). Once completed, these assessments and evaluations are used in the decision-making process for a NEPA document and often provide recommendations for removing, avoiding, or mitigating potential impacts to listed species.

There is no consultation with the USFWS on natural processes such as lightning-caused fire. Consultation may or may not be required at the time fire use decisions are made, depending on the location, time of the year, presence or absence of threatened and endangered species, and if management actions would be undertaken that may affect threatened and endangered species. Similar to suppression actions on wildfire, emergency consultation will take place when site specificity is established and it is determined there is a reasonably foreseeable effect on a federally listed species from management actions. In many instances there would be no need for consultation because there would be no substantial suppression actions or extensive human presence on the ground.

3.72 Environmental Consequences

Potential impacts on threatened and endangered species are summarized in the Biological Assessment and discussion of general short-term and long-terms impacts relating to fire and suppression actions under Cumulative Effects 3.01. Listed species are part of the greater wildlife community. The same general concerns and opportunities, such as relating to meta-population dynamics and habitat connectivity, discussed in the other wildlife sections apply to threatened and endangered species as well.

Alternative A

This alternative continues the current policy of full suppression of all wildfires outside of designated wilderness. As described in section 3.62, an unintended consequence of this alternative is it selects for, or favors, the occurrence of only large, severe wildfires. This is because initial attack is generally successful in keeping fires very small. However, when initial attack fails it is often because of extreme burning conditions, in which case escaped fires may become very large in a short period. The longer suppression efforts are generally successful, the greater the likelihood of a very large fire in the resulting homogenous, fuel-laden forested landscape

The resulting boom and bust cycle associated with a fire regime comprised of mostly large fires of severe stand-replacing intensity brings with it risks for some species. Those most at risk of experiencing a decline in occupied range are species with populations that are poorly distributed or exist at a very low density. There is a high degree of natural fragmentation in forests in this region. Past, present, and future human-induced impacts on the landscape tend to further degrade connections among patches of suitable habitat. Within the Forest, these impacts include subdivision and development of private land inholdings, highway upgrades, and increased chronic human presence in motorized corridors. It may become increasingly difficult for some animals to disperse from residual habitat and reoccupy areas that have recovered from past fires with the additive effects of very large burn areas and increased human activity and developments.

Alternative B

Adverse effects on the Kendall Warm Springs dace, the Colorado River fishes, and bald eagle nest sites would be avoided. Short-term effects to grizzly bear, Canada lynx, and gray wolf would be

limited in most cases to temporary displacement that is of limited consequence. Long-term effects on habitat for these three wide-ranging predators are beneficial.

The reintroduction of small and medium sized fires, as well as fires of mixed severity, restores an important element of the natural fire regime that has been missing or underrepresented on the landscape for many decades. This is an important element of forest health. It is beneficial for wildlife in general, including threatened and endangered species, due to the resulting vegetation mosaic and provision of habitat diversity over time and across the landscape.

Over time, a fire regime with a wide range of variability would work to curtail fuel accumulations and continuity capable of supporting major wildfire conflagrations. This would be beneficial because huge fires from fuel accumulations outside of the natural range of variability pose special risks to species with low populations or limited distribution.

3.73 Cumulative Effects

Proposed management actions such as timber sales, and vegetation treatment projects although small scale, could potentially have a cumulative effect. Fire use would most likely be utilized in roadless areas where other management practices would occur close to the existing road network.

At this time the Canada lynx standards do not prevent or curtail natural fire, although in the case of all listed species, potential effects are a consideration in fire use authorization. Vegetation standards for all management actions, (including prescribed fire) apply, and the resulting effects of all fires must be considered. Because of this fire use has the potential to prevent or curtail future timber sales or prescribed fires.

3.8 Cultural Resources

The Forest Service is required to consider the effects of agency undertakings on cultural resources that may be eligible for listing and those sites that have been listed in the National Register of Historic Places (NRHP). The criteria for listing in the Register refer to the qualities of significance in American history, architectures, archeology, and culture. Once a site has been evaluated for its National Register significance, management activities are generally focused on those determined to be eligible for the NRHP.

Section 106 of the National Historic Preservation Act of 1966, as amended, requires the Forest Service to determine if federally funded, permitted, or licensed activities would affect significant cultural resources. An undertaking is any project that can result in changes to the character or qualities of a site that make it eligible for the National Register. For most projects, consideration of the effects on an undertaking on cultural resources proceeds in sequential steps of inventory, evaluation, and determinations of effect. Consultation with the State Historic Preservation Office, the Advisory Council on Historic Preservation, and interested parties occurs during these various phases to assist in identification and evaluation efforts and to find ways to lessen impacts if adverse effects are anticipated.

For large or complex projects or classes of undertakings where effects cannot be fully determined in advance of an undertaking, the implementing regulations for Section 106 allow agencies to develop programmatic procedures and to implement phased compliance programs (36 CFR

800.13(a)). Similar approaches to wildland fire have been applied in other states among federal agencies, state historic preservation offices and the Advisory Council on Historic Preservation.

3.81 Affected Environment

Cultural resources include prehistoric sites, historic sites, and traditional cultural properties. These sites are collectively known as historic properties. Prehistoric sites found on the forest are generally small lithic scatters consisting of stone tools, projectile points, and chipping debris resulting from the manufacturing of stone tools. These sites represent small, temporary campsites and hunting camps. Some prehistoric sites also have fire pits or hearths which can provide valuable data concerning the types of food items being cooked and processed. Fire pits can also provide radiocarbon dates which provide evidence for the longevity of human occupation in these mountainous environments. Data collected from these sites suggest that humans have inhabited this area for much of the last 10,000 years. These human groups were hunters and gatherers who timed their seasonal movements to coincide with the movement of big game species such as big horn sheep, mule deer, elk and bison. The diverse environmental zones and vegetation communities also allowed these human groups to take advantage of the abundant plant foods which were available across the landscape. Spring time usually found these groups at lower elevations and as the snows began to melt from the mountain slopes and high alpine meadows, these groups would move to progressively higher elevations throughout the year. Prehistoric sites have been found from the valley floors to elevations in excess of 10,000 feet. The locations of these sites are determined by such environmental factors as slope, distance to water, and proximity to diverse vegetation communities.

The historic period on the Forest begins with the arrival of the mountain men, fur trappers, and explorers in the early 1800s. At that time, the main Indian tribe that lived in this area was the Eastern or Wind River Shoshone. Other tribes that frequented the area included the Shoshone-Bannock, Blackfeet, Gros Ventre, and Flathead tribes. The sheepeaters, a sub-band of the Shoshone Tribe, were a group who lived exclusively in the mountains of western Wyoming, southwest Montana, and eastern Idaho. These tribes continued to frequent the area until the reservations were established in the late 1860s. Treaties established with these tribes allowed them to continue to hunt, fish, and gather plants in their traditional homeland even after the establishment of the reservations.

Although the period between 1807 and 1840 saw the height of the fur trapping era, little physical evidence of the period has been found on the Forest. The period following the fur trapping era saw an increase in exploration and government expeditions. One such expedition was led by Frederick W. Lander in 1857. Lander had been exploring possible railroad routes as a surveyor when he proposed a wagon road through western Wyoming. The road was to be built the following year and became known as the Lander Cut-off of the Oregon Trail. This trail passes through the BTNF in the vicinity of Big Piney and continues west to the Smith's Fork River south of Afton. Portions of the trail can still be seen today.

By 1868 the transcontinental railroad reached Wyoming ushering in another phase in the development and use of the Forest. Railroad ties were needed for the railroad and the Forest became an important source for these ties. The Upper Green River area saw the first railroad tie production. Floating these ties down the Green River to the railhead became an annual occurrence. By the early 1900s the timber reserves in the Upper Green became depleted, necessitating expansion into other areas of the Forest. One of these areas was along the Ham's Fork River. By 1911 extensive tie hacking was taking place in this drainage system. Through the

1920s and into the 1930s, tie hack operations expanded north into the Cottonwood and Horse Creek drainages. The LaBarge drainage saw tie hack operations as late as the 1940s. Remains of tie hack cabins and villages can still be seen in many of these areas.

The forested areas of the BTNF also saw limited mining operations. Small coal mining claims and prospects were established in the Jackson Hole area as early as 1889, and evidence of mining activity can still be seen along the Snake River south of Hoback Junction. Small coal mines also became established with operations throughout Jackson Hole, in the Granite Creek area, and in the Greys River drainage. One of these mines, the Vail Mine along Deadman Creek, was the scene of a tragic mine explosion that took the lives of five miners in 1938. Mining operations continued on the Forest on a small scale into the 1960s.

The past 10,000 years of human presence in the forest now encompassed by the BTNF have left visible evidence of the interaction between humans and the environment. As of the year 2003, approximately 60,000 acres of the Forest have been inventoried in search of cultural resources. This accounts for less than 2% of the total land mass of the Forest. A total of 740 sites have been recorded to date. The data collected from these inventories and sites provides a basis for estimating where sites may occur, and the types of physical evidence that remains on these sites.

3.82 Environmental Consequences

Direction for cultural resource management is provided in law, regulation, policy, and Forest Plan direction; therefore, cultural resource management would not differ significantly by alternative. Direct effects to cultural resources vary and are dependent on a number of factors including fuel loads, burn temperatures and burn duration, and materials found in cultural resources sites. When considering effects to cultural resources from agency undertakings, potential impacts are evaluated with reference to how the significance-defining characteristics (i.e. the qualities of historic and archeological sites that make them eligible for listing in the NRHP) would be affected by the undertaking. As discussed above, these criteria refer to the qualities of significance in American history, architecture, archeology, and culture. For example, if a historic building has been deemed significant because it possess a unique architectural style or is a good example of a period of construction, burning of the building by fire would have a direct, adverse and irreversible effect on the National Register defining quality of the building.

Some materials may be more resilient than others to fire effects. Materials lying on the ground surface are more risk to direct effects from fires than those that are buried. However, buried sites located in unstable soils may be indirectly affected when a fire occurs and exposes the site to increased soil erosion or to unauthorized artifact collecting after a fire has gone out. Table 3-3 summaries the various cultural resource types and the potential risk to those resources from fire.

Table 3-3 Potential effect and risk potential by cultural resource type.

