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Environmental Assessment

Ice Caves Grazing Allotment

Mount Adams Ranger District

Skamania County, Washington

T. 5N, R. 9E; T. 5N, R. 10E; T. 6N, R. 9E; and T. 6N, R. 10E, W.

CONTENTS

SUMMARY

The Gifford Pinchot National Forest proposes to continue authorization of grazing on the Ice Caves Horse and Cattle Allotment. The project area is located in the Cave-Bear Creek and the Little White Salmon subwatersheds, just west of Trout Lake and is within the Mount Adams Ranger District, Gifford Pinchot National Forest, Washington. The Rescission Act of 1995 requires the Forest Service to establish and adhere to a schedule for the completion of National Environmental Policy Act (NEPA) analysis and decisions on all allotments within the National Forest System for which NEPA analysis is needed. There is also a need to achieve or maintain resource conditions in accordance with current law, policy, and Forest Plan direction.

Under the proposed action, livestock grazing would continue to be permitted under current management with necessary modifications to comply with Forest Service sensitive species policy and allotment utilization standards. This includes the addition of cattle exclosures to protect habitat for the Mardon skipper butterfly and pale, blue-eyed grass. Grazing could occur periodically within these exclosures based on the discretion of the Forest Service if needed to meet objectives for Mardon skipper butterflies or pale blue-eyed grass. The term permit would be reduced by approximately 50 percent of the original allocation (approximately a 100 cow/calf pair reduction).

In addition to the proposed action, the Forest Service also evaluated the following alternatives:

- Drift Fence in lieu of exclosures combined with Adaptive Management
- No Grazing

Based on this analysis, the responsible official will decide whether or not to authorize grazing on the Ice Caves Allotment and if so, whether or not any specific standards and guidelines and/or mitigation measures would apply.

CHAPTER 1 – PURPOSE OF AND NEED FOR ACTION

The USDA Forest Service has prepared this Environmental Assessment (EA) in compliance with the National Environmental Policy Act (NEPA) of 1969 and other applicable Federal and State laws and regulations. This EA discloses the direct, indirect, and cumulative environmental impacts that would result from the implementation of the proposed action and alternatives. The document is organized into four chapters:

- *Chapter 1. Purpose and Need for Action:* This chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and the issues that were raised during the scoping process.
- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a detailed description of the agency's proposed action along with alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public, other agencies, and interdisciplinary review. A "no grazing" alternative is provided as a baseline for evaluation and comparison of other alternatives. It is considered as a viable alternative and may be selected if it best meets the purpose of and need for action. This chapter also includes project design features, and any necessary mitigation measures. Chapter 2 includes a summary table of the environmental consequences from Chapter 3 that are associated with each alternative for easy reference.
- *Chapter 3. Environmental Consequences*: This chapter describes the environment of the area affected by the proposed action and the alternatives, including the no-action alternative. It is organized by resource area. Under each resource area, the affected environment is described first, followed by the environmental consequences of each alternative. The analysis of significant issues is included in this chapter (by appropriate resource area) according to the evaluation criteria specified in the issue statements in Chapter 2.
- *Chapter 4. Consultation and Coordination:* This chapter includes a list of preparers and agencies consulted during the development of the EA.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the EA.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Mount Adams Ranger District Office on the Gifford Pinchot National Forest.

Introduction

The Mount Adams Ranger District is proposing to develop/update the Allotment Management Plan (AMP) so that it meets standards and guidelines to assure cattle grazing is in compliance with the 1990 *Gifford Pinchot National Forest Land and Resource Management Plan* (referred to as the Forest Plan), as amended by the *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (1994, amended 2001, 2004) (also referred to as the Northwest Forest Plan). The updated AMP will provide guidance for the Ice Caves Grazing Allotment (the Allotment) for the next ten years.

The Ice Caves Grazing Allotment (referred to in this document as the Allotment) consists of approximately 31,996 acres and is located within the Little White Salmon watershed and the Cave-Bear Creek subwatershed of the White Salmon River watershed, just west of Trout Lake. The terrain elevation within the Allotment ranges from 2,600 to 4,000 feet. The Allotment is located within T. 5N, R. 9E; T. 5N, R. 10E; T. 6N, R. 9E and T. 6N, R. 10E, W.M., within both Klickitat and Skamania counties, Washington.

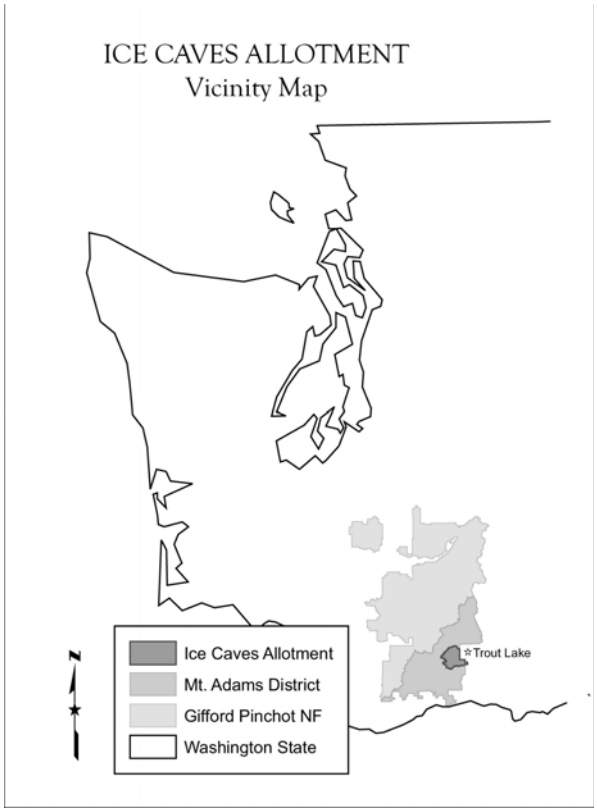

Figure 1-1. Ice Caves Grazing Allotment Vicinity.

The Forest Service administers grazing on National Forest System Lands under authority of the Organic Administration Act, Granger-Thye Act, Forest and Rangeland Renewable Resources Planning Act, and the National Forest Management Act. The Final EIS for the Gifford Pinchot National Forest Land and Resource Management Plan (USDA 1990) acknowledged present and historic grazing and the continued opportunities on three Allotments in the Mount Adams District, one of which is the Ice Caves Allotment.

Currently, the Allotment is managed as both primary and transitory range under a ten-year term grazing permit. The permit was recently re-issued and will expire at the end of 2012. The permit authorizes 200 cow/calf pairs graze on the Allotment from June 15 through September 30. The cattle winter off of National Forest System lands. The current permittee and members of his family have held the permit for more than 60 years. District records indicate use of the Allotment for grazing cattle since 1911.

The Allotment also serves as habitat for elk and deer as well as non-game wildlife species. Area streams provide habitat for fish. The Allotment includes recreation opportunities such as

camping, cross-country skiing, snowmobiling, hiking, biking, mushroom gathering, and huckleberry picking.

The Forest Service currently holds water rights from the State of Washington, Skamania County, to divert five cubic feet/second (cfs) of water into the Lost Creek Ditch from Lost Creek. The water right for the diversion permits domestic supply, recreational development, water for grazing and fire protection.

Purpose of and Need for Action

The purpose of the proposed action is to meet the requirements of the 1995 Rescission Act (the Act) to analyze and assess the continued use of the Ice Caves Grazing Allotment for grazing through the NEPA process. Provisions of the Act allow for continued authorization of livestock grazing provided that continued grazing can be done in a manner consistent with Forest Service policy and direction, it assures optimum range condition and health, and where applicable laws can continue to be met, including the Endangered Species Act (1973) and the Clean Water Act (1977). The purpose and need for action is based on the premise that livestock forage production is to be offered where forage is in excess to basic plant and soil needs, wildlife forage is available, and other specific resource conditions are achieved or maintained.

This action is needed to bring the permitted livestock grazing Allotment in alignment with the changes that have occurred since the last EA, which was completed in 1993. This need would be met by updating the 1993 AMP for the Ice Caves Grazing Allotment. The intent of the AMP is to develop a management strategy that assures consistency with Forest Plan standards and guidelines and will protect soil and water resources, promote ecological diversity by maintaining the vegetative condition of suitable rangelands, riparian areas and meadows, and to achieve the following objectives:

- Provide for sufficient protection of water quality, streambank soils and vegetation by managing livestock to avoid areas of concentrated use in riparian zones.
- Assure that rangeland health and condition is moving toward desired conditions.
- Ensure that livestock utilization within meadow habitats is managed and monitored to provide for protection and reproduction of pale blue-eyed grass (*Sisyrinchium sarmentosum*) and Mardon skipper butterfly (*Polites mardon*).
- Ensure that adequate wildlife forage and habitat can be sustained.
- Maintain and/or monitor the Cave Creek exclosure and the values of the Wildlife Special Interest area per the Forest Plan, to ensure grazing is compatible with pale blue-eyed grass and Mardon skipper butterfly management objectives, and to help control spread of invasive plant species.
- Prevent the introduction and spread of invasive species.

An AMP update is needed for the following reasons:

- The current AMP pre-dated the Northwest Forest Plan and does not address the Aquatic Conservation Strategy.
- The Mardon skipper butterfly is a candidate for federal listing under the Endangered Species Act and found within the Allotment.

- New information related to the effects of grazing on pale blue-eyed grass (a species listed on the Regional Forester's Sensitive Species List) is available.
- The original AMP is over ten years old and in need of revisions to assure compliance with the National Environmental Policy Act (NEPA) and to determine if grazing practices still meet the desired future conditions of Management Areas (see discussion below) within the Allotment.
- The amount of available forage has decreased. Transitory range included recently clearcut forested stands. Residual/planted conifers in these stands have started to grow, shading out forage plants and making these areas marginal or unsuitable as range for cattle.

Where consistent with other multiple-use goals and objectives, Congressional intent exists to permit grazing on suitable lands (Multiple Use Sustained Yield Act of 1960, Wilderness Act of 1964, Forest and Rangeland Renewable Resources Planning Act of 1974, Federal Land Policy and Management Act of 1976, National Forest Management Act of 1976).

Forest Service policy is to make forage available to qualified livestock operators from lands suitable for grazing consistent with land management plans (Forest Service Manual 2203.1). Additionally, it is Forest Service policy to continue contributions to the economic and social well being of people by providing opportunities for economic diversity and by promoting stability for communities that depend on range resources for their livelihood (Forest Service Manual 2202.1).

The National Forest Management Act of 1976 (NFMA) requires that range suitability be developed as part of the planning process for lands proposed for grazing. "Suitability" is defined in the regulations as:

> "[t]he appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone." 16 CFR §219.3.

A rangeland suitability analysis and Suitability Determination is included in this document with the intention of meeting Forest Planning regulations for grazing. The suitability analysis in this document is also used at the site specific scale to validate Forest Plan direction and whether use of the land for grazing is appropriate and can be managed in a sustainable manner. The Allotment contains lands identified as suitable for domestic livestock grazing and continued domestic livestock grazing is consistent with the goals, objectives, standards and guidelines of the Forest Plan (Forest Plan, pages IV-91 thru 149). The complete suitability analysis is included as Appendix A and summarized in Chapter 3 – Environmental Consequences.

Desired Future Condition

The desired condition for the Allotment is to provide for some level of livestock use while preventing unacceptable damage to other resource values from commercial livestock grazing. There should be a decrease in invasive weeds and a corresponding increase in native species and an increase in water quality and fish habitat. There is a need for change from current management on the Allotment. The amount of transitory range is declining as young stands close causing cattle to congregate in portions of Allotment and causing resource damage. On the basis of annual monitoring there are indicators of high-use in meadows and along streambanks. These high-use areas are presently not moving toward desired conditions.

In summary, the Allotment contains lands identified as suitable for domestic livestock grazing and continued domestic livestock grazing is consistent with the goals, objectives, standards and guidelines of the Forest Plan (Forest Plan, pages IV-91 thru 149). By regulation, forage-

producing lands will be managed for livestock grazing where consistent with land management plans (36 CFR 222.2 c).

Proposed Action

To meet the purpose of and need for action, the District Ranger of the Mount Adams Ranger District, Gifford Pinchot National Forest, proposes to continue to allow grazing within the Ice Caves Grazing Allotment, and to develop/update management standards and mitigation measures of the AMP to assure cattle grazing is in compliance with the Forest Plan standards and guidelines and Forest Service policy direction. Mitigation would include restricting stock access to sensitive habitats by constructing cattle exclosures. The forage (AUMs) within these exclosures would be deducted from the Allotment grazing capacity. However, grazing could occur periodically within these exclosures at the discretion of the Forest Service, if needed to meet objectives for maintenance of habitat. The updated AMP will provide guidance for the Ice Caves Grazing Allotment for the next ten years.

Management Direction

Gifford Pinchot Land Management Plan (Forest Plan)

The proposed action would be implemented under the direction of the Forest Plan as amended by the Northwest Forest Plan. The Final EIS for the *Gifford Pinchot National Forest Land and Resource Management Plan* (USDA 1990) acknowledged present and historic grazing and the continued opportunities on three Allotments in the Mount Adams District, one of which is the Ice Caves Allotment. This analysis is tiered to that EIS.

The Forest Plan includes Management Areas that provide direction (practices) for specific portions of forest-managed land. Each Management Area identifies a goal, or management emphasis, and the desired future condition of the land. The Ice Caves Allotment encompasses ten Management Areas (Table 1-1 and Figure 1-2):

General Late Successional Reserve (LS). The goal is to protect and enhance conditions of late-successional and old-growth forest ecosystems. Cattle grazing is permitted.

General Forest (TS). The goal is to produce a predictable and sustainable level of timber sales and non-timber resources that will not degrade the environment. Cattle grazing is permitted.

Visual Emphasis (VL and VM). The goal is to provide a natural or near-natural landscape as viewed from designated travel routes or use areas. Cattle grazing is permitted.

Administrative Site (3W). The goal is to provide for facilities required to accomplish the administration of the National Forest in an efficient manner. The Peterson Prairie Campground includes administrative site facilities and is within the Ice Caves Grazing Allotment. Cattle grazing should not be permitted.

Special Interest (GD). The goal is to maintain the special geologic features in a substantially natural condition, while providing for an appropriate level of public access and enjoyment. Cattle grazing may be permitted if it does not detract from the special feature(s) and public use and enjoyment.

Special Interest (9L). The goal is to maintain the special features in a substantially natural condition, while providing for an appropriate level of public access and enjoyment. Cattle grazing may be permitted if it does not detract from the special feature(s) and public use and enjoyment.

Roaded Recreation (RM). The goal is to provide a variety of dispersed recreational opportunities in areas conveniently reached by auto. Cattle grazing is permitted.

Wildlife Special (IX). The goal is to sustain or enhance a limited and significant habitat to support dependent wildlife. Cattle grazing is permitted only outside of the 80-acre Cave Creek Beaver and Waterfowl exclosure.

Non-national forest lands (99).

Table 1-1. Gifford Pinchot National Forest Management Areas and Acres within the Ice Caves Grazing Allotment.

Management Area	Acres
LS	10,394
TS	15,274
VL	3,236
VM	1,371
3W	26
GD	1,115
9L	82
RM	1
IX	283
99	214
Total	**31,996**

Northwest Forest Plan Allocations

The Ice Caves Grazing Allotment is comprised of lands assigned to four land allocations established by the Northwest Forest Plan (Table 1-2 and Figure 1-2). These allocations overlay the Forest Plan Management Areas and provide the context for management. Allocations within the Ice Caves Grazing Allotment:

Administratively Withdrawn Areas (AWA) - Administratively Withdrawn Areas identified in current Forest Plans include recreation and scenic areas, back country and other areas where management emphasis include grazing practices, except within the 80-acre Cave Creek Beaver and waterfowl exclosure.

Late-Successional Reserves (LSR) – Late-Successional Reserves have been established to maintain a functional, interactive, late-successional and old-growth forest ecosystem. They are designed to serve as habitat for late-successional and old-growth-related species including the northern spotted owl (Northwest Forest Plan ROD, p. 6). The standards and guidelines are designed to maintain late-successional forest ecosystems including protection from loss due to large-scale fire, insect and disease epidemics and major human impacts. Range-related management that does not adversely affect late-successional habitat is permitted.

Matrix – Matrix lands are those areas outside of the other six allocations (Late Successional Reserves, Managed Late-Successional Areas, Riparian Reserves, Congressionally Reserved Areas, Administratively Withdrawn Areas, and Adaptive Management) defined by the Northwest Forest Plan. It is the area where most timber harvest and other management activities will be conducted, including grazing. Forest stands in the Matrix provide connectivity between LSRs and provide habitat for a variety of organisms associated with both late-successional and younger forests. Matrix standards and guidelines provide for maintenance of ecologically valuable structural components such as down logs, snags and large trees. They also add ecological diversity by providing early-successional habitat.

Managed Late-Successional Areas (MLSA) - Managed Late-Successional Areas are similar to Late-Successional Reserves but are identified for certain owl locations in the drier provinces where regular and frequent fire is a natural part of the ecosystem. Certain silvicultural treatments and fire hazard reduction treatments are allowed to help prevent complete stand destruction from large catastrophic events such as high intensity, high severity fires, or disease or insect epidemics. Range-related management that does not adversely affect late-successional habitat is permitted.

Riparian Reserves - Riparian Reserves provide an area along all streams, wetlands, ponds, lakes, and unstable and potentially unstable areas where riparian-dependent resources receive primary emphasis. They have been established to maintain healthy riparian zones, functioning aquatic habitat and clean natural stream-flows. Riparian reserves also help conserve habitat for organisms dependent on the transition zone between riparian and upland areas and serve as connectivity corridors among the late-successional reserves. Within the Ice Caves Grazing Allotment, they encompass areas adjacent to perennial and intermittent streams. Prescribed widths of the reserves apply to all watersheds until a site-specific analysis and appropriate decision-making process is utilized to change the reserve boundaries.

Riparian reserves are one of four components of the Aquatic Conservation Strategy designed to restore and maintain the ecological health of watersheds and aquatic ecosystems at the watershed and landscape scale. Range-related management that does not retard or prevent attainment of the Aquatic Conservation Strategy is permitted.

Table 1- 2. Northwest Forest Plan Land Allocations and Acres.

Northwest Forest Plan Allocations	Acres
AWA	1,481
LSR	2,800
Matrix	16,644
MLSA	10,857
Non federal	214
Total	**31,996**

Figure 1-2 displays the relationship of the Forest Plan Management Areas to the Northwest Forest Plan Allocations.

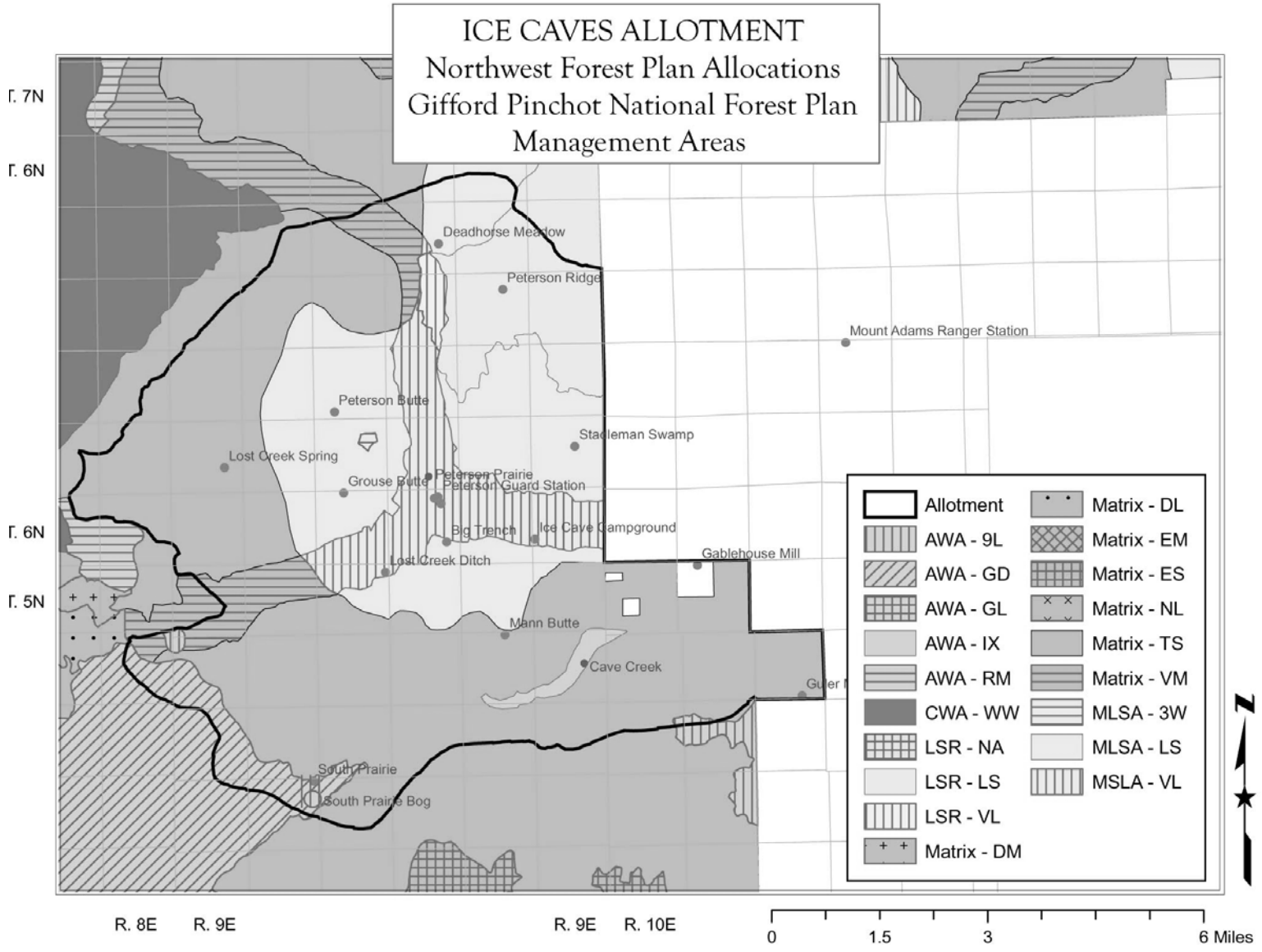

Figure 1-2. Ice Caves Allotment Management Direction.

Aquatic Conservation Strategy

The Northwest Forest Plan identifies the Aquatic Conservation Strategy (ACS) as part of its comprehensive ecosystem management strategy. The ACS includes four components:

Riparian Reserves. Described under Northwest Forest Plan Allocations (see above).

Key Watersheds. Key Watershed systems serve as refugia that are crucial for maintaining and recovering habitat for at-risk fish species and stocks. These refugia include areas of high quality habitat as well as areas of degraded habitat. The Ice Caves Grazing Allotment is located within the 5th field watershed of White Salmon River. This watershed is designated a Tier 1 Key Watershed. Tier 1 Key Watersheds contribute directly to the conservation of at-risk anadromous salmonids, bull trout and resident fish species.

Watershed Analysis. Watershed analysis is a systematic procedure for evaluating the geomorphic and ecologic processes operating in a specific watershed. The Ice Caves Allotment is within the Cave-Bear Creek watershed and the Little White Salmon watershed. Watershed analyses were conducted for both Cave-Bear Creek watershed and the Little White Salmon watershed and both discussed the presence and management of grazing. The Cave-Bear Creek Watershed Analysis (USDA 1997a) included the specific recommendations relevant to the Ice Caves Grazing Allotment:

- Complete the three-year monitoring of the Cave Creek Wildlife Special Area exclosure to assess grazing impacts to the following: vegetative cover, growth, species abundance, species diversity, noxious weed populations, pale blue-eyed grass populations and stream bank stability. The purpose of this monitoring project was to determine the appropriateness of cattle grazing within the Cave Creek Wildlife Special Area. If grazing impacts exceed thresholds, maintain the Wildlife Special Area allocation and exclude grazing from the entire area. If grazing impacts are within thresholds, remove the exclosure and permit grazing within the Wildlife Special Area allocation. Refer to the Ice Caves Cattle and Horse Allotment Decision Notice (July 12, 1993).
- Continue the annual clean out of vegetation within the Lost Creek Ditch from Forest Road 66 to Peterson Prairie Campground to facilitate water flow in the ditch.
- Continue to monitor the diversion of the permitted five cubic feet per second (cfs) of water from Lost Creek into the Lost Creek Ditch from June 1 to September 30, under the stated temperature limitations (16ºC maximum).

Watershed Restoration. Watershed restoration is a comprehensive, long-term program to restore fish habitat, riparian habitat and water quality. It is based on recommendations identified during watershed analysis and planning. The Little White Salmon River Watershed Analysis identified several potential restoration projects (USDA 1995, p. 95). One such project related to grazing is:

- *Noxious Weed Control.* Noxious weed control efforts are desired throughout the watershed. The objective is to improve forage for wildlife and livestock, maintain native biodiversity and reduce compaction and erosion. Cooperative projects with Skamania County are ongoing. Specific prevention and eradication projects relating to Ice Caves Grazing Allotment will be required.

Decision Framework

Given the purpose and need, the deciding official will review the proposed action and the other alternatives in order to make the following decisions:

- Determine if the proposed action would cause significant impacts, which would require an environmental impact statement.
- Determine whether or not to permit grazing on national forest lands within the Ice Caves Allotment and if so, determine how many cattle would be authorized and the season of use. A decision to authorize continued grazing will also update the AMP to provide guidance for the Ice Caves Grazing Allotment for the next ten years.

Where outcomes are uncertain, the action alternatives may include provisions for adaptive management (40 CFR § 1502.22), in which the "predict-mitigate-implement-monitor-adapt" environmental analysis model is used. The deciding official will employ the best available science to judge which of the alternatives best meet the purpose of and need for action and best address the significant issues. Where the predicted outcomes are unknown or uncertain, a monitoring plan will be developed to direct the collection of information that will be reviewed assure compliance with Forest Plan Standards and Guidelines and move the Allotment toward the desired future condition. If this review indicates that current management does not result in the desired outcomes, adjustments in management will be made, accordingly.

Adoption of a site-specific monitoring plan will be included as a part of the decision.

The deciding official may take into consideration other factors when making the decision, such as the agency's ability to effectively monitor and/or mitigate when necessary to assure compliance with Standards and Guidelines.

Public Involvement

The scoping process is established to invite public participation, to help identify public issues and to obtain public comment at various stages of the environmental analysis process. In addition to the following specific activities, the proposal has been listed in the Gifford Pinchot National Forest Schedule of Proposed Actions (SOPA) since spring 2003. To date, the public has been invited to participate in the following ways:

- A scoping letter detailing the proposed action and requesting public comment was mailed on April 18, 2003 to 88 individuals and organizations, including federal, state and county agencies, tribes, businesses, interested and potentially affected groups and individuals.
- On July 2, 2003 a meeting was held to present research findings concerning the pale blue-eyed grass. This research was undertaken cooperatively with Berry Botanic Garden.
- The permittee was briefed on the issues and the results of preliminary analysis, including research findings related to the pale blue-eyed grass. The permittee participated in field trips with resource specialists to review the proposed action and was invited to submit an alternative for consideration. To date, none has been received.

As a result of initial scoping, 12 written comments were received within the initial scoping period. Comments are included in the project records.

A copy of the original scoping packet (cover letter, proposed action narrative and map) is included in Appendix B. A summary of the public scoping issues derived from the comments is provided in Appendix C.

Issues

Based on comments from the public, organizations, tribes and other agencies, the interdisciplinary team assigned to this project and the District Ranger compiled an initial list of issues. A determination was then reached as to which issues were significant to the project analysis.

Significant Issues

Significant issues are those that are within the scope of the Proposed Action and suggest the need to consider alternative actions or the analysis of mitigation measures. The Proposed Action and alternatives considered in Chapters 2 and 3 will be evaluated in terms of how well they address the significant issues presented below and to what extent they respond to the Purpose of and Need for Action.

Significant Issue #1: Livestock grazing may affect the integrity and function of stream channels and riparian plant communities, degrade water quality, and impair aquatic species habitat.

Standards and Guidelines in the Gifford Pinchot National Forest Plan (1990, page IV-69), include:

> Riparian Areas will be managed to maintain or enhance wildlife and fish habitat, protect water quality and other aquatic and riparian resource values. All waters will meet State and Federal water quality standards. Preferential consideration to riparian-dependent resources will be given when conflicts among land use activities occur (FSM 2526.03). Livestock grazing may be permitted if riparian values are protected. Of particular concern are: water quality, stability of stream and lake banks, soil compaction, riparian vegetation, fish and wildlife habitat, sensitive plants (Forest Plan, IV-70).

The goal of the Clean Water Act of 1977 is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Livestock grazing is a major land use in the western U.S. that impacts water quality. Overgrazing can impact fish habitat which precludes achievement of the Clean Water Act objectives to maintain the biological integrity of the Nation's waters (Federal Water Pollution Control Act and Amendments of 1972).

Cattle concentrate in riparian zones more heavily than upland zones due to their highly productive forage sites and water availability. When cattle graze and trample stream margins plant cover and root stability is reduced resulting in soil erosion, accelerated sediment input, and changes in stream morphology. Water temperatures can be elevated if bank trampling creates a wider/shallower stream reach. Water temperatures may also be increased if streamside vegetation removal exposes more surface water to solar radiation and/or water tables are lowered. These impacts can degrade trout spawning and food producing areas resulting in decreased numbers and health of fish and other aquatic organisms. The potential for contamination from nutrients and pathogens is also increased from streamside grazing.

The perennial streams and their riparian areas in the Ice Caves Allotment are scarce and therefore highly susceptible to alteration from high grazing utilization. Streams where stream bank erosion

and riparian vegetation removal by cattle grazing is occurring include sections of Lost Creek, the South Prairie Lake East and West tributaries, and Cave Creek. These streams are especially vulnerable to grazing impacts due to elevated peak stream flows above natural conditions and past streamside timber harvest. All of these streams are fish bearing.

Evaluation Criteria:

Extent of streambank erosion and riparian damage caused by cattle grazing.

Measured by:

- Length of sensitive channel types accessible to cattle.
- Area of stream bank erosion or failure, disturbed soils, and reduced riparian vegetation density in direct proximity to stream channels resulting from access by livestock.

Significant Issue #2: A portion of Lost Creek, within the Ice Caves Grazing Allotment, is diverted for cattle watering, which may create adverse conditions for fish and other aquatic species in the creek.

Five cubic feet per second (approximately 14% of summer low flow) is diverted during the summer which reduces the amount of stream flow in Lost Creek during the driest and warmest time of the year. This increases stream temperatures lowers oxygen levels and limits the amount of available habitat for fish and other aquatic species populations. A dam is also present in Lost Creek, adjacent to the diversion intake which is an upstream migration barrier to trout during low flows.

Evaluation Criteria:

The effects to water quality, fish and other aquatic species and their habitat from diverting water from Lost Creek

Measured by:

- Whether or not Lower Lost Creek meets State water quality standards.
- Amount of quality aquatic habitat in Lower Lost Creek
- Whether or not there would be fish passage through Lost Creek Dam.

Significant Issue #3: Livestock grazing may cause adverse impacts to the Mardon skipper butterfly (*Polites mardon*) by: (1) trampling eggs, larvae, pupae and adults: and (2) Eating larvae and adult food sources. Excessive grazing could reduce the native species important to the butterfly in these meadows and increase weedy species that are not habitat.

Mardon skipper butterfly has been found at six separate sites within the Allotment: Peterson Prairie (north and west), Lost Meadow, Lost Creek, Cave Creek Meadow, and a created opening at the junction of Forest Roads 6600 and 6600-130. This species, which is a candidate for listing under the Endangered Species Act, inhabits dry meadows and created openings that support grasses and various forbs. Grass, especially bunchgrass provides a substrate upon which the eggs are laid. The larva then feed and pupates over winter. Flowering forbs are important in providing nectar to foraging adults in the summer.

Evaluation Criteria:

- Number of Mardon skipper sites at least partially protected from gazing cattle.

Significant Issue #4: Livestock grazing may threaten the viability of the pale blue-eyed grass (*Sisyrinchium sarmentosum*) populations within the Ice Caves Grazing Allotment, including those at South Prairie, Lost Creek, Peterson Prairie and Cave Creek, and a created opening at the junction of Forest Road 6600 and 6600-130.

When livestock graze pale blue-eyed grass, they consume flowers and seed heads, which may significantly reduce sexual reproduction of the plant (Raven 2003), thus reducing opportunities for recombination of genetic information. Over time, this may expose plants to greater risk of loss of genetic information through mortality events. Loss of genetic diversity reduces the ability of plants to respond to environmental challenges and reduces future evolutionary options. In addition, livestock consume plant leaves, trample plants, and mow plants while grazing; causing plant stress that increases susceptibility of the plants, to insect and disease attack, and in some cases, directly causing plant mortality.

Evaluation Criteria:

- Ability of livestock to access pale-blue eyed grass sites.
- Whether dispersal corridors are provided.

Significant Issue #5: Livestock grazing may introduce and/or spread noxious weeds.

Cattle exacerbate the introduction and spread of noxious weeds by: (1) Causing soil disturbance, which creates exposed seed beds for weed establishment at new sites; (2) Introducing weed seeds into the Allotment from off forest, and/or dispersing weed seeds from plants found on the forest by transporting them in their hooves, fur or gut.

Evaluation Criteria:

- Livestock access to noxious weed populations.

Significant Issue #6: Cattle could adversely affect small aspen stands in a number of ways. Repeated cropping or killing of sucker stands may exhaust carbohydrate reserves. Livestock grazing may result in root damage if cattle are allowed to concentrate in aspen stands due to the presence of salt or water. In the long-term, these impacts could result in the loss of aspen stands.

Small aspen stands exist at Peterson and South Prairie. Aspen groves are rare and a unique habitat on the Mount Adams Ranger District. These small stands contribute to the overall diversity of wildlife habitat in the Allotment.

Aspen reproduces primarily through root sprouting, and carbohydrate reserves in the trees supply the energy needed by elongating suckers until they can carry on their own photosynthesis.

Evaluation Criteria:

- Grazing pressure to aspen stands

Significant Issue #7: The Ice Caves Grazing Allotment is currently increasing in conifer canopy cover and decreasing in palatable forage. With the current Standards and Guidelines to protect habitat for the pale blue-eyed grass and Mardon skipper butterfly, and a reduction in suitable range due to succession there may not be sufficient forage (primary/transition range) to support the current permitted numbers (200 cow/calf pairs).

Approximately 13,657 acres (43%) of the Ice Caves Grazing Allotment are located in lands allocated as Late-Successional Reserves and Riparian Reserves. No timber harvest activities have been implemented within these lands since 1994 and any future planning efforts will most likely not create or produce new or additional forage. In addition, fire suppression has allowed conifers to encroach into forested openings and meadows in the Allotment and transitional range stand types have been undergoing natural succession which has reduced their productivity for range.

A forage capacity analysis of the Allotment conducted during 2004 and 2005 illustrates that 31 percent of the total forage production within the Allotment is within the primary range[1]. The remainder of the forage is found on the transitory range[2], which indicates a downward forage production trend.

Evaluation Criteria:

- Forage available Animal Unit Months (AUMs) based on capability/suitability analysis
- Forage loss due to exclosures/drift fence

Significant Issue #8: Changes in livestock grazing practices or adjustments to the Allotment Management Plan may have both social and economic impacts to the local community.

The social aspects for individuals tied to grazing on the Gifford Pinchot National Forest play an important part in the historical development and the continued character of this area. The current permittee has traditionally operated a cattle ranch in the local area. The availability of grazing opportunities on the National Forest has played a key role in the success of his operation. The permittee continues to depend on the range opportunities provided by the National Forest. The permittee's operation may also further contribute to the overall stability of the rural communities within the area.

Evaluation Criteria:

- Reduction in AUMs from current capacity
- Reduction in cow/calf pairs from current permitted

[1] Areas which animals prefer to use when management is limited.

[2] Land that is suitable for grazing use for a period of time. For example, on particular disturbed lands, grass may cover the area for a period of time before being replaced by trees or shrubs not suitable for livestock forage.

Other Issues

Other issues, as used in this EA, are those that affect the design of the Proposed Action, prescribe project design criteria and describe environmental effects. *Other issues* may be resolved through the application of Standards and Guidelines, Best Management Practices (BMPs), or project design criteria.

Issue #9: Livestock may cause adverse impacts to lesser bladderwort (*Utricularia minor*).

Lesser bladderwort is a species that is thought to be vulnerable to extirpation in Washington State. Livestock enter South Prairie bog during times of drought/low water and have the potential to trample the plants and cause soil disturbance, which creates a seed bed for noxious weeds seeds, which they may also transport into the bog in their fur, hooves or gut.

Issue #10: Because of the exemption of the Cave Creek Wildlife Special Area from grazing restrictions, 50 percent of the Wildlife Special Area (100 percent in years when the fence is ineffective) receives heavy grazing pressure from livestock, which may compromise the attributes for which the area was designated and continues to be maintained, as a Wildlife Special Area.

Livestock grazing at Cave Creek occurs across approximately 50 percent of a designated Wildlife Special Area which was designated for beaver, but is also an elk calving area, and hosts the Mardon skipper butterfly. The other 50 percent of the Wildlife Special Area is within a U-shaped, fenced cattle exclosure. This Wildlife Special Area is the only area on the Forest with this designation where grazing is allowed; based on a Forest Plan amendment made during the 1994 Ice Caves Allotment EA. The fence is ineffective in totally excluding cattle during drought years.

Issue #11: The Cave Creek exclosure fence may be ineffective in excluding livestock during drought years.

The exclosure is ineffective due to its U-shape and poor condition. The Forest incurs an annual expense of approximately $1,500 for its repair and maintenance.

CHAPTER 2 - ALTERNATIVES, INCLUDING THE PROPOSED ACTION

This chapter describes the proposed action and the alternatives considered for the management of the Ice Caves Grazing Allotment. Alternatives were developed in response to the significant issues, described in Chapter 1. Chapter 2 includes a description and map of each alternative considered. This chapter also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

Alternative A - Limited Change to Current Management (Proposed Action)

In this alternative, livestock grazing would continue to be permitted under current management with the addition of six cattle exclosures to protect approximately 445 acres of habitat for the Mardon skipper butterfly and pale blue-eyed grass. The forage (AUMs) within these exclosures would be deducted from the Allotment grazing capacity. However, grazing could occur periodically within these exclosures at the discretion of the Forest Service, if needed to meet objectives for Mardon skipper butterflies or pale blue-eyed grass.[3] The permitted numbers of cattle would be reduced by approximately 50 percent under this alternative. This alternative includes all applicable Standards and Guidelines from the current Forest Plan as well as any requirements from consultation under Section 7 of the Endangered Species Act or other legal requirements.

Design features of this alternative are as follows:

Grazing and Administrative Practices:

- Authorized livestock would be based on be 93 cow/calf pairs for 3.5 months (325 AUMs). These numbers could be adjusted annually depending on the utilization monitoring and results from the previous year.
- Six cattle exclosures (approximately 445 acres) would be constructed to protect the Mardon skipper butterfly and the pale blue-eyed grass. Some riparian areas would also be protected by the exclosures. (See range improvements below.)
- Range readiness in the spring/early summer would be based on soil and vegetation conditions. The soils are required to be firm and sufficiently dry in order to prevent compaction and displacement. The plants need to reach the defined stage of growth at which grazing may begin without causing permanent physiological or compositional changes to the vegetation. Historically, livestock have been allowed on the Allotment from June 15th through September 30th.
- Cattle would be prohibited from grazing within the Cave Creek Beaver and Waterfowl exclosure, the Peterson Prairie Campground, the Coyote Seed Orchard, Ice Caves, and the Atkisson Snow-Park.

[3] This analysis is based upon the supposition that grazing shall only occur within livestock exclosures when a peer reviewed Conservation Strategy for the pale blue-eyed grass or the Mardon skipper butterfly specifies that grazing shall benefit the species, and identifies under what conditions such grazing shall occur (timing and intensity).

- The Cave Creek exclosure would be increased in area by approximately ten acres to contain known infestation of western houndstongue (*Cynoglossum officinale*), an invasive weed.
- Invasive weeds would continue to be treated along roadsides and where known infestations occur in accordance with the current regulations. The permittee would be required to identify new infestations of invasive weeds and report these annually to the Forest Service. New populations of weeds would be scheduled for treatment in a different decision that is separate from the decision outlined in this proposed action.
- Only feed that is certified to be weed-free will be allowed as supplemental feed within the Allotment or holding areas.
- All significant cultural resource sites would be avoided when conducting any ground-disturbing projects. The agreement with Washington State Historic Preservation Office (SHPO) would be followed. This includes the protection of a two-acre site adjacent to Lost Meadows.
- Salt would not be placed within a quarter mile of riparian areas, meadows, Sensitive plant species or known Survey and Manage plant sites, or isolated aspen groves. Salt would be placed in a trough and not be used to encourage livestock use of primary range.
- In transitional range, allowable use would be 40 percent of the current year's growth on key species. Utilization standards are based on the ecological range conditions and grazing system used and are included in the Annual Operating Instructions (AOI). The Landscape Appearance Method will be used to determine forage utilization. Cattle would be physically removed from these areas as utilization levels dictate.
- In riparian areas, Peterson Prairie, and wet mesic areas, allowable use would be 30 percent of the current year's growth on key species. The Landscape Appearance Method will be used to determine forage utilization. Cattle would be physically removed from these areas as utilization levels dictate.

Range Improvements:

- Additional engineering controls would be required at the water trough in the Peterson Prairie holding pasture to prevent the direct diversion of water for human consumption, and prevent backflow and possible contamination of the system.
- Approximately 9.1 miles of fence (Figure 2-1) would be built by the Forest Service and maintained by the permittee. The fence is designed to be let down during the winter months to minimize damage from snow accumulation and to permit wildlife passage. The permittee would be responsible for annual let down of fences.
- The Cave Creek Beaver and Waterfowl exclosure fence would be reconstructed and brought up to standard by the Forest Service. The permittee would assume maintenance of this fence.

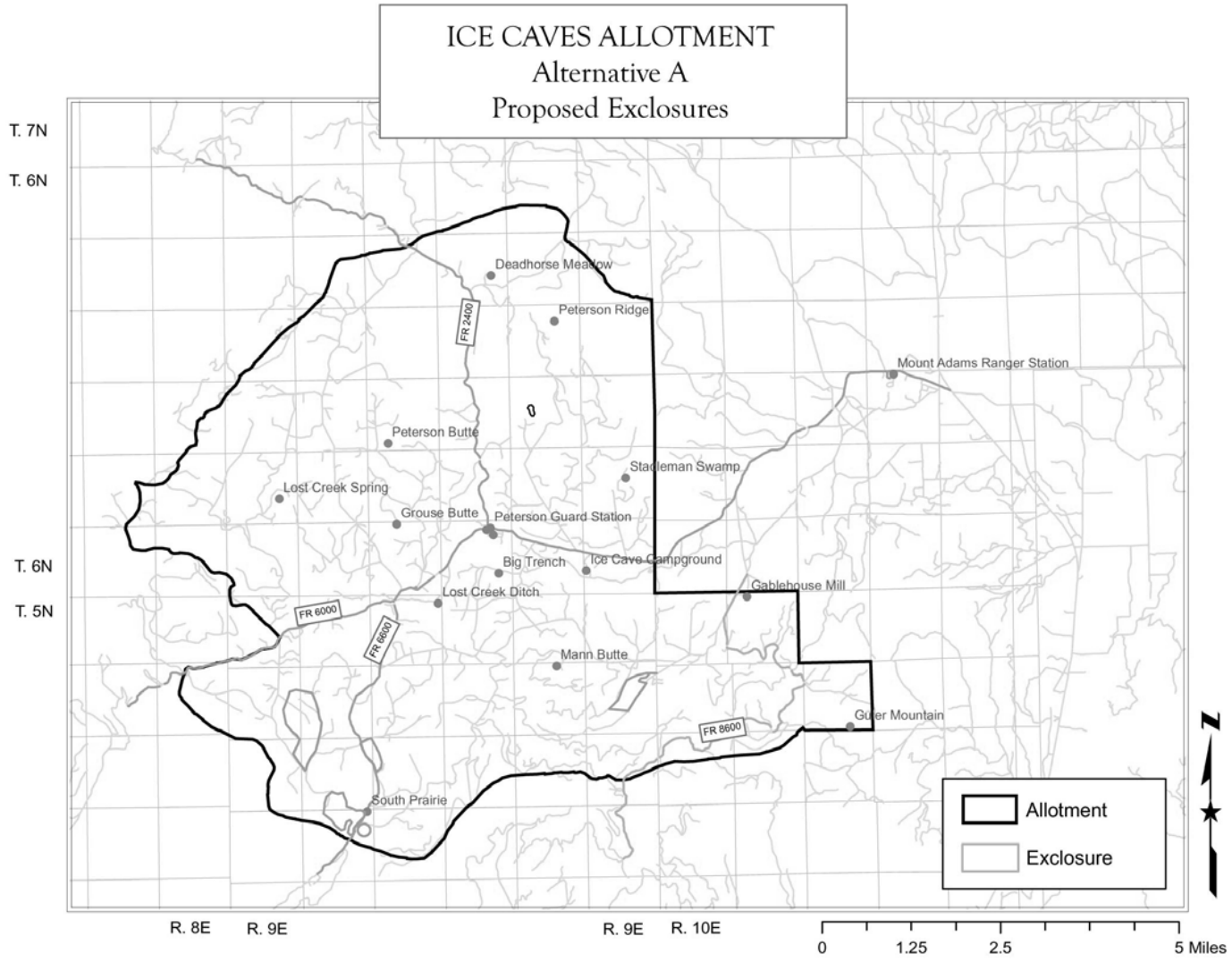

Figure 2-1. Alternative A – Location of Proposed Exclosures.

Alternative B - Drift Fence- Adaptive Management

Under this alternative, a drift fence would be constructed to prevent grazing livestock from entering the South Prairie area to protect botanical sites, Mardon skipper butterfly sites, and riparian areas in Lower Lost Creek. The forage (expressed as the number of AUMs) inaccessible because of the drift fence has been deducted from the Allotment grazing capacity. However, grazing could occur periodically "behind" the drift fence, at the discretion of the Forest Service, if needed to meet objectives for Mardon skipper butterflies or pale blue-eyed grass. Livestock grazing in the remainder of the Allotment would continue to be permitted under management systems designed to meet Forest Plan Standards and Guidelines. This alternative focuses on end results for the resource, as opposed to specific seasons or a permitted livestock number. This alternative is based on the principle of applying adaptive management. This means that a course of action is selected as a starting point that is believed to best meet and/or move towards the desired future condition(s) of the Allotment. Monitoring would occur over time, as prescribed by a monitoring plan. The evaluation of results will be used by the interdisciplinary team and the District Ranger to make adjustments to management as needed to ensure adequate progress towards the defined desired future condition. All adaptive actions would be within the scope of effects documented in this environmental assessment or a supplemental NEPA document, followed by an appropriate decision.

This alternative would also discontinue utilization of the Peterson Prairie holding pens in the fall. Instead, the existing Peterson Prairie Corral would be enlarged to approximately one acre and the cattle would be supplemental fed during the fall round-up.

Design features of this alternative are as follows:

Grazing and Administrative Practices:

- Authorized livestock would initially include 88 cow/calf pair for 3.5 months (308 AUMs). These numbers could be adjusted annually depending on the previous years utilization monitoring and results (see Monitoring, p. 23). Grazing schedules would be developed in the annual operating instructions (AOI) based on an evaluation of grazing from the previous season and the resource conditions of the current season. The schedule would be corrected the following year by changing any or all of the following: season of use, allowable use standard, stocking rate, timing of livestock use or use of temporary range improvements.
- Range readiness in the spring/early summer would be based on soil and vegetation conditions. The soils are required to be firm and sufficiently dry to prevent compaction and displacement. The plants need to reach the defined stage of growth at which grazing may begin without causing permanent physiological or compositional changes to the vegetation.
- Livestock entry and exit dates would not be firm and would be adjusted to meet allowable use standards, Forest Plan standards and guidelines, and resource conditions. Historically, livestock have been allowed on the Allotment from June 15th through September 30th.
- Cattle grazing would be prohibited from grazing within the 80-acre Cave Creek Beaver and Waterfowl exclosure, Peterson Prairie campground, Coyote Seed Orchard, Ice Caves or Atkisson Snow-Park. The Cave Creek fence would be expanded by about 10 to 15 acres to allow for more effective weed control.

- In accordance with the current regulations, invasive weeds would continue to be treated along roadsides and where known infestations occur.
- Stable banks would be maintained to standard in each stream reach. Areas where past stream bank sloughing and riparian vegetation removal has occurred (mainly by cattle), would need to show annual improvement in stream bank stability. These areas include Lost Creek, South Prairie Lake South Tributary, South Prairie Lake East Tributary and Cave Creek. Riparian streamside areas are considered those that are within 50 feet along each side of the stream.
- Continuous grazing would be avoided in riparian areas, meadows and wetlands. Short-duration grazing would be applied as feasible to provide greater opportunity for future re-growth. Utilization standards would be based on the ecological range conditions in the AOI. Utilization of the current year's growth on key species would be 30 percent in these areas. The Landscape Appearance Method will be used to determine the forage utilization. Cattle would be physically removed from these areas as utilization levels dictate. Utilization of woody species would be limited. Livestock would be moved from riparian areas and wetlands if they begin to show a preference for woody species.
- If livestock are fed on National Forest System Lands, only certified weed-free feed would be used.
- In partnership with the permittees, new infestations of invasive weeds would be identified and reported annually to the Forest Service. New populations of weeds would be scheduled for treatment in a decision separate from the proposed action.
- All significant cultural resource sites would be avoided when conducting any ground-disturbing projects. The agreement with Washington SHPO would be followed. This includes the protection a two-acre site adjacent to Lost Meadows.
- Salt would not be placed within a quarter mile of riparian areas, meadows, sensitive plant species or known Survey and Manage plant sites, or isolated aspen groves. Salt would be placed in a trough and not be used to encourage livestock use of primary range.
- In transitional range, allowable use would be between 40 percent of the current year's growth on key species. The Landscape Appearance Method will be used to determine the forage utilization.
- The holding pen within South Prairie would be discontinued and a new holding pen outside the drift fence would be constructed, if needed by the permittee.

Range Improvements:

- The Forest Service would build approximately 3.5 miles of drift fence (Figure 2-2) with the installation of about five cattle guards. The permittee would maintain the fence. The fence is designed to be let down during the winter months to minimize damage from snow accumulation and to permit wildlife passage. The permittee would be responsible for annual let down of fences.
- The existing Peterson Prairie Corral would be enlarged to approximately one acre.
- Additional engineering controls would be required at the water trough in Peterson Prairie to prevent the direct diversion of water for human consumption, and prevent backflow and possible contamination of the system.

- The Cave Creek Beaver and Waterfowl exclosure fence would be redesigned, reconstructed and brought up to standard by the Forest Service. The fence line on the north side would be expanded to the west (approximately 500 feet) to the "beaver pond." The east fence line would be expanded to include the current houndstongue infestation area (an additional 15 acres, approximately). The permittee would assume annual maintenance of the fence.
- Use of the Lost Creek Ditch would be discontinued and instead water would be piped from Lost Creek to water trough(s). Approximately two miles of piping will be required. Five cubic feet per second (cfs) could continue to be diverted, as long as this action does not cause downstream temperatures in Lost Creek to exceed State of Washington stream temperature standards of 16º C.
- Stream reaches where numerous areas of bare ground, cattle trails and trampled stream banks exist would be restored. Restoration would consist of planting vegetation (native grasses, hardwoods and conifers) and creating log barriers to direct cattle away from sensitive streamside areas under restoration. Passive restoration would occur along Lost Creek adjacent to the harvest unit located on the west side of the Creek above the 6615 bridge (Sec. 17, T. 5N, R. 9E). Active restoration (planting, seeding, barriers to access would occur along upper Lost Creek adjacent to the old harvest units below Forest Road 6030-080 (Sec.30, T. 6N, R. 9E). Along Cave Creek, restoration would occur adjacent to the harvest units below Forest Road 8620 (Sec. 1 and 6, T. 5N, R. 10E). Specific restoration actions would be covered by separate NEPA analysis and decision.

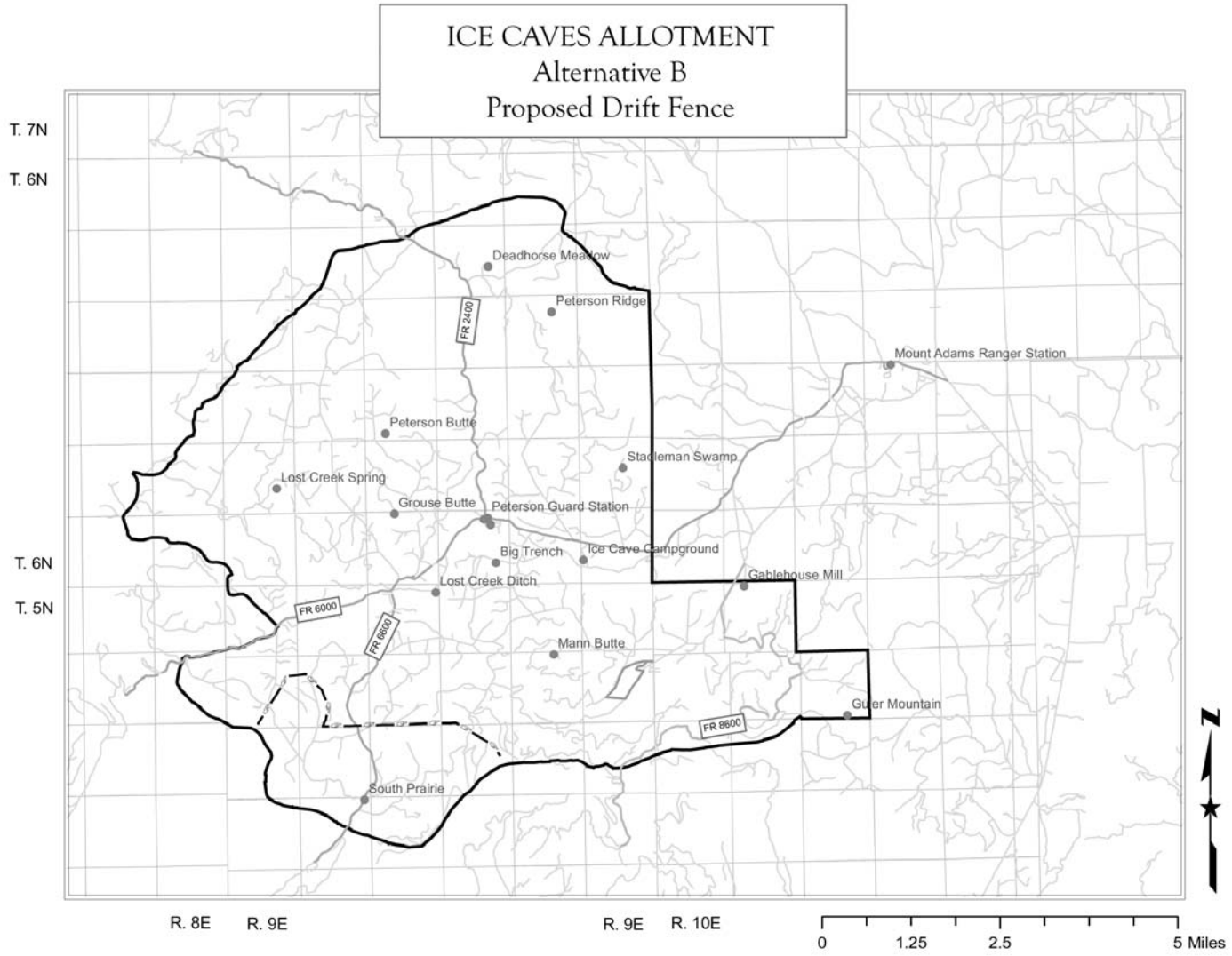

Figure 2-2. Location of Proposed Drift Fence.

Monitoring

Monitoring is used to evaluate whether the prescribed management is working as intended and if there is improvement and long-term recovery to the resource. Some indicators that would be used to evaluate improvement and recovery are the presence and coverage of native grasses and invasive weeds in the uplands, woody species canopy cover in riparian areas and range condition. Trend towards objectives in the Allotment Management Plan would be assessed.

Alternative B would focus on end results for resources through adaptive management. In general, adaptive management requires "knowledge of the current conditions, potential or capability of riparian sites, current management, effects of management on resources, and possible management changes that may be made to move the current condition toward the desired condition" (Cowley and Burton 2004).

A detailed Monitoring Plan for the Ice Caves Grazing Allotment would be developed and incorporated as a part of the decision documentation. It would include both implementation indicators at the end of the season and less frequently (three to five years) evaluation of longer-term effectiveness. For the purposes of this analysis, general indicators are described below.

Implementation monitoring:

Implementation Indicators – Example implementation indicators include bank alteration, analysis of riparian photo points and stubble height. Bank alteration is the percent of the linear length of streambank alteration that can be directly attributed to cattle and other large herbivores. Stubble height (or Residual Vegetation Measurement) is a measure of the residual vegetation height, which translates into grazing intensity. Photo points would be established in high use areas (identified "hot spots"). These indicators would be measured at the end of each grazing season according to established protocol.

A review of the condition of the fences, especially in key areas such as South Prairie, Cave Creek, and Peterson Prairie would be an important part of implementation monitoring.

Effectiveness monitoring:

Effectiveness Indicators – Effectiveness indicators would be monitored in the long term to help determine if the Allotment activity is showing an improving trend related to aquatic and riparian area conditions. Example effectiveness indicators include streambank stability, greenline vegetation composition, woody species regeneration and non-vegetated width. For example, non-vegetated width is the width of the stream channel from greenline to greenline. This indicator would act as a surrogate for health of the stream channel relating to sedimentation and stream shading. These indicators generally address the same factors as the implementation indicators, but give a more detailed assessment of the riparian area and stream channel condition (FSH 2209.21).

These indicators would initially be monitored upon the completion of the Ice Caves decision to get a "snapshot" of existing conditions. Effectiveness indicators would then be monitored the year before any additional animals (exceeding the existing AUMs) are allowed to graze. Finally, these indicators would be monitored at least every three to five years.

Adaptive Management Decisions – Condition trends would be documented by completing the effectiveness monitoring the season after the decision is made on this analysis and comparing that data to the next monitoring period's data in the year following implementation or when there is a request to add additional cow/calf pairs. As long as implementation standards are being met and a recovery trend exists in effectiveness monitoring, increased numbers of cattle could be considered. If monitoring indicates that implementation standards are not being met or show a

declining trend in effectiveness monitoring, no additional cattle would be considered. If necessary, decreasing the amount of cattle or other measures to discourage riparian and meadow area use would be necessary.

The following additional monitoring would be conducted after five years to determine permitted longer-term usage:

- Evaluate stream bank stability and riparian damage caused by cattle grazing and the improvement from restoration in Lost Creek, South Prairie Lake Tributaries and Cave Creek.
- Evaluate the effects to water quality and fish habitat from diverting water from Lost Creek.
- Determine forage utilization (percent of current year's production) of palatable forage species in the dry meadows and riparian areas at the end of the grazing season. Use levels would be based on maintaining plant survival and reproduction.
- Evaluate the long-term trends for ground cover of native grasses and forbs in the dry meadows and invasive weeds throughout the Allotment.
- Evaluate the number and re-establishment of aspen groves.

If desired conditions are not met in five years, or if an evaluation indicates that progress is not being made towards achieving desired conditions within the implementation timeframe, management would be re-evaluated. At that time, a decision would be made to either stay the course or follow an alternative course of action. If a change in management is made, the following actions would be taken, as necessary:

- Reduce the level of permitted livestock number and season of use as dictated by monitoring results.
- Request additional national forest funding to control invasive weeds.

If monitoring shows that resource conditions are not meeting or moving towards desired future condition within ten years of implementing management practices, then further reductions in the permitted livestock number and season of use would be made. These reductions would continue until demonstrated progress towards the desired future condition is made, as evidenced by monitoring and inventory data collected using methods in the R6 Rangeland Analysis and Management Guide. Changes would be reflected in the annual operating instructions (AOI) and in the term grazing permit.

Alternative C - No Grazing

Under this alternative, no permitted livestock grazing would occur on the Ice Caves Grazing Allotment. The permittee would be given two years written advance notice of the cancellation of the permit, as provided for under 36 CFR 222.4(a)(1). Existing fences would be removed at Forest Service expense. The existing developed spring (Peterson Prairie) would be retained for wildlife use. Water developments would be removed, such as the Lost Creek Ditch Diversion. Livestock driveways and trails would not be maintained and would be allowed to revegetate naturally, or may be seeded if needed. Corrals would be removed at Forest Service expense.

Project Design Criteria Common to Alternatives A and B

The following are design features of the proposed action and describe actions that would be incorporated into the final selected alternative or are legally-required through consultation with regulatory agencies and are therefore not optional. Criteria 5 through 8 are from the *Pacific Northwest Region Invasive Plant Program Preventing and Managing Invasive Plants Final Environmental Impact Statement Record of Decisio*n 2005 (R6 Invasives FEIS ROD), to be applied where applicable.

1. As a requirement by the U.S. Fish and Wildlife Service, noise-generating disturbance (such as blasting, heavy equipment, or saw activity during construction of improvements) in occupied or unsurveyed, suitable spotted owl nesting habitat would be prohibited between March 1 and July 30.
2. The Forest Service shall provide informational materials and/or training to permittees as needed, in order that the permittees have knowledge sufficient to identify, document and control weeds.
3. Require the permittee to inspect livestock prior to entry to National Forest System lands to ensure that livestock are clean (without caked mud on their coats) and free of seeds clinging to their coats (particularly important in terms of houndstongue control). The permittee may choose to quarantine or groom livestock in order to ensure that they are clean (it is left to permittee to determine most appropriate method of achieving compliance). Livestock shall be visually inspected by Forest Service personnel prior to turn-out onto the National Forest. If caked mud or seeds are observed on livestock, the Forest Service may require that the permittee either clean the affected livestock before release, or replace the livestock with clean livestock.
4. If horses or pack animals are used during project activities, clean hooves and groom animals prior to arrival on site.
5. Encourage permittee to use only pelletized or certified weed free feed on all national forest lands by adding appropriate language to Annual Operating Instructions. Use of pelletized or certified weed free feed will be required starting on January 1, 2009.
6. Require permittee to use only certified weed free straw when on national forest lands, by adding provision to Permit and Annual Operating Instructions.
7. Require permittee to clean all livestock operations equipment (livestock trailers/stock trucks) prior to moving onto the Allotment, by adding a provision to Permit and Annual Operating Instructions. This cleaning shall remove all soil, plant parts, seeds, vegetative matter, or other debris that could contain or hold seeds. Only livestock trailers and the equipment necessary to transport livestock will be cleaned, unless other vehicles will travel outside the road prism (i.e. vehicles that may enter meadows etc. during fence/corral repair, etc.), in which case these vehicles should also be cleaned. All subsequent entries of equipment to the Allotment shall be treated in the same manner.
8. Require permittee to report new noxious weed infestations, in a format to be provided by the Forest Service as an attachment to Annual Operating Instructions.
9. The Forest Service shall ensure that range readiness conditions have been met prior to permitting livestock release, by conducting inspections prior to livestock turn-out. Range inspection may indicate the need to restrict livestock grazing from wet meadows such as Cave Creek (for example) until conditions are suitable.

10. Maintain healthy vegetation across the Allotment by requiring the permittee to conduct regular utilization checks. With the cooperation of the permittee, develop a schedule and guide specifying timing and location of checks expected to occur on the Allotment during the course of the grazing season, and provide this information in the Annual Operating Instructions. Forest Service personnel shall train the permittee in methodology and documentation, and assist the permittee by conducting independent utilization checks, in order to ensure data quality. These measures will ensure compliance with utilization standards (30% in wet meadows and special habitats; 40% in upland transitory range), which provides the foundation of maintaining healthy range that maintains resistance to noxious weed invasion and spread.
11. Inform the permittee that the Forest Service may require that livestock be moved and/or kept from specific areas with known noxious weed infestations in order to facilitate noxious weed control efforts (includes but not limited to manual and herbicide treatments) and/or restoration efforts. The Forest Service shall provide the permittee with written notice no less than two weeks prior to the expected treatment date (ensures compliance with Standard 23, R6 Invasive Weeds ROD).
12. In areas where livestock have caused erosion and bare soil, the Forest Service should actively control noxious weeds from infesting sites, and restore native vegetation, where practicable. Standard 13 (R6 Invasive Weeds ROD) specifies that native plant materials are the first choice in revegetation for restoration and rehabilitation where timely natural regeneration of the native plant community is not likely to occur, and prohibits the use of non-native invasive plant species for restoration. The Gifford Pinchot National Forest Native Species Policy specifies that seed should be used that is elevation and Forest region specific, when available.
13. The Forest Service, in partnership with the Skamania County Weed Board, will annually treat houndstongue growing at the Cave Creek Wildlife Special Area.
14. The Forest Service, in partnership with the Skamania County Weed Board, will annually treat priority noxious weed infestations located in meadows or Sensitive species habitat within the Allotment (including Cave Creek Wildlife Special Area, Lost Meadow, South Prairie, Lost Creek Drainage).
15. The Forest Service, in partnership with the Skamania County Weed Board, will annually treat priority roadside infestations of noxious weeds within the Allotment.
16. The Forest Service will, to the extent practicable, time road maintenance activities within the Allotment to occur before seed set and release, so as to minimize opportunities for dispersal by road maintenance equipment, livestock and/or motor vehicles, wildlife, etc.
17. The Forest Service, in partnership with the Skamania County Weed Board, will inventory, record and prioritize newly discovered infestations for treatment.
18. Cattle will continue to be excluded from the heritage site near Lost Meadows.
19. Activities in the vicinity of the Lost Creek Ditch will be designed to preserve the integrity of the ditch as an historic feature.
20. Exact location of fence construction and associated ground disturbance included as a part of the alternatives was not evaluated in this assessment because exact locations are not known. When these specific locations are determined they will be surveyed for heritage resources so the fence lines can avoid heritage sites. A separate decision pursuant to the National Environmental Policy Act may be needed if fence construction (as mitigated) has the potential to significantly impact heritage sites.

Alternatives Considered, but Not Fully Developed

Rest/Graze – Adaptive Management

Under this alternative, the Ice Caves Allotment would be managed under a two year on/ two year off rest cycle. The two year "off" period would begin in the season following adoption of the decision. During the two year "on" period, livestock grazing would be allowed full access to the Allotment, except as indicated below. Livestock grazing to be permitted under management systems designed to meet Forest Plan standards and guidelines. During the two year "off" period, no livestock grazing would be allowed within the Allotment. This alternative would focus on end results for the resource, as opposed to specific seasons or a permitted number. This alternative is based on the principle of applying adaptive management, as described in Alternative B.

This alternative was dropped on because it was not economically feasible for the permittee to continue operations.

Season Long Grazing (Current Management)

Under this alternative, livestock grazing would continue, however it would be adjusted to reflect reduced numbers based on the 2004 grazing capacity study. All applicable standards and guidelines from the current Forest Plan and the Northwest Forest Plan would be met. Any requirements from consultation under Section 7 of the Endangered Species Act or other legal requirements would be addressed through Forest Plan Standards and Guidelines.

This alternative would have two options for grazing within Peterson Prairie:

Option A – Continue to utilize/graze the holding pens in the fall. Allowable use would be 30 percent utilization of the forage within the two Peterson Prairie fall holding pens.

Option B – Discontinue utilization of the holding pens in the fall. Instead, enlarge the existing Peterson Prairie corral to approximately one acre and supplemental feed the cattle during the fall round-up.

This alternative was dropped because it was determined to cause a trend towards federal listing of pale blue eyed grass and would therefore not meet the project objective of ensuring that livestock utilization within meadow habitats is managed and monitored to provide for protection and reproduction of pale blue-eyed grass (*Sisyrinchium sarmentosum*) and Mardon skipper butterfly (*Polites mardon*).

Comparison of Alternatives

Table 2-1 provides a summary of effects as measured by the evaluation criteria identified for each of the significant issues from Chapter 1. This table will serve as a useful guide for the Responsible Official for comparison of the expected outcomes from each alternative. The final decision will consider these effects along with all of the physical, biological, social, and economic effects disclosed in Chapter 3.

Table 2-1. Comparison of Action Alternatives.

Evaluation Criteria	Alternative A	Alternative B	Alternative C
Unstable stream banks			
Miles of sensitive channel types with areas of streambank degradation by cattle which will no longer be grazed	1.2 miles	1.8 miles	3.6 miles
Acres of degraded riparian area protected	15 acres	26 acres	44 acres
The effects to water quality and fish habitat from diverting water from Lost Creek			
Meet State standards in Lower Lost Creek?	Late season diversion negatively affects water temperature	Expect improvement with less cfs diverted	Expect improvement with no diversion
Amount of quality aquatic habitat in Lower Lost Creek	Low	Increased	Greatly increased
Fish passage through Lost Creek Dam?	No	Yes	Yes
Effects to Mardon skipper butterfly			
Number of sites at least partially protected from cattle grazing	Peterson Prairie N and W – grazed in the fall. All other known sites partially protected by exclosure fencing.	Peterson Prairie not grazed. Other known sites (3) protected behind drift fence. Lost Meadow site subject to grazing with 30% utilization standard	No sites subject to cattle grazing.
Effects to pale blue-eyed grass			
Ability of livestock to access pale-blue eyed grass sites.	Protection of individual populations; Peterson Prairie accessible	Substantial protection of major sites and dispersal corridors; Peterson Prairie not accessible	Complete protection from domestic livestock
Whether dispersal corridors are provided	No	Yes	Yes
Invasive Weed Infestations			
Livestock access to key noxious weed populations	Limited	Limited	None
Effects to aspen stands			
Livestock grazing pressure to aspen	None at South Prairie, potentially moderate at Peterson Prairie	None	None
Available forage			
Forage loss due to alternatives (exclosures, drift fence, no grazing)	37 AUMs	52 AUMs	700 AUMs
Net forage available	323 AUMs	308 AUMs	0 AUMs
Changes in livestock grazing practices			
Reduction in AUMs from current capacity	375 AUMs	392 AUMs	700 AUMs
Reduction in cow/calf pair from current permitted	107	112	200
Social and economic impacts			
Direct additional cost to permittee (herd reduction)	$3,000	$3,000	$5,500
Direct additional cost to permittee (fence maintenance)	$5,460	$2,100	$0

CHAPTER 3 - ENVIRONMENTAL CONSEQUENCES

This chapter discloses the existing condition of the resource within the project area and the likely consequences of the proposed action and each alternative on the physical, biological, social, and economic environment. The direct, indirect and cumulative effects of implementing the proposed action or an alternative are described and the effects quantified, where possible. The focus of the analysis is on the significant issues identified in Chapter 1, however disclosure of effects are included that demonstrate the degree of compliance with Forest Plan standards and guidelines or applicable laws. This chapter presents the scientific and analytical basis for the summary comparison of alternatives in Table 2-1.

Analysis of cumulative effects follows guidance developed in a memorandum from the Council on Environmental Quality (CEA), dated June 24, 2005. The cumulative effects analysis covers "present effects of past actions that are, in the judgment of the agency, relevant and useful because they have a significant cause-and-effect relationship with the direct and indirect effects of the proposal for agency action and its alternatives." Table 3-1 is a listing of past, present, and foreseeable future actions within the Allotment area that the interdisciplinary team considered in the analysis of effects.

Table 3-1. Past, Present and Foreseeable Future Actions within the Ice Caves Allotment Area.

Timber Sales	**Year**
Cave Creek	< 1980
Lost Meadows	< 1980
Borgio	< 1980
Junction	< 1980
Puppy	< 1980
Rattle	< 1980
Dina	< 1980
Hoppy	< 1980
Huck	< 1980
March	< 1980
Mandelin	< 1980
Mandy	< 1980
Slate	< 1980
Beaver	< 1980
Bumble	< 1980
Ditch	1980
Treat	1980
Peter	1981
Camp	1982
Virginia	1983
Rock	1985
Lookout	1985
Putt	1987
Freeze/Waffle + roads	1987
Ping	1987
Block	1988
Adam/Zing	1989
Rotor	1989
Elf	1990
Lobo	1990
West Lava	1990
Skyline Tran Thin	1990
Smoke	1990

Small Sales	**Year**
Pluto/Tramp Firewood	1985
Smoky Creek House Logs	1987
South Prairie House Logs	1989
6020 Post & Pole	1995
Roads/Trails	
Peterson Parking Area	1983
2420 Flood Repair/Decommissioning	1998
Middle & Service Trail Reconstruction	2003
Peterson Parking Area	1983
Infrastructure	
Peterson Prairie Fence	1988
Peterson Prairie CG Water	1988
McClellan Trail Sign	1992
Ice Caves Toilets	1992
Cave Creek Fence	1993
Peterson Prairie Guard Drainfield	1998
Atkisson Sno Park Improvement	2002
Peterson Prairie Info Booth	2003
Peterson Pr. Waterline Backflow Prev.	2003
Peterson Prairie Haz Mat Cleanup	2003
Lands	
Girl Scout Exchange	1989
SDS and Zeman	1990
Restoration	
Peterson meadow maintenance	ongoing
Restoration in the vicinity of Lost Meadow	
Restoration South Prairie (not successful)	

The scope of the cumulative effects analysis may vary between different resources. Some consider effects at the watershed scale while others are more localized. The consideration of specific past actions that are relevant to the cumulative effects analyses is explained by individual resource.