Resource Type	Resource Values at Risk	Potential Effect	Risk Potential
Prehistoric Artifact scatter	Surface artifacts	Displacement and heat damage to artifacts. Increased vandalism due to better surface visibility following a fire	Low to moderate
Prehistoric campsites with features exposed on surface	Information (radiocarbon dates) from features	Displacement and heat damage to artifacts, contamination of features	Moderate to high
Stone Circle sites	Surface artifacts	Displacement and heat damage to artifacts, contamination of features	Moderate to high
Rock cairns	Feature artifacts	Displacement of rocks and heat damage	Low
Wood Wickiups	Wood structures and associated artifacts	Loss of site	High
Game entrapments	Wood or rock structures and associated artifacts	Loss of date and site integrity.	Moderate to high
Quarry sites	Surface artifacts and features	Loss of site integrity, displaced artifacts and heat damage	Low to moderate
Rock art	Petroglyphs and pictographs	Damage to features	Low to moderate
Buried prehistoric sites	Artifacts and features	Displacement and heat damage to artifacts and features	Low
Trails, roads, ditches	Surface features	Loss of site integrity	Low
Foundations	Features and associated artifacts	Damage to features and artifacts	Low to moderate
Historic artifact scatters	Surface artifacts	Displacement and heat damage to artifacts	Low to high
Collapsed structures	Structural elements with surface and subsurface artifacts	Loss of features, heat damage to artifacts	Moderate to high
Aspen art	Aspen carving	Loss of site	Moderate to high
Mining features	Surface and subsurface features and artifacts	Damage to structures, heat damage to artifacts	Moderate to high
Standing structures	Buildings	Loss of site	High

Cumulative effects to cultural resources from past, present and future fire occurrences are difficult to assess. In pre-settlement times, fires were part of the natural ecological process and burned without human intervention and undoubtedly burned over many prehistoric sites. The effects of these fires to those sites is not known but is considered part of the natural process. Active fire suppression during the last 80 years resulted in fewer fires, however suppression activities such as fire line construction and fire camp construction likely affected cultural resources that would not have been impacted by the fires themselves. Timber harvest of burned areas may have also

adversely affected cultural resources. Cumulative effects from future wildland fire use may reduce some effects to cultural resources because of fewer ground disturbing suppression activities or post-fire timber harvest. However, there may be increased impacts to some types of cultural resources because of the increase in standing historic structures that have been built in the Forest since settlement times.

A variety of management techniques are available to the Forest under both alternatives to reduce or, in some cases, eliminate the effects of fire. These techniques include identifying known fire-susceptible sites and areas likely to contain fire susceptible sites; using natural topographic features, vegetation clearings, existing roads and hand-built or dozer lines to limit the spread of fires; and establishing wet lines or applying retardant to halt fire spread; or wrapping a historic building in fire resistant material. In addition, ensuring cultural resource specialists are involved fire planning and suppression activities will assist fire managers in identifying and recommending appropriate actions to protect fire susceptible resources.

Alternative A Effects

Under this alternative, it is likely that long-term fuel loading would continue to increase, thus leading to larger, uncharacteristically severe fires. When unplanned ignitions occur, the agency may not be able to manage wildland fire within prescription limits. Some susceptible cultural resource sites would be directly and indirectly affected when this occurs.

Alternative B Effects

Under this alternative, the long-term effect to cultural resources would likely decrease because the frequency of uncharacteristic large, high severity and high intensity wildfires would be reduced. Cultural resources can be further protected during wildland fire use by establishing strategies and tactics that can be applied in wildland fire planning and implementation. Upon ignition of a wildland fire, the Forest would identify known sites and areas deemed to have potential for containing susceptible cultural resources. This information would be incorporated into the Fire Management Plans prior to approval and before a decision (the go-no-go decision) has been made. The progress of a wildland fire would be monitored on a daily basis to insure that susceptible cultural resources are protected. The Forest would continue to consult with SHPO on a case by case basis when cultural resources are threatened. Post fire inventory may also be implemented to monitor the effects of the wildland fire and to assess the effectiveness of the protection strategies and tactics

3.9 Recreation, Related Resources, and Visual Quality

3.91 Affected Environment

The Bridger-Teton is known for the following:

- Outstanding scenery and opportunities for outdoor recreation
- Diverse and healthy wildlife populations, including top predators
- Diverse and healthy plant communities, especially those of interest to visitors or their recreation and scenic attributes—riparian areas, alpine zone, wildflower parks (tall forb), aspen, mixed forest, and mountain shrublands.
- Clean water and clean air

- Healthy, functioning watershed that drain into the West's main rivers (Snake/Columbia, Green/Colorado, Yellowstone)
- Large backcountry and wilderness areas that offer opportunities for multi-day trips
- Blue-ribbon trout fisheries and big game hunting
- Winter sports, both in developed areas and backcountry

The Bridger-Teton National Forest plays a unique role in providing outdoor recreation. A third of the Forest is in classified wilderness or Wilderness Study Areas and therefore covered by existing Fire Management Plans; another 40 percent is included in undesignated backcountry that is every bit as wild and which would benefit from natural fire. The remaining part of the Forest includes major recreation corridors, roads that give access to backcountry trailheads, scenic byways, and rivers that attract great numbers of visitors. Current standards and guidelines for these areas may limit large-scale fire use in these areas.

Resource values of interest to Forest visitors and the public include: wildlife (especially large populations of ungulates and species such as grizzly bear and bald eagle), the varied scenery, wildlands of large size and pristine condition, and the diverse recreation opportunities found here.

Greater Yellowstone is one of the largest relatively intact ecosystems in the global temperate zone. The Bridger-Teton National Forest is a large part of this internationally recognized region, and we have some of the most pristine areas in it. Riparian areas are generally in great shape; there are large tracts of undisturbed land, and more diversity of geology and vegetation than is found elsewhere in the region.

The Forest includes headwaters of three nationally significant rivers (the Yellowstone, Snake, and Green). They offer outstanding fisheries and have been found eligible for inclusion in the national Wild and Scenic Rivers system.

The Bridger-Teton is well known for scenery. The Visual Management System was adopted by the Forest Service in the early 1970s. A concern for the quality of the visual environment prompted the establishment of the "visual landscape" by the Forest Service "as a basic resource to be treated as an essential part of and receive equal consideration with the other basic resources of Forest land" (B-T Volume 1). The objectives of this system are to:

1. Establish criteria for identification and classification of scenic quality as well as esthetic concern for that quality on National Forest lands.
2. Establish quality objectives for alteration of the visual resource.
3. Provide all disciplines involved in land management the freedom to explore viable alternatives in order to attain the appropriate visual quality objectives.
4. Input the visual resource into the established as well as the proposed land use and multiple use methods of planning and operation.
5. Recognize the great variation in visual strength of the various types of natural landscapes and their inherent capabilities to accept alteration.
   (NF Landscape Management Volume 2)

The Visual Management System was used in the formation of the Bridger-Teton's existing Land and Resource Management Plan (September 1989). Generally, Desired Future Conditions (DFCs) for land areas have associated Visual Quality Objectives (VQOs) that include: Preservation (P), Retention (R), Partial Retention (PR), Modification (M), and Maximum Modification (MM). Since the last Forest Plan, a new document, Landscape Aesthetics - Handbook for Scenery Management

(1995), has been developed and will replace the Visual Management System (VMS) with the new Scenery Management System (SMS) in the 2005 Forest Plan revision. The concepts are the same, and Appendix H of the new Handbook offers a conversion key for the old VMS objectives to the new SMS terms.

3.92 Environmental Consequences

Alternative A- (No Action)

Current Forest Plan direction for fire suppression, prescribed fire, wildland fire use, fuels standards, would remain in effect. Individual projects would be evaluated consistent with NEPA and NFMA requirements. Fire use fires would not be a tool for managing for vegetation diversity in backcountry areas.

The short-term effects to visual quality would be slight. Changes in vegetation as described in the Vegetation section would be gradual to all cover types. Long-term visual quality effects, in a no action alternative, would be more pronounced—such as the loss of aspen stands to succession. However, it is difficult to predict how wildfires or disease/insect outbreaks and infestations can affect the visible landscape. This was addressed in the Utah Fire Amendment:

> If we do not allow fire, visual quality could decrease from insect/pathogen outbreaks or intense wildfire activity that scorches soils and effects post-fire plant regeneration.
> Past fire management practices reduced the spread of fires over each national forest. This allowed many forested areas to become overstocked with fire-sensitive tree species and increased their susceptibility to damage by unwanted wildland fire and to outbreaks of insects and pathogens (USDA Forest Service 1996). The effects of these past management practices are expected to continue [with a no action alternative]". (Utah Fire Amendment, p.3-3)
> "Existing forest plans contain management direction that restricts prescribed fire implementation activities. These restrictions include, but are not limited to, maintenance of hiding and thermal cover for wildlife and visual quality objectives (VQO's). For example, areas that have a VQO of retention would typically prohibit a prescribed burn because the blackened landscape could be noticeable and perhaps dominate the scenery. Tradeoffs between resource availability, use, and protection are expected to continue as a cumulative effect." (Utah Fire Amendment, pg. 3-2)

Alternative B

Long-term effects of fire use fires in backcountry areas would be to enhance the natural replacement of old forest, overgrown willows and other shrubs, and grassland renewal. Wildland fires have been shown to enhance aspen sprouting and renew grasslands, thus providing more forage for big game. Short-term effects on the recreation resource and people's enjoyment of the Forest could include the following:
Smoke and a reduction in visibility, potential he risks to those with pre-existing factors such as asthma.

- Fire in popular backcountry campsites would make them less attractive for a while, especially where there is considerable soot and charring in forested types.
- The may be local increases in available firewood after fire-use fires near roads.

- To the extent that fire has negative effects on fisheries (as discussed in section 3.7) there could be a local reduction in fishing opportunities.
- There may be emergency closures during the main wildfire season, which also is the main backcountry recreation season, often extending into hunting. This may affect people's camping and hunting plans.
- Outfitter operations may be affected by the presence of fires burning in the area; we can usually help them find alternative locations for their use, but in some cases, their assigned sites may be affected by fires.

The short-term and long-term effects to visual quality with increased use of fire are expected to increase the heterogeneity and would result in greater biodiversity at the landscape scale. This trend is expected to move these ecosystems toward properly functioning condition. As presented in this document, it is important to note that all types of fire, or the absence of fire, change scenery over time from live vegetation to a mosaic of living and burned vegetation in transition. In terms of visual quality and recreation, the Utah Fire Amendment addresses this.

> … fires are expected to continue to be perceived as natural phenomena, and while, to some, they may diminish scenic quality in the short term, their presence is not expected to unduly affect visitor recreation experiences. People will continue to generally prefer recreating in vigorous, forested landscapes compared to landscapes recently burned. People will continue to fear the destructive force of fire yet they will continue to increasingly appreciate and accept the role fire has in maintaining and perpetuating ecosystems. "suppression of wildland fires in wilderness areas not approved for wildland fire use would continue to negatively impact wilderness values such as solitude, primitive recreation experience, untrammeled settings, and primeval character and influences; …. [The use of wildland fire alternative] would provide for fire's role in sustaining ecosystems within wilderness areas."

Air clarity and visibility during a fire event can impair views and diminish the appreciation of scenic vistas. This is a relatively short-term effect that is mitigated with passing of the fire event, winds, and weather. Some Forest visitors may even choose to recreate in a different area because fire, smoke, and visibility, or conversely, some may be attracted to a burned area by the chance to learn about fire's role in rejuvenating and sustaining ecosystems.

2003 East Table Fire from the Snake River Canyon Highway (photo by D. Martens)

The Utah Fire Amendment addressed the visual quality of post-fire plants in the section that follows. The photo set, taken from the Bridger-Teton National Forest, portrays this message.