Range Resource

A more detailed range report is located in the project record, located at the Mount Adams Ranger District. The analysis and conclusions of the report are summarized below.

Grazing History

Early settlers in the Trout Lake and Glenwood valleys in the 1870s and 1880s used the area at the southwestern end of the Trout Lake Valley—extending as far west as the Ice Caves and Peterson Prairie—as summer pasture for their cattle and horses.

According to the Upper White Salmon Watershed Analysis (USFS 1998; p. IV-81), the "great conflagration of 1885" heralded the introduction of sheep in the Mount Adams region, when large tracts of forest were burned and replaced by grass-dominated openings. Estimates of numbers of sheep on Mount Adams in 1900 ranged from 100,000 to 150,000 (Ladiges 1978, as cited in USDA 1998). Cattle followed the introduction of sheep. Management control of livestock density did not occur until 1908. By 1926, 75,000 sheep and 1,500 head of cattle grazed the broader Mount Adams country.

Records indicate that permits have been issued for the Ice Caves Allotment since 1908. At that early date, approximately 300 cattle grazed under permit on what was referred to as either the Ice Caves Community Range or the Trout Lake Community Range. These cattle were owned by a number of Trout Lake ranchers and it is clear from early records that they also utilized range outside the current Allotment, between Trout Lake and the national forest boundary. At this same time period, records indicate that two bands of sheep (1,200 sheep per band) passed through the Allotment each season, on their way to other Allotments (probably Big Huckleberry and Bald Mountain). The number of cattle under permit was reduced to 200 by 1922, and these cattle were owned by seven Trout Lake ranchers (T. L. Jones, John Fisk, Pearson Brothers, John Schmid, C. A. Pearson, J. O. Vendon and Ulrich Zuberbuhler). The number was further reduced to 120 by 1933. In 1927 the portion of the Allotment in the vicinity of South Prairie was removed from the cattle Allotment and added to the Little Huckleberry Sheep Allotment, with 750 sheep under permit. There were two sheep camps within the current project area during this time period, referred to as South Prairie Camp and East Meadow Camp. By 1943 the number of cattle under permit on the Allotment was 110, owned by three permittees. The South Prairie area was returned to the Ice Caves Allotment in the late 1940s.

Major stock driveways within the Allotment included the Peterson Driveway and the Service Trail/Middle Trail Driveway. Other stock developments included a water system for sheep at Smoky Creek, constructed in 1940. It contained eight wooden troughs, 16 feet long, as well as a fenced pasture.

Since then, grazing of sheep, horses and cattle has been consistently permitted within the Ice Caves Grazing Allotment. However, the number of livestock permitted to graze under the permit, and the season of use, has varied dramatically. The area encompassed by the Allotment has also varied with the most notable alteration of boundaries occurring in 1944 with the addition of South Prairie.

According to the Ice Caves Range Allotment Plan of 1964 which included a range capacity analysis "the openings created by timber harvesting come up to grasses and shrubs and form the

bulk of the primary range of this allotment." During this time, the Ice Caves Allotment was approximately 20,600 acres in size and contained approximately 1,000 acres of capable range (755 acres primary range and 245 acres of secondary range). South Prairie, Cave Creek, Dead Horse Meadows, and Lost Meadows made up the majority of the primary range, while the secondary range consisted mostly of timber harvest units, which had been clearcut and in the early seral stage of development. Range condition for the primary range was documented as 18 percent in good condition class, 13 percent in fair, 36 percent in poor, and 33 percent in very poor. The estimated grazing capacity for the Allotment during this time was 178 animal unit months (AUMs), which is equivalent to 51 cow/calf pair for a 3.5-month period. A decision was made in 1964 to not increase the permitted livestock numbers due to the issue of potentially losing 50 AUMs in South Prairie to a proposed recreation site, encroachment of conifers (shading out the forage plants, especially in the clearcuts), and livestock damage to the plantation seedlings. Currently, South Prairie is a key portion of the primary range within the Allotment and has sustained domestic livestock grazing continuously for more than 100 years.

Existing Condition

Current Allotment Management

The livestock grazing system, since the early 1960s has been a season-long use of the Allotment with the cattle grazing on the national forest 35 percent of the time and off the national forest on private lands 65 percent of the time. The area outside the national forest would be grazed in the early part of the season. Accelerated timber harvesting in the 1970s and 1980s opened up more transitional range and the amount of forage increased to the presently permitted levels. In 2004, the permittee was reissued a 10-year, term grazing permit, authorizing 200 cow/calf pairs from June 15th to September 30th. Currently, the permittee also has grazing leases/agreements, near Trout Lake, with the State of Washington Department of Natural Resources, SDS Lumber Company, and the Dean Estate on approximately 4,000 acres. After range readiness, usually in late June, the cattle are moved from private and state lands onto the national forest. Salting is used to distribute the cattle over the Allotment, with herding occasionally needed to obtain uniform utilization. In late September, the cattle are rounded up and moved back to private land where they graze until the end of the season.

On July 29, 2004, a letter of authorization was issued to the permittee to graze 75 cow/calf pairs within a portion of the vacant Twin Buttes Horse and Sheep Allotment. The objective was to provide a short-term relief pasture to help reduce the grazing pressure on the primary range within the Ice Caves Allotment. The Twin Buttes Allotment has been utilized by the current permittee every year since 2004.

Forage Production

The Ice Caves Grazing Allotment includes approximately 31,996 acres and contains nearly 14,142 acres of capable range (544 acres of primary range and 13,598 acres of secondary range). The primary range within the Allotment consists of mainly dry meadows (Lost Meadow and Peterson Prairie) and wet mesic (South Prairie, Deadhorse and Cave Creek) areas. Red fescue (*Festuca rubra*), Kentucky blue grass (*Poa pratense*) and sedges (*Carex* species) mostly dominate these areas. Several other grasses are present in much lesser quantities, including: fescue (*Festuca* sp.), western needlegrass (*Stipa occidentalis*), orchardgrass (*Dactylis glomerata*), *Bromus* species, oatgrass (*Danthonia californica*) and common timothy (*Phleum pratense*). Tufted hairgrass (*Deschampsia caespitosa*) is widely spread in its distribution at South Prairie while forb species occupy a large portion of the vegetative cover. Numerous species are found in the Allotment as well, including strawberry (*Fragaria* sp.), Drummond's cinquifoil (*Potentilla drummondii*), early blue violet (*Viola adunca*), Aster (*Aster occidentalis*) and *Erigeron* species.

The secondary range (transitory range) was artificially created with past timber harvest and road building practices. The increase of secondary range from the 1964 figures is a result of regeneration harvest cutting within the Allotment during the '70s, 80s and early 90s (Table 3-1).

Table 3-2 summarizes the stand structure acreages and capable range.

Table 3-2. 2004 Stand Structure Classes and Capable Range Acres within the Ice Caves Allotment.

Structural Class	Acres	Forage <50 lbs/acre[1]	Slope >45%	Other Deductions	Capable Acres
Large Tree Single Story	440	420	20	0	0
Large Tree Multi-Story	12,225	11,949	276	0	0
Light Forest	495	0	0	0	495
Open Small Tree	734	734	0	0	0
Open Sapling/Pole	3,807	0	53	0	3,754
Closed Sapling/Pole	5,527	0	93	0	5,434[2]
Closed Small Tree	3,679	3,603	76	0	0
Grass/Forbs	840	0	13	0	827
Shrub/Seedlings	3,144	0	55	0	3,089
Dry Meadows	70	0	0	0	70
Wet Mesic	474	0	1	0	473
Water	62	0	0	62	0
Rock	466	0	45	421	0
Other	3	0	0	3	0
TOTAL	**31,996**	**16,706**	**632**	**486**	**14,142**

[1] Land producing less than 50 lbs of forage per acre is not capable of supporting livestock.

[2] Contains a >60% canopy cover. Meets capable criteria, but not suitability criteria.

Ninety-six percent of the capable acres within the Ice Caves Allotment consist of transitory range. The remaining four percent of the capable acres is primary range, which currently contributes 31 percent of the available forage. Table 3-3 summarizes the forage availability by timber stand structure class.

Table 3-3. Forage Weight (lbs/acre) by Structure Class within the Ice Caves Allotment.

Structure Class	Gross Acres	Slopes (NFS) >45%	Net Acres	Capable Acres	Average Forage Weight (lbs./acre)	Total Forage (lbs./acre)
Large Tree Single Story	440	20	420	0	36.6[1]	0
Large Tree Multi-Story	12,225	276	11,949	0	0	0
Light Forest	495	0	495	495	229.5	113,603
Open Small Tree	734	0	734	0	33.7*	0
Open Sap/Pole	3,807	53	3,754	3,754	121.9	457,613
Closed Sap/Pole	5,527	93	5,434	5,434	135	733,590
Closed Small Tree	3,679	76	3,603	0	0	0
Grass/Forbs	840	13	827	827	361.4	298,878
Shrub Seedlings	3,144	55	3,089	3,089	121	373,769
Dry Meadows	70	0	70	70	2,164	151,480
Water	62	N/A	62	0	0	0
Rock	466	45	421	0	0	0
Wet Mesic	474	1	473	473	1,591	752,543
Other	3	0	3	0	0	0
Total	**31,996**	**632**	**31,334**	**14,142**		**2,881,476**

[1] Does not meet the minimum 50-lbs/ac for capable forage acres.

The estimated total forage produced that could be available for cattle is equivalent to 511 AUMs. This is the estimated capacity based on all acres capable of producing forage (14,142 acres) being available and used by livestock. Assuming a mature cow with an unweaned calf consumes 34 lbs of dry matter each day over a month's time (Valentine 1990), the Allotment can support approximately 146 cow/calf pairs for 3.5 months. (A detailed capacity analysis for the Allotment is found in Appendix A.) This is below the current permit number of 200 cow/calf pairs. In addition, not all capable acres are suitable for livestock grazing. The capability data above is used in the suitability analysis displayed in Table 3-8. The suitability analysis is used to determine the appropriateness of grazing within the Allotment boundaries.

Range Utilization and Monitoring

Range utilization has been an issue primarily in the meadow systems and riparian zones. Utilization was monitored in the Allotment in the 2004–2006 grazing seasons. In 2004–2006 seasons, the permittee agreed to move 75 cow/calf pair off the Ice Caves Allotment and into the vacant Twin Buttes Sheep and Goat Allotment to provide some grazing pressure relief. In addition, since 2004, the permittee has reduced his permitted numbers (2004 – 170 cow/calf pairs, 2005 – 180 cow/calf pairs, and 2006 – 140 cow/calf pairs) with the objective of moving toward improvement of resource conditions within the primary range. Even with livestock numbers averaging around 100 cow/calf pair within the Allotment, utilization standards in a portion of the key primary range were exceeded in 2005 and 2006 (Table 3-4).

Table 3-4. Observed Utilization 2004 – 2006 (percent utilization).

Year	2004			2005			2006		
Sample Date	Early	Mid	Late	Early	Mid	Late	Early	Mid	Late
South Prairie	23	26	15	39	36	45		47	40
Lost Meadows						65			68
Dead Horse Meadow				4		70			
Cave Creek						63		82	66
Peterson Prairie									38

Long-term monitoring sites were established in 1963 to measure trends in range condition. They were initially established using the "Parker 3-Step" approach (Parker 1951). These sites were abandoned and no quantitative data for determining range condition were obtained. In 1978 and 1980, photo-monitoring sites were established within the Allotment utilizing the Fred Hall method (USDA 1976). Photographs with data collection were used to sample range condition and measure the change in vegetation and soil over time. The Fred Hall method was only documented in 1978 and 1980. Of the five monitoring sites, three were located on the primary range. Table 3-5 illustrates the documented range condition and trend.

Table 3-5. Observed Range Condition and Trend

Primary Range	1978	1980
South Prairie	Good/Stable	Fair/Stable
Lost Meadow	Good/Stable	Fair/Downward[1]
Cave Creek	Good/Stable	Fair/Stable

[1] Timber harvest activity

In 2000, ground-based photo monitoring (repeat photography) was used to monitor vegetation conditions and change. Site-specific repeat photography identifies specific topics on selected tracts of ground within the Allotment, to document change or lack of change in vegetation and soil. In six years, little change in vegetation conditions have been noticed. The monitoring did note the introduction of houndstongue *(Cynoglossum officinale)* into Cave Creek in 2002. Based on the initial results of this monitoring and in the professional judgment of the Range Conservationist, the range condition appears to be holding at a "stable" condition for the three primary range areas within the Allotment. With most of the transitory range at the end of the early seral stage, tree canopy closure is increasing and available forage within these areas is decreasing. Table 3-6 illustrates the rate of tree canopy closure over time. When an early seral plantation reaches 45 percent canopy closure (usually about 15 years old), canopy closures can reach 60+ percent within four years. Timber stands of 60 percent and greater canopy cover are not suitable for forage production. Consequently, the desired future condition of sustaining an improving trend in range condition within the primary range is presently hampered by increased grazing pressure on these areas as transitory range becomes less suitable.

Table 3-6. Years to Grow From 45% Canopy Closure to 60% Canopy Closure.

Year	Branch Growth (inches)	Canopy Growth (sq.ft.)	Canopy Closure	Number of Trees/Acre
0	--	--	45%	250
1	3”	2,284	50.2%	247
2	3”	2,516	56.0%	245
3	3”	2,623	62.0%	242

Assumptions:
Branch length of leave trees @ year 0 = 5 feet (79 sq.ft./tree/acre)
Stand age = 12-16 years old, after precommercial thinning treatment

Range Improvements

Several range improvements exist within the Allotment. Both the permittee and/or the Forest Service share the responsibility of the maintenance for these improvements. Table 3-7 lists the improvements within the Allotment and identifies maintenance responsibilities.

Table 3-7. Existing Range Improvements.

Type	Location	Number /Miles	Description	Maintenance Responsibility	Condition
Fence	Peterson Prairie Campground	0.8 miles	4 wire line and tree fence	Forest Service	Poor
Water Diversion	Lost Creek (T6N., R9E., Section 32	1	Cement dam with ditch head gate	Forest Service/ Permittee	Good
Water Ditch	T6N., R9E., Sections 32,34,35; T5N., R9E., Sections 3,4,5	4.25 miles	Lost Creek Water Diversion	Forest Service/ Permittee	Fair/Good
Corral	Peterson Prairie	1	Log corral with water basin	Permittee	Good
Water System	Peterson Prairie	1	Piped water transmission to log corral	Forest Service	Good
Fence	Peterson Prairie	200 feet	Peterson Prairie Spring	Permittee	Fair
Fence	Peterson Prairie Holding Pens	0.7 miles	4 wire line and tree fence	Permittee	Good
Holding Pen	South Prairie	1	Wire line and tree fence	Permittee	Fair
Holding Pen	Cave Creek	1	Wire line and tree fence	Permittee	Fair
Fence	Cave Creek	1.1 miles	Wire line and tree fence	Forest Service	Fair (priority for replacement)
Resource Fence	Lost Meadows	1	Wire line and tree fence	Permittee	Good
Cattle Guard	8631 Road	1	Cattle Guard	Forest Service	Fair

Routine maintenance of range improvements is performed annually, prior to turning the cattle onto the range. All range improvements are maintained according to the intended purpose and to ensure longevity. Where improvements have deteriorated below a maintenance objective standard, the permittee and the Forest Service collaborate to schedule replacement or removal.

Environmental Consequences

Rangeland Suitability Determination of the Alternatives

A rangeland suitability analysis for each alternative was performed to determine the appropriateness of grazing within the Allotment boundaries. The combined capability and suitability analysis constitutes a Suitability Determination. The Suitability Determination provides basic information regarding the potential of the land to produce forage in a sustainable manner, as well as the appropriateness of using that land for range. There are no direct, indirect, or cumulative effects associated with the determination of suitability. The determination that a parcel of land is Suitable is a finding that the land is capable of sustaining grazing over the next ten years and that there are no current or planned activities for that parcel of land that would render livestock grazing incompatible. Table 3-8 shows the results of the suitability analysis. A detailed suitability analysis is found in Appendix A.

Table 3-8. Summary of Acres of Land Determined to be Suitable for Livestock Use (cattle) within the Ice Caves Grazing Allotment.

	Alt. A	Alt. B	Alt. C
Acres presently capable for cattle grazing	14,142	14,142	14,142
Acres exceeding 60% canopy cover	5,434	5,434	5,434
Management Area Prescriptions excluding grazing	66[1]	66[1]	66[1]
Acres proposed for full closure	421[2]	2,507[3]	8,642
Total Environmentally Suitable Acres (cattle)	8,221	6,135	0
Economically unsuitable for cattle	0	0	0
Total Suitable Acres for Cattle Grazing	8,221[4]	6,135[5]	0
Available AUMs	323	308	0
Cow/Calf pair (3.5 month season)	93	88	0

[1] Does not include the Closed Sapling Pole acres (40 ac.), which have been deducted in line 2 of Table 3-9.
[2] Does not include the Closed Sapling Pole acres (15 ac.) or Wet Mesic acres (9 ac. – Wildlife Special – Cave Creek), which have been previously deducted in Table 3.5.
[3] Does not include the Closed Sapling Pole acres (204 ac.), which have been deducted in line 2 of Table 3.9.
[4] 95 pecent transitory range. Cost to graze these acres to standard is estimated at $99,500 (exclosure costs).
[5] 92 pecent transitory range. Cost to graze these acres to standard is estimated at $80,900 (drift fence costs).

The Suitability Determination identifies only 8,642 acres of the capable acres being available for grazing before the exclosures or drift fences are included. This is based primarily on loss of transitory range with increased canopy cover (60%). In addition, each action alternative has improvements that further reduce available acres due to the necessity to provide control measures and protection for sensitive species. The available AUMs and associated cattle numbers from the Suitability Determination are the starting point from which to determine grazing capacity.

Alternative A - Limited Change to Current Management (Proposed Action)

Direct and Indirect Effects

With implementation of Alternative A, forage loss resulting from the six exclosures is anticipated to be 37 AUMs. This leaves the Allotment with 323 AUMs (based on the current capacity and suitability analysis) available for cattle grazing (93 cow/calf pairs for a 3.5-month grazing season). This is a 377 AUM and 107-cow/calf pair reduction from the current permit.

Results of monitoring range condition over the last three years indicates the current permit number of 700 AUM (200 cow/calf pairs) is not sustainable and has the potential for overgrazing the Allotment, especially the primary range. Four major factors indicate that the 700 AUM numbers are too high.

Factor 1 (Land Management Objectives) – Approximately 13,657 acres (43 percent) of the Allotment is located in lands allocated in the Forest Plan as Late Successional Reserves (LSRs) or Managed Late Successional Area (MLSA). Late Successional Reserves were established to maintain a functional, interactive, late-successional and old growth forest ecosystem. Vegetation management is permitted within LSRs only to improve, maintain or protect late successional forest ecosystems, or to salvage and replace forests killed by large-scale disturbances such as fire or insect attacks (USDA and USDI 1994, pp. B-1, B-5).

Regeneration timber harvests, common within the Allotment during the 1970s to early 1990s, do not meet the objectives of the LSR. Prior to the Northwest Forest Plan (1994), these regeneration harvests provided openings which contributed to forage for the Allotment. This type of forage is commonly known as “transitory range”. If not maintained, these openings will eventually close as conifers become re-established and grow larger. No substantial timber harvest activities have been implemented within these lands since 1994 and any future planning efforts will most likely not create or produce opportunities for new or additional forage.

Factor 2 (Conifer Encroachment) – Since the early 20th century, wildfires have been perceived socially and scientifically as an agent of destruction rather than a necessary ecosystem function. Decades of fire suppression have allowed conifers to encroach within several natural meadows and in other portions of the Allotment. This has resulted in a loss of forage by reducing the amount of sunlight that reaches the ground. Most forbs and grasses are shade intolerant and require direct sunlight to live and grow.

Factor 3 (Exclosures) – Six exclosures are part of the design features stated in Alternative A. Table 3-9 is based on the 2006 capacity analysis and shows the impacts of excluding cattle from these exclosures. Approximately 445 acres and 250,999 lbs. of primary and transitory forage would be unavailable for utilization. This equates to a 37 AUM reduction or 11 cow/calf pairs for 3.5 months.

Table 3-9. Forage Loss from Six Exclosures.

Stand Structure Type within Exclosures	Acres	Forage Weight (lbs/acre)	Total Forage Loss (lbs)
Large Tree Multi-Story	93	N/A	0
Open Sap/Pole	110	121.9	13,409
Closed Sap/Pole	15	135	2,025
Closed Small Tree	25	N/A	0
Shrub Seedlings	7	121	847
Wet Mesic	70	1,591	111,370
Dry Meadow	57	2,164	123,348
Water	25	N/A	0
Rock	43	N/A	0
Total	**445**	**--**	**250,999**

Factor 4 (Capacity Analysis) – The 2006 rangeland capacity analysis (Appendix A) illustrates that fire exclusion and conifer encroachment over the last several decades, has reduced the grazing capacity within the Allotment. Based on two years of data, the current capable acres and AUMs available for cattle are approximately 14,142 acres (511 AUMs). This would support approximately 146 cow/calf pairs for a 3.5-month grazing season. With the six exclosures, this would result in a capacity of 474 AUMs, or 135 cow/calf pairs for 3.5 months. The subsequent Suitability Determination further reduces capacity (primarily removes acres with 60% canopy closure).

Cumulative Effects

The cumulative effect of eliminating 375 AUMs, due to the reduction in transitory range acres and six exclosures, would have an impact to the current demand for private grazing pastureland. The permittee would need to find other grazing pasture for the 107-cow/calf pairs for 3.5 months. If the permittee decides instead to reduce numbers of cattle in their operation, no additional demand or impacts to private land would occur.

With a reduction in regeneration timber harvest within the Allotment, it is anticipated that near the end of the next ten-year period, approximately 80 percent of the current transitory range will disappear as a result of conifer encroachment. The remaining 20 percent will be limited to maintained road prisms, root rot pockets within the stands, and portions of older plantations that are understocked with conifers.

The rangeland vegetation in the Allotment would improve in health and condition over time by grazing cattle numbers that can be managed to meet utilization standards during the 3.5-month season. Season-long grazing would continue due to the lack of individual pasture units. This may result in occasional heavy pressure on plants especially during dry or heavy snow years.

Alternative B - Drift Fence (Adaptive Management)

Direct and Indirect Effects

Implementation of Alternative B would focus on end results for the resource, as opposed to specific seasons or a permitted livestock number. Under this alternative, rangeland health would improve. This alternative is based on the principle of applying adaptive management, which means that a course of action (permitted livestock number and season of use) is selected as a starting point, which is believed to best meet and/or move towards the desired future condition of the Allotment. The starting point for this alternative is a capacity of 308 AUMs (equivalent to 88 cow/calf pair for 3.5 months). This reduces the current permit by 392 AUMs (or 112 cow/calf pairs for 3.5 months). This alternative allows the flexibility needed to manage the resources within the Allotment in the future as the forage within the transitory range disappears due to conifer encroachment. Monitoring would occur over time with the evaluation of the annual forage utilization (upland and riparian), presence and ground coverage of invasive weeds, and riparian health. Monitoring results would be used by the Interdisciplinary Team and the District Ranger to make adjustments (permitted livestock number, season of use, etc.) to management as needed to ensure adequate progress towards the defined desired future condition.

In terms of short-term direct effects, loss of access to forage resulting from the drift fence and exclusion of the Peterson Prairie holding pasture is estimated to equate to 52 AUMs (15 cow/calf pairs for a 3.5-month grazing season). The four factors which have caused a reduction in forage (described in Alternative A) would be the same for Alternative B, except for Factor 3 (Exclosures). Alternative B proposes a drift fence instead of exclosures to protect habitat for the Mardon skipper butterfly and pale blue-eyed grass, as well as riparian resources and water quality. This would reduce the amount of acreage and forage available to cattle by 2,711 acres and 345,528 lbs. for the drift fence vs. 445 acres and 250,999 lbs for the exclosures in Alternative A.

Table 3-10. Forage Loss From Drift Fence and Peterson Prairie Holding Pens.

Stand Structure Type	Acres	Forage Weight (lbs/acre)	Total Forage Loss (lbs)
Large Tree Single Story	288	N/A	0
Large Tree Multi-Story	489	N/A	0
Light Forest	27	229.5	6,197
Open Small Tree	245	N/A	0
Open Sap/Pole	531	121.9	64,729
Closed Sap/Pole	204	135	27,540
Closed Small Tree	466	N/A	0
Grass/Forbs	73	361.4	26,382
Shrub Seedlings	106	121	12,826
Dry Meadow	24*	2,164	51,936
Wet Mesic	98	1,591	155,918
Water	45	N/A	0
Rock	115	N/A	0
Total	**2,711**	**--**	**345,528**

*18 acres is Peterson Prairie Holding Pens.

Cumulative Effects

The cumulative effect of eliminating 392 AUMs, due to the reduction in transitory range acres and the drift fence, would have an impact to the current demand for private grazing pastureland. The permittee would need to find other grazing pasture for the 112-cow/calf pairs for 3.5 months. Replacement pastureland would have to be irrigated or at a high elevation due to the time of year needed (summer). The permittee has stated that his current private leasing agreements are plentiful with forage and allows for increased numbers in the spring, but he currently needs pastureland on the national forest to graze in during the summer months. If the permittee decides instead to reduce numbers of cattle in their operation, no additional demand or impacts to private land would occur.

It is anticipated that near the end of the next ten-year period, approximately 80 percent of the current transitory range will disappear as a result of conifer encroachment. The remaining 20 percent will be limited to maintained road prisms, root rot pockets within the stands, and portions of older plantations that are understocked with conifers.

The rangeland vegetation in the Allotment would improve in health and condition over time by grazing cattle numbers that can be managed to meet utilization standards during the 3.5-month season. Season-long grazing would continue due to the lack of individual pasture units. This may result in occasional heavy pressure on plants especially during dry or heavy snow years.

Alternative C – No Grazing

Direct and Indirect Effects

Through implementation of Alternative C, grazing reduction resulting from the decision to rescind the ten-year term grazing permit is anticipated to be 700 AUMs. This leaves the Allotment with no cattle grazing during the year.

Short-term general improvements to rangeland health are anticipated to be more rapid with no grazing than with grazing at proper use levels. The long-term effects of no grazing on the range resource may be insignificant when compared to grazing at proper use.

A comparison of the 80-acre exclosure site at Cave Creek to other sites within the Allotment indicates that there would be positive changes to the ecosystem from eliminating grazing, including an increase in forage production, improved plant vigor, a decrease in bare soil, and increased amounts of litter and decaying organic matter. Whenever livestock grazing is removed from a landscape, litter increases because less is being consumed by herbivores. With a buildup of litter, ground cover increases and bare ground declines. Under these conditions soil productivity usually increases in the short term.

The Cave Creek exclosure site was fenced in the early 1990s to provide an ocular and photographic comparison of grazed and ungrazed ranges for the purpose of determining the appropriateness of continuing livestock grazing in a current wildlife special interest area allocation. Based on these ocular comparisons, implementing the no-grazing alternative is also anticipated to result in a trend toward improvement of in range condition throughout the Allotment area. Implementing the no grazing alternative is also anticipated to accelerate the apparent trend toward improvement in range condition for the riparian areas throughout the Ice Caves Grazing Allotment. The rate of acceleration in improvement would be hard to predict.

Forage use would continue to occur in these areas from wildlife (elk and deer), but overall, it is assumed that the range condition trend would continue to improve. With no domestic cattle

grazing, approximately 520,767 pounds of forage (see Appendix A) would become available. The expected result would be more herbivore grazing on herbaceous vegetation and less woody browse use. Many ecologists and plant physiologists agree that herbivores can alter plant communities (Caldwell 1984, Pieper 1984). Mechanical impacts associated with livestock would also be eliminated with this alternative. There would be less soil compaction and plant defoliation by domestic herbivores in the riparian areas.

Relaxation of grazing pressure can reverse the degradation process toward excellent range condition and climax vegetation (Pieper 1994). As Anderson (1977) has stated, "merely lessen the grazing intensity, shorten or change the season, and measurable improvement is apparent." Moreover, the implication is that removal of livestock from rangelands will return them to pristine conditions. If livestock grazing is excessive, reduction in stocking will often provide some improvement such as greater plant density, cover and productivity and less soil erosion. Changing season of use or some other modification of grazing practice can result in dramatic improvements in riparian vegetation, as well as upland vegetation (Elmore, et al. 1994). However, the idea that recovery of pristine conditions can be restored simply by removing livestock is much too simplistic in light of other changes that have occurred such as introduction of invasive species, changes in fire regimes, etc. Livestock grazing constitutes only one component of rangeland ecosystems. Numerous extrinsic factors, especially weather variations, are instrumental in altering ecosystem components (Pieper 1994).

Cumulative Effects

The cumulative effect of eliminating commercial livestock grazing from the Allotment would have an impact on the private and state lands adjacent to the eastern boundary of National Forest System lands. The permittee currently leases several hundred acres on private and state, which serve as spring grazing pastures prior to turn out to the national forest.

Elimination of livestock grazing would have the most significant improvement to rangeland health in the short term, especially to the areas where livestock tend to concentrate. In these areas, the production and composition of native grasses would gradually increase because the grazing use of these species would decline. Upland sites would improve at a slower rate than mesic and dry meadows because they lack the natural productivity and resiliency as sites with greater soil moisture availability. Mechanical impacts associated with livestock would also be eliminated with this alternative.

Ultimately, Alternative C is assumed to improve rangeland conditions more rapidly than Alternative A or B.

Comparison of Capable Acres of Forage Loss for each Alternative

Table 3-11 summarizes the reduction in AUMs for each alternative.

Table 3-11. Summary Comparison of Forage Loss and Corresponding Herd Reduction from Current Permitted, by Alternative.

Measurement	Alternative A	Alternative B	Alternative C
A. Available Forage (AUMs) – Based on Capability Analysis	511	511	511
B. Forage Loss (AUMs) – Based on Suitability Analysis	151	151	151
C. Net Available Forage (AUMs) = A – B	360	360	360
D. Forage Loss (AUMs) – Alternative Actions	37[1]	52[2]	700[3]
E. Net Available Forage (AUMs) = C – D	323	308	0
F. Cow/Calf Pair Based on Available Forage	93	88	0
G. Cow/Calf Pair Reduction = 200[3] – F	107	112	200

[1] Exclosures.

[2] Drift fence.

[3] Based on current permit.

Financial Analysis

Existing Condition

Social and Economic History of Livestock Grazing (Nationally and Klickitat County)

Permittees are charged for federal rangeland grazing use according to the number of livestock and the amount of time they are authorized to graze on National Forest System lands. The grazing fee receipts collected from permittees are later distributed (according to legislative requirements) to the following: Agency Range Betterment Funds, states and counties, and the U.S. Treasury. On National Forest System lands, grazing fee receipts are distributed as follows: 50 percent to the Range Betterment Fund (to be appropriated the following year), 25 percent to the states for distribution to the county of origin for roads and schools, and 25 percent to the U.S. Treasury. Half of the funds in the Range Betterment Fund are returned to the Forest Service region of origin and half are returned to the forest of origin.

In the 1994 Rangeland Reform EIS, research on 4,336 ranchers in eleven western states described ranching lifestyle, employment, and rancher interactions with the western public (USDI, pp. 3-75). Ranching is a way of life for many ranchers whose average age is 55 years and who had worked on the same ranch for 31 years. The average ranching family had been in the business for 78 years and had been in the same state for 68 years. Ranchers in this study (1991) estimated that they contributed about $19,000 annually in local communities. When asked what they would do if livestock grazing was prohibited on federal land, 57 percent said that they would operate on a smaller scale, 18 percent said they would retire, nine percent said they would begin a new occupation, and 21 percent said they would convert their lands to real estate development.

Although the Allotment is physically located in Skamania County, the permittee's ranch and base of operations is in Klickitat County. Klickitat County has traditionally relied on the agricultural (including livestock production), lumber and wood products industries as main economic drivers. Although the methods for harvesting crops and trees have changed drastically, and the types of agricultural products have changed, Klickitat County continues to rely on these sectors for a bulk

of its employment. In 2000, Klickitat County had far more of its employment in agriculture – 17.4 percent compared to 3.3 percent for the state, and 1.5 percent for the nation.

Based on a three-year average (1998, 1999 and 2000) Klickitat County is considered one of Washington State's economically "distressed" counties. A distressed county is defined as having an unemployment rate 20 percent higher than the statewide average for three consecutive years. This designation ensures that local businesses are eligible for some preference in bidding for government contracts. Unemployment insurance claims in the agriculture, forestry and fishing sectors, filed in Klickitat County from July 1, 2000 – June 30, 2001, comprised 5.7 percent of the claims. "Structurally mature" industries are characterized in the county by long-term declines in total annual average employment. These declines may be the result of increased productivity, automation, technological change, exhaustion of natural resources, or other factors. Aluminum smelters, lumber and wood products, and agriculture accounted for almost all the employment classified as structurally mature within Klickitat County.

According to the last Census of Agriculture in 1997, slightly less than half of Klickitat County, or 589,000 acres, was classified as farmland (Washington State 2002). This was a substantial drop from the estimated 690,000 acres of farmland in 1992. In 1997, about 70 percent of the farmland was classified as pastureland or rangeland for livestock. There were 530 farms in the county, roughly the same number recorded in the 1987 and 1992 Censuses (USDA 1987, USDA 1992). Most were relatively small in acreage: 73 farms contained more than three-fourths of all the farmland and 62 contained almost 60 percent of the harvested cropland. Slightly more than half of the County's farmers and ranchers listed farming as their major occupation. More than one-third work extensively at a job away from their farm. According to occupation projections for Klickitat, Kittitas and Yakima Counties, agriculture, precision production and operators/fabricators/laborers – all blue-collar jobs – are expected to decline through 2008.

Farming is an important facet of life within Klickitat County and farm income is also a significant feature in the economy. In 1970, the county's farm income totaled $17.1 million (in 1999 dollars) or 11 percent of all personal income. The next few years were very good for farming: 1973 saw farm income reach $44.1 million – a full 20 percent of personal income. However since then, income has fluctuated by between six and ten percent of the total. In 1999, it fell to 2.5 percent ($9.7 million), the smallest share size since 1977. However, statewide farm income amounted to only one percent of personal income.

Total product sales from county farms declined from 1987 to 1997 mostly due to a decrease in the sale of livestock products. In 1997, livestock product sales were estimated at $33 million, ranking the county at 22nd in the State out of 39 counties. Approximately $8 million of the total sales were for cattle and calves.

Environmental Consequences

Alternative A - Limited Change to Current Management

Direct and Indirect Effects

The direct effect to the permittee from the reduction of 108 cow/calf pairs would be an increase in livestock operating costs. The permittee would need to secure summer grazing land or reduce livestock numbers for 108 cow/calf pairs (377 AUMs). Replacement pastureland would have to be irrigated or at a high elevation due to the time of year needed (summer).

The current estimates for private/state grazing leases during the summer months can vary locally, depending on the amount and quality of forage, the type of terrain, and the type of improvements

located on each range. Current rates for grazing pasture leases on Washington State Department of Natural Resources are $7.92 per AUM (phone conversation with DNR 8/2005). Other private land grazing rates are estimated to be about the same as DNR. The direct additional costs to the permittee associated with utilizing additional private land for grazing 108 cow/calf pairs are estimated at approximately $2,994 per 3.5-month period. Additional indirect costs for utilizing private land would include additional time, effort, and incidental operating costs needed by the permittee to operate two separate grazing operations. A worst-case scenario would be if the permittee were unable to secure additional rangeland for 108 cow/calf pairs. The reduction in numbers would leave the permittee with an operation that may not be economically viable.