> "The common or abundant plants that take a comparatively long time to recover to preburn status following fire are not especially attractive to pollinators. These are commonly wind pollinated and without showy flowers and include pinyon, juniper, spruce, fir, big sagebrush, and curl-leaf mountain-mahogany. In many cases, plants with showy flowers recover rapidly after fire. Many produce flowers the year after fire and in some cases the year of fire. These include sprouting woody species such as chokecherry, currents, rose, and serviceberry and herbaceous species such as fireweed, arnica, lupine, penstemon, balsamroot, mountain hollyhock, crepis, bluebells, geranium, and larkspur. Although some of these plants with brightly colored flowers might also be wind pollinated or self pollinated, visits to these plants by pollinators can be expected to be much greater that to wind pollinated species without showy flowers…
> Visual impact of intense fires- loss of structure, alteration of color, erosion etc., not only affect natural processes but can become unsightly outcomes of fire suppression cumulative affects."

3.93 Cumulative Effects

The use of wildfire involves variables and factors that make it difficult to predict cumulative effects. These variables include but are not limited to the variety of Forest areas and their Desired Future Conditions (DFCs), existing projects and land management activities, disease and drought effects

on timber stands, as well as climatic factors such as avalanche or wind events. However, in the proposed go/no go fire use decision point, existing conditions would be considered with the potential effects of pending wildfire. In terms of visual quality, there is no significant cumulative effect – that is to say the use of wildfire would actually result in a more natural condition both in the short and long term. Visual quality would be an insignificant factor in the determination of go/no go wildfire use.

2000 Boulder Fire area shown in 2003 bloom (photo by S.Marsh)

Appendix A
List of Preparers

	Area(s) of Expertise	Education	Years Experience
Andy Norman (Team Leader)	Fire and Fuels	B.S. Forestry	20
Susan Marsh	Recreation	B.S. Geology Masters, Landscape Architecture	24
Fred Fouse	Wildlife	A.A. Wildlife Technology B.S. Biology	27
Darin Martens	Landscape Architecture	B.S. Landscape Architecture M.A. Adult Learning & Technology	15
Dave Fogle	Fisheries	A.A.S Forestry B.S. Fisheries	20
Jody Kougioulois	Watershed	B.S. Environmental Engineering	8
Levi Broyles	Range and Timber	B.S. Renewable Natural Resources	12
Dave Scott	Fire Ecology	B.S. Forestry	4
John Kuzloski	NEPA Specialist	M.A. Sociology	12
Jamie Schoen	Forest Archeologist	B.S. Anthropology	25

Appendix B

Glossary

Autotrophic-Used to describe organisms, especially green plants, that are capable of making nutrients from inorganic materials

Activity Fuel- Fuel resulting from, or altered by, management practices such as timber harvesting, thinning, or road construction.

Appropriate Management Response- Specific actions taken in response to a wildland fire to implement protection and fire use objectives.

Burning Period- That part of each day when fires spread most rapidly.

Burn Severity- A qualitative assessment of the heat pule directed towardthe ground during a fire. Burn severity relates to soil heating, large fuel and duff consumption, consumption of the litter and organic layer beneath trees and isolated shrubs, and mortality of buried plant parts.

Defensible Space- An area either natural or manmade where material capable of causing a fire to spread has been treated, cleared, reduced, or changed to act as a barrier between an advancing wildland fire and the loss to life, property, or resources. In practice, "defensible space" is defined as an area a minimum of 30 feet around a structure that is cleared of flammable brush or vegetation**.**

Desired Future Condition- A future land or resource condition that achieves a set of compatible multiple resource goals and objectives.

Disturbance- Any relatively discrete event, either natural or human-induced that causes a change in the existing condition of an ecological system

Escaped Fire- A fire that has exceeded, or is anticipated to exceed, preplanned initial action capabilities or the fire management direction

Fire Behavior- The mannner in which a fire burns in response to the variables of fuel, weather and topography.

Evapotranspiration- the return of moisture to the air through both evaporation from the soil and transpiration by plants

Fire Management Plan (FMP)- A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational plans such as preparedness plans, preplanned dispatch plans, prescribed fire plans, and prevention plans

Forest Plan- Prepared under the provisions of the National Forest Management Act, a comprehensive land and resource management direction document which may be amended and revised as needed.

Fuel- Combustible wildland vegetative materials, living or dead.

Fuel Management- The practice of evaluating, planning, and treating wildland fuel to reduce flammability and to reduce its resistance to control through mechanical, chemical, biological, or manual means, including prescribed fire and wildland fire use in support of land management objectives.

Fuel Model- A simulated fuel complex for which all fuel descriptors required for the solution of a mathematical fire spread model have been specified.

Fire Use- The combination of wildland fire use and prescribed fire application to meet resource objectives.

Guideline- A set of land, resource, or human-use values or parameters meant to generally constrain organizational actions or define resource conditions and usually stated as flexible and, occasionally, optional limits in the forest plan using the terms “should be” or “may be.”

Heterotrophic- Obtaining nourishment by digesting plant or animal matter, as animals do, as opposed to photosynthesizing food, as plants do

Hydric- used to describe or relating to an environment that is extremely wet

Ladder Fuels- Fuels which provide vertical continuity between strata, thereby allowing fire to carry from surface fuels into the crowns of trees or shrubs with relative ease. They help initiate and assure the continuation of crowning.

Lithic- relating to stone

Management Action Points-(also called "trigger points"). Either geographic points on the ground or specified points in time where an escalation or alteration of management actions is warranted. These points are defined and the management actions to be taken are clearly described in an approved Wildland Fire Implementation Plan (WFIP) or Prescribed Fire Plan. Timely implementation of the actions when the fire reaches the action point is generally critical to successful accomplishment of the objectives.

Maximum Manageable Area (MMA)- The firm limits of management capability to accommodate the social, political, and resource impacts of a wildland fire. Once established as part of an approved plan, the general impact area is fixed and not subject to change. The MMAs can be developed as part of the Fire Management Plan (FMP) and described as a fire management area (FMA). They can also be developed as part of the planning and implementation actions after a fire has ignited. If they are developed after the ignition, their definition occurs during the Wildland Fire Implementation Plan Stage III process. In the event a fire occurs in a preplanned MMA or FMA, and the local unit determines that this MMA is not the best-suited alternative for the present conditions, a new MMA can be developed as part of the Stage III process. Once this occurs, the Stage III MMA becomes the firm limits of the fire and is fixed.

Mesic-growing in or characterized by moderate moisture

Natural Fuel- Fuel comprised of combustible wildland vegetation resulting from natural processes and not directly generated or altered by management practices, including fuel that has accumulated as a result of fire exclusion.

Natural Ignition- An ignition resulting from any natural cause.

Prescribed Fire- Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements must be met, prior to ignition.

Prescribed Fire Plan- A plan required for each fire application ignited by managers. The plan is prepared by qualified personnel and approved by the appropriate agency administrator prior to implementation. Each plan follows specific agency direction and includes critical elements described in agency manuals.

Prescription- Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of appropriate management responses, and indicate other required actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.

Standard- A land, resource, or human-use value against which organizational actions or resource conditions can be measured and limited, and usually stated as requirements in this document using the term "will be."

Spotting- Behavior of a fire producing sparks or embers that are carried by the wind and start new fires beyond the zone of direct ignition by the main fire.

Succession- The process of vegetation development whereby an area becomes successively occupied by different plant communities of higher ecological order.

Torching- The ignition and flare-up of a tree or small group of trees, usually from bottom to top

Wildfire- An unwanted wildland fire.

Wildland Fire- Any nonstructure fire, other than prescribed fire, that occurs in the wildland.

Wildland Fire Implementation Plan (WFIP)- A progressively developed assessment and operational management plan that documents the analysis and selection of strategies and describes the appropriate management response for a wildland fire being managed for resource benefits. A full WFIP consists of three stages. Different levels of completion may occur for differing management strategies (that is, fires managed for resource benefits have two or three stages of the WFIP completed, while some fires that receive a suppression response may have only a portion of Stage I completed).

Wildland Fire Management Program- The full range of activities and functions necessary for planning, preparedness, emergency suppression operations, and emergency rehabilitation of wildland fires and prescribed fire operations, including nonactivity fuels management to reduce risks to public safety and to restore and sustain ecosystem health.

Wildland Fire Situation Analysis (WFSA)- A decisionmaking process that evaluates alternative management strategies against selected safety, environmental, social, economic, political, and resource management objectives.

Wildland Fire Suppression- An appropriate management response to wildland fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire. All wildland fire suppression activities provide for firefighter and public safety as the highest consideration, but

minimize loss of resource values, economic expenditures, and/or the use of critical firefighting resources.

Wildland Urban Interface- The line, area or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Appendix C

I. Threatened, Endangered, Proposed Species – Biological Assessment

Discussion of "T&E" species is consistent with U.S. Fish and Wildlife Service letter ES-61411/W.19/WY, cover latter dated 5/1/03 (USDI Fish and Wildlife Service, 2003). This update specifies which listed species may occur within the area of effect of actions on the Bridger-Teton National Forest.

Implementation of the proposed amendment would be expected to increase the number of small fires and fires of mixed severity across the landscape, along with some larger fires. Lightning fires typically occur in mid-summer through early fall when the young-of-the-year of listed wide-ranging predators are readily mobile and able to stay out of harm's way. Bald eagles will usually have fledged by the time fire use occurs, but they may still be found in the vicinity of nests. The decision to proceed with fire use will have to take into consideration potential effects within nesting territories.

Lightning strikes and the resulting fires are a natural process. Consultation with the U.S. Fish and Wildlife Service is not required for what may be described as "acts of God" such as fire, flood, land movement, weather impacts, and insect and disease outbreaks. Consultation may be necessary if the agency response to these events causes additional effects on listed species. Where there is potential for effects on T&E species resulting from human actions, emergency consultation with the U.S. Fish and Wildlife Service is required. The same procedures will be followed for fire use as would occur with a wildfire situation.

A. Potential Fire and Fire Management Impacts on Listed Species

Generally, the wide-ranging predators are well adapted to fire as a natural ecological process. Lightning fires of any size normally occur mid-summer to early fall. By that time of the season young of the year are readily mobile and able to adapt to short term displacement effects. All of these species benefit from fire over time due to resulting vegetation structure and positive population response of prey species. Bald eagles are fledging by the time the natural fire season arrives.

There are potential adverse impacts because some species are restricted to specific locations or habitats at certain times of the year. Loss or alteration of these productive sites can harm species that occur at a very low population density. (See "Conservation Recommendations" for description of sensitive sites or habitats.)

<u>Grizzly Bear (Threatened)</u>

The short-term impact of fire alone can be temporary displacement. No direct loss of animals is expected because cubs are readily mobile by mid-summer. An important mitigation for bears (black bears as well as grizzlies) when people are committed to a project on the ground, is food storage and good management of refuse during fire management operations. The long-term impact of fire is beneficial because of the resulting vegetation response and habitat mosaic. Bears rely on succulent vegetation, berries, ants and insects associated with coarse woody debris, and other food resources that typically increase after fire. An indirect impact that may be locally beneficial is related to post-fire increases in ungulates. This can result in more available carrion at some locations and more fawns and calves that may be subject to predation by bears.

Suppression actions that re-open old roads, create motorized routes, or otherwise increase potential for motorized use can be a negative impact. Old roads or travelways can also open up as a result of trees and woody debris being burned up. However, fire use will result in no permanent change in existing motorized routes or uses. Post-fire treatments will be employed as needed to insure permanent closure and rehabilitation of unauthorized motorized routes.