Alternative A proposes to decommission the original Cave Creek enclosure and build six exclosures (9.1 miles of fence). Estimated costs to the Forest Service to decommission and complete the new exclosure fencing, using congressionally appropriated funding, would be approximately $99,500 (investment of $9,950 per year pro-rated over a ten year permit period). Part of the reason Federal grazing fees are lower than private fees is that the permittee is expected to invest labor or materials for improvements. After the construction of the six exclosures, maintenance responsibilities would be transferred to the permittee. The proposed fence design would be a partial let down, four-strand barbed wire fence. The top two wires would require manual labor to put up two wires in the spring and let the two wires down prior to winter. The permittee would incur additional economic impact from the time and labor costs for these additional maintenance responsibilities. Assuming an hourly rate of $25 per hour per person, two people at a production rate of two miles per eight hours would be required to let down the wires and two people at a rate of one mile per eight hours would be required to put up the wires. The permittee would incur an additional $5,460 in annual maintenance costs. Annual fence damage from fallen branches and trees is expected during winter and would add to this cost, depending on the severity of weather-related events.

The current rate for federal rangeland is $1.79 per AUM (2005 grazing season). Lost grazing fee receipts to the Forest Service from the reduction in permitted numbers under this alternative would be $677 per year plus approximately $339 in Range Betterment Funds. This equates to a loss of approximately twenty percent in grazing fee receipts and Range Betterment Funds collected annually by the Gifford Pinchot National Forest. Additional monitoring would increase the direct cost to the national forest for permit administration.

Cumulative Effects

Agricultural and farming incomes within the county are projected to continue a downward trend in the future. The cumulative effects of this alternative on the economic future of Klickitat County's agricultural outlook could be affected by the viability of the permittee's operation. Alternative A would result in the least direct cost to the permttee and would have the least cumulative effect to the economic future of Klickitat County.

Alternative B - Drift Fence- Adaptive Management

Direct and Indirect Effects

The direct effect to the permittee from the reduction of 112 cow/calf pairs would be an increase in livestock operating costs. The permittee would need to secure summer grazing land for 112 cow/calf pairs (392 AUMs). Replacement pasture land would have to be irrigated or at a high elevation due to the time of year needed (summer).

The direct additional costs to the permittee, associated with utilizing additional private land for grazing 112 cow/calf pairs is estimated at approximately $3,105 per 3.5 month period. Additional indirect costs for utilizing private land would include additional time, effort, and incidental operating costs needed by the permittee to operate two separate grazing operations. Alternative B would also discontinue the use of the Peterson Prairie holding pens. This would require the permittee to provide supplemental feed to the cattle while they are held within the corral prior to removal from the Allotment in the fall. This would increase the permittee's costs and require a more systematic and timely removal process. As with Alternative A, the worst case scenario would be if the permittee is unable to secure additional rangeland for 112 cow/calf pairs. The reduction in numbers would leave the permittee with an operation that may not be economically viable.

Proposed actions under Alternative B include building a drift fence (3.5 miles of fence), installing five cattle guards, constructing a pipeline within Lost Creek ditch (1-2 miles), and reducing the Peterson Prairie holding pasture to one acre (0.15 miles of fence). Estimated costs to the Forest Service, using congressionally appropriated funding to complete these projects, would be:

- 3.5 miles of drift fence – $35,000
- 5 cattle guards – $20,000
- Pipe: 1.0 miles of the Lost Creek ditch w/troughs – $20,000
- Decommission 0.7 miles of the Peterson Prairie fence – $3,900
- Construct 0.15 miles of fence (Peterson Prairie Corral) – $2,000
- **Total Costs – $80,903**

This investment would equate to $8,090 per year pro-rated over the life of the ten-year permit. Maintenance responsibilities for the drift fence and Lost Creek water system would be transferred to the permittee after project completion. As in Alternative A, the fence design would be a partial let down fence, where manual labor is required to put up the top two wires in the spring and let the wires down prior to winter snows. The permittee would incur an estimated $2,100 additional economic impact from the time and labor costs for these additional maintenance responsibilities. Annual fence damage from fallen branches and trees are expected during the winter and would add to this cost, depending on the severity of the weather-related events.

Lost grazing fee receipts to the Forest Service would be approximately $702 per year plus approximately $351 in Range Betterment Funds. This would equate to a loss of approximately 21 percent in grazing fee receipts and Range Betterment Funds collected annually by the Forest. Additional monitoring would increase the direct cost to the national forest for permit administration.

Cumulative Effects

Agricultural and farming incomes within the county are projected to continue a downward trend in the future. The cumulative effects of this alternative on the economic future of Klickitat County's agricultural outlook could be affected by the viability of the permittee's operation. Alternative B would result in an increase in direct cost to the permttee compared to Alternative A. There is a potential for cumulative effect to the economic future of Klickitat County from the permittee's inability to maintain an economically viable operation.

Alternative C – No Grazing

Direct and Indirect Effects

As with Alternatives A and B, the direct effect to the permittee from reducing the 2005 permitted numbers of 200 cow/calf pairs to 0 cow/calf pairs on National Forest System Lands would be an increase in livestock operating costs. The permittee would need to secure summer grazing land for all 200-cow/calf pairs (700 AUMs). Replacement pastureland would have to be irrigated or at a high elevation due to the time of year needed (summer).

The direct additional costs to the permittee, associated with utilizing additional private land for grazing 200 cow/calf pairs, is estimated to be approximately $5,544. Additional indirect costs for utilizing private land would include additional time, effort, and incidental operating costs needed by the permittee for operating on private land. As with Alternatives A and B, the worst-case scenario would be if the permittee were unable to secure additional rangeland for 200 cow/calf pairs. In this case, depending on the ranch's financial health, the permittee's livelihood and income loss could put the entire ranch and base property at risk.

Alternative C would decommission approximately 2.6 miles of fence, modify the Lost Creek diversion dam to permit fish passage, remove the log corral at Peterson Prairie, and remove the cattle guard on Forest Road 8631. Decommission costs are anticipated to be approximately $25,000 utilizing congressionally appropriated funds. Alternative C is expected to greatly affect the economic well being of the permittee.

Lost grazing fee receipts to the Forest Service would be $1,254 annually, plus approximately $627 in Range Betterment Funds. This equates to a loss of approximately 40 percent in grazing fee receipts and Range Betterment Funds collected yearly on the Gifford Pinchot National Forest.

Cumulative Effects

Agricultural and farming incomes within the county are projected to continue a downward trend in the future. The cumulative effects of this alternative on the economic future of Klickitat County's agricultural outlook could be affected by the viability of the permittee's operation. Alternative C would result in greater likelihood of the permittee being unable to maintain an economically viable operation. An uneconomical cattle operation could potentially cause a loss of open space (at the base ranch) in Klickitat County.

Invasive Weeds

Non-native plants include those species introduced intentionally or unintentionally to areas where they do not naturally occur. Invasive non-native plants in the Pacific Northwest most often originate from Europe and Asia. Problems can arise when the associated natural predators and diseases that controlled these species in their native habitats are not present in the habitat where they are introduced. If a species is unchecked by predators, it may become invasive, dominating the site and altering ecosystem balance. The results may include changes in biodiversity, fire frequency, soil erosion and hydrology of a site. Other effects include poisoning of livestock and reducing the quality of recreational experiences. There were an estimated 2,000 invasive and noxious weed species in the U.S and 129 class A, B and C weeds listed in Washington State in 2006.

Existing Condition

Within the Allotment, there are a number of active mechanisms of invasive plant establishment and dispersal. Noxious weeds may be introduced or spread by motor vehicles, off-road vehicles (ORVs), heavy equipment, boats, humans, livestock, wildlife, importation or transportation of infested soil, cinders or gravel, project related disturbances (such as ground disturbance occurring as a result of log yarding, restoration, etc.). Wind and water also play a role in dispersing noxious weed seeds.

Livestock exacerbate the introduction and spread of noxious weeds by: (1) causing soil disturbance, which creates exposed seed bed for weed establishment at new sites; (2) introducing weed seeds into the Allotment from off-forest, and/or dispersing weed seeds from plants found on the forest, by transporting them in their hooves, fur or gut. In intensively grazed areas, livestock may also suppress the growth of native species that act as competitors to invasive species, causing the generally less palatable (or unpalatable) invasive species to have a competitive advantage within plant communities.

Noxious weed species with recorded occurrences within the Allotment (NRIS 2005), sorted by state rank, are listed below. Class A weeds are non-native species whose distribution in Washington State is still limited; preventing new infestations and eradicating existing infestations are of highest priority; eradication of Class A species is required by State law. Class B weeds are non-native species presently limited to portions of Washington State; such species are designated for control in regions where they are not yet widespread. Preventing new infestations in currently uninfested areas is a priority; containment of infestations is the management goal for these species in other areas. Class C weeds are species that are widespread throughout Washington; the Class C status allows County Weed Boards to judge desirable local levels of control and enforcement.

Class A

None

Class B

Centaurea biebersteinii (spotted knapweed)
Centaurea diffusa (diffuse knapweed)
Centaurea sp. (knapweed sp.)
Cynoglossum officinale (houndstongue)
Cytisus scoparius (scotch broom)
Hypochaeris radicata (cat's ear)
Leucanthemum vulgare (oxeye daisy)
Senecio jacobaea (tansy ragwort)

Class C

Circium arvense (Canada thistle)
Circium vulgare (Bull thistle)
Hypericum perforatum (St. John's wort)

In addition to noxious weeds, which are designated by the State Noxious Weed Control Board, there are other non-native, invasive plants of concern, which may warrant treatment in order to meet desired landscape conditions. On the Allotment, *Taraxacum officinale* (dandelion) comprises such a species. Common dandelion occurs throughout South Prairie, and the population appears to be expanding within the prairie, displacing native forbs and grasses.

During the 1998 pale blue-eyed grass field monitoring at Cave Creek Wildlife Special Area (Cave Creek) (Raven 2000a), data was collected for a weed density comparison within and outside the livestock exclosure. A total of 1,308 quadrats located in suitable habitat for Canada thistle (*Circium arvense*) and tansy ragwort (*Senecio jacobaea*) were surveyed. The study revealed differences in weed densities between fenced (cattle excluded) and unfenced (grazed) quadrats. Canada thistle was found in 46 percent of the fenced quadrats, compared to 36 percent of the unfenced quadrats, a statistically significant difference. Tansy was found in 26 percent of unfenced quadrats, and in 12 percent of fenced quadrats, also a statistically significant result. The data clearly show that these two weed species have different distributional patterns in the Cave Creek study area: Canada thistle is denser within ungrazed portions of the study area, whereas tansy is denser in grazed portions of the study area. The study design does not permit conclusions about the cause of these patterns (i.e. these patterns cannot be linked directly to livestock grazing). Also, because the data were collected during a single field season, conclusions about trends cannot be drawn. The study results, however, are suggestive, particularly when examined in light of more recent observations of the Cave Creek Study area. In 2004, a visit to the study area revealed what appear to be an expanding infestations of Canada thistle, tansy ragwort, (though this species was not nearly as dense as Canada thistle), and houndstongue. It appeared that the density of the Canada thistle was greater inside the cattle exclosure than outside, the same pattern that Raven observed in 1998; however, populations have expanded considerably both inside and outside the exclosure since that time. In contrast, it appeared that the houndstongue infestation was denser outside the exclosure than inside. It was difficult to judge whether tansy ragwort density differed inside and outside the exclosure. Hypothetically, because both tansy ragwort and houndstongue are toxic to livestock (Baker, et al. 1989; Baker, et al. 1991, Coombs, et al. 1997; Knight, et al. 1984) the grazing cattle avoid these species, grazing the adjacent palatable species, conveying a competitive advantage to the noxious weed species. Because Canada thistle is non-toxic, livestock may be more likely to graze this species (although in both 2003 and 2004 it was noted that Canada thistle were some of the last plants remaining after grazing, therfore they appear to be less palatable than many other native species). Based on this hypothesis, without active control it is predicted that the density of Canada thistle will continue to increase, both inside and outside the exclosure, but the rate of increase inside the exclosure will probably exceed that in the grazed area. In contrast, it is predicted that the density of tansy ragwort and houndstongue will continue to increase, but the rate of increase outside the exclosure, in the grazed portion of the area, will exceed that inside the exclosure.

Canada thistle (*Circium arvense*) and tansy ragwort (*Senecio jacobaea*) have been identified as a serious threat to pale blue-eyed grass at the Cave Creek site (Raven 2003), as has common houndstongue (*Cynoglossum officinale*) (A. Ruchty, J. Scott, D. Wallenmeyer pers. comms. 2003). Canada thistle, tansy ragwort, common dandelion and oxeye daisy have also been identified as concerns at other Sensitive plant sites and special habitats within the Allotment, including South Prairie Botanical Special Interest Area (South Prairie), Peterson Prairie, and Lost Meadow. Livestock are recognized vectors for many noxious weed species, particularly houndstongue, which produces seeds that readily attach to fur (De Clerck-Floate 1997).

From 2003 to 2006, the Gifford Pinchot National Forest has partnered with the Skamania and Klickitat County Noxious Weed Control Board in prioritizing control of houndstongue infestations on the Gifford Pinchot National Forest. Within the Allotment, the known infestation centered at Cave Creek has been aggressively treated through hand pulling and clipping (in cases where hand pulling was not feasible), with the short term goal of reducing population density and minimizing spread, and the long term goal of elimination. Hand control of Canada thistle and tansy ragwort has also been consistently implemented at this site over this time period, with the goal of containing spread in habitat occupied by pale blue eyed grass and the Mardon skipper butterfly. Localized Canada and bull thistle infestations within South Prairie have also been

aggressively treated on an annual basis during this period. Roadsides within the Allotment have also been treated through hand pulling of certain herbaceous species, and hand pulling, clipping or weed wrenching of woody species, on a priority basis. These treatments have been limited in scope because of funding constraints, and limited available treatment tools. Invasive weed control efforts at both Cave Creek and South Prairie have been hampered by the presence of livestock where grazing has reduced vegetative competition, and created fresh seed bed. Livestock at Cave Creek have been observed with faces coated with houndstongue seed, creating an important vector for this species.

Along Lost Creek, Cave Creek and within other riparian zones adjacent to South Prairie, livestock have caused bank erosion and exposure of bare soil, creating a high risk for noxious weed invasion.

Future decisions on treatment methods for identified invasive plant populations within the Allotment will be based on information and tools provided in the Gifford Pinchot National Forest Invasive Plants EIS, which is expected to be ready for implementation by the start of the 2007 grazing season on the Allotment (June 15, 2007).

Environmental Consequences

Alternative A - Limited Change to Current Management

Direct Effects

By restricting grazing from South Prairie, Alternative A will reduce the likelihood that known infestations of Canada and bull thistle will spread, due to a reduction in seed bed creation and elimination of livestock as a seed dispersal vector. In addition, elimination of livestock grazing in this area will allow the highly palatable native species of grasses, sedges and forbs (that livestock tend to preferentially select during grazing) to gain stature and vitality, allowing these species to better compete with the invasive species that are generally avoided by livestock (and therefore given a competitive advantage). A decrease in density of common dandelion, which is currently widespread throughout South Prairie, is anticipated as well, as native grasses, sedges and forbs more fully reach their growth potential and shade this relatively low-growing invasive species. Along Lost Creek where livestock have caused bank erosion and exposure of bare soil, the cessation of grazing will allow vegetation recovery, but without active management of noxious weeds documented from the area (including Canada thistle, bull thistle), re-vegetation may be dominated by these aggressive species. With active control of noxious weeds, and native plant restoration during the important period of initial re-vegetation, native plants will become re-established at these sites, which we anticipate will result in a more stable (less frequently disturbed) plant community better able to resist invasion by noxious weeds.

Throughout the portions of the Allotment open to grazing, livestock will continue to serve as a vector for invasive species, and will continue to create seed bed. The level of impact that livestock have within the Allotment in terms of noxious weed establishment and spread is unclear; we assume, however, that livestock numbers, along with the area within the Allotment accessible to livestock, represent indirect measures for probability of seed transport and seed bed creation. Based on this assumption, of all the alternatives, Alternative A poses the highest risk for noxious weed introduction and spread by livestock across the Allotment as a whole.

Indirect Effects

Treatments designed to control spread of houndstongue, Canada and Bull thistle and tansy ragwort at Cave Creek, as well as Canada and Bull thistle infestations at South Prairie and Lost Creek, will likely be more effective as a result of reduced seed bed, elimination of livestock as a dispersal vector, and increased resource competition from native species.

As shown by Raven at Cave Creek (2000), livestock may help control the rate of population expansion for certain species, under some circumstances (i.e. Canada thistle at Cave Creek; see discussion under Existing Condition section). The effect observed at Cave Creek, in which the density of Canada thistle inside the cattle exclosure exceeded that outside the exclosure, suggests that the cessation of livestock grazing at this site may contribute to an expansion of the existing Canada thistle infestations, in the absence of active control.

Cumulative Effects

There are many factors and vectors contributing to the establishment and dispersal of noxious weeds. Within the Allotment, noxious weeds may be introduced or spread by motor vehicles, off-road vehicles (ORVs), heavy equipment, boats, humans, livestock, wildlife, importation or transportation of infested soil, cinders or gravel, project related disturbances (such as ground disturbance occurring as a result of log yarding, restoration, etc.). Wind and water also play a role in dispersing noxious weed seeds. The contribution of livestock to the overall problem is difficult to determine; however, livestock are likely important contributors to the problem at sites within the Allotment where they tend to congregate, including a number of sites that host rare plants/animals, and/or comprise special habitats, such as natural meadows. These sites, including South Prairie, Lost Creek, Cave Creek and Lost Meadow, all have identified noxious weed infestations. Noxious Weed infestations at these sites are exacerbated by the concentrated presence of livestock, and control efforts at these sites are hampered by the persistent presence of livestock. As a result, livestock grazing contributes substantially to the cumulative impact of noxious weeds already present at these sites.

Alternative B - Drift Fence- Adaptive Management

Direct Effects

By restricting grazing from the southwestern portion of the Allotment, Alternative B will reduce the likelihood that known infestations of Canada and bull thistle at South Prairie and Lost Creek will spread, due to a reduction in seed bed creation and elimination of livestock as a seed dispersal vector. In addition, elimination of livestock grazing in this area will allow the highly palatable native species of grasses, sedges and forbs (that livestock tend to preferentially select during grazing) to gain stature and vitality, allowing these species to better compete with the invasive species that are generally avoided by livestock (and therefore given a competitive advantage). A decrease in density of common dandelion, which is currently widespread throughout South Prairie, is anticipated as well, as native grasses, sedges and forbs more fully reach their growth potential and shade this relatively low-growing invasive species. Along Lost Creek where livestock have caused bank erosion and exposure of bare soil, the cessation of grazing will allow vegetation recovery, but without active management of noxious weeds documented from the area re-vegetation of bare soil may be dominated by these aggressive species. With active control of noxious weeds, and native plant restoration during the important period of initial re-vegetation, native plants will become re-established at these sites, which we anticipate will result in a more stable (less frequently disturbed) plant community better able to resist invasion by noxious weeds. At Cave Creek, the expansion of the exclosure fence to

encompass the heart of the houndstongue population will substantially reduce dispersal opportunities for this noxious weed species, for which livestock are recognized seed dispersal vectors.

Throughout the portions of the Allotment open to grazing, livestock will continue to serve as a vector for invasive species, and will continue to create seed bed. The level of impact that livestock have within the Allotment in terms of noxious weed establishment and spread is unclear; we assume, however, that livestock numbers, along with the area within the Allotment accessible to livestock, represent indirect measures for probability of seed transport and seed bed creation. Based on this assumption, Alternative B poses less risk for noxious weed introduction and spread across the Allotment as a whole, than Alternative A.

Indirect Effects

Treatments designed to control spread of houndstongue, Canada and bull thistle, and tansy ragwort at Cave Creek, as well as Canada and bull thistle infestations at South Prairie and Lost Creek, will likely be more effective as a result of reduced seed bed, elimination of livestock as a dispersal vector, and increased resource competition from native species.

As shown by Raven at Cave Creek (2000), livestock may help control the rate of population expansion for certain species, under some circumstances (i.e. Canada thistle at Cave Creek; see discussion under Existing Condition section). The effect observed at Cave Creek, in which the density of Canada thistle inside the cattle exclosure exceeded that outside the exclosure, suggests that the cessation of livestock grazing at this site may contribute to an expansion of the existing Canada thistle infestations, in the absence of active control.

Cumulative Effects

There are many factors and vectors contributing to the establishment and dispersal of noxious weeds. Within the Allotment, noxious weeds may be introduced or spread by motor vehicles, off-road vehicles (ORVs), heavy equipment, boats, humans, livestock, wildlife, importation or transportation of infested soil, cinders or gravel, project related disturbances (such as ground disturbance occurring as a result of log yarding, restoration, etc.). Wind and water also play a role in dispersing noxious weed seeds. The contribution of livestock to the overall problem is difficult to determine; however, livestock are likely important contributors to the problem at sites within the Allotment where they tend to congregate, including a number of sites that host rare plants/animals, and/or comprise special habitats, such as natural meadows. These sites, including South Prairie, Lost Creek, Cave Creek and Lost Meadow, all have identified noxious weed infestations. Noxious Weed infestations at these sites are exacerbated by the concentrated presence of livestock, and control efforts at these sites are hampered by the persistent presence of livestock. As a result, livestock grazing contributes substantially to the cumulative impact of noxious weeds already present at these sites. Under Alternative B, the extension of the exclosure fence at Cave Creek will substantially reduce the contribution of livestock to the cumulative impacts contributing to the persistence/expansion of the houndstongue population at this site.

Alternative C – No Grazing

Direct Effects

With no livestock grazing occurring on the Allotment, this activity would no longer contribute to the establishment or dispersal of noxious weeds. All other factors and vectors contributing to this problem would remain unchanged. The level of impact that livestock have within the Allotment

in terms of noxious weed establishment and spread is unclear; we assume, however, that livestock numbers, along with the area within the Allotment accessible to livestock, represent indirect measures for probability of seed transport and seed bed creation. Based on this assumption, Alternative C eliminates the risk of noxious weed establishment and spread resulting from livestock.

Indirect Effects

Treatments designed to control spread noxious weeds within the area comprising the Allotment (including ongoing control efforts at South Prairie, Cave Creek and at a number of additional roadside and meadow sites) will likely be more effective as a result of reduced seed bed, elimination of livestock as a dispersal vector, and increased resource competition from native species.

As shown by Raven at Cave Creek (2000), livestock may help control the rate of population expansion for certain species, under some circumstances (i.e. Canada thistle at Cave Creek; see discussion under Existing Condition section). The effect observed at Cave Creek, in which the density of Canada thistle inside the cattle exclosure exceeded that outside the exclosure, suggests that the cessation of livestock grazing at this site may contribute to an expansion of the existing Canada thistle infestations, in the absence of active control.

Cumulative Effects

Grazing will not contribute further to noxious weed establishment, infestation and spread within the Allotment.

Noxious Weed Risk Assessment for Ice Caves Allotment

Forest Service Manual direction requires that Noxious Weed Risk Assessments be prepared for all activities that involve ground-disturbance. For projects that have a moderate to high risk of introducing or spreading noxious weeds, recent Forest Service policy requires that decision documents must identify noxious weed control measures that will be undertaken during implementation of activities. The USDA Forest Service Guide to Noxious Weed Prevention Practices (FSM 2081.03, 11/29/95) provides weed prevention practices that mitigate identified risks of weed introduction and spread for projects/programs occurring on National Forests and Grasslands. *The Pacific Northwest Region Invasive Plant Program Record of Decision for Preventing and Managing Invasive Plants* (USDA 2005) provides invasive plant prevention and treatment/restoration standards and direction on all national forest lands within Region 6. This decision directs the Forest Service to address prevention of invasive plant establishment and spread in allotment management plans, and to use available administrative mechanisms to incorporate invasive plant prevention practices into rangeland management, including (but not limited to): revising permits and grazing allotment management plans; providing annual operating instructions; and using adaptive management.

Risk Ranking

Factors and Vectors considered in determining the risk level for the introduction or spread of noxious weeds are:

Factors

A. Known noxious weeds in close proximity to project area that may foreseeably invade project.
B. Project operation within noxious weed population.
C. Any of vectors 1-8 in project area.

Vectors

1. Heavy equipment (implied ground disturbance including compaction or loss of soil "A" horizon).
2. Importing soil/cinders/gravel/straw or hay mulch.
3. ORVs or ATVs.
4. Grazing.
5. Pack animals (short term disturbance).
6. Plant restoration.
7. Recreationists (hikers, mountain bikers, etc…).
8. Forest Service or other project vehicles.

High, moderate, or low risk rankings are possible. A high risk ranking must contain a combination of factors A+C or B+C in the project. A moderate ranking contains any of the Vectors 1 through 5 in the project area. A low ranking contains any of the Vectors 6 through 8 in the project area or known weeds within or adjacent to the project area, without vector presence.

Weed Risk Ranking Results

Project	Factors	Vectors	Risk Ranking
Alternative A	A, B, C	2, 4, 5, 7, 8	High
Alternative B	A, B, C	2, 4, 5, 7, 8	High
Alternative C	C	7, 8	Low

Aquatic Resources

The fisheries and hydrology report is located in the project record, located at the Mount Adams Ranger District. The analysis and conclusions of the report are summarized below.

Existing Condition

The characterization of the existing condition is derived from the Cave-Bear Creeks Watershed Analysis (USDA 1997A), the Little White Salmon River Watershed Analysis (USDA 1995), and field surveys from 1993 through 2005. The specifics related to riparian area condition and grazing

influences within the Allotment are described in detail in Alternative A in Environmental Consequences, page 63.

Allotment Area and Structures

The 31,996-acre Ice Caves Cattle Allotment occurs within national forest lands in two 5th field watersheds on the Mount Adams Ranger District, the White Salmon River watershed and the Little White Salmon River watershed. Approximately two-thirds of the Allotment lies within the Cave-Bear Creek 6th field subwatershed of the White Salmon River watershed. A separate Watershed Analysis was done for the Cave-Bear subwatershed as it has a much different character than the White Salmon River. Most of the streams in the Cave-Bear sub-watershed are intermittent, and during most of the year there is no surface water discharge to the White Salmon River (Cave-Bear Watershed Analysis, 1996). The remainder of the Allotment falls in the Dry Creek and Big Lava Bed Frontal 6th field subwatersheds of the Little White Salmon River watershed. Whole or portions of 7th field drainages included in the Allotment area include: Dry Creek, Lost Creek (north), and South Prairie in the Little White Salmon watershed, and Coyote, Dry, Bear, and Cave Creek in the Cave-Bear watershed (Table 3-12, Figure 3-1).

Table 3-12. 5th, 6th, and 7th Field Drainages in the Ice Caves Grazing Allotment.

5th Field Watershed	6th field	7th field
White Salmon River Watershed	Cave-Bear Creek (10-6)	Dry, Coyote, Bear, Cave Creeks
Little White Salmon Watershed	Dry Creek (11-01), Big Lava Bed Frontal (11-02)	Dry Creek, Lost Creek (north), South Prairie

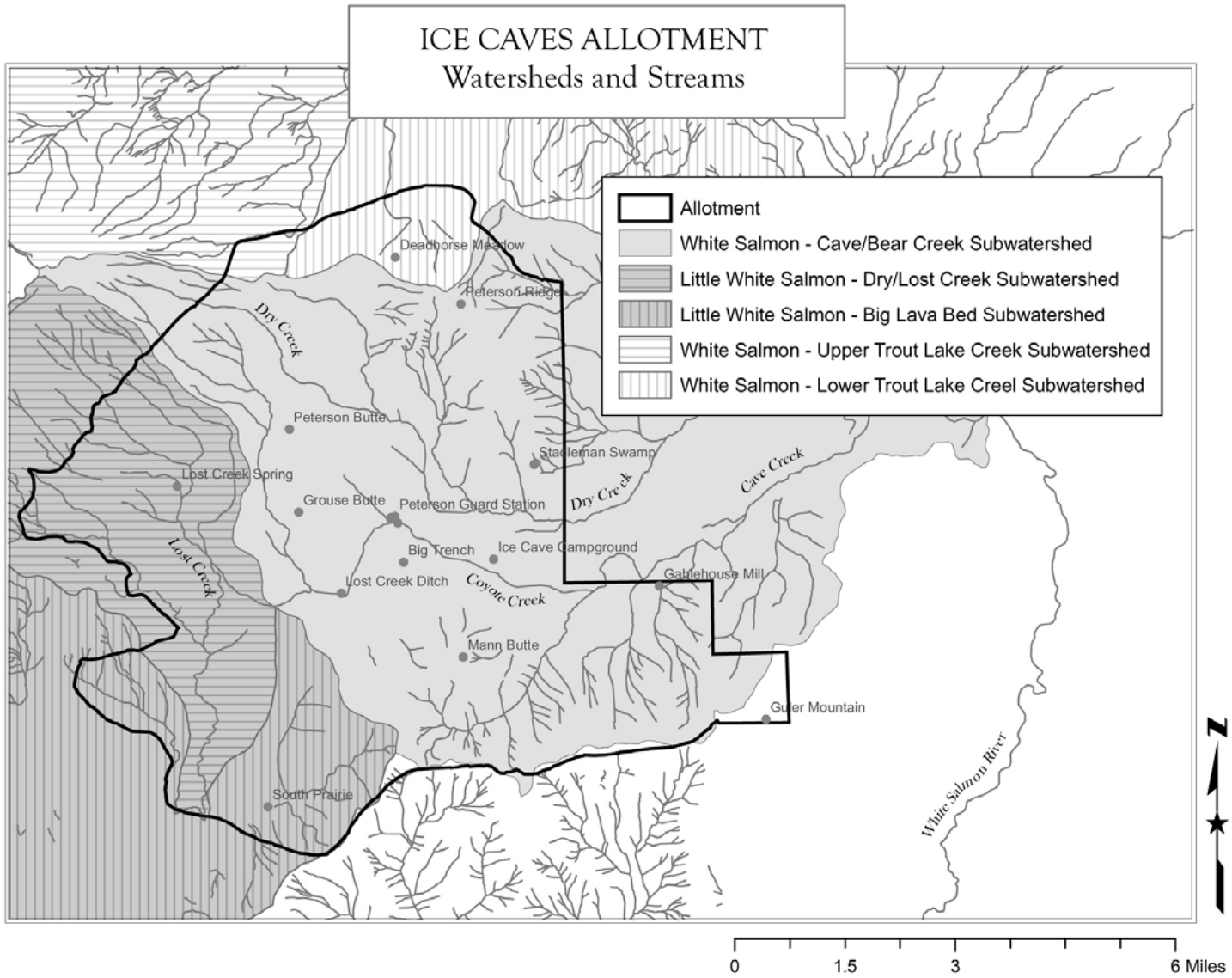

Figure 3-1. Watersheds and streams.

Fence structures in the Allotment include: a cattle exclosure in the Cave Creek meadow area, a fence and corral in Peterson Prairie, a fence around Peterson Prairie campground and its water source, and an exclosure at the headwaters of Lost Meadow Creek.

A stream diversion exists in the Allotment on Lost Creek, a resident trout fish bearing stream. In September of 2004, the diversion site was located 4.08 miles upstream of where Lost Creek ran subterranean before reaching the Big Lava Bed. The total stream length is 5.36 miles, therefore 76 percent of the main channel length lies below the diversion. The diversion consists of a wood and concrete impassable dam (which is an upstream fish migration barrier at low flow), an adjustable control valve, a culvert, a fish screen, and 1.5 miles of constructed ditch. The ditch crosses the Little White Salmon River watershed boundary and connects to Coyote Creek in the White Salmon River watershed. Coyote Creek is an intermittent stream which is dry during the summer. The Lost Creek diversion is normally opened up June 15 and closed September 30. A Certificate of Water Right issued in 1937 to the Forest Service allows withdrawal of a maximum of five cubic feet per second (cfs) from Lost Creek. This water right was issued for the purposes of "domestic animals, recreational development, water for grazing stock, and fire protection." Currently the water in Lost Creek is diverted solely for livestock watering.

Geology/Soils

Most of the terrain in the Allotment area is moderate to gently sloped with shallow soil depths and lava flows that weather to sands and silts. Potentially unstable soils exist in upper Cave Creek and its beaver ponds (USDA 1996). Active and potential mass wasting sites exist mainly in riparian reserves (USDA 1996). There is a low potential for mass wasting and surface erosion along with relatively few streams, making the natural rate of sediment production relatively low in the Cave-Bear subwatershed overall.

The area of the Allotment which falls in the Little White Salmon River watershed also has very little mass wasting potential. The Allotment lies north of the Big Lava Bed in an area of mostly basalt lava flows (USDA 1995). Glaciation has smoothed this area creating thin soils that are not very erosive (USDA 1995).

Peak and Low Stream flows

Management activities, namely timber harvest and road construction, can alter hydrologic processes and increase peak stream flows. Summer low flows can be altered by water diversions, timber harvest, and road construction. Increased peak flows can degrade stream channels, fish habitat, water quality, and channel condition. Low flows can impact water quality and fish habitat. Water is very limited in the Allotment area overall.

Cave-Bear Watershed

Based on road densities, elevation, and vegetation age classes present in the Cave Creek drainage, the drainage has a relatively high risk of increased peak flows above natural conditions (USDA 1997a). Lower Cave, Coyote, and Bear Creeks have no stream flow during the summer months, so there is no surface discharge from these streams for several months each year. Ditch systems were constructed in the Cave-Bear watershed as early as the late 1800s. In 1908 Lost Creek ditch was constructed to bring water from the Little White Salmon watershed to the Cave-Bear Creek subwatershed. The lack of water in the Cave-Bear watershed is likely attributable in part to the highly porous basalts underlying much of the watershed (USDA 1996). It is likely the water from the Cave-Bear subwatershed re-emerges as seeps and springs along the White Salmon River below the town of Trout Lake.

Little White Salmon Watershed

Based on modeling of stream flows under both current and "natural" forest cover scenarios, the two year flood in the Lost Creek and South Prairie drainages are estimated to be greater than ten percent above natural conditions (USDA 1995). The affect these peak flow increases have had on the stream channels has not been determined, but most likely the streambank condition has been degraded to some extent.

Lost Creek flows 5.4 miles during the summer months before going subterranean. Lost Creek Spring contributes about 40 to 50 percent of the stream flow to Lost Creek in the summer. Adjacent to South Prairie the stream disperses into several incised channels (which are dry during summer months). A few of these channels flow into South Prairie itself, where the stream dumps the sediment load it is carrying into parts of the prairie. This flooding of South Prairie by Lost Creek helps to maintain it as an open meadow.

Summer low flows are a concern in Lost Creek since five cfs is diverted from the stream all summer. This diversion is solely for the benefit of livestock watering in the Allotment. Approximately 14 to 18 percent of the water flow in the stream is diverted into the Lost Creek ditch during the low flow summer months. Low flow in summer often establishes an upper limit on the quality and quantity of fish habitat. The present use of the diversion negatively affects aquatic habitat in the lower 4.08 miles (76% of stream length) of Lost Creek by decreasing the amount of water flow and stream length and by elevating water temperatures. The very lower section of Lost Creek would likely be dry in most years regardless of the diversion.

In past years the public has opened the diversion gate more than the allocated five cfs resulting in the stranding and subsequent death of numerous rainbow trout. On July 29, 2005 (a drought year), campers below Forest Road 6615 on Lost Creek reported that the stream flow had stopped and trout were trapped in isolated warm pools. The amount diverted at this time was five cfs. Because of the potential fish kill, the ditch was turned off at this time to restore stream flow to these isolated pools. On August 18, with no rainfall occurring after the ditch was closed, stream length was measured below the point where the flow had stopped when the diversion gate was opened. The stream length had increased by 1,677 feet. Therefore, diverting five cfs from Lost Creek in the summer of 2005 resulted in about 0.3 miles of habitat loss alone. The dam at the diversion intake is a fish barrier at low stream flows when the diversion ditch gate is open to five cfs.

Dry Creek, the main tributary to lower Lost Creek, is dry all summer but is a major contributor to Lost Creek when flowing. On September 9, 2004, Dry Creek was dry at its confluence with Lost Creek. Three days later after substantial rainfall Dry Creek was flowing and estimated to be contributing approximately 30 percent of the total flow to Lost Creek. The upper reaches of Lost Creek contain numerous year-round flowing springs.

The two tributaries to South Prairie Lake flow short distances before reaching the lake. South Prairie Lake south tributary flows for 0.6 miles and the east tributary flows 1.8 miles. There is no outlet stream from South Prairie Lake. Water flows into South Prairie from the lake and eventually goes subterranean into the Big Lava Bed. There is no above surface flow from any stream in the Allotment connecting to the Little White Salmon or White Salmon Rivers.