Canada Lynx (Threatened)

The short-term impact of fire alone can be temporary displacement. No direct loss of animals is expected because kittens are readily mobile by mid-summer. The long-term impact is decidedly beneficial because many natural fires will occur at higher elevations and in timber types that will support increased numbers of snowshoe hare during the ensuing early seral stages of stand regeneration and development. Logically, fire suppression might have been a contributing factor to the decline of the species.

Vegetation standards in the Lynx Conservation Assessment and Strategy (LCAS)(Ruediger et al., 2000) were not intended to curtail natural fire. However, the decision to proceed with fire use in a Lynx Analysis Unit (LAU) will sometimes be dependent on existing conditions as they relate to these standards. For example, if fire use results in the standard for lynx habitat in "currently unsuitable"condition being exceeded, timber sale contracts within the LAU would have to be cancelled, or planned sales dropped from consideration until the standard can be met.

Fire use in larger blocks of higher elevation spruce/fir should consider potential effects on lynx and a number of other species, such as pine marten, the Forest Plan ecological indicator (Management Indicator Species) for old growth. Although LCAS vegetation standards do not apply to fire use, they may still used as a guideline, especially in the remaining population center for lynx in the Piney Front. Fire is without question very beneficial for lynx. However, due to the small size of the remaining population, the effects of larger fires on existing habitat should be assessed with care in that area. The existing condition for lynx may be less of a concern in other areas of the Forest where there is either only incidental or no lynx presence. In those areas, more fire may lead to re-establishment of conditions suitable for an elevated snowshoe hare population capable of supporting lynx.

Due to the advancing age and condition of much of the Forest, potential denning habitat would seem to be well above the 10% standard in most areas. However, it could become a consideration with either a large fire, or multiple fires over a relatively short period of time within a LAU. Due to the complex structure and cover the type provides, old spruce/fir at higher elevations can be good denning habitat. Although fire generates good foraging and denning habitat after a couple decades, attention must be given to the immediate post-fire environment and residual amounts of these habitats.

Gray Wolf (Nonessential/Experimental)

The short-term impact of fire alone can be temporary displacement. No direct loss of animals is expected because pups are readily mobile by mid-summer. However, fire could cause some disruption by affecting pack rendezvous sites. Known pack activity centers and rendezvous sites

will be taken into consideration in making the decision to proceed with fire use, in consultation with the U.S. Fish and Wildlife Service.

Long-term effects are generally beneficial due to the positive ungulate response to increased forage. The loss of the cover component of big game habitat could be a concern at some locations if a fire has potential to become very large or the area has been impacted by previous fires. Moose winter range can be a localized concern.

Wolves prefer den sites overlooking natural meadows or human-caused openings such as clearcuts. Fires will maintain natural meadows and vegetation mosaic favorable for the species. Pack activity centers, including den and rendezvous sites, could be subject to adverse impacts in the event of fire or suppression activities.

Bald Eagle (Threatened)

Natural fire can occur prior to the time bald eagle fledge or become readily mobile. Most bald eagle nest locations are known and will be taken into consideration in deciding to proceed with fire use, in consultation with the U.S. Fish and Wildlife Service. Loss of nest and perch trees, and potential replacement trees, will be avoided. Fire use adjacent to major water features capable of supporting bald eagle nesting will generally be avoided due to potential wildlife, recreation, soil, and water impacts.

Kendall Warm Springs Dace (Endangered)

Fire use will not be considered anywhere Kendall Warm Springs may be affected.

Colorado River Fishes (four species listed as Endangered)

These downstream residents of the Colorado River are not expected be affected by fire use decisions in the upper Green River watershed. These populations are separated by distance and major reservoirs from the upper Green River. Fire use on a scale that would cause soil and water effects far downstream is highly unlikely.

B. Determination of Effects

A full range of responses to fire use opportunities may occur, ranging from aerial or ground monitoring of a fire to partial or even full suppression action. At the programmatic level of assessment, there are no “reasonably foreseeable” effects on listed species that can be identified because there is no way to either predict the time and location of naturally occurring fires, or the ensuing management response. Under no circumstances would a decision be made to proceed with fire use when there would be potential for “take” of a listed species. Therefore, the determination of effect for the Forest Plan amendment authorizing consideration of fire use on a case by case is **“no effect”** for listed species and consultation with the U.S. Fish and Wildlife Service is not required at this time at this stage of planning.

However, this determination of effect is contingent on the following stipulations:

1. The need to consult with the U.S. Fish and Wildlife Service must be determined at the project level based on potential human-caused effects on listed species at the time and location of the fire use incident.

2. A decision to proceed with a fire use project will not occur if there is potential for "take" of any listed species.

3. Species' Conservation Recommendations in the following section are followed.

C. Conservation Recommendations (mandatory):

1. There will be no "take" of any listed species.

2. Emergency consultation with the U.S. Fish and Wildlife Service will be initiated in the event fire use monitoring or suppression actions result in a "may affect" determination for any listed species.

3. Bald eagle nesting territories will be protected consistent with direction in the Greater Yellowstone Bald Eagle Management Plan. The presence or absence of young of the year that have not yet successfully fledged is an important consideration.

4. Vegetation standards in the Lynx Conservation Assessment and Strategy will be used as a guideline in assessing potential fire effects. (Note: These standards do not apply directly to fire of natural origin, but they may be used as a guide for the purpose of analysis.)

5. Known lynx maternal den sites and associated habitat will be protected. The intent of this recommendation is to retain rearing habitat that is currently in suitable condition, but to still allow improvement of snowshoe hare and lynx habitat through fire use in the vicinity. This will have to be assessed on a site-specific basis.

6. Known active wolf pack activity centers, including dens and rendezvous sites, will be protected.

7. Grizzly bear presence will be taken into consideration, especially females with cubs. Standard food storage and refuse management practices will accompany all monitoring and suppression actions Forest-wide, to protect both species of bears.

8. Researchers studying listed species will be contacted for information and guidance in the event of a possible fire use project in their study areas.

II. Intermountain Region Sensitive Species - Biological Evaluation

Impacts on sensitive species at this programmatic level are expressed in generalized terms and limited to fire effects. It is assumed most fire use will occur mid-summer or later. There may be earlier fires, but the area affected at that time of the year can be expected to be much more limited than during the peak of the fire season.

At the project level, impacts may vary from those indicated in Table C-1 depending on the specific location and time of the year. Sensitive species should be considered along with T&E species when the decision to proceed with a fire use project is being made. At that time, more site-specific information on habitat can be taken into consideration, along with the time of the year relative to impacts on reproductive processes.

R4 Sensitive Mammals, Birds, Amphibians and Fish

In general, mid-summer and later fire use may result in displacement effects on sensitive species, but direct mortality will normally not be expected to occur in fire use applications. Some species thrive in recent burns or derive short-term benefits within a few growing seasons. Many others realize long-term habitat benefits from fire. All species, of necessity, must have short- or long-term adaptations to fire as a natural ecological process. However, the influence of past and present human impacts must be considered in on a case-by-case basis for these species. Table C-1 is a summary of general short-term and long-term fire relationships.

Table C-1 – Short Term and Long Term Fire Effects – R-4 Sensitive Species

Common Name	**Short-Term Effects**	**Long-Term Effects**
Mammals:		
Wolverine [1]	May Impact [*]	Beneficial
Fisher [2]	May Impact	Beneficial
Western Big-Eared Bat [3]	May Impact / Beneficial	Beneficial
Spotted Bat [3]	No Impact	No Impact
Birds:		
Peregrine Falcon [4]	May Impact / Beneficial	Beneficial
Northern Goshawk [5]	May Impact / Beneficial	Beneficial
Boreal Owl [6]	May Impact	May Impact / Beneficial
Flammulated Owl [7]	May Impact / Beneficial	Beneficial
Great Gray Owl [8]	May Impact	May Impact / Beneficial
Trumpeter Swan [9]	No Impact	No Impact
Common Loon [10]	May Impact	No Impact
Harlequin Duck [11]	May Impact	No Impact / Beneficial
Three-toed Woodpecker [12]	Beneficial	Beneficial
Greater Sage Grouse [13]	May Impact	May Impact/Beneficial
Amphibians:		
Spotted Frog [14]	May Impact / Beneficial	Beneficial
Fish:		
Bonneville cutthroat trout [15]	May Impact [*]	May Impact / Beneficial
Colorado River cutthroat trout [15]	May Impact [*]	May Impact / Beneficial

Snake River Finespot cutthroat trout [15]	May Impact [*]	May Impact / Beneficial

[*] "May impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or a loss of viability to the populations or species."
Scientific names available at Wyoming Natural Diversity Database
http://uwadminweb.uwyo.edu.wyndd/

[1] Wolverine: There is the possibility of short-term displacement, but also long term benefits from enhanced small game prey base and increased big game that ultimately provide more carrion.

[2] Fisher: There is very limited potential for adverse effects due to the current scarcity of the species. Preferred lower elevation riparian forest is less likely to be affected by fire use. There are potential long-term habitat benefits from enhanced small mammal prey base in early seral vegetation and complex post-fire woody structure.

[3] Western Big-eared Bat and Spotted Bat: There are possible displacement effects from fire and smoke on day roots. Insect response and ease of hunting in recent burns could be beneficial. Loose bark on fire-killed trees and cavities in snags may provide day roosts for the big-eared bat. The spotted bat is known to inhabit open ponderosa pine, desert scrub, and open pasture and hay fields. Fire use in higher elevation conifers and aspen is not likely to affect spotted bat habitat.

[4] Peregrine Falcon: Nest sites on exposed bedrock features would usually be secure, but smoke could be an impact at the end of the nesting season or when recently fledged birds are still present. Fire use in the vicinity of active eyries should consider the time of the season in regards to nesting and fledging. Most fire use opportunities will occur later in the summer.

There can be an immediate short-term benefit due to ease of hunting exposed prey (birds) in burned areas. The typical post-fire increase in number and diversity of prey species, and ease of hunting over open forest, is beneficial for a number of decades (USDA Forest Service, 2003).

[5] Northern Goshawk: Most fire use opportunities that could affect a large area will occur after the nesting and fledging periods. However, large fires can destroy nesting territories and reduce fledging and foraging habitats. Over the long-term, fire is decidedly beneficial in providing a mosaic of seral stages and structural conditions suitable for goshawk prey base (USDA Forest Service, 2003).

Although goshawks commonly move among nest sites from one year to the next, the species exhibits a high degree of fidelity to the nesting territory. Expanded surveys to locate nesting territories would greatly enhance protection of the species in implementing fire use.

[6] Boreal Owl: Preferred higher elevation spruce/fir habitat would often be shaped by small fires or somewhat larger fires of mixed severity ranging from sublethal underburns to scattered torching of overstory patches. Fire use in larger blocks of higher elevation spruce/fir should consider potential effects on this species along with pine marten (a Management Indicator Species), and the lynx. Post-fire structural legacies and forest mosaic would benefit the species long-term.

[7] Flammulated Owl: Potential for adverse effects is modest because the species is most commonly associated with ponderosa pine forest. However, flammulated owls will use semi-open Douglas fir. Underburns or mixed severity fires in the Douglas fir zone that create or maintain small openings, clear the understory, and result thinning of the overstory provide more suitable structure.