Streams and Fish Populations

Streams within the Allotment area support resident fish populations. No Threatened, Endangered or Sensitive fish or other aquatic species or designated Critical Habitat are known to be present in water bodies within the Allotment boundaries. No streams in the Allotment are considered to be bull trout habitat (Table 3-13). The Sustainable Fisheries Act of 1996 (Public Law 104-267) amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens

Act) to require federal agencies to consult with National Marine Fisheries Service (NMFS) on activities that may adversely affect Essential Fish Habitat (EFH). No EFH exists within the Allotment area.

Table 3-13. Summary of Effects from the Ice Caves Cattle Allotment to Listed Fish Species.

Fish Species	Existing Sightings	Habitat or Species Present	Alternatives A, B	Alternative C
ENDANGERED/THREATEND				
Columbia River bull trout (Salvelinus confluentus)	No	No	No Effect	No Effect
Lower Columbia River steelhead (Oncorhynchus mykiss)	No	No	No Effect	No Effect
Middle Columbia River steelhead (Oncorhynchus mykiss)	No	No	No Effect	No Effect
Lower Columbia River chinook (Oncorhynchus tshawytscha)	No	No	No Effect	No Effect
Puget Sound chinook (Oncorhynchus tshawytscha)	No	No	No Effect	No Effect
Columbia River chum (Oncorhynchus keta)	No	No	No Effect	No Effect
CANDIDATE OR SENSITIVE SPECIES				
Southwestern Washington/ Columbia River coastal cutthroat trout *(Oncorhynchus clarki)*	No	Yes (habitat) None found during fish population surveys	No Impact	No Impact
Lower Columbia River/ Southwest Washington Coho (Oncorhynchus kisutch)	No	No	No Impact	No Impact
Interior Red Band Trout (Oncorhynchus mykiss)	No	No	No Impact	No Impact
Pygmy Whitefish (Prosopium coulteri)	No	No	No Impact	No Impact

Endangered/Threatened species – NE = No Effect, NLAA = Not Likely to Adversely Affect, LAA = Likely to Adversely Affect

NLJ = Not Likely to Jeopardize

Sensitive species (S) – No Impact/May Impact

Low flows appear to be the limiting factor for fish production in streams in the Allotment, particularly in the Cave-Bear subwatershed. Very few perennial streams exist in the Allotment, therefore livestock tend to concentrate in the few available riparian areas. The main perennial

streams in the Allotment include Cave and Beaver Creek in the Cave-Bear watershed, and Lost Creek and two tributary streams to South Prairie Lake in the Little White Salmon watershed. All of these perennial streams are fish bearing and contain non native eastern brook trout (*Salvelinus fontinalis*) and rainbow trout *(Oncorhynchus mykiss)*, with the exception of the South Prairie Lake tributaries which only contain brook trout. Washington Department of Wildlife suspects that the rainbow trout in Lost Creek are a native stock with no genetic influence from hatchery stock. Electrofishing and snorkel surveys in Lost Creek have only found rainbow and brook trout, although anglers have stated in the past that they have caught cutthroat trout in Lost Creek.

Dry Creek (west), an intermittent stream, is a main tributary to Lost Creek and likely contains fish in its lower reaches during the time of year it is flowing. Intermittent streams include Dry Creek (east) and Coyote Creek in the Cave-Bear watershed, and Lost Meadows, an unnamed stream west of Lost Creek, and Dry Creek (west) in the Little White Salmon watershed. Cave Creek normally has little to no flow during the summer below Forest Road 8620.

Fish bearing lakes in the Allotment include the Cave Creek Beaver Ponds and South Prairie Lake. Cave Creek ponds were last stocked in 1994 with brook trout by the Washington Department of Fish and Wildlife, and South Prairie Lake was last stocked in 1993 with brook trout. No streams or lakes in the Allotment are currently being stocked with fish.

Meadows where livestock concentrate include Lost Meadow and Peterson Prairie in the Cave-Bear subwatershed, and South Prairie and Deadhorse Meadow in the Little White Salmon River watershed. Streams affiliated with meadows include Lost Meadow Creek, an intermittent stream, and the tributaries to South Prairie Lake. Ephemeral streams also exist. The headwaters of Lost Meadow Creek is severely eroded into deep gullies and consequently has been fenced to exclude cattle.

Stream Channel Types

Stream channel conditions are important for fish and other aquatic species habitat. Channel conditions strongly affect water quality and the microclimate for riparian dependent species. Channel gradient is a key factor in assessing channel response to disturbances, and gradient is a primary element used in channel typing for the “Rosgen” stream channel categories. Low gradient channel types in the Allotment area which are most accessible to cattle include Rosgen “C” and “E” channels (Rosgen 1996). “C” channel types include the entire National Forest portion of Cave Creek (5.4 river miles), 3.75 river miles of Lost Creek (70%), 2.0 river miles (50%) of Dry Creek, and 0.75 river miles (46%) of South Prairie Lake East tributary. “E” channel types in the Allotment include 0.3 river miles of South Prairie Lake South tributary (50%), and 0.4 river miles of Lost Meadow Creek (25%). Beaver Creek, a tributary to Cave Creek, is a slightly higher gradient “B” channel type.

These “E” and “C” stream channels are relatively flat deposition areas. They are alluvial streams that are highly sensitive to physical bank disturbance and to increases in stream flows. Riparian vegetation is very important in these channel types to hold stream banks together. They are easily destabilized by physical disturbance to the banks, i.e. livestock trampling, and by vegetation loss along the stream banks. Once riparian vegetation is removed in C and E stream channel types, high flows become more effective at eroding channel banks and down cutting.

As noted previously, past management activities have contributed to elevated peak flows. Peak flows above normal conditions are predicted to occur in the Lost Creek, Cave Creek, and South Prairie 7th field drainages. Because these drainages have altered flows which affects streambank integrity, they are more vulnerable to streambank degradation from other disturbances, such as grazing. Streams where bank failure, bare ground along streamsides, and/or riparian vegetation

damage due to cattle grazing is evident include Lost Creek, Cave Creek, and the East and South Tributaries to South Prairie Lake.

Fish Habitat and Channel Stability

All fish bearing streams in the Allotment were surveyed between 1993 and 2004 using the Region 6 Stream Survey Method (USDA 2000). Table 3-14 summarizes the averages for the entire stream length surveyed. Results of individual stream reaches would vary from these results to some degree. The calculations for Cave Creek could not be determined for the whole stream length because 0.9 miles of the stream is a wetland/pond which could not be surveyed, and 1.5 miles below Forest Road 8620 was dry at survey time. Much of these two reaches where no fish habitat survey data was collected were described in channel stability narratives as areas heavily utilized by livestock. Cave Creek below Forest Road 8620 is utilized by cattle early in the season when the stream is flowing.

Table 3-14. Stream Survey Data for Fish Bearing Streams in the Ice Caves Grazing Allotment

Stream Name	Lost Creek	So. Prairie Lake E Trib.	So. Prairie Lake S Trib.	Cave Creek	Beaver Creek
Survey Date	2004	2001	2001	1993	1996
Stream Length Surveyed	5.4	1.8	0.6	4.6	1.3
Rosgen Channel Type	B, C	B, C	E, B	C, A	B
Fish Species	Rainbow, Brook	Brook	Brook	Rainbow, Brook	Rainbow, Brook
Width/Depth	29	7	6	undetermined[2]	6
Avg. Pieces Wood/Mile[1]	24	28	17	undetermined[2]	4
Avg. # Pools/Mile	21	32	30	undetermined[2]	106
Ave. Channel Stability Rating	Fair to Poor (31-35% of stream banks eroding)	Fair	Fair	Fair	Fair
Notable Surveyor's Comments Regarding Grazing	Extensive grazing impacts to riparian area in upper reach (below Lost Cr. Spring) and above and below FS Road 6615	Heavy grazing activity along some portions of Reach 1 has damaged stream banks and degraded aquatic habitat.	Good bank vegetation except at the cattle crossing sites. Cows present at survey time.	Dry in late summer below FR 8620. Beaver pond/ wetland along stream @ 0.9 mi. Cattle grazing impacts along stream banks between fence and pond, and below FR 8620.	Provides good spawning/ rearing habitat for Cave Creek. Some cattle trampling on banks in lower reach.

Shaded numbers indicate poor aquatic habitat conditions as compared to the Anadromous Fish Policy Implementation Guide (PIG) and Desired Future Conditions (DFC) (USFS, 1991).

[1] Large and medium sized wood = >24" dbh large end, 50' long

[2] Cannot be determined because 2.4 miles of the stream could not be surveyed. (1.5 miles of Cave Creek below the 8620 road was dry at survey time, and 0.9 miles of the stream course lies in a wetland/pond area that could not be surveyed.).

All streams rated an average of "fair" for overall channel stability (Pfankuch 1978), although most reaches where cattle grazing was occurring along old stream-side timber harvest units rated "poor". Cave Creek surveyors noted "degradation in the form of bank crushing, heavy grazing consumption, trampling, noxious weed spread, sedimentation, and animal feces in and along the stream" (USFS 1993). The 2004 survey of Lost Creek rated an average of 30.5 percent of both stream banks as unstable. Unstable banks are characterized by one or a combination of the following factors provided they occur at an elevation above bankfull flow: bare exposed colluvial or alluvial substrates, exposed mineral soil, evidence of tension cracks, or active sloughing (USDA 2000). Thirty percent bank instability is higher than any other stream surveyed on the Forest except the streams in the Mount St. Helens volcanic blast zone (Ken Meyer, pers. comm.).

The stream bank condition and fish habitat in Lost Creek is a concern, especially in reach #1 (2.7 miles in length) where the average bankfull width is 63.8 feet, and the width/depth ratio is 34/1. Bankfull widths of less than 10/1 are considered optimal. Factors contributing to this wide/shallow reach in Lost Creek likely include high peak flows of greater than ten percent above natural conditions, and flashy stream flows from snow runoff from the Indian Heaven Wilderness. Roads, road crossings, and timber harvest in the drainage (36 percent of timber composition in the Lost Creek drainage is under 14 inch dbh) have contributed to increasing peak flows. One area of extensive mass wasting is present about 1.25 miles above Forest Road 6615 (Figure 3-2).

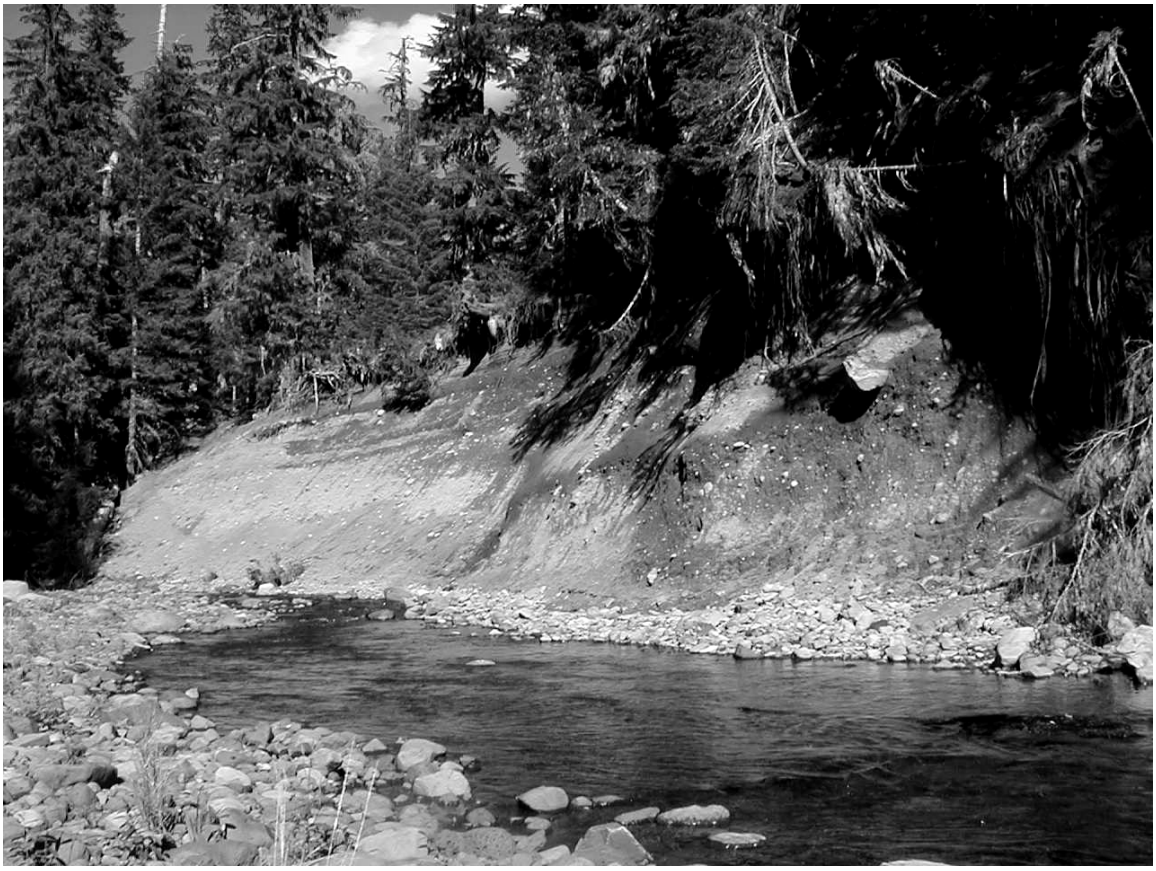

Figure 3-2. Mass wasting in Lost Creek, September, 2004.

Stream surveyors noted damaged stream banks and cattle trails along portions of all the perennial streams surveyed within the Allotment with the exception of Beaver Creek, where impacts to the stream channel from grazing were minimal due to a lack of forage.

Water Quality

Stream Temperature

Lost Creek is the only stream in the Allotment where stream temperature monitoring has been done. Lower Lost Creek has been sampled during periods of five cfs diversion. During the summers of 2001 and 2002 a continuous temperature monitoring device was installed just above the 6615 road bridge. In both those years temperatures did not meet the Washington State standard of 16 degrees Celsius (˚C). The high in 2001 was 19.4˚C, and in 2002 was 17.8˚C. In 2005 a monitoring devise was placed below the 6615 bridge (3.5 miles from the diversion) and stream temperatures were higher than the state standard 18 days in July alone. With the diversion ditch closed in August, 2005, temperatures were higher than the standard on only one day for approximately one hour.[4]

Nutrients and Pathogens

The streams in Allotment have not been monitored for nutrients and pathogens. No monitoring of these contaminants has been done because there are no known domestic water uses affected by grazing. The only domestic drinking water source in the Allotment is the Peterson Prairie spring which is piped to the Peterson Prairie campground for use by campers. The spring is not accessible to cattle. Cave Creek is diverted into multiple ditches in the town of Trout Lake where it is sometimes used for stock watering.

Sediment/Turbidity

No sediment or turbidity monitoring has been done in streams which lie within the Allotment. The largest sources of sediment above natural levels are related to roads, harvest units, and stream bank cutting. Stream crossings by roads are often a major contributor to sediment. Lost Creek drainage has 2.9 miles of roads/square mile Road density for South Prairie is 3.7 miles/square mile and Cave Creek drainage is 4.3 miles/square mile. These densities are all considered to be high. Stream bank erosion is being accelerated by livestock grazing in some reaches, especially along streambanks where timber harvest has removed the riparian forest. Streams in the Allotment where a significant portion of the riparian area has been harvested include Cave Creek, Lost Meadow Creek, Dry Creek (west), and Lost Creek.

Environmental Consequences

The Gifford Pinchot National Forest Plan states:

> "Allotment analysis and periodic evaluation should be conducted throughout the season. The analysis and evaluation should cover the protection of soils, water, botanical areas, and wildlife habitat. Also covered should be native plant vigor, composition, and utilization. Protection may include such measures as range rotation and curtailment in critical areas; e.g., natural openings and riparian areas with the use of salting, fencing, and other methods" (USDA 1990. p. IV-55).

[4] Lost Creek is not currently listed as a 303(d) stream for water temperature.

Monitoring and evaluation is part of all the alternatives considered in this document. In all the following alternatives riparian allowable use is assumed to be no more than 30 percent of the current year's growth on key species. Cattle would be physically removed from riparian areas once this utilization level is met. The following effects analysis for all alternatives is based on the assumption that no more than 30 percent utilization would occur in riparian areas, and that the grazing strategy would be adjusted if substantive improvements are not evident in streambank erosion and streamside herbaceous and woody species vegetation re-establishment at sites currently degraded by cattle grazing. Reference conditions would need to be first established for each stream section to be monitored.

Riparian Areas, Stream Banks and Aquatic Species Habitat

Alternative A - Limited Change to Current Management (Proposed Action)

Direct and Indirect Effects

Livestock grazing can affect four general components of an aquatic system: streamside vegetation, stream channel morphology, shape and quality of the water column, and the structure of the soil portion of the streambank (Platts 1978). Streamside vegetation is affected by changing or reducing the vegetation bordering the stream. Channel morphology is affected by the widening and shallowing of the streambed, stream channel trenching or braiding. The water column can be altered by increasing water temperatures, nutrients, suspended sediment, bacterial counts, and by altering the timing and volume of water flow (Platts 1978). Overgrazing and trampling can cause bank sloughoff and accelerated sedimentation and degradation of trout spawning and food producing areas. This can result in decreased numbers and health of fish and other aquatic organisms. Increased sedimentation reduces the quality of trout spawning gravels and affects embryo development. Keller, et al. (1978) found that trout prefer stream areas in ungrazed habitat over grazed habitat.

Riparian vegetation in general is an important component of the stream ecosystem. Riparian vegetation acts as a roughness element that reduces the velocity and erosive energy during peak flows. Healthy riparian vegetation stabilizes banks, provides shade, prevents water temperature fluctuations (Meehan, et al. 1977), and acts as a filter to prevent sediment from reaching stream channels. It also provides organic detritus and insects for stream organisms (Meehan, et al. 1977).

During the summer of 2003 most perennial and some intermittent stream reaches in the Allotment were visually surveyed for stream bank erosion and disturbed soils along streamsides where cattle grazing was a contributor to these conditions. Other recent surveys include Region 6 stream surveys of Lost Creek in 2004 and of the tributary streams to South Prairie Lake in 2001. Stream bank trampling, bank sloughing, and riparian vegetation removal where cattle had recently grazed was evident in the four major perennial streams in the Allotment: Lost Creek, South Prairie Lake South Tributary, South Prairie Lake East Tributary, and Cave Creek (Table 3-14, Figure 3-3). All of these streams are fish bearing.

To distinguish livestock grazing impacts from solely deer and elk grazing, at all of the sites listed in Table 3-15 livestock were either seen grazing during the time of survey or cattle feces were present. The approximate total area affected is 3.65 miles out of 13.7 miles surveyed (27%) (Table 3-15)**.** The 3.65 linear stream miles equates to approximately 44.2 acres based on an estimated 50-foot riparian area width on each side of the stream. This is an average; some riparian areas will be much larger and some smaller. This does not imply that the entire 3.6 miles of both stream banks is trampled and devoid of vegetation. It means that these locations, which are all flat, easily assessable, and contain livestock forage, are being grazed and instability problems

associated with streamside cattle grazing and trampling is evident at points along these reaches. Much of the heavily grazed riparian areas lie in old harvest units where most of the large trees were harvested from the riparian areas. Pfankuck (1975) channel stability surveys were done on these reaches and all rated "Fair" to "Poor".

Table 3-15. Locations of stream reaches exhibiting some riparian area damage due to cattle grazing within the Ice Caves Cattle Allotment.

Stream Name	Location	Approx. Length of Stream (mi.)	Rosgen Channel Type
Lost Creek	T6N, R9E, sec. 30	0.4	C
Lost Creek	T5N, R9E, sec. 7, 8, 17, 18	1.8	C
So. Prairie Lake Tribs	T5N, R9E sec. 16, 21	0.25 (not including lake perimeter)	C, E
Cave Creek	T5N, R9E, sec. 11, 12	0.5	C
Cave Creek	T5N, R10 E, sec. 1, 6	0.7	C
Total		**3.65 miles = approx. 44.2 acres (=27% of the total 13.7 miles surveyed)**	

Elk and deer are also contributing to stream bank instability by riparian grazing and trampling, yet cattle are the main contributors to the streamside conditions found in the Allotment. Narrative comments in stream survey reports of the Allotment streams highlight impacts to channels from livestock grazing in all the areas listed in Table 3-15. A few specific comments from these surveys are displayed in Table 3-14. Observations of streams of similar "C" channel types in the nearby vicinity, which are not grazed by livestock, show relatively very few impacts to stream banks. Only elk and deer would have access to these areas. To verify this observation, stream survey reports of similar stream channel types on the Mount Adams Ranger District were reviewed, including Meadow Creek, Little Goose Creek, and Cultus Creek in the Trout Lake Creek drainage, and Lusk Creek, Berry Creek, Cabbage, and the Little White Salmon River in the Little White Salmon River watershed. Of these seven streams, survey comments regarding elk or deer use along stream channels included a few observations of game tracks, trails, and elk wallows, and ranged from 0 to 4 elk or deer comments per stream. The surveyors of these streams did not identify elk and/or deer utilization to be creating any impacts of concern to the stream channels.

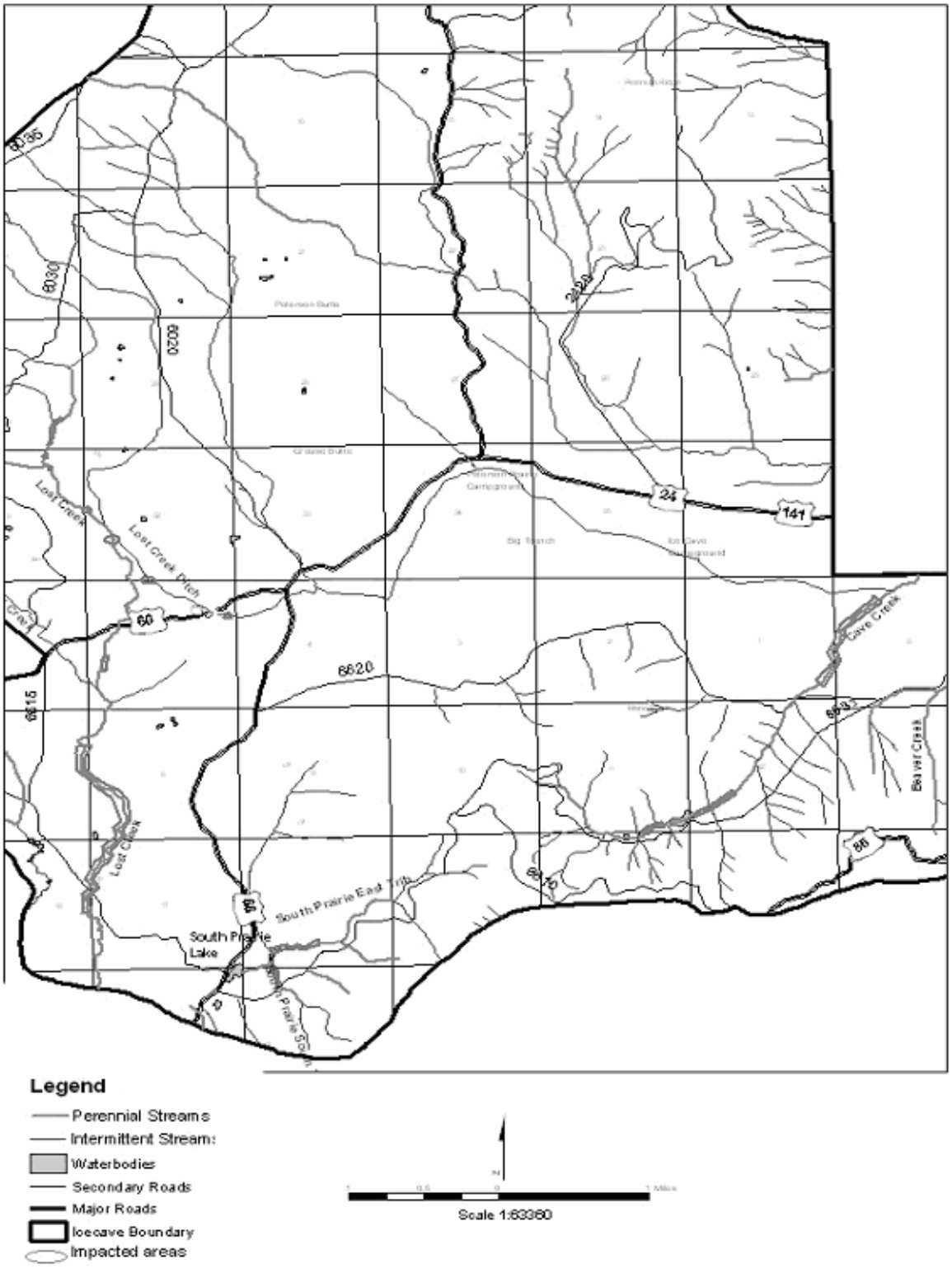

Figure 3-3. Locations of riparian areas showing impacts from livestock grazing in the Ice Caves Allotment.

All of the areas where riparian degradation from livestock grazing is evident are “C” and “E” Rosgen channel types where sediment delivery is increased due to direct disturbance and loss of vegetative cover. These channels are flat alluvial reaches that are highly sensitive to physical bank disturbance and to increases in stream flows. Riparian vegetation is very important in these channel types to hold the stream banks together. “C” channels are characterized by deep rooted species such as alder, willow, and dogwood (Rosgen 1996). These deeper rooted, woody species are critical to the bank stability of “C4” channel types as found in Lost and Cave Creeks. Willows and young cottonwoods are generally the first species to drop out of the vegetative community under late-season (mid-summer, fall) grazing (Rosgen, 1996). When riparian vegetation is removed and/or prevented from being established in these channel types (in part by grazing) the streams are vulnerable to bank sloughing, greater width/depth ratios, and increased sediment introduction.

The unstable streamside conditions in the Allotment streams are not likely created by livestock grazing, but grazing is a contributing factor to the channel conditions. Areas of particular concern include Cave and Lost Creeks (Figure 3-3). Cave Creek below Forest Road 8620 (Sec. 1 and 6, T. 5N, R. 10E) receives heavy grazing usage in the early summer as evidenced by numerous cattle trails and trampled stream banks. However, by late summer this section of Cave Creek is dry so the cattle have moved to other areas in the Allotment. Approximately 0.5 miles of Cave Creek is fenced above Forest Road 8620 which excludes livestock usage along this portion of the stream. Some of Cave Creek which lies inside the fence is thickly forested, but much of the south bank would be accessible to grazing if the fence were removed. The stream within the fence exclosure contains several beaver dams which have created multiple channels and wetlands. This reach of Cave Creek where livestock grazing is excluded by fencing (wildlife are not excluded) does not have the streamside trampling and riparian vegetation removal as found in the section of Cave Creek below Forest Road 8620 where livestock grazing is occurring.

The perimeter of South Prairie Lake and its tributary streams exhibit some livestock trampling and cattle trails. However, much of the streamside is vegetated with shrubs and small trees. Lower Lost Creek in the vicinity of Forest Road 6615 is an area of elevated concern due to the length of its poor habitat condition and high stream temperatures. The riparian areas of particular concern include approximately 0.5 miles below the 6615 bridge and along the streamside harvest units above Forest Road 6615 (Figure 3-3). This area of Lost Creek is also a popular camping destination. This stream reach has a high width/depth ratio (34/1) and a high percentage of unstable banks (37 to 41%). There are areas of trampled bare ground along the stream and multiple cattle trails exist. During a 2003 channel stability survey 40 head of cattle were counted adjacent to the stream within the old harvest unit on the west bank of Lost Creek above Forest Road 6615.

Figure 3-4. Livestock trail on lower Lost Creek, September, 2004.

Under Alternative A, approximately 1.2 miles of the 1.8 miles of impacted area of lower Lost Creek (Table 3-14) would be fenced to exclude cattle. The length of sensitive C and E channel types being grazed in the Allotment would be reduced by 33 percent, from 3.65 to 2.45 miles. The estimated total riparian acreage protected from cattle grazing would be 14.54 acres.

Immediately above the fence, streamsides along Lost Creek are more heavily forested and steeper making cattle access difficult. Little to no riparian damage from cattle has occurred in the past from the point above the proposed fence to the stream diversion site located at river mile 4.8. The area of Lost Creek below the proposed fence and below Forest Road 6615 currently utilized by livestock (Figure 3-4) would continue to be open to cattle grazing.

Bank trampling and areas of bare ground from livestock use is also occurring in upper Lost Creek along the old clearcut units approximately 0.5 mile below Forest Road 6030-080 (Sec. 30, T. 6N, R. 9E) (Figure 3-5). Approximately 0.4 miles of both streamsides of Lost Creek are impacted and would continue to be open to cattle grazing under this alternative.

Figure 3-5. Bank trampling by cattle in lower Lost Creek, September, 2004.

Several factors contribute to the unstable conditions that make the area especially vulnerable to degradation from grazing. Based on 1995 modeling of stream flows under both current and "natural" forest cover scenarios, the two year flood in Lost Creek was estimated to be greater than ten percent above natural conditions (USDA 1995). This drainage has a relatively high road density (2.9 miles/sq. mile), it is a flashy system due to the runoff from the Indian Heaven Wilderness snowmelt, it is heavily harvested including several streamside harvest units, and it is an easily erodable "C" stream channel type. The constant summer grazing is one more factor which exacerbates the erosion problems in Lost Creek. Livestock grazing and trampling is removing streamside vegetation and preventing high densities of forb, shrub, or tree establishment. Without strong root structures to hold stream banks together during high flows, further bank unraveling occurs adding excessive sediment to stream channels, widening the channel, and creating poor habitat conditions for aquatic organisms.

The actual amount of sediment introduction into streams created solely by cattle grazing or any other sources (i.e. roads) above baseline conditions is difficult to measure and has not been determined. No quantitative data has been collected on the total area of stream bank and riparian degradation occurring in this Allotment from livestock grazing; only visual observations are available.

Conditions as described previously would likely greatly improve in the section of Lost Creek located within the proposed fenced exclosure. Duff (1983) reported that riparian vegetation biomass increased 63 percent in an exclosure along Big Creek, Utah during four years of rest. After a decade of fenced protection, an Oregon stream received 75 percent more shade from alder and willow cover than when it had been grazed (Clair and Storich 1983). Well vegetated banks would help to provide fish cover, reduce stream bank erosion, control water velocities and temperatures, and supply terrestrial foods. Improvements in stream morphology may be seen as root structures become established. Stream width normally decreases when domestic livestock are removed or grazing is eliminated from the surrounding area, and water depth has been found to be greater in sections of stream in ungrazed areas than in sections in grazed areas (Gunderson 1968). Deep pools are vital components of fish habitat for cover from predators and as cool water refuges and rearing habitat during low flows.

Research shows that while riparian areas quickly improve when they are fenced to exclude cattle (Duff 1983), stream morphology improves slowly and fish populations may or may not be improved (Platts 1981). Platts, et al (1983) compared a continuously grazed area on Tabor Creek, Nevada, with an adjacent area that had been rested five years. Stream banks rebuilt rapidly and stream width was significantly less inside than outside the rested exclosure. Bank undercuts, which are important for fish cover and are used as an indicator of stream bank protection, were twice as abundant in the un-grazed reach than those in the grazed reach.

By eliminating 1.2 miles of grazing along Lost Creek more pressure would be placed on the riparian areas not protected by fencing, which would include upper Lost Creek, Lost Creek below Forest Road 6615, South Prairie Lake, and portions of Cave Creek. The harvest units along upper Lost Creek (about 0.5 mile below Forest Road 6030-080) contain an area of approximately 0.4 miles of stream length currently showing areas of downcutting and degradation (Figure 3-8), as well as 1.2 miles of Cave Creek. In these two reaches much of the stream margins are being grazed and trampled and bank failures are common. Grazing has contributed to reduced plant cover and root stability along the stream margins likely resulting in an increased level of sediment input and may have contributed to changes in stream morphology. The impacts exhibited along these stream channels would be expected to persist or may degrade further from present conditions if livestock stay in these areas longer than currently due to the elimination of a portion of the lower part of the Allotment.

Figure 3-8. Upper Lost Creek, September, 2004.

It is not expected that reducing number of livestock alone would result in a great improvement in streamside conditions currently degraded along Lost Creek and Cave Creek. The favorite grazing "hot spots" with the best available forage would continue to be the "hot spots". It is possible that the cattle would try to remain in the riparian areas for a longer period of time due to a higher forage/animal availability. Another potential scenario is that the amount of forage in the riparian areas may have always been utilized to its maximum potential with a low number of cattle, so a decrease in numbers alone may not in turn mean an improvement in riparian area condition.

The riparian areas would continue to be the first choice for cattle grazing and watering. It is difficult to conclude what the actual impacts of this alternative on stream banks and riparian areas would be. It does not take excessive utilization of the forage to heavily damage a sensitive stream bank. Because cattle concentrate near streams much damage can occur within a short time period. Most indications show sensitive stream banks cannot be protected just be reducing cattle numbers (Cooper 1977). Reducing stocking numbers by itself seldom solves riparian problems when the reduction is determined to fit the needs of the non-riparian range. Because livestock are selective grazers, the reduction of stocking numbers must usually be combined with other grazing strategies, such as animal distribution, to achieve successful results in riparian habitats (Platts 1984).

This analysis is based upon the implementation of this alternative resulting in substantive changes from the present management practices by including grazing strategies that allow for riparian area

recovery. Extensive riparian use monitoring would be required and cattle would need to be physically moved out of riparian areas as soon as the 30 percent utilization is reached. If these guidelines are met, it is expected there would be an overall improvement in riparian conditions from current conditions but the extent cannot be determined.

Alternative B - Drift Fence (Adaptive Management)

Under this alternative, the number of cattle would be reduced and a fence would be built to exclude cattle from the entire lower section of the Allotment. Additionally a fence would be constructed to increase the amount of riparian area protected in Cave Creek by another 500 feet of stream length. This area of Cave Creek (between the existing fence and pond) is currently heavily grazed. The number of AUMs is derived from the 2004 and 2005 grazing capacity analysis, along with an additional reduction in numbers due to less forage availability due to the fence eliminating a portion of the Allotment.

The following hydrology and aquatic species effects are based on a maximum utilization standard of 30 percent that will be maintained in all riparian areas. This alternative is based on adaptive management. Close monitoring would be required to evaluate if this strategy results in an improvement and long-term recovery of streams and riparian areas. Short term "Implementation" and long term "Effectiveness" monitoring of streamside vegetation and streambank condition would take place under this alternative. This grazing strategy would be adjusted if substantive improvements are not evident in streambanks currently degraded by grazing and hoof trampling, and in the regrowth of streamside herbaceous and woody species vegetation.

Hydrologic recovery of the sections of streams located within the exclosure would occur before cattle would be allowed into the area again. Reentry by cattle would only be allowed if there was a benefit to a specific resource.

Direct and Indirect Effects

This alternative would protect much more riparian area from cattle grazing than Alternative A. The proposed drift fence would eliminate cattle use from the lower 1.8 miles of Lost Creek (Sec. 7, 8, 17, 18, T. 5N, R. 9E,) which are currently being heavily grazed by livestock. Also excluded would be the entire South Prairie Lake and its tributary streams. The length of "C" and "E" sensitive channel types currently being grazed which are exhibiting channel impacts from livestock grazing and trampling would be reduced from 3.65 miles to 1.5 miles (59% less). Approximately 26.1 acres of riparian area would be protected from cattle grazing impacts**.** The fence would exclude cattle from the lower 1.8 miles of Lost Creek, the entire South Prairie Lake and its tributary streams, and an additional 0.1 miles of Cave Creek under this alternative.

Except for eliminating cattle grazing altogether, fencing riparian areas would provide the best chance for stream rehabilitation. The area fenced would have complete rest from cattle grazing (aside from strays) which would enable streamside forbs, shrubs and trees to become established. Duff (1983) reported that riparian vegetation biomass increased 63% in an exclosure along Big Creek, Utah, during four years of rest. After a decade of fenced protection, an Oregon stream received 75 percent more shade from alder and willow cover than when it had been grazed (Clair and Storich 1983). Well vegetated banks would help to provide fish cover, reduce stream bank erosion, control water velocities and temperatures, and supply terrestrial foods. Improvements in stream morphology may be seen as root structures become established. Stream width normally decreases when domestic livestock are removed or grazing is eliminated from the surrounding area, and water depth has been found to be greater in sections of stream in ungrazed areas than in

sections in grazed areas (Gunderson, 1968). Deep pools are vital components of fish habitat for cover from predators and as cool water refuges and rearing habitat during low flows.

Research shows that riparian areas quickly improve when they are fenced to exclude cattle (Duff 1983), but stream morphology improves slowly and fish populations may or may not be improved (Platts, 1981). Platts (1983) compared a continuously grazed area on Tabor Creek, Nevada, with an adjacent area that had been rested 5 years. Stream banks rebuilt rapidly and stream width was significantly less inside than outside the rested exclosure. Bank undercuts, which are important for fish cover and are used as an indicator of stream bank protection, were twice as abundant in the un-grazed reach than those in the grazed reach.

By eliminating the lower section of the Allotment, more pressure would be placed on the riparian areas not protected by fencing, which would include upper Lost Creek and portions of Cave Creek. The diversion ditch has not been observed to draw many livestock away from Lost Creek because there is little forage along the ditch system. The proposed water troughs would likely provide little relief to the riparian areas unless they are placed in areas of substantial forage.

The harvest units along upper Lost Creek (below Forest Road 6030-080) contain an area of approximately 0.4 miles of stream length currently showing degradation from grazing, as well as 1.2 miles of Cave Creek. In these two reaches much of the stream margins are being grazed and trampled and bank failures are common. Grazing has contributed to reduced plant cover and root stability along the stream margins likely resulting in an increased level of sediment input and may have contributed to changes in stream morphology. The impacts exhibited along these stream channels would be expected to persist or may degrade further from present conditions if livestock stay in these areas longer than at present if the lower part of the Allotment is excluded.

It is not expected that the reduced number of livestock alone in both Lost and Cave Creeks would result in a great improvement in streamside conditions currently degraded along Lost Creek and Cave Creek. The favorite grazing “hot spots” with the best available forage would continue to be the “hot spots”. It is possible that the cattle would try to remain in the riparian areas for a longer period of time due to a higher forage/animal availability. Another potential scenario is that the amount of forage in the riparian areas may have always been utilized to its maximum potential with a low number of cattle, so a decrease in numbers alone may not in turn mean an improvement in riparian area condition.

The riparian areas would continue to be the first choice for cattle grazing and watering. It is difficult to conclude what the actual impacts of this alternative on stream banks and riparian areas would be. It does not take excessive utilization of the forage to heavily damage a sensitive stream bank. Because cattle concentrate near streams much damage can occur within a short time period. Most indications show sensitive stream banks cannot be protected just be reducing cattle numbers (Cooper, 1977). Reducing stocking numbers by itself seldom solves riparian problems when the reduction is determined to fit the needs of the non-riparian range. Because livestock are selective grazers, the reduction of stocking numbers must usually be combined with other grazing strategies, such as animal distribution, to achieve successful results in riparian habitats (Platts, 1984).

Extensive riparian use monitoring would be required and cattle would need to be physically moved out of riparian areas as soon as the 30 percent utilization is reached. If these guidelines are met, it is expected there would be an overall improvement in riparian conditions from current conditions but the extent cannot be determined.

If this alternative is implemented, stream restoration within the locations impacted by livestock which will not be protected from future grazing by fencing would be carried out. The restoration would consist of re-vegetating areas of bare soil (planting woody species and seeding native forbs

and grasses), and placing log barriers along upper stream banks to direct cattle away from impacted areas to chosen less sensitive watering sites. The goal of this restoration would be to reduce the area of disturbed soils in direct proximity to stream channels and to allow for vegetative growth along stream banks. Well vegetated banks would help to provide fish cover, reduce stream bank erosion, control water velocities and temperatures, and supply terrestrial foods for aquatic organisms. This in turn should reduce the introduction of sediment into stream channels. Priority areas for restoration would occur along upper Lost Creek adjacent to the old harvest units about 0.5 mile below Forest Road 6030-080 (Sec. 30, T. 6N, R. 9E) and along Cave Creek adjacent to the harvest units below Forest Rpad 8620 (Sec. 1 and 6, T. 5N, R. 10E). The impacted riparian areas along Lost Creek and the tributaries to South Prairie Lake protected by the new fence exclosure would be allowed to recover naturally.

Cumulative Effects (Alternative A or B)

The hydrology and aquatic species effects from grazing within the Ice Caves Allotment are localized to the stream system where the effects are occurring. Of the streams with the most severe cattle grazing impacts, Lost Creek, Cave Creek, and South Prairie Lake tributaries, none of them have above surface flow into another stream or into the Little White Salmon or the White Salmon Rivers. The Lost Creek drainage, which includes its major tributary Dry Creek (West), flows subterranean into the Big Lava Bed. Cave Creek, which includes intermittent tributaries Coyote, Bear, Dry (East), and Lost Meadow Creek, flows into the Trout Lake valley where it is diverted into numerous irrigation ditches and eventually disappears before reaching the White Salmon River. The South Prairie Lake tributaries flow into South Prairie Lake, which drains into surrounding meadows and the Big Lava Bed during high flows. Because of this lack of connection of streams in the grazing allotment with any other downstream water bodies, there should be no detectable hydrologic, water quality, or aquatic species effects from grazing at the 5^{th} field watershed scale from the implementation of this Alternative.

It is apparent that grazing is contributing to maintaining or increasing the erosion problems found along Lost and Cave Creeks. The existing conditions in these drainages, which include predicted peak flows greater than ten percent above natural conditions, the high number of roads/sq.mi. (2.9 miles/sq.mi. in Lost Creek, 4.3 miles/sq.mi. in Cave Creek), the flashy runoff from the Indian Heaven Wilderness snowmelt in Lost Creek, the past riparian area timber harvesting (mid 1990 data showed 34 percent of riparian reserves in early seral stage in Lost Creek and 20 percent in Cave Creek), historical livestock grazing and the fact that much of both stream channels are easily erodable “C” stream channel types, have all led to the unstable channel conditions present today. The constant summer grazing is one more factor which exacerbates the erosion problems in these streams and is cumulatively helping to maintain the unstable conditions. Livestock grazing and trampling is removing streamside vegetation and preventing high densities of forb, shrub, and tree establishment along portions of the stream banks of Lost and Cave Creeks. Without strong root structures to hold stream banks together during high flows, further bank unraveling occurs adding excessive sediment to stream channels, widening the channel, and creating poor habitat conditions for aquatic organisms. Increased sediment loads in turn create wide/shallow stream channels as well as reduce spawning gravel quality and affect trout reproductive success.

No effects from grazing on riparian areas would occur within the proposed fenced sections of Lost Creek. If the riparian vegetation along the fenced portions grows to a height and density where stream shade is provided, stream temperatures may decrease. A trend towards recovery in the riparian areas located within the exclosures by implementation of this alternative would be expected. Riparian vegetation would be allowed to grow to a healthy level where the velocity and erosive energy during peak flows is reduced, stream banks are more stable, and sediment input

into stream courses is lessened. If however the livestock use of Lost Creek above the fence is intensified, impacts from this higher use may be evident in that reach as well as in downstream reaches. This might include increased sediment deposition and the subsequent stream morphology and aquatic species effects from higher sediment loads. Consistent monitoring and enforcement of riparian standards in areas not fenced would be crucial.

Alternative C – No Grazing

Direct and Indirect Effects

Under the No Grazing alternative, cattle disturbances (trampling and foraging) in riparian areas, including the most disturbed reaches of Lost Creek, South Prairie Lake tributaries, and Cave Creek, would cease. Streamside vegetation, stream channel morphology, water quality (sediment, water temperature, nutrients and pathogens), and stream bank soil structure would no longer be influenced by cattle use within the Allotment boundaries. Any accelerated sedimentation from livestock grazing and subsequent degradation of trout spawning and aquatic food producing areas would be curtailed.

A trend toward recovery of streambanks and riparian vegetation and an improvement in aquatic habitat in the grazed sensitive "C" and "E" channel types would be expected if this alternative is implemented. It is anticipated that riparian vegetation would be allowed to grow to a healthy level where the velocity and erosive energy during peak flows is reduced, stream banks are more stable, and sediment input into stream courses is lessened. Over time, if cattle grazing continues to be eliminated from the riparian areas, riparian vegetation would be expected to grow to a height and density where stream shade is provided and wood input into streams is increased. Input of organic detritus and food sources for stream organisms would also be expected to be enhanced. Numerous studies have demonstrated that range riparian-stream habitats degraded by livestock over-grazing can be rehabilitated once grazing has ceased (Platts 1984, Platts 1981). This alternative allows for the natural passive recovery of these riparian areas which would likely take several years.

Cumulative Effects

Of the three sub-watersheds (Lost Creek, Cave Creek and South Prairie Lake) with livestock riparian impacts, none have above surface flow into another stream or into Little White Salmon or White Salmon rivers. Without a connection of streams to any other downstream water bodies in the grazing Allotment, hydrologic, water quality, and aquatic species effects (beneficial in this alternative) would not be expected at the 5th field watershed scale.

Water Quantity and Quality – Lost Creek Diversion

Alternative A – Limited Change to Current Management (Proposed Action)

Direct and Indirect Effects

Under Alternative A, five cfs would continue to be diverted from Lost Creek into the Lost Creek diversion ditch from mid-June through September. This would decrease the volume of water in Lost Creek below the stream diversion (approximately 4 miles) by approximately 14 to 18 percent during the summer months. When the ditch was closed during the summer of 2005, the length of flowing stream increased by 1,677 feet (approx. 0.3 miles). The effect of continuing this

water withdrawal would include a decreased amount of available habitat for fish and other aquatic species, and contribute to higher water temperatures and lower oxygen dissolved oxygen levels below the diversion.

Resident rainbow trout and brook trout reside in Lost Creek. Approximately 76 percent of the stream channel length of Lost Creek lies below the diversion dam and would therefore be affected by the decrease in water discharge. Continued removal of this volume of water from the stream channel would be especially critical in late summer when stream flows are at their lowest and water temperatures are at their highest. Summer is a vital time for fish growth. Low flow in summer establishes an upper limit on the quality and quantity of fish habitat. Elevated stream temperatures can cause physiological stress which increases susceptibility to disease and predation, and a decreased competitive ability of juveniles (USDA 1985). Trout survive best in waters 10 to 16ºC, and temperatures above 25.5ºC are lethal (Hunter 1991). Decreased flow volumes also decrease the amount and diversity of available habitat. A limit of habitat space creates stress and competition for food and individual territory, and a reduction in deep pool habitat limits hiding cover and thermal retreat areas.

The dam migration barrier would continue to block all species and ages of trout from migrating upstream at low flows when the five cfs is being diverted. The dam would likely be a barrier at low stream flow regardless of the diversion. Washington State law RCW 75.16.060 requires fish-ways in dams and obstructions. Maintaining free migratory access is important as resident salmonids often make substantial movements within streams to reproduce (USDA 1985) and seek optimal habitat.

The stream temperatures in lower Lost Creek (measured 3.5 miles below the diversion dam) often do not meet state water quality standards when five cfs are being diverted. High stream temperatures were 19.4ºC in 2001 and 17.8ºC in 2002. No continuous measurement of water temperature was done in 2003 or 2004. In 2005 data loggers revealed that from June 30 through July 27, just prior to the stream drying up at this point which resulted in the diversion intake being closed, stream temperatures taken hourly did not meet the state standard 19 days out of this 28. The seven-day maximum temperature was 17.44ºC with the ditch open. After closing the diversion and returning all the water to the main stream course, stream temperatures from August 15 through September 28 only reached 16 degrees at one one-hour reading. The seven-day maximum with the ditch closed was 15.15ºC, approximately 2.29ºC less than when water was being diverted.

Other streams on the district were examined for temperature changes during the same two seven-day maximum time periods when the diversion was open and when it was closed. Table 3-16 displays the differences in these two time periods.

Table 3-16. Stream temperature differences during the same two seven-day maximum time periods when the diversion was open (7/15/05-7/21/05) and when the diversion was closed (8/16/05-8/22/05).

Stream	Temperature Difference º C
Trout Lake	- 0.36
Lower Compass	+ 0.85
Trout Creek below FR 4300	- 0.65
Trout Creek baseline	+ 0.37
Lost Creek	- 2.29

None of these temperatures decreases (in two of the four streams examined temperatures actually increased) are close to the substantial decrease seen in Lost Creek by closing the ditch. It is apparent that diverting five cfs during the low flow summer months is elevating water temperatures in Lost Creek. The current stream temperature and aquatic habitat conditions resulting from diverting five cfs from Lost Creek would remain unchanged with the implementation of this alternative.

No nutrient or pathogen monitoring has been done in the Allotment, and it is unknown if levels meet state standards. No monitoring of these contaminants has been done because there are no known threats to domestic water uses. Decreases in coliform and other bacteria and nutrients from livestock waste would be expected to occur in the area of Lost Creek that is excluded from grazing by fencing.

Cumulative Effects

The hydrology and aquatic species effects from grazing within the Ice Caves Allotment are localized to the stream system where the effects are occurring. Of the streams with the most severe cattle grazing impacts, Lost Creek, Cave Creek, and South Prairie Lake tributaries, none of them have above surface flow into another stream or into the Little White Salmon or the White Salmon Rivers. The Lost Creek drainage, which includes its major tributary Dry Creek (west), flows subterranean into the Big Lava Bed. Cave Creek, which includes intermittent tributaries Coyote, Bear, Dry (east), and Lost Meadow Creek, flows into the Trout Lake valley where it is diverted into numerous irrigation ditches and eventually disappears before reaching the White Salmon River. The South Prairie Lake tributaries flow into South Prairie Lake, which drains into surrounding meadows and the Big Lava Bed during high flows. Because of this lack of connection of streams in the grazing Allotment with any other downstream water bodies, there should be no detectable hydrologic, water quality, or aquatic species effects from grazing at the 5^{th} field watershed scale from the implementation of this Alternative.

Localized cumulative effects from diverting water from Lost Creek, along with streamside grazing, may be occurring at the 6^{th} field watershed. Diverting five cfs all summer long from Lost Creek appears to elevate stream temperatures in its lower reaches. The effect of removing some of the stream discharge during the hot summer months reduces the amount of water in the stream making it more vulnerable to heating. The warm water temperatures are likely due to a combination of conditions in the drainage. Aside from water withdrawal, influences on stream temperature include direct effects from solar radiation on the stream surface and ground water input. Warming from solar radiation has increased due to streamside logging which removed some of large tree shade component, as well as the future in-stream large wood source, from the riparian areas along portions of Lost Creek and Cave Creek. Grazing is contributing to preventing tree and shrub re-growth in portions of the riparian areas, in particular those which lie in past harvest units, resulting in increased water surface exposure to solar radiation. The current wide-shallow dimension of the stream also increases solar radiation exposure on the stream surface, increasing stream temperatures. Grazing is likely contributing to maintaining the wide/shallow character of sections of Lost Creek and Cave Creek by restricting riparian vegetation re-growth. The diversion ditch does not appear to be drawing many livestock away from Lost Creek because there is much less forage along the ditch system than along lower Lost Creek.

It is also apparent that grazing is contributing to maintaining or increasing the erosion problems found along Lost and Cave Creeks. The existing conditions in these drainages, which include predicted peak flows greater than ten percent above natural conditions, the high road density (2.9 miles/sq.mi. in Lost Creek, 4.3 miles/sq.mi. in Cave Creek), the flashy runoff from the Indian

Heaven Wilderness snowmelt in Lost Creek, the past riparian area timber harvesting (mid-1990 data showed 34 percent of riparian reserves in early seral stage in Lost Creek and 20 percent in Cave Creek), historical livestock grazing and the fact that much of both stream channels are easily erodable "C" stream channel types, have all led to the unstable channel conditions present today. Constant summer grazing would be one more factor which exacerbates the erosion problems in these streams and would cumulatively help to maintain the unstable conditions. Livestock grazing and trampling is removing streamside vegetation and preventing high densities of forb, shrub, and tree establishment along portions of the stream banks of Lost and Cave Creeks. Without strong root structures to hold stream banks together during high flows, further bank unraveling would occur adding excessive sediment to stream channels, widening the channel, and creating poor habitat conditions for aquatic organisms. Increased sediment loads in turn create wide/shallow stream channels as well as reduce spawning gravel quality and affect trout reproductive success.

No effects from grazing on riparian areas would occur within the proposed fenced sections of Lost Creek. If the riparian vegetation along the fenced portions grows to a height and density where stream shade is provided, stream temperatures may decrease. A trend towards recovery in the riparian areas located within the exclosures by implementation of this alternative would be expected. Riparian vegetation would be allowed to grow to a healthy level where the velocity and erosive energy during peak flows is reduced, stream banks are more stable, and sediment input into stream courses would be lessened. If however the livestock use of Lost Creek above the fence is intensified, impacts from this higher use may be evident in that reach as well as in downstream reaches. This might include increased sediment deposition and the subsequent stream morphology and aquatic species effects from higher sediment loads. Consistent monitoring and enforcement of riparian standards in areas not fenced would be crucial.

Alternative B – Drift Fence (Adaptive Management)

Direct and Indirect Effects

Use of the Lost Creek ditch would be discontinued and instead water would be piped from Lost Creek to water troughs adjacent to the junction of Forest Road 6000 and 6600. It is estimated that the pipe would be four inches in diameter, and a maximum of less than one cfs at one time can go down a pipe of this size. Therefore, there would be a decrease of four or more cfs being diverted from Lost Creek. In addition, the filling of these troughs would not be a continuous withdrawal. The troughs would be equipped with a float valve so that when full, they would no longer draw water.

Piping the water would be expected to improve aquatic habitat conditions in Lost Creek by increasing the volume of water entering the stream below the stream diversion (approximately four miles) by approximately four cfs during the summer months. The amount of water withdrawn would be expected to decrease from the current withdrawal of 14 to 18 percent of average summer flow, to less than three percent. This is an estimate as the rate of flow down the pipe along with the frequency that the troughs would need to be filled cannot be determined. Approximately 76 percent of the stream channel length of Lost Creek lies below the diversion dam, therefore 76 percent of the stream channel would receive more water discharge during the critical warm temperature/low flow time of year. Less water diverted would have a positive effect on the amount and quality of aquatic habitat in Lost Creek, and should lower water temperatures in lower Lost Creek during the low flow time of year. Cooler, higher water flow reduces trout susceptibility to disease, predation, and competition for space and food. Higher water volume would signify more quality habitat available for fish and other aquatic species. If it is found that the water temperatures in Lost Creek continue to not meet the state standards, and that the piping

of water from the stream is contributing to these high water temperatures, then the withdrawal of the water to fill the troughs would be discontinued.

Monitoring the use of the water troughs would also be done to determine the amount of cattle use and continued necessity of diverting water to the troughs. It has been observerd that cattle have not chosen to graze and obtain water along the ditch instead of Lost Creek itself due to the abundance of forage along lower Lost Creek. Since the entire lower Lost Creek would be fenced under this alternative, obtaining water from the traditional spots along the stream would no longer occur, making the water in the troughs more valuable.

The diversion dam would have a higher volume of water flowing over it by piping the water. If the dam is still considered to be a migration barrier the dam would be breached to allow for up and downstream migration of all species and ages of trout at all times of the year. Maintaining free migratory access is important as resident salmonids often make substantial movements within streams to reproduce (USDA 1985) and seek optimal habitat.

No nutrient or pathogen monitoring has been done in the Allotment, and it is unknown if levels meet state standards. No monitoring of these contaminants has been done because there are no known threats to domestic water uses. Decreases in coliform and other bacteria and nutrients from livestock waste would occur in the areas of Lost Creek and South Prairie Lake that would be excluded from livestock use from fencing.

Cumulative Effects

The hydrology and aquatic species effects from grazing within the Ice Caves Allotment are localized to the stream system where the effects are occurring. Of the streams with the most severe cattle grazing impacts, Lost Creek, Cave Creek, and South Prairie Lake tributaries, none of them have above surface flow into another stream or into the Little White Salmon or the White Salmon Rivers. The Lost Creek drainage, which includes its major tributary Dry Creek (West), flows subterranean into the Big Lava Bed. Cave Creek, which includes intermittent tributaries Coyote, Bear, Dry (East), and Lost Meadow Creek, flows into the Trout Lake valley where it is diverted into numerous irrigation ditches and eventually disappears before reaching the White Salmon River. The South Prairie Lake tributaries flow into South Prairie Lake, which drains into surrounding meadows and the Big Lava Bed during high flows. Because of this lack of connection of streams in the grazing Allotment with any other downstream water bodies, there should be no detectable hydrologic, water quality, or aquatic species effects from grazing at the 5th field watershed scale from the implementation of this Alternative.

Localized cumulative effects from diverting water from Lost Creek, along with streamside grazing, may be occurring at the 6th field watershed. Diverting approximately one cfs, or less, all summer long from Lost Creek may affect stream temperatures. However, the amount of temperature change from diverting this amount of water intermittently through a pipe may be negligible. The warm water temperatures in Lost Creek are likely due to a combination of conditions in the drainage. Aside from water withdrawal, influences on stream temperature include direct effects from solar radiation on the stream surface and ground water input. Warming from solar radiation has increased due to streamside logging which removed some of large tree shade component, as well as the future in-stream large wood source, from the riparian areas along portions of Lost Creek and Cave Creek. Continued grazing would contribute to preventing tree and shrub re-growth in portions of the riparian areas, in particular those which lie in past harvest units, resulting in increased water surface exposure to solar radiation. The current wide-shallow dimensions of the stream also increase solar radiation exposure on the stream surface, increasing stream temperatures. Grazing would likely contribute to maintaining the wide/shallow character of sections of Lost Creek and Cave Creek by restricting riparian vegetation re-growth.

Alternative C – No Grazing

Direct and Indirect Effects

If Alternative C is implemented and the grazing permit discontinued, there would be no future need to divert water from Lost Creek for grazing, its sole current use. The four miles (approximately 76% of the total stream length) of stream channel below the diversion would receive approximately 14 percent or more water volume than it currently receives during the summer. This increase in water volume in the main channel would be expected to decrease water temperatures and increase oxygen availability and the amount and diversity of habitat for aquatic organisms.

Approximately 76 percent of the stream channel length of Lost Creek lies below the diversion dam, therefore 76 percent of the stream channel would receive more water discharge during the critical warm temperature/low flow time of year. Less water diverted would have a positive effect on the amount and quality of aquatic habitat in Lost Creek, and should lower water temperatures in lower Lost Creek during the low flow time of year. Cooler, higher water flow reduces trout susceptibility to disease, predation, and competition for space and food. Higher water volume would signify more quality habitat available for fish and other aquatic species. More habitat area would decrease competition for food and individual territory. Higher water volume may create more deep pool habitat, increasing fish hiding cover and thermal retreat areas.

The migration barrier dam at the Lost Creek diversion intake would be modified if the dam is determined to be a barrier with the ditch closed. This would allow trout free up and downstream passage to seek optimal spawning and rearing habitat.

No nutrient or pathogen monitoring has been done in the Allotment, and it is unknown if levels meet state standards. No monitoring of these contaminants has been done because there are no known threats to domestic water uses. If the riparian areas within the Allotment are no longer grazed, pathogens, i.e. fecal coliform, and nutrients (nitrates and phosphates) from cow feces in streams would decrease.

Cumulative Effects

Elimination of the Lost Creek water withdrawal and streamside grazing should contribute to a decrease in water temperatures in the Allotment streams. If riparian vegetation grows to a height and density where stream shade is provided, stream temperatures and sediment would most likely continue to decrease while streamside stability would increase. Over time channel morphology should improve as riparian vegetation re-establishes and reduces the velocity and erosive energy during peak flows. Improved fish habitat could be expected as the streams narrow, deepen and stabilize, providing cooler water temperatures, increased cover from predators and decreased sediment input.

Wildlife

A terrestrial species Biological Evaluation was completed as part of this analysis and for consultation purposes. The Biological Evaluation is incorporated by reference and is located in the project record, located at the Mount Adams Ranger District. The analysis and conclusions of the Evaluation are summarized below.

Existing Condition

Historically, terrestrial wildlife habitat within the Ice Caves Allotment was considerably different than it is today. Timber harvest, fire suppression, human habitation on the east side of the Allotment and grazing have all played an important role in shaping the landscape of this area. Fire suppression, which started in the early 1900s, played a major role in converting much of the Allotment from relatively open stands of fire-resistant conifers to a landscape dominated by dense stands of less fire-resistant conifer species. These changes in the landscape over time have had a significant effect on the abundance and distribution of wildlife species as well as the distribution of range cattle.

Past timber harvest in the Allotment provided transitory livestock grazing as mature timber stands were harvested and created openings were frequently seeded with palatable grass species. Since the mid-1990s, timber harvest on the Forest has decreased and is unlikely to be a significant future disturbance factor in the Allotment area. There is a decrease in forage growth in previously harvested stands as replanted conifers grow.

The most frequently occurring grazing problem in the Allotment area has been over-utilization of meadows during season-long grazing. As timber harvest and associated grass seeding have been reduced in the Allotment area, grazing pressure has increased on the natural meadows and some created openings (Lost Meadow, South Prairie and Cave Creek Meadow). This increased use, combined with the lack of rotating grazing use within the Allotment, has affected the condition of the meadows.

Federally Listed Proposed, Threatened and Endangered Species

The Ice Caves Grazing Allotment Project Area contains potential habitat for one federally listed endangered species, the gray wolf (*Canis lupus*); and four federally listed Threatened species or Critical Habitat: grizzly bear (*Ursus arctos horriblis*), bald eagle (*Haliaeetus leucocephalus*), northern spotted owl (*Strix occidentalis carina*) and designated northern spotted owl Critical Habitat (CHU WA-41). The project area also contains a single Candidate species; Mardon skipper butterfly (*Polites mardon*).

Note: Candidate species are those which the U.S. Fish and Wildlife Service has enough scientific information to support proposing them for listing under the Endangered Species Act, but issuance of a proposed rule is currently precluded by higher priority listing actions.

Gray Wolf

The gray wolf is managed under the Northern Rocky Mountain Wolf Recovery Plan (USFWS 1987), which was approved by the U.S. Fish and Wildlife Service in August 1987. This plan identified three recovery areas: the Yellowstone ecosystem, northwest Montana, and central Idaho. There are no designated recovery areas in the State of Washington. Although areas outside the designated recovery areas are not specifically managed to provide wolf habitat, any individual wolves located outside these recovery areas are still protected.

Wolves have recently been reported in the vicinity of the Gifford Pinchot National Forest. A sighting that is considered as confirmed by the Washington Department of Fish and Wildlife was made in 1991. Unconfirmed sightings were made in 1992 and 1996. Several reports have been made on the Wind River District west of the analysis area, and on the Yakama Indian Reservation on the east side of Mount Adams. Surveys for wolves were conducted on the Gifford Pinchot National Forest during the summer of 2000. No wolf detections were made. Although few sightings on the Forest have been confirmed as wolves, it is assumed that single, transient animals moving within large land areas occupy the Mount Adams District.

Wolves are capable of utilizing a broad spectrum of habitats and vegetative conditions. When addressing wolf habitat needs, the Northern Rocky Mountain Wolf Recovery Plan focused on three key components of wolf habitat: (1) a sufficient year-round prey base of ungulates and alternate prey; (2) suitable and somewhat secluded denning and rendezvous sites; and (3) sufficient space with minimal exposure to humans. The following discussion of these key habitat components is based upon information contained in the recovery plan cited above.

(1) Ungulate Prey Base:

Within the northern Rocky Mountains, wolves are highly dependant on elk and deer as a year-round food source. On a biomass basis, ungulates comprise more than 90 percent of wolves' diets during the summer and fall. During winter, wolves in the Rocky Mountains prey almost exclusively upon deer, elk and moose.

See the discussion of elk and deer in the Management Indicator Species section.

(2) Denning and Rendezvous Sites and Minimal Exposure to Humans:

Denning sites in the northern Rocky Mountains are characteristically located on southerly aspects of moderately steep slopes in well-drained soils, usually within 400 yards of surface water and at an elevation overlooking surrounding low-lying areas. Some dens receive traditional use by a wolf pack from year to year, however specific areas may contain several den sites, which are used in different years by the pack. Most wolf packs are sensitive to human disturbance near den sites, and may abandon the den as a result of disturbance.

Rendezvous sites are specific resting and gathering areas occupied by wolf packs during summer and early fall after they have left the natal den site (late May to early July) until the pups are mature enough to travel with the adults (September to early October). These sites are usually complexes of meadows and adjacent hillside timber with nearby surface water. Bogs, abandoned and revegetated beaver ponds, and stream corridors are often used as rendezvous sites. The size of these areas can vary, but most are small (approximately one acre). The location of the rendezvous site will move during the summer as the pups grow. The first site is usually within one to six miles of the natal den, and successive sites are one to four miles distant from the previous site. As with den sites, rendezvous sites, especially the first one may receive traditional use year after year. Wolves appear less sensitive to human disturbance at later rendezvous sites than with the first one.

The degree of seclusion (exposure to humans) experienced by wolves within an area is directly related to the road and trail network with that area. From a management perspective, providing seclusion or minimizing human caused disturbances to wolves is best accomplished by minimizing motorized vehicle traffic within an area during the time that it is occupied by wolves. A road density of less than one mile per square mile is considered necessary for suitable wolf habitat (Thiel 1985; Jensen, et al. 1986; Mech 1988).

Although the analysis area contains habitat that appears suitable for den and rendezvous sites, the road density in the allotment is high. According to the Cave-Bear Creeks Watershed Analysis, the road density in the four sub-watersheds ranges from 2.8 to 4.8 miles per square mile, and averages 3.8 miles per square mile. Due to proximity to the Portland/Vancouver Metro area, the allotment receives a moderate amount of recreation use throughout the year. For these reasons, it is unlikely that wolves would utilize the area for denning and rendezvous sites. These high road densities reduce the quality of the habitat in general, to the point that wolves are unlikely to persist there.

Grizzly Bear

The U.S. Fish and Wildlife Service (FWS) has completed a recovery plan (USDI 1993), which identifies specific grizzly bear ecosystems. Recovery areas have been delineated within those ecosystems and are classified into Management Situations based on the needs of the bears and the capabilities of the areas to supply those needs. The Interagency Grizzly Bear Committee and recovery coordinators have agreed upon these recovery areas. Individual grizzly bears are protected, but are not specifically managed or encouraged outside existing recovery areas.

The grizzly bear recovery plan describes prime grizzly habitat as being diverse, providing a wide range of vegetation types producing a varied food supply. It also states that an interspersion of cover with open park feeding sites is important.

The effects to grizzly bears outside of recovery areas are related to the effects on secluded habitat, and effects on cover and forage quality. Effects to seclusion relates to increases in road or trail use of an area, which may increase the chance for human/bear interactions. The Recovery Plan states that studies have shown that grizzly bears avoid roads open to motorized use, and even roads that are closed to vehicles, but provide walk-in access to humans. No surveys specific to grizzly bears have been conducted on the Forest, however surveys conducted for gray wolf and lynx on the Forest could likely have detected grizzly bears if they were present.

As discussed in the gray wolf section, the analysis area receives moderate year-round use by people, and road densities in the watershed are high. For these reasons it is unlikely that grizzly bears utilize the habitat in the area.

Bald Eagle

The bald eagle is a Threatened species that could be found within the allotment. There is a known bald eagle nest site at Goose Lake, which is located just west of the allotment boundary. Since the boundary is not fenced, cattle occasionally graze near the shoreline of the lake. Eagles may also forage at Forlorn Lakes on the west side of the allotment, and roost in the vicinity of these lakes.

Northern Spotted Owl (Management Indicator Species)

There are six historic northern spotted owl pair activity centers and two resident single centers within the allotment. Three of the pair activity centers and one of the resident single centers are located in the Late-Successional Reserve (LSR) established by the Northwest Forest Plan. The remaining centers are within Matrix. Habitat suitability is expected to increase as previously harvested stands in the LSR mature. Spotted owls are highly associated with late-successional forest habitats, which are generally avoided by livestock.

Northern Spotted Owl Critical Habitat

Most of the allotment is within spotted owl Critical Habitat Unit WA-41. CHU WA-41 was designated with the expectation that the CHU would support at least 33 spotted owl pairs by providing essential nesting, roosting, foraging and dispersal habitat. The CHU was also designated to provide habitat connectivity between CHU WA-42 along the Yakama Nation lands to the east and CHU WA-40 and the Lewis River corridor to the west, and connectivity south to the Columbia River. Spotted owl surveys, completed in the 1980s to mid-1990s, located 31 spotted owl pairs and 12 single spotted owls within the CHU, and an additional 14 spotted owl activity centers within a 0.7-mile radius of the CHU boundary.

CHU WA-41 covers approximately 169,421 acres, all within the administrative boundary of the GPNF. Due to a history of intensive timber harvest in the area prior to its designation as critical

habitat, only about 52 percent of the CHU is currently suitable as spotted owl habitat. Analysis of the physiographic features within the CHU indicates that approximately seven percent (12,127 acres) of the CHU is naturally unsuitable in the form of water, lava beds, etc. Currently, about 43 percent of the area within the CHU is early-seral forest that has the potential to develop into suitable spotted owl habitat over the next 50 to 150 years.

In the 1994 FSEIS baseline assessment, CHU WA-41 was estimated to contain approximately 88,099 acres of suitable spotted owl habitat, which represents about 18 percent of the spotted owl habitat on the Forest. An additional 20,784 acres within the CHU provides dispersal habitat. Since 1994, FWS has authorized the removal or downgrading of 1,042 acres of suitable spotted owl habitat in the CHU, thus the current baseline for the CHU is 87,057 acres of suitable habitat.

Mardon Skipper Butterfly

Status

The Mardon skipper was petitioned for listing under the Endangered Species Act, as an endangered or threatened species, in December 2002 by the Xerces Society, Center for Biological Diversity, Gifford Pinchot Task Force, Northwest Environmental Defense Center, Northwest Ecosystem Alliance, Oregon Natural Resource Council and Friends of the San Juan.

The Mardon skipper is classified as a federal Candidate species on the 1999, 2001 and 2002 U.S. Fish and Wildlife Service candidate lists. The listing process for the Mardon skipper began prior to dropping of the C1 and C2 designations in 1989, when it was classified as a C2, and subsequently in 1991 and 1994, also as a C2 species.

Mardon skipper is ranked as “Endangered” in Washington State. The Washington Natural Heritage Program has given it a State Rank of S1 (critically imperiled). The Oregon Natural Heritage Program lists it as S2 (vulnerable to extirpation) with a “List 1” ranking indicating that this species is considered threatened with extinction throughout its entire range. This species is ranked G2G3 by the Natural Heritage network indicating that it is very rare and local throughout its range.

Mardon skipper surveys conducted on the Gifford Pinchot NF beginning in 2000 through 2005 have documented 36 occupied sites within the Forest boundary. A total of about 46 sites have been found in the southern Washington Cascades on all ownerships. Twenty-nine of the sites on the Forest are on the Mount Adams District and the other seven sites are on the Cowlitz Valley District. The majority of the known sites on the Forest are in the Gotchen area south of Mount Adams. These sites include both natural meadows and grassy conifer plantations. The number of Mardon skippers observed at these sites varies from one or two individuals to 50+ individuals. Most sites have had less than 15 individuals counted, and only seven sites on the Forest have had 50+ individuals counted during the past five years.

Surveys in the Ice Caves allotment have located Mardon skippers at six sites: Peterson Prairie North and West, Cave Creek, Lost Meadow, an old harvest unit along Lost Creek, and an old harvest unit at the junction of Forest Roads 66/66-130. These sites represent about 10 to 15 percent of the known Mardon skipper population in the Washington Cascades. The populations at Peterson Prairie and Cave Creek have been known of since the year 2000. The other three sites were found during surveys in 2003 and 2004. While South Prairie appears to be suitable for Mardon skippers, the annual flooding there undoubtedly renders it unsuitable. Surveys conducted there have not detected the species.

The Cave Creek population is largely protected from cattle grazing because of the exclosure, although adults have been counted in open areas outside of the exclosure as well. The Peterson

Prairie North and West populations are protected from cattle grazing except during the month of September when the meadows are used as a holding pen. The September use occurs at a time when larvae are likely actively feeding on grass, and direct mortality by cattle is likely. Both the Cave Creek site and the Petersen Prairie sites are three of only seven locations on the Forest that have had counts of over 50 Mardon skippers within the past five years, indicating these are significant sites for this species.

Decades of fire suppression have undoubtedly reduced the amount of suitable habitat in the Allotment. The habitat that remains is found at small natural meadows and created openings. The sites at Cave Creek, Lost Creek, and the junction of Forest Roads 66/66-130 are in created openings. Without active management, these old harvest units will eventually grow back in with conifers and eventually become unsuitable for Mardon skippers. Due to the elevated water table at Cave Creek, this could take a very long time.