There may be potential for incidental displacement effect, but structural changes in dense Douglas fir can be a long-term benefit. It may be possible to create suitable habitat and maintain it with periodic underburning.

[8] Great Gray Owl: This species rarely forages in forested habitats. Mixed severity fires and ground fires that maintain meadows and forest openings would be beneficial. Owls nest/fledge early in the season, so mortality from fire use is unlikely, but there could be incidental displacement effects.

[9] Trumpeter Swan: This species has very limited distribution in the affected area. Fire use in or around limited wetland habitats suitable for trumpeter swans is very unlikely due potential effects on multiple resources.

[10] Common Loon: This species has very limited distribution in the affected area. There is probably only very modest potential for fire use along larger lakes suitable for loon nesting. This is because of possible impacts on water, recreational resources, and private property. Loon are susceptible to loss of eggs when nesting, but most fire use opportunities would occur after eggs have hatched and nestlings are mobile. There could be some displacement effect, which would likely be of minor importance given the size of lakes loons typically use. On larger lakes loons could take refuge in quiet areas, assuming in most cases an entire lake would not be surrounded by fire or subject to human presence at the same time.

[11] Harlequin Duck: This species has very limited distribution in affected area. Potential for fire use in riparian zones along major mountain streams is likely limited due to impacts on water, recreational activities, and private property, as well as potential for fire spread from locations in lower drainages. There could be possible beneficial effects from post-fire coarse woody debris in and along stream providing suitable nest sites.

[12] Three-toed Woodpecker: Small fires and larger fires of mixed intensity and a mosaic pattern of burn are particularly beneficial because of the specie's foraging habits. Three-toed woodpeckers are attracted to insects in the bark of recently killed trees and dead snags in the early stages of decay. Fire-killed trees attract bark beetles first and then over a period of time the insects spread to damaged trees, or healthy live trees near the edge of the burn. Post-fire beetle activity provides enhanced forage opportunity for three-toed woodpeckers for a number of years. The reintroduction of fires of variable size and intensity will help maintain this species.

[13] Sage grouse can benefit from fire over time through age class and structural diversity in sagebrush providing for seasonal habitat needs. Some habitats may be in limited supply in any given area. Human-induced effects such as grazing may have altered habitat quality. Generally, there is only a limited amount of sage grouse range found within the National Forest boundary. However, burning of sage grouse habitat should be allowed only after an analysis of existing habitat conditions in the vicinity shows it will either do no harm or lead to improved conditions for the species. Post-burn grazing effects are often an important consideration.

[14] Spotted Frog: Large fires of stand-replacing intensity can have secondary impacts, such as flooding and mass erosion, that could harm small wetland habitats. However, fire use would seek to avoid such severe impacts. Potential for direct effects on wetland and riparian habitats suitable for frogs is limited, but individuals could be affected. Reduced shade from fire-killed overstory trees adjacent to small woodland ponds, wetlands, and streams can improve conditions for reproduction

of amphibians through increased water temperature and extension of the warm-water season. Sites not viable for amphibian reproduction may become productive due to fire effects.

[15] Bonneville, Colorado River, and Snake River Finespot cutthroat trout: Fires can have a direct affect on aquatic habitat by altering riparian shading, water chemistry, water quantity, and the recruitment and delivery of coarse debris that provide fish habitat. Fire may also influence stream channel structure through changes in transpiration, infiltration, ground water recharge, erosion and mass wasting. These factors may create conditions that have a potential to kill fish and cause local extinctions.

R4 Sensitive Plants

Table C-2 lists R4 sensitive plants and the habitats or communities they typically occupy. Most species are associated with wet or sparsely vegetated, rocky sites, often above timberline, with very limited potential to be affected by fire. Only two species occupy habitats that are more fire-prone: Payson's milkvetch and soft aster. Payson's milkvetch increases after disturbance and often erupts in great abundance after fires. Soft aster is found in sagebrush grasslands, often at the edge of aspen or pine forest. These vegetation types are adapted to periodic fire return. A frequent fire return interval might be problematic for the species. However, fire use will typically occur only at locations where fire has been absent for a long period of time. A frequent fire return interval at any location is unlikely due to the level of fuel reduction that will occur the first time an area burns.

Most other sensitive plants occur in open, non-forested habitats unlikely to be affected by fire. Periodic burning at long intervals would seem to be potentially beneficial for some species by inhibiting forest encroachment, but it is not possible to assess a "beneficial impact" in a programmatic analysis. It appears no species would be adversely impacted with periodic fire return at longer intervals.

The determination of effect for Payson's milkvetch is **"beneficial impact".**

The determination of effect for soft aster is **"may impact individuals or habitat, but will not likely lead to a trend towards Federal listing or cause a loss of viability to the population or species".**

The determination of effect for all other plant species is **"no impact".**

Table C-2 – R4 Sensitive Plant Habitats and General Vegetation Types

Species [*]	**General Vegetation Type**	**Habitat/Community**	**Known Elevation Range**
Pink agoseris	wet meadows	subalpine meadow, saturated soils	8500 - 10600
Sweet-flowered rock Jasmine	rock crevices & ledges	montane rock crevices in rocky limestone or dolomite soils	8500-10800
Soft aster	sagebrush grasslands	sagebrush grasslands & mountain meadows in calcareous soils	6400-8500

Meadow milkvetch	wet meadows	moist, often alkaline meadows & swales in sagebrush valleys	4400-6300
Starveling milkvetch	alpine scrub	dry barren ridges & bluffs of shale & stone, clay or cobblestones	6000-7100
Payson's milkvetch	disturbed sites	disturbed areas & recovering burns on sandy soil	6700-9600
Seaside sedge	alpine	alpine and subalpine moist tundra and wet rock ledges	10000-12200
Black and purple sedge	riparian areas	subalpine wet meadows and stream sides	10000-10600
Wyoming tansymustard	rock crevices & ledges	sparsely vegetated sandy slopes at base of cliffs of volcanic breccia or sandstone	8300-10000
Boreal draba	rock crevices & ledges	moist north-facing limestone slopes & cliffs & shady stream sides	6200-8600
Rockcress draba	talus	moist gravelly alpine meadows & talus slopes, often on limestone derived soils	10400-12000
Wooly fleabane	talus	alpine or subalpine limestone talus slopes	11000
Narrowleaf goldenweed	barren slopes & ridges	semi-barren, whitish clay flats & slopes, gravel bars, & sandy lake shores	7700-10300
Payson's bladderpod	alpine scrub	rocky, sparsely vegetated slopes, often calcareous substrates	6000-10300
Naked-stemmed parrya	talus	alpine talus, often limestone substrates	10700-11400
Creeping twinpod	barren slopes & ridges	barren, rocky, calcareous hills & slopes	6500-8600
Greenland primrose	riparian areas	wet meadows along streams & calcareous montane slopes	6600-8000
Weber's saw-wort	talus	alpine talus & gravel fields, often on limestone	10200-11200

[*] See Fertig et al. (1999) for scientific names.

Appendix D

Comparison of Existing Forest Plan Direction with Alternative B (proposed action) wording.

The proposed wording utilizes current accepted fire terminology. The wording also includes reference to the Forest Fire Management Plan that is now required by Forest Service policy.

Wording is included "Forest-wide" and for individual "DFC's."

"Current wording" includes page reference from the Forest Plan. "Proposed wording" is the proposed action.

Forest-Wide Resource Management Prescriptions, Standards and Guidelines

Current Wording	Proposed Wording (Proposed Action)
Protection: General Prescription Natural resources of and human presence on the Bridger-Teton National Forest are protected from catastrophic events and endemic or epidemic pests. (p.142)	**Delete.** Already covered in fire, insects and disease guidelines.

Protection: Fire Prescription – Fire is managed as a tool to accomplish resource objectives while protecting identified values within acceptable levels of risk. (p. 142)	**Protection: Fire Prescription-** Provide an appropriate fire protection and use program that is economically efficient, responsive to land management objectives and provides for public safety and property values.

Forest Protection Standard A fire protection program will be developed and coordinated with local, state, and other federal agencies. A program for reducing fuel loadings adjacent to or on private in holdings will be included. (p. 143)	**Fire Management Standard** The forest Fire Management Plan (FMP) will provide operational direction for implementation of the forest's land management plan. The interdisciplinary developed FMP will be developed and implemented in coordination with local, state, and other federal agencies.

No current standard	**Fire Management Standard** Firefighter and public safety is the highest priority during all fire management activities.

Current wording)	Proposed Wording (Proposed Action)
No current standard	**Fire Management Standard** Human-caused fires (either accidental or arson) are unwanted wildland fires, and will be suppressed using an appropriate management response.

No current standard	**Wildland fire suppression standards** A full range of suppression tactics is authorized Forest-wide, consistent with Forest-wide and individual DFC management emphasis and direction.

No current standard	Cultural resources will be protected if feasible with priority given to sites listed on the National Historic Register. Second priority will be given to sites recommended for selection to the Register.

Prescribed fire guideline Prescribed fire may be used to accomplish resource objectives, which include: Protecting, enhancing, or providing desirable habitat for Threatened, Endangered, and sensitive species; Insect and disease suppression; Reducing fuel loading to acceptable levels; Improving or developing desired wildlife habitat conditions; Achieving other desired vegetation conditions to meet management objectives; and Maintaining fire-dependent animal and plant species. (p. 143)	**Prescribed fire guideline** Prescribed fire is authorized in all non-wilderness areas Forest-wide. Prescribed fire may be used to accomplish resource objectives, which include, but are not limited to: Protecting, enhancing, or providing desirable habitat for Threatened, Endangered, and Sensitive species; Controlling insect and diseases. Reducing fuel loading to acceptable levels. Improving or developing desired wildlife habitat conditions. Achieving other desired vegetation conditions to meet management objectives. Maintaining fire-dependent animal and plant species.

Current Wording	Proposed Wording (Proposed Action)
No current standard	**Wildland fire use standard** Wildland fire use is authorized Forest-wide, consistent with Forest-wide and DFC emphasis and direction. The Fire Management Plan will designate areas of high resource values that will be protected during fire use. These sites include: Administrative sites Developed recreation sites Summer homes Communication sites Oil and gas sites Utility corridors, Other sites containing capital improvements In areas authorized for wildland fire use, the full range of management responses from full suppression to monitoring may be used.

Activity Fuels Standard – Residual fuels that result from mechanical activities such as timber harvest will be reduced or otherwise treated so the potential fireline intensities will not exceed 400 BTU per second per foot (four foot flame lengths) on 90 percent of the days during the regular fire season, or continuous fuels concentrations exceeding the above standard will be broken up into manageable units with breaks, or additional protection will be provided for areas exceeding the above standards when such protection will not be required for more than five years. **(This standard was previously included as part of each DFC).**	**Activity Fuels Standard** The amount and composition of activity fuels that are left on project sites will be determined through project level NEPA and site-specific silvicultural prescriptions.
Fuels Guideline Hazardous fuels in the form of native vegetation *wi*ll be cleared from around buildings and facilities. For further information, see Wildfire Protection A Guide for Home Owners and Developers, Wildfire Hazard and Residential Development, Utah and California. (Previously listed in individual DFC's).	**Fuels Standard- Forest Service Developments** Defensible areas will be defined and maintained for all Forest Service developments. The size of the area and the level of maintenance will be determined based on values of capital investments and adjacent fuel types.