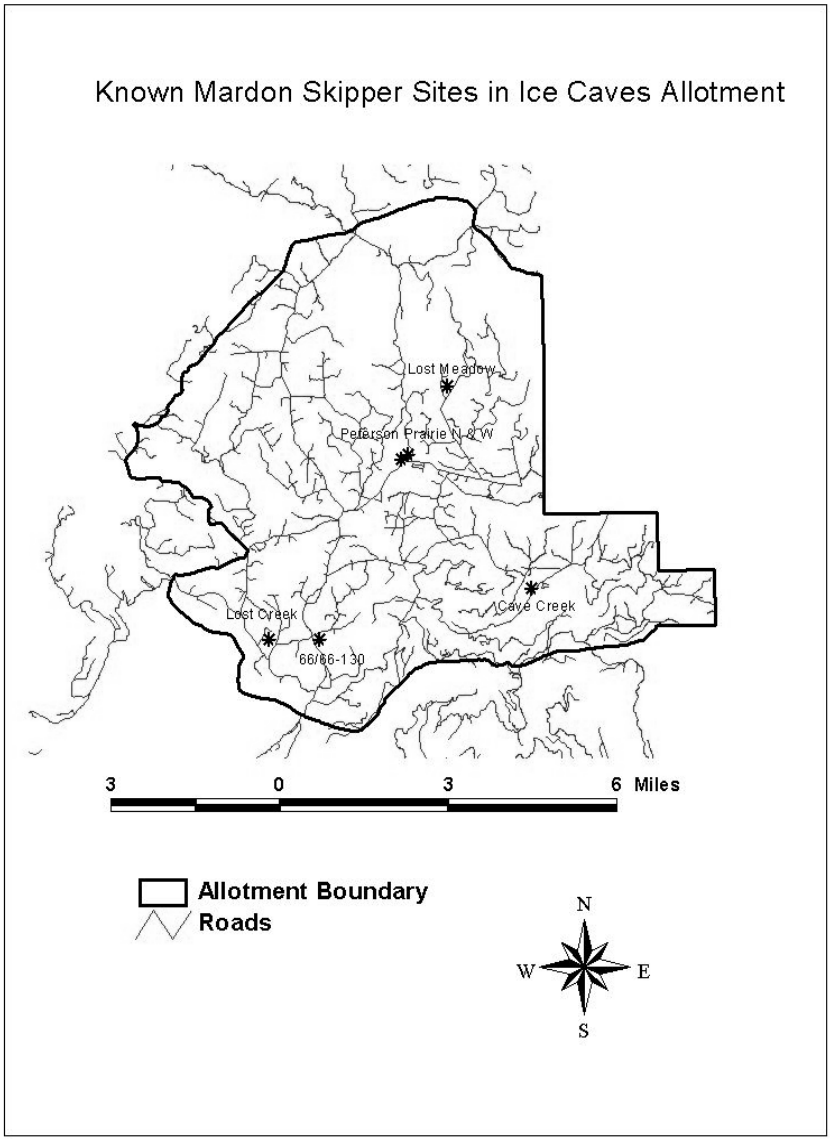

Figure 3-7. Known Mardon skipper sites in Ice Caves Allotment

Table 3-17. Mardon skipper Detections at Known Sites in Ice Caves Allotment since 2000.

	2000	2001	2002	2003	2004	2005
Peterson Prairie N	100	180	0	50+	0	23
Peterson Prairie W	20	49		2	1	8
Cave Creek	3–10 (Not a complete survey)	10 (Not a complete survey)	5+ (Not a complete survey)	2 (Not a complete survey)	79	71
Lost Meadow	Not Surveyed	Not Surveyed	Not Surveyed	16	15	15
FR 6600/ 6600-130	Not Surveyed	Not Surveyed	Not Surveyed	1	Not Surveyed	0
Lost Creek	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed	6	15

Biology

Mardon skippers complete their life cycle annually. In Washington, adults typically emerge between May and July for a month-long flight period, with individuals living between five days and two weeks. In large populations, the flight period may extend for over a month, while small populations may have adults present for only ten or fewer days. Emergence in the allotment seems to be mid-June to early July. The Mardon skipper does not migrate, and dispersal distance is unknown, but it is believed to be limited. After mating, females deposit their eggs into tufts of native bunchgrass (*Festuca* spp.). Eggs hatch after six or seven days, and larva feed on fescue grass for approximately three months. Pupae hibernate through winter, probably in a loose cocoon low in the grass, and emerge as adults.

In the southern Cascades, the Mardon skipper is found in open grassland sites within the Ponderosa pine savanna/woodland, at elevations ranging from 1900’ to 5600’. Sites vary in size from small one half acre or smaller meadows, to larger grassland complexes. Site conditions range from dry, open ridgetops to areas associated with wetland or riparian habitats with a dominant cover of fescues and pasture grasses. A variety of adult nectar sources, such as strawberry, violets, and vetch, is an important habitat component for meeting energy needs as well as water needs. The Mardon skipper appears to prefer short-statured native grasses (less than six inches) and avoids tall weedy species (Runquist pers.com.).

Historically, habitat for Mardon skippers was probably more widespread on the Mount Adams District than what exists today. Before fire suppression, open Ponderosa pine stands with a bunchgrass understory were more common, and probably provided well-connected habitat throughout the lower-elevation areas. Today, these stands have grown in with other conifers, and the isolated grassy meadows and some created openings comprise the remaining habitat. A mark-recapture study in the Siskiyous of southwestern Oregon documented movements by Mardon skippers of 0.25 mile, and up to a mile on one case, but over their lifetime there appears to be very little dispersal beyond their natal meadow (Runquist). During mark/recapture studies (Runquist), males were found to travel further than females, often along corridors such as powerlines and roads with nectar resources. Thus, dispersal may occur, though relatively slowly.

With the exception of the two Peterson Prairie sites, there is probably no to very little dispersal between the known occupied sites in the allotment.

Natural meadow habitat, mapped as "Dry Meadow/Shrub" in the Gifford Pinchot vegetation database, likely represents the remaining natural habitat for Mardon skipper. There are about 63 acres of this habitat type in the allotment, and about 46 acres of this is currently occupied by Mardon skippers. These sites likely represent the "source" populations that have dispersed to, and occupied transitional habitat as it became suitable after timber harvest.

The Mardon skipper evolved on the Mount Adams District with some level of grazing by elk and deer. However, the way that elk would have grazed these areas was likely much different that the current use by cattle (i.e. patchy, inconsistent utilization versus more uniform heavy utilization). In addition, having more widespread interconnected habitat historically meant that sites where butterflies were extirpated due to fire or other disturbance could be repopulated by nearby unaffected portions of the population.

Existing Condition of Sites in the Allotment

The occupied habitat at Lost Meadow, Lost Creek, and Cave Creek (outside of the exclosure) receives fairly heavy grazing use each summer. Based on ocular estimates, utilization of the grass species at Cave Creek and Lost Meadow was estimated to be more than 60 percent in 2003 and 2004. The Peterson Prairie site receives moderate grazing use by cattle in September, but it may be grazed by elk or deer anytime during the snow-free months.

Because each of these Mardon skipper populations are small and are probably isolated from each other, these populations are at increased risk of local extirpation due to stochastic events such as inclement weather or fire.

The number of adult Mardon skippers detected at many known sites in the south Cascades appears to have dropped since 2000, Peterson Prairie seems to be an example of this. This drop may be at least partially related to weather conditions. In 2003 and 2004 the winter snow pack melted off early, exposing the chrysalises to cold rain and freezing temperatures. This may have affected how many survived to emerge as adult butterflies (Potter pers.com.). These weather-related effects would be cumulative to other factors that suppress population numbers, and activities like cattle grazing may make it difficult for populations to rebound.

The Cave Creek exclosure receives minor sporadic cattle use, and little apparent use by deer or elk, and the number of adult Mardon skippers seen in and near the exclosure in 2004 was significantly higher than at the other known sites in the allotment. It may be that the ungrazed vegetation in the exclosure provided more protection from the weather for the chrysalises, and/or that less grazing pressure allowed the population to recover more quickly.

There is very little data available regarding the effects of different levels of grazing on Mardon skippers. It is not known if Mardon skippers can be maintained at a site if 30 percent or 40 percent of the current year's growth is removed. However, intuitively it is more likely that skippers can be maintained in areas with lighter grazing that with heavier grazing.

The fact that Mardon skippers still persist in the allotment despite decades of grazing use by sheep and then cattle indicates that they can withstand the impacts of grazing, at least for a period of time. However, the current low numbers of adults counted (except for Cave Creek) may indicate that they are barely holding on at these sites.

Region 6 Sensitive Species

The Ice Caves Grazing Allotment Project Area contains potential habitat for the Cascade torrent salamander (*Rhyacotriton cascadae*), Cope's giant salamander (*Dicampton copei*), Oregon spotted frog (*Rana pretiosa*), northwestern pond turtle (*Clemmys marmorata marmorata*), California wolverine (*Gulo gulo*), Pacific western big-eared bat (*Corynorhinus townsendii*), terrestrial mollusks, Larch Mountain salamander (Plethodon larselli), Van Dyke's salamander (*Plethodon vandykei*)and great gray owl (*Strix nebulosa*). These species are Forest Service Region 6 Sensitive Species and listed on the Regional Forester's Sensitive Species list.

Cascade Torrent Salamander and Cope's Giant Salamander

Cope's giant salamander is almost always neotenic with only four metamorphosed adults having ever been documented (Corkran, C.C, et al. 2006). Both species are found in small, steep-gradient, permanent streams with clear cold water. The streambed, composed of large gravel to small boulders with some large logs, has no silt. The streams in the Allotment are generally low gradient and have either silty bottoms or are eroded down to lava bedrock bottoms. Many smaller streams dry up during the summer and don't appear to be suitable habitat for these species.

Alternatives that protect stream banks from excessive grazing would result in better habitat conditions for amphibians. Alternatives may include reducing sedimentation or maintaining/improving width-to-depth ratios, vegetation cover and woody debris.

Oregon Spotted Frog

The Oregon spotted frog inhabits waters and associated vegetated shorelines of ponds, springs, marshes and slow-flowing streams. This frog appears to prefer waters with a bottom layer of dead and decaying vegetation and is found in aquatic sites in a variety of vegetation types, from grasslands to forests. Females are reported to lay egg masses in communal clusters at locations that may be used in successive years. Larvae have a diet of algae, plant material and other organic debris. Adults eat insects (ants, beetles, mosquito larvae, and grasshoppers), spider, mollusks, tadpoles, crayfish and slugs (McAllister, K.R., et al. 1997).

This species can be found in Trout Lake Marsh area about three miles east of the Allotment. Within the Allotment, the pond northeast of South Prairie, and the bog east of South Prairie, may be suitable habitat for this species. It is not known if they inhabit these ponds.

Northwestern Pond Turtle

This turtle inhabits marshes, sloughs, lakes, ponds, and slow-moving portions of creeks and rivers. They generally require emergent logs for basking sites and seem to be associated with sites providing underwater refuge, such as undercut banks, submerged boulders and roots. Pond turtles are found almost exclusively near water, but also use terrestrial habitats for nesting, over-wintering and dispersal. Dispersing individuals have been known to occasionally wander into and through the uplands away from the riparian corridors (Washington State 1993a).

Northwestern pond turtles occur in two areas in Washington: along the Columbia River from the vicinity of Vancouver in Clark County to an area near Lyle in Klickitat County; and in restricted areas near Puget Sound. The draft northwestern pond turtle conservation strategy (July 2000) only addresses the populations in Washington that are in the Puget Sound area and the Columbia Gorge.

There are no known populations in the Allotment, and the area is too far from known western pond turtle populations to expect that individuals could disperse there. However, the pond

northeast of South Prairie supports western painted turtles so it may also be suitable habitat for western pond turtles.

California Wolverine

Wolverines are similar to gray wolf and grizzly bear in that they are sensitive to disturbance by humans, have large home ranges and use a variety of habitats. Wolverines are especially sensitive to human disturbance near den sites, which are usually found in north-facing, high elevation boulder fields. The dens are often among the boulders and are accessed by tunnels dug through the snow. In general wolverine populations have been regulated to the last available habitat that has not been developed, extensively modified, or accessed by humans (such as roads and trails) (USDA 1994).

Two fairly reliable wolverine sightings were made in 1999 near Windy Ridge, just east of Mount St. Helens and about 27 miles northwest of the Allotment. These sightings were within about a month of each other and may have been the same animal. Surveys specific for wolverines have not been conducted on the Forest. A photo of a wolverine was captured at a camera bait survey station in 2006 on the Yakama Reservation east of Mount Adams. Mount Adams is about 12 miles northeast of the allotment. Surveys specific for wolverines have not been conducted on the Forest.

The slopes of Mount Adams (12 miles away) and areas to the north may be suitable denning habitat. Within the Allotment however, the high road density and amount of year-round human use most likely reduces the habitat quality. Due to the wide ranging nature of wolverines, it is possible that the Allotment could be within a wolverine's home range and that an animal could forage there, especially during the winter months when human use is reduced and elk and deer carcasses may be available to feed on.

Pacific Western Big-eared Bat

The Forest Plan (Amendment 11, p. 2-77) provides for managing important Pacific western big-eared bat habitat by protecting caves, mines, wooden bridges and abandoned buildings. These sites are important for roosting and for rearing young. Except for bridges, these structures may also be important as hibernacula.

There are many lava tubes in the Allotment, and many of these support this species. The lava tubes are used for hibernacula as well as day and night roosting.

Foraging usually occurs along forest edges and along the edges of streams and intermittent watercourses. These bats glean insects, including moths, beetles and caterpillars from trees in coniferous and deciduous woodlands. They will also pursue aerial prey (Howell, Donna J., et al.).

Survey and Manage Species

As part of the ongoing Survey and Manage lawsuit (Northwest Ecosystem Alliance, et al. v. Mark E. Rey, et al.), the Forest Service has been ordered by Judge Pechman to comply with the 2001 Survey and Manage Record of Decision (USDA and USDI 2004). This includes any amendments or modifications in effect as of March 21, 2004. As a result, project analysis must consider project impacts upon Survey and Manage species.

The objective of the Survey and Manage standards and guidelines are to help the Northwest Forest Plan provide for the persistence of late-successional and old-growth forest related species (USDA and USDI 2004, pg. 4).

Terrestrial Mollusks

There are a total of eight terrestrial Survey and Manage (Sensitive) mollusk species that are known or suspected to occur on the Gifford Pinchot National Forest. Of these, only Malone's jumping slug (*Hemphillia malonei*) has been found in the Allotment. A total of 23 sites in the Allotment for this species have been entered in the Survey and Manage database (ISMS). Approximately 800 sites for this species have been documented on the south half of the Forest. The Allotment also contains habitat that is suitable for warty jumping slug (*H. glandulosa*), which has been found elsewhere on the Mount Adams District. Neither of these species is closely associated with riparian habitat, although they can be found there and in moist upland sites.

Malone's jumping slug is most often found in moist forest stands more than 70 years of old with a tree canopy cover of 70-plus percent. The stands where it is found usually contain a relatively dense understory of shrubs and forbs, and large woody material. It is possible that many other slug sites exist in the unsurveyed areas within the Allotment.

None of the mollusk species identified in the Northwest Forest Plan as "protect from grazing" are documented or are suspected to occur on the GPNF.

Aquatic Mollusks

One aquatic mollusk species is suspected to occur on the Forest. Columbia duskysnail (*Lyogyrus* n.sp.1) inhabits cold, well-oxygenated perennial springs and spring outflows in shallow, slow-flowing areas.

Columbia duskysnail has a very sporadic distribution in the central and eastern Columbia Gorge. It is not likely to be found in the Allotment due to the distance from the Gorge and the very few perennial springs. One perennial spring in the Allotment – Lost Creek Spring – was checked for the presence of this species in 2004. No mollusks were seen, and there was no evidence that cattle graze near this spring.

Larch Mountain Salamander

This species is typically associated with steep wooded talus slopes that have large amounts of decaying plant material and little soil. However, they have also been found in late-seral forest in the western hemlock zone where there is no talus. In virtually all cases where this species is found in timber stands, the terrain is steep, a few very large Douglas-fir trees and snags were found, and the stands contain fairly abundant woody debris (Washington State 1993b).

Surveys for this species have been conducted in the Allotment in conjunction with the Goose Egg and Elf Timber Sales and Larch Mountain salamander was not found. Some talus areas within the Allotment may be suitable habitat, but cattle do not use these areas or other habitat where the species may be found. If there were undetected populations in the Allotment, they would not be affected by grazing.

Van Dyke's Salamander

Van Dyke's salamander is generally considered one of the most aquatic of the woodland salamanders. It is typically found in the splash zone of creeks or waterfalls under rocks or woody debris, or under woody debris and loose bark on logs near water. When not found near water, Van Dyke's salamanders are usually on north-facing slopes that have a thick cover of mosses, and often in association with Larch Mountain salamander (Leonard, et al. 1993).

Surveys for this species have been conducted in the Allotment in conjunction with the Goose Egg and Elf Timber Sales and it has not been found in the Allotment. Streams that might be affected

by grazing in the Allotment are low gradient and not likely to support their existence. Upland habitat for this species is not likely to be grazed by cattle since these areas are generally steep and do not support cattle forage.

Great Gray Owl

The literature shows that great gray owls utilize openings, such as meadows and timber harvest openings, for foraging areas and mature and late-successional habitats for nesting. Within the Northwest Forest Plan area, surveys have shown that 84 percent of the nest sites are adjacent to created openings. They forage preferentially on ground dwelling rodents such as voles and pocket gophers. Surveys for this species have not been done in the allotment, but historic surveys for spotted owls have not detected great gray owls (Quintana-Coyer, et al. 2004).

Key habitat characteristics include:

- Stick nests built by other raptors or ravens large enough to accommodate the owl, or large broken-top trees or snags.
- Nest sites near (within about 1,000 feet) a natural meadow or created openings.
- Mature or old-growth conifer forests, or forests with remnant older trees or snags.
- Nest stands that have at least 60 percent canopy closure with an open understory, a number of leaning trees and abundant dead and down material. (from Great Gray Owl Survey Protocols, 1995)

Many parts of the allotment appear to be suitable habitat for great gray owls. There are several natural meadows as well as numerous created openings that are adjacent to late-successional conifer stands. The natural meadows however, appear to lack the dense herbaceous vegetation and down wood that would be needed to support healthy rodent populations. This is partly due to heavy grazing use by cattle.

GPNF-LRMP Management Indicator Species

The Forest Plan (USDA 1990) documents seven forest wildlife species and one group as Management Indicator Species. Indicator species act as a barometer to signify the health of the habitat they represent. These species include black-tailed deer, Roosevelt elk, American marten, northern spotted owl, pileated woodpecker and all other woodpeckers, wood duck and goldeneye duck. (Northern spotted owl was discussed earlier).

Pileated Woodpecker, Other Cavity Excavating and Late-Successional Species

Several species of woodpeckers are known to reside within the Allotment. All nest in snags/dying trees and feed on a variety of insect species. Snag levels may be the best habitat indicator for woodpeckers and other cavity nesting species. Snags serve as an important component in fulfilling the life history requirements for many species of birds, bats and other species. They provide cavities for nesting and protection from inclement weather, foraging perches and insect food sources. The nest holes excavated by these woodpeckers serve as future nest sites for a variety of other animals.

Managing the Peterson Late-Successional Reserve and Riparian Reserves by following Standards and Guidelines in the Northwest Forest Plan should have a long-term positive impact on pileated woodpecker, other cavity excavating species, and species such as the northern spotted owl and marten. Grazing would not otherwise affect habitat (snags) for late-successional species.

Elk and Deer

The allotment supports elk and deer for most of the year. Elk cows and calves are in the allotment from early spring though late fall. Although the allotment is not in biological winter range, it is likely that a number of elk spend the winter there depending on snow accumulation. Black-tailed deer would be expected to use the area at the same times of the year as elk, however they are less likely to be there during periods of heavy snowfall as they are less able to move through deep snow.

The elk that use the area are part of the Mount St. Helens herd, and a final herd management plan was completed by the Washington Department of Fish and Wildlife (WDFW) in 2006. The overall goal for the herd is to decrease elk numbers from an estimated 12,500 in 1999 to 10,000. Past and current management strategy in Game Management Units 574 and portions of 578 (which overlap Ice Caves Allotment) is to suppress elk numbers for the potential benefits of black-tailed deer. The plan also has a goal however, of maintaining elk summer ranges, including protecting key habitats, and forage enhancement on public and private lands. The WDFW has also documented an apparent downward trend in deer numbers on the Forest. Biologists with the WDFW believe that poor quality forage on summer range areas is a key factor in declining elk and deer numbers. In many areas the animals are not going into the winter with enough fat reserves to survive until spring (Fred Dobler pers. com.). The WDFW estimates that there are roughly 250 elk in the allotment, which is equal to the agency's goal. The number of deer has been estimated to be 250 at most, but the agency's goal is to have roughly 500 deer in the area of the allotment.

The quality and quantity of herbaceous forage in meadows and grasslands throughout the Ice Caves Allotment has declined due to heavy livestock grazing, encroachment of shrubs and conifers, and invasion of non-native vegetation. Cattle and elk compete for the same forage resources in the areas that cattle graze within the allotment. These areas are generally in the meadows and low-gradient riparian areas.

Recent studies of the interactions between cattle, elk, and mule deer in northeastern Oregon show that there is competition for space as well as for forage (Coe et.al. 2004). When cattle are absent, elk and deer generally partition themselves into different parts of the landscape, elk on the flatter areas with higher production of grasses and forbs, and deer on the steeper slopes where they forage on forbs and shrubs. In this way, competition among the species is reduced. This scenario occurs on the allotment during the spring before the cattle are turned out into the allotment when elk and deer need to make rapid weight gain to make up for what was lost over the winter.

The northeastern Oregon study showed that when cattle are introduced in the early summer they often displace elk out of the more productive areas into the areas normally occupied by deer. Deer were less likely to be affected by the presence of cattle, and their movements seemed to be more a response to the presence of elk. As such, deer could in turn be displaced by the presence of elk. This scenario occurs on the allotment beginning in mid to late June.

The study showed that in late summer and fall the three ungulates are more commonly found on the same portions of the range, probably indicating increased competition for forage among the three species as resources are depleted. Being forced to forage on lower productive areas during the summer, and directly competing with cattle for forage in the late summer means that elk would likely enter the winter in poorer condition than if cattle were not present. Similarly, this cattle-induced movement of elk into lower productivity areas and food sources comes at the detriment of deer. Specifically, when the ecological generalist elk modify their habitat use and feeding habits in response to the presence of cattle, they in effect, then occupy the niche normally held by deer. In response to this competition, deer may either disperse into other areas that are likely already at carrying capacity for ungulates, or try to persist in the vicinity of the grazing

allotment in a compromised nutritional state. Poor nutrition affects deer individually as well as at the population level, resulting in reduced rates of recruitment, poor summer weight gain, reduced winter survival, reduced ability to escape predation, and greater susceptibility to disease.

Competition among the different ungulates for space, as well as the heavy grazing by cattle in the primary range areas have probably negatively impacted elk and deer in the allotment.

Wood Duck and Goldeneye Duck

Wood duck and goldeneye duck represent species requiring mature and old-growth deciduous riparian habitat and conifer riparian habitat respectively.

Wood duck nests are in tree cavities adjacent to, or up to one mile from water. Goldeneye duck nests are found in tree cavities usually within 100 feet of water, but can also be on the ground. Nest sites are usually located near relatively shallow lakes and ponds that have extensive beds of submerged aquatic and marsh vegetation. South Prairie pond and bog are suitable habitat for these species.

Neotropical Migratory Birds

Conservation strategies for land birds of the east slope of the Cascade Mountains in Oregon and Washington and a conservation strategy for land birds in coniferous forests in western Oregon and Washington were prepared in June 2000 and March 1999 respectively by Bob Altman of American Bird Conservancy for the Oregon-Washington Partners in Flight. The strategies are designed to achieve functioning ecosystems for land birds by addressing the habitat requirements of "focal species". By managing for a group of species representative of important components of a functioning ecosystem, it is assumed that many other species and elements of biodiversity will be maintained. The Ice Caves Allotment contains elements of both these physiographic regions.

The following table displays the focal species potentially positively or negatively affected changes in habitat in the eastern slope of the Cascade Mountains region, and the forest conditions and habitat attributes they represent.

Table 3-18. Focal Bird Species, Eastern Slope Cascades.

FOREST CONDITIONS	HABITAT ATTRIBUTE	FOCAL SPECIES
Ponderosa Pine	Old-forest, large patches	White-headed woodpecker
Ponderosa Pine	Large trees	Pygmy nuthatch
Ponderosa Pine	Open understory, regeneration	Chipping sparrow
Ponderosa Pine	Burned old-forest	Lewis' woodpecker
Mixed Conifer	Large trees	Brown creeper*
Mixed Conifer	Large snags	Williamson's sapsucker
Mixed Conifer	Grassy openings, dense thickets	Flammulated owl
Mixed Conifer	Multi-layered, structural diverse	Hermit thrush

Mixed Conifer	Fire edges and openings	Olive-sided flycatcher*
Oak-Pine Woodland	Early-seral, dense understory	Nashville warbler
Oak-Pine Woodland	Large oaks with cavities	Ash-throated flycatcher
Oak-Pine Woodland	Large pine trees/snags	Lewis' woodpecker
Lodgepole Pine	Mature/old-growth	Black-backed woodpecker
Whitebark pine	Mature/old-growth	Clark's nutcracker
Montane Meadows	Wet and dry	Sandhill crane
Aspen	Large trees/snags, regeneration	Red-naped sapsucker
Subalpine fir	Patchy presence	Blue grouse*

*Significantly declining population trends in the Cascade Mountains physiographic Region

The following table displays the focal species potentially positively or negatively affected changes in habitat in the west slope of the Cascade Mountains region, and the forest conditions and habitat attributes they represent.

Table 3-19. Focal Bird Species, Western Slope Cascades.

FOREST CONDITIONS	HABITAT ATTRIBUTE	FOCAL SPECIES
Old-growth	Large snags	Vaux's swift *
Old-growth/Mature	Large trees	Brown creeper *
Old-growth/Mature	Conifer cones	Red crossbill
Mature	Large snags	Pileated woodpecker
Mature	Mid-story tree layers	Varied thrush *
Mature/Young	Closed canopy	Hermit warbler
Mature/Young	Deciduous canopy trees	Pacific-slope flycatcher
Mature/Young	Open mid-story	Hammond's flycatcher
Mature/Young	Deciduous understory	Wilson's warbler
Mature/Young	Forest floor complexity	Winter wren
Young/Pole	Deciduous canopy trees	Black-throated gray warbler
Pole	Deciduous subcanopy/understory	Hutton's vireo
Early-seral	Residual canopy trees	Olive-sided flycatcher *
Early-seral	Snags	Western bluebird
Early-seral	Deciduous vegetation	Orange-crowned warbler

Early-seral	Nectar-producing plants	Rufous hummingbird *

* Significantly declining population trends in the Cascade Mountains physiographic areas.

Species that are most likely to be affected by cattle grazing are those that are found in early-seral habitats, especially those that nest on the ground or in deciduous shrubs, those that depend on deciduous trees such as aspen, and those that depend on nectar-producing plants.

The orange-crowned warbler is a foliage gleaning insectivore associated with dense deciduous shrubs. It nests on the ground under herbaceous vegetation, of near the ground in shrubs. Likely habitat in the allotment for this species and the others it represents would occur along creeks, old harvest units, and around the edges of meadows.

The rufous hummingbird is primarily associated with forest edges and openings with a diversity of flowering plants for feeding and open space for aerial displays of courtship behavior. They also require the presence of shrubs or small trees for nesting sites and presence of insects for feeding young and dispersing juveniles.

The red-naped sapsucker is associated with large dead and decaying trees in mature aspen and coniferous forest mixed with aspen. Nesting habitat is affected by lack of recruitment of young aspen due to grazing and fire suppression, and encroachment of conifer trees into aspen stands.

Species Dropped from Further Analysis

The following species are found in habitat that does not occur in the project area and would not be affected by any of the alternatives: Canada lynx because the allotment does not contain subalpine fir habitat (Canada lynx Conservation and Assessment Strategy 2000); Marbled murrelet because the allotment is too far from the Pacific Ocean (Ralph, et al. 1995); Peregrine falcon because the allotment does not contain cliff habitat (USDI 1982), Striped whipsnake or California Mountain kingsnake (Washington State. undated); Common loon because the allotment does not contain lakes suitable for loons (Richardson, et al. 2000), Ferruginous hawk (Richardson 2004), Green-tailed towhee because it occurs in pine-sagebrush communities; Western gray squirrel because there are no oak communities in the allotment (Washington State. 1993c) and Mountain goat because the allotment does not contain suitable steep rocky habitat (Dalrymple 1978).

Environmental Consequences

Table 3-18 provides a summary of effects to federally listed, USFS Sensitive and Survey and Manage animal species.

Table 3-20. Summary of Effects to Threatened, Endangered, Proposed, and Sensitive Wildlife Species

Species Name	Species Status	Species habitat present within or adjacent to the project area?	Species Documented in the project area?	Alt. A	Alt. B	Alt. C
Gray Wolf *Canis lupus*	Endangered	Potential	No	1*	1	1
Grizzly Bear *Ursus arctos*	Threatened	No	No	1	1	1
California Wolverine *Gulo gulo*	USFS Sensitive	Potential	No	1	1	1
Pacific Western Big-eared Bat *Corynorhinus townsendii*	USFS Sensitive	No	No	1	1	1
Bald Eagle *Haliaeetus leucocephalus*	Threatened	No	No	1	1	1
Northern Spotted Owl *Strix occidentalis caurina*	Threatened	Yes	No	1	1	1
Critical Habitat for the Northern Spotted Owl	Designated	No	No	1	1	1
Northwestern Pond Turtle *Clemmys marmorata marmorata*	USFS Sensitive	Yes	No	1	1	1
Oregon Spotted Frog *Rana pretiosa*	Candidate	Yes	No	1	1	1
Larch Mountain Salamander *Plethodon larselli*	USFS Sensitive	Yes	Yes	1	1	1
VanDyke's Salamander *Plethodon vandyke*i	USFS Sensitive	Yes	No	1	1	1
Cope's Giant Salamander/ *Dicampton copei*	USFS Sensitive	Yes	No	1	1	1
Cascade Torrent Salamander *Rhyacotriton cascadae*	USFS Sensitive	Yes	Yes	1	1	1
Mardon Skipper/ *Polites Mardon*	Candidate	Yes	Yes	3	3	1
Terrestrial Mollusks	USFS Sensitive,	Yes	Yes	3	3	1

Species Name	Species Status	Species habitat present within or adjacent to the project area?	Species Documented in the project area?	Alt. A	Alt. B	Alt. C
	Survey and Manage					
Aquatic Mollusks	USFS Sensitive, Survey and Manage	Yes	No	1	1	1

*1 – No effect/No impact

2 – Not likely to adversely affect

3 – May impact individuals or habitat but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

Federally Listed Proposed, Threatened and Endangered Species

Gray Wolf

Direct, Indirect and Cumulative Effects – All Alternatives

None of the alternative would affect denning or rendezvous sites, and would not affect seclusion opportunity in the allotment. The alternatives would have differing effects to the wolf's prey base, which are described in the elk and deer section under Management Indicator Species.

In summary: Alternatives A and B would likely maintain the current population numbers if utilization standards can be met, and Alternative C is likely to result in increased wild ungulate numbers.

Since wolves are not likely to inhabit the allotment due to the high road density, they are not likely to be affected by any of the alternatives. Since none of the alternatives would likely result in continued decline of wild ungulates in the allotment, they would have *no effect* to gray wolf. There would be no cumulative effects.

Grizzly Bear

Direct, Indirect and Cumulative Effects – All Alternatives

The North Cascades Grizzly Bear Recovery Area lies about 90 miles north of the analysis area. Therefore, proposed project activities will have no effect on established recovery objectives. There would be no cumulative effects. Due to the low likelihood of grizzly bears occurring in the allotment, continuation of livestock grazing is highly unlikely to affect them. Given this, there are minor differences among the alternatives as to the potential effects to habitat suitability in the allotment. Since a large part of the grizzly bear's diet is vegetarian, alternatives that result in less grazing use by cattle, leaving more ungrazed vegetation, would increase grizzly bear forage resources. For this reason, Alternative C (No Grazing) would have the greatest benefit, followed in order by Alternatives B and A.

All alternative have a utilization standard that, if reached each year, would improve the health of the forage resources. Given the utilization standard, there would be *no effect* to grizzly bears with each alternative. There would be no cumulative effects.

Bald Eagle

Direct, Indirect and Cumulative Effects – All Alternatives

None of the alternatives would result in effects to nesting foraging habitats. There would be *no effect* to the bald eagle. There would be no cumulative effects.

Northern Spotted Owl

Direct, Indirect and Cumulative Effects – All Alternatives

Since the types of habitat used by spotted owls for nesting and foraging are generally avoided by cattle because mature and old-growth conifer stands do not produce forage that is utilized by cattle, none of the alternatives would impact habitat for spotted owls. There would be *no effect* to spotted owls. There would be no cumulative effects.

Mardon Skipper Butterfly

The analysis of effects for the three alternatives assumes that the utilization standards described in the alternative descriptions would not be exceeded. This would require regular monitoring during grazing season, and close communication and cooperation with the permittee. If the utilization standards are not met in most years, it is unlikely that Mardon skippers will persist in the Allotment in the long-term, except where the population is protected by exclosure fencing.

Alternative A - Limited Change to Current Management

Direct and Indirect Effects

Livestock grazing may cause adverse impacts to the Mardon skipper butterfly by: (1) trampling eggs, larvae, pupae and adults, and (2) eating larvae and adult food sources. Excessive grazing would reduce the native species important to the butterfly in these meadows and increase weedy species not used by the butterfly.

With this alternative, the Mardon skipper sites in the natural meadow portion of Lost Meadow at Lost Creek, and at the junction of Forest Roads 6600 and 6600130 would be fenced so that cattle grazing would then be controlled at at least part of all of the six sites in the Allotment. At none of these sites would all of the occupied habitat be protected. Mardon skippers are likely to persist in the Allotment in the long-term at four of the six controlled sites, including Cave Creek, Lost Meadow, 66/66-130, Forest Roads 6600 and 6600-130 junction, and Lost Creek.

Although it is currently fenced, grazing would be allowed at two Peterson Prairie meadows when the cattle are being gathered. Due to utilization standards for the Allotment, the gathering could happen earlier in the summer if the utilization limits are met and cattle are required to be removed. In this case, Peterson Prairie may be used earlier in the summer than under the current system. In either case, grazing utilization at Peterson Prairie would be limited to 30 percent.

Enforcement of the utilization standard would gradually improve habitat conditions for Mardon skippers inside the exclosure. This level of utilization occurring in the fall would improve the vigor of perennial grasses because light to moderate grazing would occur generally after the grass

has set seed. However, concentration of cattle within the exclosure, even for a relatively short time, likely increases the risk of trampling and consumption of Mardon skipper larvae. With continued current use of Peterson Prairie, there is a risk of eventually extirpating Mardon skippers at the site. Since the skippers at Peterson Prairie have withstood previous decades of excessive grazing at the site (and there were high numbers as recently as 2001), and since the vegetation condition should improve given 30 percent utilization, the risk of extirpation is most likely low.

Usually when an area is grazed to the 30 percent level, utilization tends to be patchy with portions that are grazed heavily and others hardly touched at all. At 40 percent, use pattern tends to be slightly more uniform, and the fescue grasses tend to be more heavily grazed. As stated above, it is uncertain that Mardon skippers can be maintained in the long-term given a 30 percent or 40 percent utilization standard, but it would be a significant improvement over the current condition. At this level of utilization, the vigor of the grass and forb species in the unprotected skipper sites should be improved. In addition, there would be more plant residue left over the winter, helping to protect chrysalises in the event of early snowmelt. Mechanical effects such as trampling and consumption of eggs and larvae by cattle would likely be a bigger threat than loss of forage for the larvae and adults.

If these standards can be maintained in the Allotment, Mardon skipper populations may be able to persist in meadow areas such as Peterson Prairie where there is a 30 percent standard, but would be affected more in the transitional range areas where there is a 40 percent standard. Only a small portion of the Mardon skipper population in the Allotment would be found in the unprotected transitional range sites. For this reason, it is expected that Mardon skippers would persist in the Allotment in the long-term.

Cumulative Effects

The effects of grazing for southern Cascade Mardon skipper population in the Allotment would be cumulative to grazing effects to sites in the Mount Adams Allotment south of Mount Adams. The degree of effect to the sites in the Mount Adams Allotment is not known, but it is likely that sites located in flat meadows are also receiving heavy grazing pressure. Livestock do not graze the seven sites on the Cowlitz Valley District.