Desired Future Conditions

Desired Future Condition 1B
Substantial Commodity Resource Development with Moderate Accommodation of Other Resources

Theme: An area managed for timber harvest, oil and gas, and other commercial activities with many roads and moderate to occasionally substantial emphasis on other resources.

Experience: Overall, you notice many signs of people as a part of commercial timber harvest. Yet, you cannot drive to as many areas as you can in more intensively managed parts of the Bridger-Teton National Forest.

Management Emphasis -- Management emphasis is on scheduled wood-fiber production and use, on livestock production, and on other commodity outputs.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1.1(a-d,h,i), 1.2(a-f), 1.4(a), 2.1(a,b), 2.4(a,b), 2.5(a-c), and 4.2(a-c).

Current Wording	Proposed Wording (Proposed Action)
Protection: Fire Fire management emphasizes preservation and enhancement of timber and range values scheduled for current use. A full range of suppression techniques is used. (p. 158)	**Delete:** Redundant, covered in DFC description.
Prescribed Fire Guideline Prescribed fire should be used to favor reducing fuel loadings, improving livestock forage conditions on primary ranges, and improving site conditions to increase wood fiber production. (p. 158)	**Delete:** Cover in proposed forest -wide standards**.**

Fire Protection Standard Wildfires will be suppressed using control strategies during the normal fire season. Pre- and post-fire season strategies may include containment, confinement, or surveillance. (p. 158)	**Delete:** Redundant, covered in DFC description.

Current Wording	Proposed Wording (Proposed Action)
Fuels Guideline Fuel conditions should be maintained that permit fire suppression forces to meet fire protection objectives for the area under historic weather conditions. (p. 158)	**Delete:** Will cover in Fire Management Plan.

Fuels Standard Activity fuels will be reduced or otherwise treated so the potential fireline intensities will not exceed 400 BTU per second per foot (four foot flame lengths) on 90 percent of the days during the regular fire season, or continuous fuels concentrations exceeding the above standard will be broken up into manageable units with breaks, or additional protection will be provided for areas exceeding the above standards when such protection will not be required for more than five years. (p. 158)	**Delete**, Move to Forest-wide standards and guidelines.

Desired Future Condition 2A
Non-motorized Recreation Areas

Theme: An unroaded area managed to give a quiet, almost primitive recreation experience.

Management Emphasis -- Management emphasis is to maintain or enhance Primitive and Semi-primitive Non-motorized dispersed recreation opportunities.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1. 1(e-h), 2.1(a,b), 2.2(c,d), 2.3(a), 4.4(b), 4.5(a,b), and 4.6(b).

Current Wording	Proposed Wording (Proposed Action)
Protection: Fire Prescription Fire management emphasizes a natural-appearing landscape. (p. 164)	**Delete:** Redundant, covered in DFC description.

Fire Protection Standard Wildfires will be suppressed using strategies that keep fireline intensities below 400 BTU per second per foot. (p. 164)	**Delete:** Cover in Fire Management Plan.

Desired Future Condition 2B
Motorized Recreation Areas

Theme: An area managed to give a motorized recreation experience.

Management Emphasis -- Management emphasis is to maintain or enhance dispersed recreation opportunities including Semi-primitive Motorized and Roaded Natural. Opportunities for dispersed, motorized recreation are maintained and enhanced. Such areas are suitable for non-motorized uses, such as hiking, but they are not emphasized.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1. 1(fl, 1.2(c,d), 2. 1(a,b), 2.4(a,b), 2.5(a-d), 4.1(b), 4.4(a-c), and 4.5(a).

Current Wording	Proposed Wording (Proposed Action)
Protection: Fire Prescription Fire management emphasizes a slightly modified landscape. (p 170)	**Delete:** Redundant, covered in DFC description.

Current Wording	Proposed Wording
Fire Protection Standard Wildfires will be suppressed using strategies that keep fireline intensities below 400 BTU per second per foot. (p.170)	**Delete:** Covered in Fire Management Plan.

Desired Future Condition 3
River Recreation

Theme: An area managed to give river- and scenic-recreation experiences.

Management Emphasis -- River segments outside of Wilderness that have been determined eligible for potential addition to the National Wild and Scenic River system are protected from activities that could diminish or change the free-flowing characteristic, water quality, or the scenic, recreational, fish and wildlife, and other values which make the river eligible for designation. For further information, see the Wild and Scenic River Act.

Other recreational experiences and commodities are provided from river segments not eligible. If any portion of this area contains grizzly bear habitat, no surface-disturbing activities can occur there until the grizzly bear cumulative effects model can be run to help determine potential effects on the bear.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1. 1(d,e), 2.1(a,b), 2.2(a,b), 2.3(a,b), 3.2(b-fl, 4.2(b), 4.3(c), 4.4(a-c), 4.6(b),and 4.7(b).

Protection: Fire Prescription Fire management emphasizes preservation of fish and wildlife values and river-oriented recreation opportunities. (p. 177)	**Delete:** Redundant, covered in DFC description.

Fire Protection Standard Wildfires will be suppressed using primarily containment and control strategies during the normal fire season. Pre- and post-season period strategies could include containment, confinement, and surveillance. (p.177)	**Delete:** Cover in Fire Management Plan.

Fuels Guideline Hazardous fuels in the form of native vegetation *wi*ll be cleared from around buildings and facilities. For further information, see Wildfire Protection A	**Delete:** Revise and include in Forest-wide standards and guidelines.

Guide for Home Owners and Developers, Wildfire Hazard and Residential Development, Utah and California. (p. 177)	

Desired Future Condition 4
Special Emphasis Area for Municipal Water Supply

Theme: An area managed to protect municipal water supplies.

Management Emphasis -- Management emphasis is to protect or improve the quality of municipal water supplies.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1. 1(d-i), 1.3(a,b), 2.1(a,b), 2.3(a), 2.5(a,b,d), 4.1(b), 4.2(b), 4.4(a-c), and 4.7(b).

Protection: Fire Prescription Fire management emphasizes preservation of soil and water values. A full range of suppression techniques is used. (p. 182)	**Delete:** Redundant, covered in DFC description.

Current Wording	**Proposed Wording (Proposed Action)**
Fire Protection Standard Wildfires will be suppressed using primarily contain and control strategies during the normal fire season. Pre- and post-season period strategies may include containment, confinement, and surveillance. (p.182)	**Delete:** Cover in Fire Management Plan.
Fuels Guideline Fuel conditions should be maintained that permit fire suppression forces to meet fire protection objectives for the area under historic weather conditions. (p. 182)	**Delete**: Cover in Fire Management plan.
Fuels Standard Activity fuels will be reduced or otherwise treated so the potential fireline intensities will not exceed 400 BTU per second per foot on 90 percent of the days during the regular fire season, or continuous fuels concentrations exceeding the above standard will be broken up into	**Delete:** Move and revise in Forest-wide standards and guidelines.

manageable units with fire breaks, or additional protection will be provided for areas exceeding the above standards when such protection will not be required for more than five years. (p. 182)	

Desired Future Condition 6A-6D and 6S
Wildernesses, Wilderness Study Areas, and Wild Rivers

Theme: A mostly pristine area where the presence of people is rarely or never noticed.

Wilderness-wide resource management prescriptions, standards and guidelines

Protection: Fire Prescription Fire management emphasizes preservation of Wilderness values and allows natural processes of ecological change to operate freely. (p. 191)	**Protection: Fire Prescription** Fire management emphasizes preservation of Wilderness values and allows natural processes of ecological change to operate freely. The number, size and intensity of fires approximate the natural fire regime.

No standard	**Prescribed Fire Standard** Prescribed fire is only used when natural occurring fires cannot be allowed. Prescribed fire use in wilderness must meet Forest Service wilderness and fire standards.

Land and Resource Management Objectives addressed and, in part, met by the Wilderness fire prescription include: 4.6(a).

Current Wording	**Proposed Wording (Proposed Action)**
Fire Protection Guideline Wildfires will be managed in accordance with approved Wilderness Fire Management Plans for each Wilderness Area. The favored suppression techniques should be those that have the least long-term impact on Wilderness resources. (p. 191)	**Fire Protection Guideline** The favored suppression techniques should be those that have the least impact on wilderness values and resources. Evidence of fire suppression activities will not be evident within one year.

Protection: Pests Prescription Insects, diseases, and noxious weeds are not controlled. (p. 191)	**Protection: Pests Prescription** Natural mechanisms of disturbance, such as insects and diseases are not controlled**.** Non-native plants, especially those that may significantly alter natural plant succession, are controlled by means that have the least impact on the wilderness resource.

Land and Resource Management Objectives addressed and, in part, met by the Wilderness insect, disease, and noxious weed prescription includes: 4.6(a).

Management Prescription 6A

Management Emphasis -- Management emphasis is for the protection and perpetuation of pristine biophysical conditions, and a high degree of solitude with essentially no perceptible evidence of human use. Natural biological processes are not adversely or artificially changed over time by human use.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1.1(g), 2. 1(a,b), 3. 1(a,b), 3.2(a,d-h), 4.5(a,b), and 4.6(a).

Management Prescription 6B

Management Emphasis -- Management emphasis is to provide for the protection and perpetuation of natural biophysical conditions and a high degree of solitude for visitors but with some perceptible evidence of past human use.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1.1(e,g,h), 2. 1(a,b), 3.1(a), 3.2(d-h), 4.5(a,b), and 4.6(a).

Management Prescription 6D

Management Emphasis -- Management emphasis is to provide for the protection and perpetuation of essentially natural biophysical conditions inside Wilderness boundaries which are adjacent to and accessed from heavily used developed recreation sites. Management is directed towards providing a natural physical setting and Semi- primitive Non-motorized social setting.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1. 1(e,g,h), 2. 1(a,b), 3.1(a), 3.2(d-h), 4.5(a,b), and 4.6(a).

Management Prescription 6S

Management Emphasis -- The Wyoming Wilderness Act designated two areas on the Bridger-Teton National Forest for wilderness study: Shoal Creek and Palisades. The Wilderness Study Areas (WSAs) will be managed to protect long-term wilderness attributes. No activities will be allowed that will jeopardize the eligibility of the WSAs for future Congressional designation as Wilderness. Existing uses of the WSAs, such as snowmobiling and mountain biking, will be allowed to continue.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition for Wilderness Study Areas include: 1. 1(fl, 2.3(a,b), 4.4(c), and 4.6(a,b.)

Desired Future Condition 7A

Grizzly Bear Habitat Recovery Through
Scheduled Timber Harvest

Theme: An area managed to provide forage and security for the recovery of grizzly bears, allowing for some resource development and roads.

Management Emphasis -- Management emphasis is on enhancement of habitat and maintenance of recovered grizzly bear populations. Habitat improvement practices such as fire or silvicultural practices and human activities are managed to provide the habitat needed to meet the management emphasis. No surface-disturbing activities can occur until the grizzly bear cumulative effects model can be run to help determine potential affects on the bear.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1.1(a-i), 1.2(a-f), 2.1(a), 3.1(a,b), 4.2(a,c), 4.4(a-c) and 4.7(d).

Current Wording	Proposed Wording
Protection: Fire Prescription -- Fire management emphasizes preservation and enhancement of grizzly bear food, cover, and security habitat.	**Delete:** Redundant, covered in DFC description.

Prescribed Fire Guideline -- Prescribed fire should be used to favor producing desired grizzly bear and wildlife forage with consideration for reducing fuel loadings.	**Delete:** Redundant, covered in DFC description.

Fire Protection Standard Wildfires will be suppressed using strategies that will keep fireline intensities below 400 BTU per second per foot. (p. 205)	**Delete:** Move to Forest-wide standards and Fire Management Plan.

Fuels Guideline Fuel conditions should be maintained which permit fire suppression forces to meet fire protection objectives for the area under historic weather conditions. (p. 205)	**Delete:** Cover in the Fire Management Plan.

Desired Future Condition 7B
Grizzly Bear Habitat Recovery

Theme: A mainly primitive area with few roads and limited human access, managed to provide food and security for grizzly bears.

Management Emphasis -- Management emphasis is on enhancement of habitat and maintenance of recovered grizzly bear populations. Habitat improvement practices such as fire or silvicultural practices and human activities are managed to provide the habitat needed by the grizzly bear. No surface-disturbing activities can occur until the grizzly bear cumulative effects model can be run to help determine potential affects upon the bear.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1. 1(d-i), 2.1(a), 3. 1(a,b), 4.2(b,c), 4.4(a-c), and 4.7(d).

Current Wording	Proposed Wording
Protection: Fire Prescription Fire management emphasizes preservation and enhancement of grizzly bear food, cover, and security habitat. (p. 211)	**Delete:** Redundant, covered in DFC description.

Current Wording	Proposed Wording (Proposed Action)
Prescribed Fire Guideline Prescribed fire should be used to favor producing desired grizzly bear and wildlife forage with consideration for maintaining adequate security habitat. (p. 211)	**Delete:** Redundant, covered in DFC description.

Fire Protection Standard Wildfires will be suppressed using strategies that will keep fireline intensities below 400 BTU second per foot. (p. 211)	**Delete**: Move to Forest-wide standards and Fire Management Plan.

Desired Future Condition 8
Environmental Education About Integrated Multiple Uses

Theme: An area managed to provide conservation and environmental education, including the study of resources and the practice of forest management.

Management Emphasis -- Management emphasis is on environmental education. Understanding of how lands and resources are managed and change with management activities is emphasized.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1. 1(b-h), 1.2(a-e), 1.3) a), 2.1)a,b), 2.3)a 2.4(a,b), 2.5(a-d), 2.8(a), 3.2(e,h), 3.3(a), 4.1(a), 4.2(a,c,d), 4.3(a-c), 4.4)a-c), 4.5)a,b 4.7(a-d), and 4.9(a).

Current Wording	Proposed Wording
Protection: Fire Prescription Fire management emphasizes preservation and enhancement of management indicator species habitat, particularly hiding cover for big game. A full range of suppression techniques is used. (p. 219)	**Delete:** Redundant, covered in DFC description.

Fire Protection Standard Wildfires will be suppressed using control strategies during the normal fire season. Pre- and post-season period strategies may include containment, confinement, and surveillance. (p. 219)	**Delete:** Move to Forest-wide standards and Fire Management Plan.

Current Wording	**Proposed Wording (Proposed Action)**
Fuels Guideline Fuel conditions should be maintained that permit fire suppression forces to meet fire protection objectives for the area under historic conditions. (p. 219)	**Delete:** Covered in Fire Management Plan**.**
Fuels Standard Activity fuels will be reduced or otherwise treated so the potential fireline intensities will not exceed 400 BTU per second per foot on 90 percent of the days during the regular fire season, or continuous fuels concentrations exceeding the above standard will be broken up into manageable units with fire breaks, or additional protection will be provided for areas exceeding the above standards when such protection will not be required for more than five years. (p. 219)	**Delete:** Move to Forest-wide standards and guidelines.

Desired Future Condition 9A
Developed and Administrative Sites

Theme: An area managed for campgrounds, other noncommercial areas, and Forest Service administrative sites, including related roads and sites.

Management Emphasis -- The management emphasis is on existing and proposed developed recreation sites and Forest Service administrative sites: campgrounds, picnic grounds, trailheads, visitor information centers, water-related recreation facilities and concentrated use areas in Roaded Natural areas.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 2.2(a,b).

Current Wording	Proposed Wording (Proposed Action)
Protection: Fire Prescription Fire management emphasizes protection of developed facilities and related site values. A full range of suppression techniques is used. (p. 224)	**Delete:** Redundant, covered in DFC description.

Prescribed Fire Guideline Prescribed fire should be used to reduce fuel loadings and accomplish vegetation manipulation objectives. (p. 224)	**Delete:** Covered in Forest-wide standards.

Fire Protection Standard Wildfires will be suppressed using control strategies. (p. 224)	**Delete:** Move to Forest-wide standards and Fire Management Plan.

Fuels Near Facilities Standard Hazardous fuels will be cleared from around buildings and facilities within administrative sites, campgrounds, and other developed sites. For further information, see Wildfire Protection A Guide for Home Owners and Developers, Wildfire Hazard and Residential Development, Utah and California. (p. 224)	**Delete:** Standard will be covered in Forest-wide standards.
Fuels Standard Natural fuels will be reduced or otherwise treated so the potential fireline intensities will not exceed 100 BTU per second per foot on 90 percent of the days during the regular fire season. (p. 224)	**Delete:** Standard will be covered in Fire Management Plan.

Desired Future Condition 9B
Special-Use Recreation Areas

Theme: An area managed for permitted, private recreation homes, permittees, and others offering services to the public, including related roads and sites.

Management Emphasis -- Management emphasis is on summer home groups, concession operations, ski areas, lodges, and group camps, and other privately operated sites on National Forest System lands and retention of selected sites for future opportunities.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1. 1(fl, and 2.2(a,b).

Recreation Residence Landscape Guideline Natural vegetation should be favored around facilities. However, mowing natural	**Recreation Residence Landscape Guideline** Natural vegetation should be favored around facilities. Landscaping around all

vegetation around facilities may be allowed. (p. 228)	facilities should maintain an appropriate fire defensible space to protect structures from wildfires.

Current Wording	Proposed Wording (Proposed Action)
Protection: Fire Prescription Fire management emphasizes protection of private permitted developments. Permittees are responsible for fuels management. A full range of suppression techniques is used. (p. 229)	**Protection: Fire Prescription** Fire management activities will reduce the risk to public safety and capital improvements. Permittees are responsible for fuels management.

Current Wording	Proposed Wording
Prescribed Fire Guideline Prescribed fire should be used to reduce fuel loadings and accomplish vegetation manipulation objectives. (p. 230)	**Delete:** Move to Forest-wide standards and Fire Management Plan.

Fire Protection Standard Wildfires will normally be suppressed using control strategies during the normal fire season. Pre- and post-season period strategies could include containment, confinement, and surveillance. Access to special-use recreational sites will allow for safe ingress and egress during wildfire suppression. (p. 230)	**Delete**: Move to Forest-wide standards and Fire Management Plan.

Fuels Guideline Hazardous fuels should be cleared from around permitted facilities and dwellings. For further information, see Wildfire Protection A Guide for Home Owners and Developers, Wildfire Hazard and Residential Development, Utah and California. (p. 230)	**Fuels Guideline –** Permittees will be responsible for maintaining adequate defensible space to protect capital improvements and resource values. Specific requirements may be included as part of their annual operating plan.

Fuels Standard Around buildings and facilities, natural fuels will be reduced or otherwise treated so potential fireline intensities will not exceed 100 BTU per second per foot on 90 percent of the days during the regular	Delete: Move standard to Forest-wide standards and Fire Management Plan.

season, and in other areas, natural fuels will be reduced or otherwise treated so that potential fireline intensities will not exceed 400 BTU per second per foot on 90 percent of the days during the regular fire season, or continuous fuel concentration exceeding the above standards will be broken up into manageable units with firebreaks, or additional protection will be provided for areas exceeding the above standards when such protection will not be required for more than five years. (p. 230)	

Desired Future Condition 10

Simultaneous Development of Resources, Opportunities for Human Experiences, and Support for Big-Game and a Wide Variety of Wildlife Species

Theme: An area managed to allow for some resource development and roads while having no adverse and some beneficial effects on wildlife.

Management Emphasis -- Management emphasis is to provide long-term and short-term habitat to meet the needs of wildlife managed in balance with timber harvest, grazing, and minerals development. All surface-disturbing activities are designed to have no affect or beneficial effects on wildlife. If any portion of this area contains grizzly bear habitat, no surface-disturbing activities can occur there until the grizzly bear cumulative effects model can be run to help determine potential affects on the grizzly bears.

Land and Resource Management Objectives addressed and, in part, met by achieving this Desired Future Condition include: 1.1(a-i), 1.2(a-fl, 2.1(a,b), 2.3(a), 2.4(a,b), 2.5(a-d), 4. 1(a,b), 4.2(a,c,d), 4.3(a-c), 4.4(a-c), and 4.7(a-d).

Current Wording	Proposed Wording (Proposed Action)
Protection: Fire Prescription Fire management emphasizes preservation and enhancement of habitat. A full range of suppression techniques is used. (p. 239)	**Delete:** Redundant, covered in DFC description.

Fire Protection Standard Wildfires will be suppressed using strategies that will keep fireline intensities below 400 BTU per second per foot. Wildfires will be suppressed using control strategies when they threaten plantations.	**Delete:** Move to Forest-wide standards and Fire Management Plan.

(p. 239)	

Current Wording	Proposed Wording
Fuels Guideline Fuel conditions should be maintained that permit fire suppression forces to meet fire protection objectives for the area under historic weather conditions. (p. 239)	**Delete:** Covered in operational Fire Management Plan.

Fuels Standard Activity fuels will be reduced or otherwise treated so the potential fireline intensities will not exceed 400 BTU per second per foot on 90 percent of the days during the regular fire season, or continuous fuels concentrations exceeding the above standard will be broken up into manageable units with fire breaks, or additional protection will be provided for areas exceeding the above standards when such protection will not be required for more than five years. (p. 239)	**Delete:** Move to Forest-wide standards and guidelines.

Desired Future Condition 12
Backcountry Big-Game Hunting, Dispersed Recreation, and Wildlife Security Areas

Theme: An area managed for high-quality wildlife habitat and escape cover, big-game hunting opportunities, and dispersed recreation activities.

Management Emphasis -- Management emphasis is on providing such important habitat for big game as winter ranges, feedgrounds, calving areas, and security areas. Management provides for habitat capability and escape cover, and maintained Semi-primitive Non-motorized opportunities that emphasize big-game hunting activities. If any portion of this area contains grizzly bear habitat, no surface-disturbing activities can occur there until the grizzly bear cumulative effects model can be run to help determine potential affects on the bear.

Current Wording	Proposed Wording
Protection: Fire Prescription Fire management emphasizes preservation and enhancement of habitat, particularly through prescribed fire. A full range of suppression techniques is used. (p. 246)	**Delete:** Redundant, covered in DFC description.

Fire Protection Standard Wildfires will be suppressed using control strategies during the normal fire season. Pre-season and post-season period strategies will include containment, confinement, and surveillance. (p. 246)	**Delete:** Move to Forest-wide standards and Fire Management Plan.

Fuels Standard Activity fuels will be reduced or otherwise treated so the potential fireline intensities will not exceed 400 BTU per second per foot on 90 percent of the days during the regular fire season, or continuous fuels concentrations exceeding the above standard will be broken up into manageable units with fire breaks, or additional protection will be provided for areas exceeding the above standards when such protection will not be required for more than five years. (p. 246)	**Delete:** Move to Forest-wide standards and Fire Management Plan.

Appendix E
References

Agee, James K. 1993. Fire ecology of Pacific Northwest forests. Island Press, Washington D.C. 493 p.

Agee, James K. 1997. The severe weather wildfire – Too hot to handle? Northwest Science; Vol. 71 No.1: p. 24-34.

Agee, James K. 1998. The landscape ecology of western forest fire regimes. Northwest Science; Vol. 72 (special issue 1998) : p. 24-34.

Barrett, Stephen W. 1994. Fire regimes on the Caribou National Forest, southeastern Idaho. Unpublished Contract No. 53-02S2-3-05071.

Bartos, Dale L.; Mueggler, W. F.; 1981. Early succession in aspen communities following fire in western Wyoming. Journal of Range Management. 47 (1): 79-83.

Bartos, Dale L.; Mueggler, Walter F.; Campbell, Robert B. Jr. 1991. Regeneration of aspen by suckering on burned sites in Western Wyoming. USDA For. Serv. Res. Pap. INT-448. 9 p. Intermountain Resource Station., Ogden, Utah.

Bessie, W. C.; and E. A. Johnson. 1995. The relative importance of fuels and weather on fire behavior in subalpine forests. Ecology. Vol. 76 Issue 3. p. 747-762.

Bisson, Peter A. et al 2003. Fire and Aquatic Ecosystems of the Western USA: Current Knowledge and Key Questions; Prepublication Draft, Forest Ecology and Management.

Bradley, Anne F.; Fischer, William C.;Noste, Nonan V. 1992. Fire ecology of the forest habitat types of Eastern Idaho and Western Wyoming. General Technical Report INT-290. Ogden, UT:USDA Forest Service, Intermountain Research Station. 92 p.

Bridger-Teton National Forest Properly Functioning Condition Assessment. 1997. Bridger-Teton National Forest. USDA For. Service. Intermountain Region.

Brown, James K.; DeByle N. V. 1989. Effects of prescribed fire on biomass and plant succession in western aspen. General Technical. Rep. INT-412 16p. Intermountain Research Station, Ogden, Utah.

Brown, James K. and Norbert V. Debyle. 1989. Effects of prescribed fire on biomass and plant succession in western aspen. USDA Forest Service Res. Pap. INT-412. 16 p. Intermountain Forest Research Station, Ogden, Utah.

Brown, James K.; Smith, Jane Kapler, eds. 2000; Wildland fire in ecosystems; effects of fire on flora. General Technical Report RMRS 42 – vol. 2. Ogden, UT. USDA Forest Service. Rocky Mountain Research Station. 257 p.

Carter Mountain Vegetation Treatment Environmental Assessment. 2003. Shoshone National Forest, USDA For. Service. Rocky Mountain. Region.

Commissary Ridge/Tunp Range Landscape Scale Assessment. 2001. Bridger-Teton National Forest. USDA For. Service Intermountain Region.

Committee of Scientists. 1999. Sustaining the People's Lands. U.S. Department of Agriculture, Forest Service, Washington D.C.

Doyle, Kathleen M. 1997. Fire, environment, and early forest succession in a Rocky Mountain landscape, Northwestern Wyoming. Ph.D. dissertation. Univ. of Wyoming, Dept. of Botany. Laramie, WY.

Everett, Richard L.; Schellhaas Richard; Ohlson, Pete; Spurbeck Don; Keenum, David. 2001. Continuity in fire disturbance between riparian and adjacent side slopes in the Douglas-fir forest series. USDA For. Service., Pac. Northwest Research Station. Wenatchee, Washington.

Fertig, W. and G Beauvais. 1999 Wyoming Plant and Animal Species of Special Concern. Wyoming Natural Diversity Database, Laramie, Wyoming. Unpublished report. Available at http://uwadmnweb.uwyo.edu/wyndd/.

Franklin, Tamara L.; Laven, Richard D. 1989. Fire influences on Central Rocky Mountain lodgepole pine stand structure and composition. Proceedings 17th Tall Timbers Fire Ecology Conference. May 18-21 Tallahassee, Florida.

Fuhlendorf, Samuel D.; Smeins, Fred E.; 1997. Long-term vegetation dynamics mediated by herbivores, weather and fire in a Juniperus-Quercus savanna. Journal of Vegetation Science. Vol. 8. p. 819-828.

Gresswell 1999. Fire and aquatic ecosystems in forested biomes of North America. Tran. Am. Fisheries Society. 128(2), 193-221.

Gros Ventre Fire History Study. 2003. Bridger-Teton National Forest. USDA Forest. Service, Intermountain Region.

Keane, Robert E. et. al 2002. Cascading Effects of Fire Exclusion in Rocky Mountain Ecosystems. USDA Forest Service Rocky Mountain Research Station GTR-91.

Leopold et. al. 1964. Fluvial Processes in Geomorphology.

Miller, Richard F.; Rose, Jeffrey A.; 1999. Fire history and western juniper encroachment in sagebrush steppe. Journal of Range Mgmt. Vol. 52 Issue 6. p. 550-559.

McIver and Starr 2000. Environmental Effects of Post-fire Logging: Literature Review and Annotated Bibliography. General Technical Report. PNW-GTR-486. U.S. Department of Agriculture Forest Service, Pacific Northwest Research Station. Portland OR, pp.72.

Morgan, Penny; Bunting, Stephen C.; 1989. Fire effects in whitebark pine forests. Proceedings of the Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource, Bozeman MT, March 29 – 31, 1989. USDA Forest Service General Technical. Report INT – 270 Int. Research Station. Ogden, UT. 386 p.

National Interagency Fire Center. 1998. Wildland and Prescribed Fire Management Policy, Implementation Procedures Reference Guide.

Ogle, Karen A.; DuMond, Valerie; 1997. Historical vegetation on national forest lands in the Intermountain Region. USDA For. Service. Intermountain Region. 0gden, UT.

Prescribed Fire and Fire Effects Working Team. 1985. Prescribed Fire Smoke Management Guide. National Wildfire Coordinating Group, Boise ID. 28pp. PMS 420-2.

Rieman, Bruce et. al. 2003. Status of Native Fishes in the Western United States and Issues for fire and Fuels Management: Prepublication Draft; Forest Ecology and Management.

Reiman and Clayton 1997. Wildlife and native fish: Issue of forest health and conservation of sensitive species. Fisheries 22(11), 6-15.

Robichaud, Peter R. 2000. Forest Fire Effects on Hillslope Erosion: What We Know. USDA Forest Service, Rocky Mountain Research Station, Moscow, Idaho.

Ruediger, Bill, Jim Claar, Steve Gniadek, Bryon Holt, Lyle Lewis, Steve Mighton, Bob Naney, Gary Patton, Tony Rinaldi, Joel Trick, Anne Vanderhey, Fred Wahl, Nancy Warren, Dick Wegner, and Al Williamson. 2000. Canada Lynx Conservation Assessment and Strategy. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Missoula MT. The report is available at http://www.fs.fed.us/r1/wildlife/carnivore/Lynx/lcas.pdf.

Steele, Robert; Cooper Stephen V.; Ondov, David M.; Roberts, David W.; Pfister, Robert D. 1983. Forest habitat types of Eastern-Idaho and Western Wyoming. USDA For. Service General Technical Report. INT–144 Ogden, Utah, Intermountain. Forest. and Range Experiment Station. 122 p.

Tart, David; Winward, Alma; 1997. Fire effects on plants of the Bridger-Teton National Forest. 25 p.

Teton Landscape Scale Assessment. 2003. Bridger-Teton National Forest. USDA For. Service Intermountain Region.

Tomback, Diana F.; Hoffman, Lyn A.; Sund, Sharren K. 1989. Co evolution of whitebark pine and nutcrackers: Implications for forest management. Proceedings of the Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource, Bozeman MT, March 29 – 31, 1989. USDA Forest Service Gen. Technical Report INT–270 Intermountain Resource Station. Ogden, UT. 386 p.

Upper Green Landscape Scale Assessment. 1999. Bridger-Teton National Forest. USDA Forest Service, Intermountain Region.

United States Environmental Protection Agency. 1999. EPA-452/F-99-001 Fighting Fire with Fire: Keeping Forests Healthy and Protecting Air Quality,

United States Environmental Protection Agency. 1998. Interim Air Quality Policy on Wildland and Prescribed Fires. 38pp.

USDA Forest Service. 2000 Bitterroot National Forest Burned Area Assessment, Watershed Integrity

USDA Forest Service. 1999 Utah Fire Amendment, Environmental Assessment

USDA Forest Service. 1990. Forest Plan. Bridger-Teton National Forest.

USDA. 1983. Department Regulation 9500-04 (http://www.usda.gov/directives).

Utah Fire Amendment Environmental Assessment. 2000. USDA For. Service Intermountain Region, Ogden, UT.

Wadleigh, Linda; Jenkins, Michael. J.; 1996. Fire frequency and the vegetative mosaic of a spruce-fir forest in northern Utah. Great Basin Naturalist. Vol. 56, Issue 1. p. 28–37.

Warren and Liss 1980. Adaptation to aquatic environments. In: Lackey, R.T., Nielsen, L. (Eds), Fisheries Management. Blackwell Scientific Publications, Oxford, pp.15-40.

Williams, Gerald W. 2001. References on the American Indian use of fire in ecosystems. Literature review. Unpublished. USDA Forest Service, Washington D.C.

Appendix F
Scientific and Common Names Appearing in Text

The Natural Resource Conservation Service Plants Database was used for plant names. This database is available at http://plants.usda.gov/.

Common Name	Scientific Name
Aspen	Populus tremuloides
Basin big sagebrush	Artemisia tridentata spp. tridentata
Big sagebrush	Artemisia tridentata ssp. spiciformis
Canada thistle	Cirsium arvense
Cheatgrass	Bromus tectorum
Curl-leaf mountain mahogany	Cercocarpus ledifolius
Engelmann spruce	Picea engelmannii
Douglas-fir	Pseudotsuga menziesii
Limber pine	Pinus flexilis
Mountain big sagebrush	Artemisia tridentata. spp. vaseyana
Musk thistle	Carduus nutans
spotted knapweed	Centaurea biebersteinii
Subalpine fir	Abies lasiocarpa
Whitebark pine	Pinus albicaulis
Wyoming big sagebrush	Artemisia tridentata ssp. wyomingensis