Populations within the Ice Caves Allotment represent the western-most populations in the southern Cascades. They also represent a significant portion of the species range in the Washington Cascades. These sites are sufficiently isolated from other Mardon skipper populations that recolonization of the habitat is not likely if a local population is extirpated. However, since other sites in the Mount Adams Allotment are also subject to grazing, the number of secure sites on the Forest is unknown.

Given the number of known Mardon skipper sites in the southern Washington Cascades, the potential extirpation of Mardon skippers at two sites on transitional range in the Allotment would represent a loss of an insignificant portion of the known Mardon skipper population in the southern Washington Cascades. Long-term, the three sites that are in created openings will eventually become unsuitable for Mardon skippers as conifers take over the sites. Implementing this alternative *would impact individuals, but would not contribute to a trend towards federal listing, and is not likely to jeopardize the continued existence of the species.*

Alternative B - Drift Fence- Adaptive Management

Direct and Indirect Effects

This alternative would protect the Lost Creek and the Forest Roads 6600/6600-130 junction sites behind the drift fence, and grazing would be discontinued at the Peterson Prairie meadows. The

exclosure would be maintained at the Cave Creek site so that grazing would be controlled at five of the six sites, including all significant sites on the Allotment. The Cave Creek and Peterson Prairie sites have supported significant numbers of adult skippers in recent history, indicating they may be the most important sites in the Allotment as well as important in the southern Washington Cascades.

With this alternative, one site where a total of 15 or fewer adults have been counted in previous surveys would be subject to cattle grazing. As stated above, it is uncertain that Mardon skippers can be maintained in the long-term given a 30 percent or 40 percent utilization standard, but it would be a significant improvement over the current condition. At this level of utilization, the vigor of the grass and forb species in unprotected skipper site should be improved. In addition, there would be more plant residue left over the winter, helping to protect chrysalises in the event of early snowmelt. Mechanical effects such as trampling and consumption of eggs and larvae by cattle would likely be a bigger threat than loss of forage for the larvae and adults.

Since the important Mardon skipper sites in the Allotment would be protected and grazing utilization would be limited to 30 and 40 percent at the other sites (an improvement over the current condition), it is expected that Mardon skippers would persist in the Allotment in the long-term.

Cumulative Effects

The effects of grazing in this Allotment to the southern Cascade Mardon skipper population would be cumulative to grazing effects to sites in the Mount Adams Allotment south of Mount Adams. Livestock does not graze the six sites on the Cowlitz Valley District. The degree of effect to all sites in the Mount Adams Allotment is not known, but sites located in flat meadows such as Gotchen Meadow are also receiving heavy grazing pressure.

With enforcement of the utilization standards there would be less chance that Mardon skippers would be extirpated at unprotected sites in the Allotment. However, since there is little information about the effects of different levels of grazing, the long-term persistence of skippers at the unprotected site is not assured. The one site still subject to grazing comprise a minor portion of the southern Cascades population, and neither site has supported significant numbers of adults in recent surveys. In the long-term, the three sites that are in created openings will eventually become unsuitable for Mardon skippers as conifers take over the sites. Implementing this alternative *would impact individuals, but would not contribute to a trend towards federal listing, and is not likely to jeopardize the continued existence of the species.*

Alternative C - No Grazing

With this alternative, all cattle grazing would be discontinued and existing fences would be removed. The six Mardon skipper sites in the Allotment would no longer be impacted by cattle grazing. The vigor of the native grass and forb species would increase providing more forage and cover for larvae and adults. The chrysalises would likely be better able to survive in the event of early snowmelt.

A potential negative effect of total removal of cattle would be the potential accumulation of excessive dead plant material because cattle would not remove vegetation. In this case, its value as forage for skipper larvae would decline, and some of the flowering forbs may be shaded out. The sites would still be grazed by elk and deer, and in the absence of cattle, it is likely that elk will make more use of the meadows than they do now. Therefore, it is difficult to predict what the net effect would be.

Cumulative Effects

All known Mardon skipper sites in the Allotment would likely persist with this alternative. However, in the long-term, the three sites that are in created openings would eventually become unsuitable for Mardon skippers as conifers take over.

This alternative would have *no effect* on Mardon skippers, and the result of implementing this alternative would likely be beneficial to the species.

Region 6 Sensitive Species and Forest Plan

Cascade Torrent Salamander and Cope's Giant Salamander

Alternative A - Limited Change to Current Management

Direct and Indirect Effects

This alternative would require that the permittee allow no more than 30 percent average utilization in riparian areas, and riparian areas with unstable banks along Lost Creek would be protected within a cattle exclosure. If the utilization standard were reached annually, there would be gradual improvement in the vegetation condition in riparian areas. The stream banks would gradually become more stable with less sedimentation.

Water would continue to be diverted from Lost Creek into the ditch, reducing amphibian habitat quality in Lost Creek during summer months.

Cumulative Effects

The effects to amphibian habitat would be cumulative to other activities in the Allotment such as road construction and timber harvest that have heavily impacted the Allotment in the past. However, under provisions of the Northwest Forest Plan, these types of impacts to streamside habitat are expected to be minimal in the future. Since streams in the Allotment are unlikely to support populations of Cope's giant salamander or Cascade torrent salamander, there would be *no impacts* and no cumulative impacts to these species.

Alternative B - Drift Fence- Adaptive Management

Direct and Indirect Effects

The effects of this alternative would be similar to Alternative A. The Lost Creek riparian area would be protected behind the drift fence instead of within an exclosure.

Cumulative Effects

The effects to amphibian habitat would be cumulative to other activities in the Allotment such as road construction and timber harvest that have heavily impacted the Allotment in the past. However, under provisions of the Northwest Forest Plan, these types of impacts to streamside habitat are expected to be minimal in the future. Since streams in the Allotment are unlikely to support populations of Cope's giant salamander or Cascade torrent salamander, there would be *no impacts* and no cumulative impacts to these species.

Alternative C - No Grazing

Direct and Indirect Effects

With this alternative, amphibian habitat in streams would recover more quickly than in Alternatives A and B. Even though elk and deer would still graze the Allotment, there would be much more plant material left each year to help stabilize stream banks.

The water diversion from Lost Creek would be discontinued.

Cumulative Effects

There would be *no impacts* to these species and no cumulative effects.

Oregon Spotted Frog

Direct, Indirect and Cumulative Effects – All Alternatives

Past livestock grazing in the Allotment has had little impact to frog habitat near the two ponds. The pond margins are generally too wet to allow cattle to graze up to the water's edge. If the 30 percent riparian standard can be maintained throughout the Allotment, none of the alternatives would affect habitat for spotted frogs. There would be *no impacts* to spotted frogs and no cumulative impacts.

Northwestern Pond Turtle

Direct, Indirect and Cumulative Effects – All Alternatives

Past livestock grazing in the Allotment has had little impact to turtle habitat near the pond. The pond margin is generally too wet and boggy to allow cattle to graze up to the water's edge. If the 30 percent riparian standard can be maintained throughout the Allotment, none of the alternatives would affect habitat for western pond turtles. There would be *no effects/impacts* to this species and no cumulative impacts.

California Wolverine

Direct, Indirect and Cumulative Effects – All Alternatives

None of the alternatives would affect seclusion opportunity in the Allotment. The alternatives would have differing effects to the wolverine's prey base, which are described in the elk and deer section under Management Indicator Species.

In summary: Alternatives A and B would likely maintain the current population numbers if utilization standards can be met. Alternative C is likely to result in increased wild ungulate numbers.

Since wolverines are not likely to inhabit the Allotment, they are not likely to be affected by any of the alternatives. There would be *no impacts* to wolverine and no cumulative impacts.

Pacific Western Big-eared Bat

Direct, Indirect and Cumulative Effects – All Alternatives

None of the alternatives would affect roosting, maternity, or hibernating habitat for Pacific western big-eared bat (caves), and continued grazing at proper utilization levels would not reduce the bats' prey base (moths). There would be *no impacts* to this species and no cumulative effects.

Terrestrial Mollusks

Direct, Indirect and Cumulative Effects – All Alternatives

In general, cattle do not graze in habitat that is likely to support Survey and Manage mollusk species (relatively dense conifer stands). The exception may be along forested streams where cattle trail between open grazing sites. Impacts in these areas would include trampling and loss of herbaceous vegetation. The area along stream channels that may be impacted by cattle comprises a small percentage of suitable habitat in the Allotment so the potential to impact populations of these species in the Allotment in minor.

Alternatives C, which terminates livestock grazing in the Allotment, would have a beneficial impact to terrestrial mollusks. Alternatives A and B *may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.* The potential impacts with Alternatives A and B would be cumulative to the habitat loss that has occurred from timber harvest and road construction. However, contributions of these alternatives to cumulative effects are negligible.

Aquatic Mollusks

Direct, Indirect and Cumulative Effects- All Alternatives

Since this species is not likely to occur in the Allotment, and since the spring that appears to be suitable habitat has not been affected by livestock grazing and would likely remain that way with reduced grazing pressure, there would be *no impacts* with implementation of any alternative and no cumulative effects.

Larch Mountain Salamander

Direct, Indirect and Cumulative Effects – All Alternatives

If this species occurs in the Allotment, it is using habitat (talus slopes) that is not occupied by cattle or affected by livestock grazing since there is no forage. For this reason, there would be *no impacts* with implementation of any alternative and no cumulative effects.

Van Dyke's Salamander

Direct, Indirect and Cumulative Effects- All Alternatives

If this species occurs in the Allotment, it is using habitat that is not affected by livestock grazing since thee is no forage. For this reason there would be *no impacts* with implementation of any alternatives and no cumulative effects.

Great Gray Owl

Direct, Indirect and Cumulative Effects- All Alternatives

Livestock grazing would not affect great gray owl nesting habitat. However, excessive grazing could impact foraging habitat because it would likely result in lower numbers of rodents found in meadows and created openings.

The 30 percent utilization standard in meadows and 40 percent utilization standard in upland areas would likely be sufficient to maintain healthy rodent populations. A light to moderate level of grazing would maintain herbaceous species in good condition while keeping the plants from becoming "wolfy" (overgrown with a high percentage of old dead vegetation).

Given that great gray owls have not been documented on the Forest, and that the utilization standards are likely to maintain or improve habitat for prey base populations, there would be *no impact* with implementation of any alternative. There would be no cumulative impacts.

GPNF-LRMP Management Indicator Species

Pileated Woodpecker, Other Cavity Excavating and Late-Successional Species

Direct, Indirect and Cumulative Effects

Livestock grazing does not impact snag habitat or large woody debris. There would be *no impacts* to any of these species with implementation of any alternative. There would be no cumulative impacts.

Elk and Deer

Alternative A - Limited Change to Current Management

Direct and Indirect Effects

Under Alternative A, about 450 acres of meadows that could be grazed by elk would be excluded from livestock grazing. This may allow elk to make use of the forage in the large exclosures (South Prairie) when cattle are present in the Allotment. In addition, enforcing the utilization standard would reserve more forage for wild ungulates in primary range areas for increased use by elk in late summer. To meet the utilization standard, it may be necessary to reduce the number of livestock and/or remove them from the Allotment sooner. If the utilization standard is met by removing the cattle from the allotment sooner than normal, elk and deer may benefit because a significant portion of the year's forage production would remain. Also, early removal would reduce direct competition for forage and space between cattle and wild ungulates in the late summer when elk and deer need to gain weight prior to winter.

Implementation of the utilization standards will likely improve the vigor of forage plants, allowing native forage species to better compete with non-native plants. The native species will most likely be able to set seed, but since there would be no rest period built into the grazing system, it is not certain that new seedlings could be established. However, less grazing pressure makes it more likely that seedlings could establish than under the current system.

An assumption was made in the analysis that the fences built to restrict cattle would be designed to allow movement by elk and deer. There are designs that have been tested, which include a prescribed wire spacing and a smooth top wire, that are known to not be barriers to these animals. Even so, there is a slight possibility that individual animals could become tangled in the fence while trying to jump over it (Thomas, et al. 1982, Wallmo 1981). There could be a minor increase

in elk and deer mortality as a result. This increase in mortality in expected to be very minor, and would not appreciably affect the population as a whole.

This Alternative would almost certainly maintain existing numbers of elk and deer in the Allotment. In the absence of significant disturbance to create more open grazing areas however, as transitory range is lost to conifer succession, the number of elk and deer in the Allotment would likely decline over time.

Cumulative Effects

The reduction in forage available for wild ungulates on the Gifford Pinchot National Forest from permitting cattle grazing in the Ice Caves Allotment would be cumulative to a potential reduction in forage from permitted grazing on the Mount Adams Allotment and to the gradual decline in forage production forest wide from a reduction in timber harvest over the last 20 years. If the utilization standard were not met with this Alternative, it would likely contribute to a gradual decline in elk and deer numbers on the Mount Adams District.

If utilization standards can be met by reducing the number of cattle and/or shortening the season, it is possible that this alternative would not contribute to the reduction in forage and may help to maintain wild ungulate populations.

Alternative B - Drift Fence- Adaptive Management

Direct and Indirect Effects

Under Alternative B, important grazing areas for elk would be excluded from cattle grazing. In addition, the utilization standard would be enforced on the remainder of the Allotment.

Enforcing the utilization standard would reserve more forage for wild ungulates in primary range areas for increased use by elk in late summer. In order to meet the utilization standard, it may be necessary to reduce the number of livestock and/or remove them from the Allotment sooner. If the grazing season is shortened by taking cattle off the Allotment about a month earlier than normal, elk and deer may benefit because a significant portion of the year's forage production would remain. Early removal would also reduce direct competition for forage and space between cattle and wild ungulates when elk and deer need to gain weight prior to winter.

Implementation of the utilization standard would likely improve the vigor of forage plants, allowing native forage species to better compete with non-native plants. The native species will most likely be able to set seed, but since there would be no rest period built into the grazing system, it is not certain that new seedlings could be established. However, less grazing pressure makes it more likely that seedlings could establish than under the current system.

An assumption was made in the analysis that the fences built to restrict cattle would be designed to allow movement by elk and deer. There are designs that have been tested, which include a prescribed wire spacing and a smooth top wire, that are known to not be barriers to these animals. Even so, there is a slight possibility that individual animals could become tangled in the fence while trying to jump over it. There could be a minor increase in elk and deer mortality as a result. This increase in mortality in expected to be very minor, and would not appreciably affect the population as a whole.

This Alternative would probably maintain existing numbers of elk and deer in the Allotment. In the absence of significant disturbance to create more open grazing areas however, as transitory range is lost to conifer succession, the number of elk and deer in the Allotment would likely decline over time.

Cumulative Effects

The reduction in forage available for wild ungulates on the Gifford Pinchot National Forest from permitting cattle grazing in the Ice Caves Allotment would be cumulative to a potential reduction in forage from permitted grazing on the Mount Adams Allotment and to the gradual decline in forage production forest wide from a reduction in timber harvest over the last 20 years. If the utilization standard were not met with this Alternative, it would likely contribute to a gradual decline in elk and deer numbers on the Mount Adams District.

If utilization standards can be met by reducing the number of cattle and/or shortening the season, it is possible that this alternative would not contribute to the reduction in forage and may help to maintain wild ungulate populations.

Alternative C - No Grazing

Direct and Indirect Effects

With this alternative cattle would be permanently removed from the Allotment. Approximately 700 AUMs that would have been allocated to cattle would be available for wild ungulates each year. Elk and deer would not be displaced from their preferred grazing areas due to the presence of cattle. The quality and quantity of forage plants should increase as the native plants are allowed to set seed each year, and the seedlings are allowed to establish. The number of non-native species should decline. This alternative would likely allow the numbers of elk and deer in the Allotment to increase. In the absence of significant disturbance to create more open grazing areas however, as transitory range is lost to conifer succession, the number of elk and deer in the Allotment would likely stabilize and then decline over time.

Cumulative Effects

Since this alternative is likely to benefit wild ungulates and result in increased numbers in the area, there would be no cumulative effects.

Wood Duck and Goldeneye Duck

Direct, Indirect and Cumulative Effects

Livestock grazing in the Allotment has not affected habitat for these waterfowl. The greatest potential for impacts would be with excessive grazing near pond margins that would remove cover for nesting females and ducklings as they make their way from the nest site to the water. The ponds margins are generally too wet for cattle to graze them, so past impacts to vegetation cover near the ponds have been minor. Continuation of grazing under any of the alternatives, or elimination of grazing, would not impact these species.

Neotropical Migratory Birds

Alternatives A & B

Direct and Indirect Effects

Each of the action alternatives would improve habitat for the birds that are associated with early-seral habitat. Both alternatives include fencing that would protect important meadow and riparian habitat from cattle grazing. Both alternatives would protect existing aspen and cottonwood stands at South Prairie, and the small aspen stand in Peterson Prairie would be maintained. In addition,

both alternatives include utilization standards that would reduce the level of grazing from what it has been historically. Enforcing the utilization standards would result in improved vigor and cover of herbaceous plants, and reduced use of woody species. The aspen stands would still be subject to browsing by elk and deer, but overall grazing use of aspen regeneration will likely be reduced.

Cumulative Effects

Since implementation of either of the action alternatives would result in long-term improved habitat for these bird species over the current condition, there would be no cumulative effects.

Alternative C - No Grazing

Direct and Indirect Effects

Eliminating grazing in the allotment would benefit early-seral bird species that nest on the ground or in shrubs, species that require nectar-producing plants, and bird species that are associated with mature deciduous trees. The cover and vigor of herbaceous vegetation would increase fairly quickly. Aspen trees would still be subject to browsing by elk and deer, but overall grazing use of aspen regeneration will be much reduced.

Cumulative Effects

There would be no cumulative effects.

Botany

A more detailed botanical resource report was completed for this analysis. It is located in the project record, located at Mount Adams Ranger District. The analysis and conclusions of the evaluation are summarized below.

Existing Condition

Federally Threatened, Endangered, Proposed, and Sensitive Botanical Species

There are no Federally Threatened, Endangered, and Proposed known to occur on the Gifford Pinchot National Forest, or in the Ice Caves Grazing Allotment. Water Howellia (*Howellia aquatilis*), a federally Threatened species, is suspected to occur on the Gifford Pinchot National Forest. Despite surveys performed in suitable habitat, water Howellia has not been found in the Allotment. Therefore, this project will have no effect on water Howellia.

Forest Service Region 6 Sensitive Species

The Ice Caves Grazing Allotment contains occurrences and suitable habitat for pale blue-eyed grass (*Sisyrinchium sarmentosum*) and golden chinquapin (*Chrysolepis chrysophylla*), as well as rosy owl clover (*Orthocarpus bracteosus*), which is not currently listed as Sensitive. Since it will likely be included with the next list revision, it is discussed below.

Potential habitat exists for additional Sensitive species within the Allotment. Surveys were conducted within the Allotment in habitat potentially impacted by grazing; no occurrences of these species were found. For many of these species, potential habitat located within the Allotment is not substantially impacted by livestock. These species are not discussed further in

the EA. A complete list of Sensitive species with potential habitat within the Allotment is documented in the Mount Adams District files.

Pale blue-eyed grass

Species Rank

Pale blue-eyed grass is a Forest Service Region 6 Sensitive Species, and a Bureau of Land Management Bureau Sensitive Species in both Oregon and Washington (Interagency Special Status Species Program 2005). NatureServe ranks pale blue-eyed grass as "threatened" in Washington State, with a rank of S2, and "endangered" in Oregon, with a rank of S1 (critically imperiled within the state), where it is considered "a candidate for listing" (NatureServe 2005). The species is globally ranked by NatureServe (2005) as G1G2, which indicates that the species is considered globally imperiled.

Pale blue-eye grass is a United States Fish and Wildlife Service (USFWS) Species of Concern, and was previously ranked as a candidate for listing under the Endangered Species Act (Federal Register Vol. 55, No. 35, February 21, 1990) until "candidate 2" species were converted to Species of Concern. This new rank was also published in the Federal Register.

Habitat

S. sarmentosum grows best in seasonally wet open meadow or meadow-like environments. Greene (1895) describes the species habitat as "the edges of meadows at 2,000–3,000 ft." The Center for Plant Conservation (2005) reports the habitat as slightly raised (and therefore slightly drier) sections of open, wet meadows in forest openings, primarily in the Pacific Silver Fir and Grand Fir zones.

Based on the most current Natural Heritage Program data from Oregon (ORNHIC 2005) and Washington (WNHP 2005), the lowest elevation pale blue-eyed population found in Oregon is 2,040 feet and 1,600 feet[5] in Washington. The highest is 4,600 feet in Oregon and 3,920 feet[6] in Washington.

On Gifford Pinchot National Forest, pale blue-eyed grass has been found growing among grasses, sedges and other forbs. These include *Deschampsia caespitosa*, *Carex* spp., *Fragaria* sp. and *Achillea millefolium*, and shrubs such as *Spiraea douglasii* and *Salix* sp. Microhabitats vary; the species has been found growing on the gravelly bottom of an ephemeral stream channel in a fairly open, cut forest (old clear-cut.) Along the same stream channel, pale blue-eyed grass grows in shallow depressions some feet away from the channel, among *Spiraea* shrubs that cast shade upon the plants. Concentrations of individuals often appear to occur along meadow edges at South Prairie and Peterson Prairie, Gifford Pinchot National Forest, Clackamas Meadow and Mount Hood National Forest. More atypical habitats where this species has been found on

[5] Does not include the Bergen Road Population (see botanical Biological Evaluation for more information), which is suspected to be a misidentification or population with primarily hybridized individuals. This population needs to be re-examined (Raven pers. comm. 2006).

[6] Does not include the Pine Tree Springs/Aiken Lava Bed population, which is suspected to be a misidentification of *Juncus ensifolius* (J. Scott pers. comm. 2005). . . . .

Gifford Pinchot National Forest include boggier sites where it grows among *Veratrum, Dodecatheon, Camassia* and *Lycopodium* (Raven 2003a).

Pale blue-eyed grass distribution: range-wide and on Gifford Pinchot National Forest

Pale blue-eyed grass is a narrow endemic that grows in south central Washington (Skamania and Klickitat counties) and north central Oregon. The majority of populations and individuals occur on national forest lands on Gifford Pinchot and the Mount Hood National Forests.

According to the Washington and Oregon Natural Heritage Program databases (WNHP 2005; ORNHIC 2005) and new data from Gifford Pinchot and Mount Hood National Forests, there are 22 documented populations of *S. sarmentosum* worldwide. Thirteen of these populations are in Washington and nine in Oregon. Of the Washington populations, nine are located on Gifford Pinchot National Forest. Of these, one is now recognized as a likely misidentification (Pine Tree Springs) and one (Little Mosquito Lake) appears to be in decline (Raven 2003b). In addition, the Bergen Road population (on private land) appears to be a misidentification or to consist of primarily hybrid plants (Raven pers. comm. 2006). Also, based on 2005 field data, the Little White Salmon population on Gifford Pinchot National Forest appears to consist of most, if not all, hybrid plants (Raven 2006). The results of genetic analysis should confirm or refute this conclusion.

Of the nine populations in Oregon, all are located on Mount Hood National Forest. Two of these populations appear to be in extreme decline, with five or fewer plants, and one site that may be extirpated. According to Raven (2004), the one population appears to be composed primarily of hybrid plants, and it is likely that one other population is also hybridized.

Throughout the range of the species, many populations are too small to be considered self-sustaining. According to Raven (2003b), only five populations have the potential to be self-sustaining, including three on Gifford Pinchot National Forest (South Prairie, Cave Creek and Peterson Prairie) and two on Mount Hood National Forest (Little Crater Meadow and Lower Lake). Of these populations, only three are comparatively large with several thousand individuals; all are located on Gifford Pinchot National Forest within the Allotment, including South Prairie, Cave Creek and Peterson Prairie.

In addition, approximately 80 percent of all known individuals are concentrated at only two sites (Cave Creek and South Prairie), and between 82 and 90 percent of all individuals range-wide are found within the Allotment on Gifford Pinchot National Forest (Raven 2006a). Despite the concentration of individuals within a few populations, widely distributed small populations of pale blue-eyed grass are comprised of relatively small numbers of individuals that may store genetic variability important to the long-term survival of the species as a whole.

Current pale blue-eyed grass distribution within the Allotment

Raven estimates that 80 percent of all pale blue-eyed grass individuals are found within two populations (Cave Creek and South Prairie). She estimates that 82 to 90 percent of all individuals are found within the Allotment (Raven 2006).

The Cave-Bear Watershed Analysis (1997) states:

> "subpopulations [of *Sisyrinchium sarmentosum*] in Cave-Bear watershed (Peterson Prairie and Cave Creek populations) are located near the geographic center of the species' range in the state, and as such are potentially an important link between subpopulations within and outside of the watershed".

Examination of aerial photographs of the Allotment from 1959 to 2000 indicates that available habitat for pale blue-eyed grass is declining within the Allotment and on Gifford Pinchot National Forest. This decline is the result of natural succession and encroachment of conifers and other woody species into openings and natural meadows that provide both present and potential future habitat for this species.

Historic Distribution of pale blue-eyed grass on Gifford Pinchot National Forest

The historic distribution of pale blue-eyed grass is largely unknown.

Wilhelm N. Suksdorf (a pioneer botanist made famous by his extensive botanical descriptions and collections from the Mount Adams area) made the "type" collection for the species in 1893 from "Gerstenwiese" (Barley Meadow in German), which is now known as South Prairie (Weber 1944). This "type" collection was used to describe *Sisyrinchium sarmentosum* as a new species in 1895.

South Prairie is a large natural meadow complex. Unlike most natural meadows on the Mount Adams District, which have historically been maintained by fire, the open nature of South Prairie is apparently maintained primarily by the area's unique hydrology. Fire has most likely played a role as well. During late fall, winter and early spring, South Prairie is a shallow lake. In late spring, water on the prairie drains through a lava tube, leaving South Prairie an open, dry meadow.

Since pale blue-eyed grass appears to require open meadow or meadow-like environments with moist to wet solids in early growing seasons, the hydrology of South Prairie has most likely been a significant factor in maintaining the area as suitable habitat. The fact that South Prairie hosts the largest population of pale blue-eyed grass, and is apparently less dependent on fire to maintain its open nature than most other meadow systems in this area, suggests that this site has been more stable on the landscape, and experienced greater continuity, than other pale blue-eyed grass habitat patches. As such, it may have acted (and be acting) as a seed source for more ephemeral populations of the species.

In addition, South Prairie is recognized as the most genetically diverse site of pale blue-eyed grass known (Karst 2003; Wilson, et al. 2000). Undoubtedly, South Prairie has been important habitat for this species for much longer than a century.

As a narrow endemic with very specific habitat needs, pale blue-eyed grass may always have been rare at a landscape level, but this is unclear. It is likely that habitat for this species was more extensive in prehistoric times (prior to fire suppression), when fire maintained the open character of natural meadows, formed large forest gaps, and sustained low tree density within many forested stands. These types of open habitats, located in areas with a suitable hydrologic regime, likely provided habitat for pale blue-eyed grass. The species' current patchy, widely spaced populations are most likely remnant islands of more widespread pale blue-eyed grass habitat in previous times.

Cave Creek hosts the second largest population of pale blue-eyed grass. Until the clearcuts of the 1950s, the area was an old growth western red cedar swamp. The disturbance history of this site includes clear-cut timber harvest and slash treatment using tractors, grass seeding and fertilization in the '60s, ditching and scarification using tractors in support of reforestation efforts in the '70s, and use of the area by wild ungulates and domestic livestock, pocket gophers and beavers (Cave Creek Exclosure Survey Data, June 1995 – 1997).

The intense shade of an old growth red cedar swamp would presumably not have provided suitable habitat for pale blue-eyed grass, so the present population is most likely the result of new

establishment or expansion of a relictual population. Under the first scenario, seeds or rhizomes of pale blue-eyed grass would have been transported to the Cave Creek area after being harvested. At that time, they established and reproduced to create the population that now occurs. Alternatively, the population may be an expansion of a small population that had persisted in or near Cave Creek from a time when habitat conditions through much of the area were perhaps more open and suitable for the species. When the habitat was converted from red cedar swamp to wet "meadow," a small relictual population may have been able to expand and take advantage of the newly created habitat. The first recorded observance of this species at Cave Creek was in 1985.

Golden Chinquapin

Golden chinquapin is an evergreen member of the oak family (Fagaceae). It reaches the northern edge of its range in Washington State (Kruckeberg 1980). This species is shade intolerant and can easily be overtopped in growth by conifers. However, following fire or logging, golden chinquapin is reported to compete well with the young re-growth of conifers for a time (Kruckeberg 1980).

Kruckeberg notes that peripheral populations of this species (such as those populations in Washington State) are likely to have different genetic resources and environmental tolerances than those in the heart of a species' range. He further states that "in our judgment … the fortuitous thinning of conifers at this locality [referring to a Hood Canal colony] will improve the growth and longevity of the younger chinquapins …. But given the more rapid growth rate of the conifers, the chinquapin is sure to become suppressed in growth beneath the canopy of dominant needle-leaved evergreens."

Golden chinquapin reportedly fruits sparingly and sets few seeds with low germinability (Kruckeberg 1980). Selective logging or pre-commercial thinning of associated conifers and deciduous hardwoods prevent suppression of the slower growing chinquapin. The Berry Botanic Garden participated in a survey of Gifford Pinchot National Forest for golden chinquapin. According to the final report (Raven 1995), there are four known sites of golden chinquapin within the Allotment

Rosy owl clover

The Washington Natural Heritage Program (2005) ranks Rosy owl clover as Endangered within Washington State, with a state rank of S1. This indicates that it is considered critically imperiled, with five or fewer occurrences within the state. It is not currently considered a Forest Service Region 6 Sensitive species, but will most likely be considered in the next Region 6 Sensitive plant species list update.

Rosy owl clover is an annual herb of the figwort (Scophulariaceae) family that grows in low elevation meadows west and east of the Cascades (Hitchcock and Cronquist 1973). Rosy owl clover is considered an indicator of transitions between upland and wetland boundaries (Guard 1995). COSEWIC (2004) describes suitable habitat for the species as "moist vernal pools and depressions that are moist in the winter and dry out in the summer."

Rosy owl clover is found from British Columbia, Canada, to California, United States. Two reports regarding this species from the east coast of the United States were apparent introductions (COSEWIC 2004). A single population of rosy owl clover is known from Gifford Pinchot National Forest. That population is found within the Allotment at Peterson Prairie. According to the Washington Natural Heritage Program (2005), environmental factors important to this species most likely include hydrologic regime (given the species' restriction to the transition zone around

wetland perimeters) and full exposure to sunlight. Fire may have played a historical role in the distribution of this species on the landscape by maintaining suitable habitat. There is one other reported extant occurrence of this species in Washington State.

Survey Impractical Sensitive Species

Lichen and Fungi Species

Within the Allotment, there is potential habitat for one lichen species and 13 fungi species, including: *Chaenotheca subroscida* (lichen), and the fungi, *Cordyceps capitata, Gomphus kaufmannii, Gyromitra californica, Leucogaster citrinus, Mycena monticola, Otidea smithii, Ramaria cyaneigranosa, Ramaria gelatiniaurantia, Ramaria gelatiniaurantia, Ramaria rubrievanescens, Sarcodon fuscoindicus, Sowerbyella rhenan and Spathularia flavid.*

Surveys for these species are considered to be impractical (USDA and USDI 2004). Surveys for the lichen are considered impractical because it is minute and cryptic. Because fungi "fruit" (produce visible sporocarps) unpredictably (i.e. may not fruit each year, vary in fruiting timing from year to year), surveys are not reliable indicators of presence or absence (absence of evidence is not evidence of absence). In addition, many fungi species require laboratory examination by a taxa expert for reliable identification. As a result, it is probable that many Sensitive fungi species are under-reported and under-collected across their ranges. In addition, the habitat requirements for many of the species are too broad or too poorly understood to allow for reasonable mitigations at a project scale, particularly when no sporocarps have been located within the project area. These species are all thought to be associated primarily with late-successional/old growth forests (USDA and USDI 1994a, b, 2001a, b), though some of these species have been located in forests younger than 80 years old.

There are no known sites for any survey impractical Sensitive species within the Allotment. It is unknown whether survey impractical Sensitive species occur within the grazing Allotments' area of impact. For the purpose of analysis, the assumption is that there is a potential for occurrence within the project area and estimates are based on whether the likelihood of occurrence is low, moderate or high, using guidelines set by Region 6 of the Forest Service (USDA 2004b: Likelihood of Occurrence Key). The impact analyses reflect this assumption**.**

Survey and Manage Botanical Species

As part of the ongoing Survey and Manage lawsuit (Northwest Ecosystem Alliance, et al. v. Mark E. Rey, et al.) the Forest Service has been ordered by Judge Pechman to comply with the 2001 S&M Record of Decision (USDA and USDI 2001), including any amendments or modifications that were in effect as of March 21, 2004. As a result, project analysis must consider project impacts upon Survey and Manage species.

For this reason, surveys for Survey and Manage Strategy A and C species are required for projects that may provide habitat for the species and which have the potential to impact the species.

There are a total of 18 Survey and Manage category A and C botanical species with potential habitat within the Allotment, including: 1 fungus (*Bridgeoporus nobillisimus*); 6 epiphytic lichens (*Dendriscocaulon intricatulum, Hypogymnia duplicata, Leptogium cyanescens, Lobaria linita, Nephroma occultum, Pseudocyphellaria rainierensis*); 2 bryophytes (*Schistostega pennata* and *Tetraphis geniculata*); and 9 vascular plants (*Botrychium montanum, Coptis asplenifolia, Coptis trifolia, Corydalis aquae-gelidae, Cypripedium fasciculatum, Cypripedium montanum,*

Eucephalius vialis, *Galium kamtschaticum*, and *Platanthera orbiculata* var. *orbiculata* (Table 1-1, Standards and Guidelines, USDA & USDI 2001).

Survey and Manage species are, by definition, associated with late-successional/old growth forest (USDA and USDI 2001). Livestock grazing impacts within the Allotment are concentrated in non-forested areas, particularly natural meadows (such as South Prairie) and openings created by disturbance (such as Cave Creek). In both cases, habitat most impacted by livestock grazing is early seral or non-forested. Livestock may impact late-successional/old-growth habitat to a small extent, by passing through such habitat to reach their preferred grazing areas. By trailing through forests, livestock may compact soils and deposit manure, which has the potential to impact fungal mycelia, ground dwelling lichens and bryophytes, and understory vascular plants. Some limited grazing may also occur in the forest understory. Since livestock use of these areas is transitory and diffuse, however, it is unlikely that livestock cause substantial impacts upon Survey and Manage species that reside in these areas.

Bridgeoporus nobillisimus is restricted to the base of true-firs (almost always noble fir), while the lichens are epiphytic (grow on trees and shrubs), with some that occasionally may also be found growing on rocks. *Tetraphis geniculata*, a bryophyte, grows on large old wood debris, in humid, shady locations (such as the cut ends of large old trees), whereas *Schistostega pennata* is restricted to upturned tree rootwads located adjacent to standing water or in very moist locations. All of the vascular plants are forest understory species unlikely to occur in areas where livestock concentrate use.

Surveys for Survey and Manage species were conducted concurrently with surveys for Sensitive botanical species. Surveys were focused within areas where grazing has the potential to impact habitat for Survey and Manage species, including meadows, frequently used riparian areas, gathering areas and along livestock trails. No Survey and Manage species were located during surveys in these areas.

There are four Survey and Manage species, comprising 10 known sites, known to occur within the Allotment. All four species are fungi that grow on soil/duff beneath conifers. None of the known sites are located in areas within the Allotment typically utilized by livestock.

Other Botanical Species of Concern

Lesser bladderwort *(Utricularia minor)*

Lesser bladderwort is considered to be vulnerable to extirpation in the state, with only six to 20 occurrences (Washington Natural Heritage Program database, 2004). This species is not currently considered a Forest Service Sensitive species, but may be added to the Sensitive plant list during the next update. Lesser bladderwort grows in shallow wetlands such as South Prairie Bog — one of only three known sites for this species on the Mount Adams District.

Small bog cranberry *(Vaccinium oxycoccos)*

Small bog cranberry has been found growing in the South Prairie bog, among the sphagnum mats. This species holds no federal or state ranking, but it is an unusual attribute of a unique habitat, recognized with a Botanical Special Interest Area designation (South Prairie bog and South Prairie proper).

Environmental Consequences

Table 3-19 provides a summary of effects to USFS Sensitive plant species.

Table 3-21. Summary of Effects for USFS Sensitive Plant Species.

Species Name	Current Conditions	Alt. A	Alt. B	Alt. C
Pale Blue-eyed Grass *Sisyrinchium sarmentosum*	Will Impact	May Impact	May Impact	No Impact
Golden Chinquapin *Chrysolepis chrysophylla/*	No Impact	No Impact	No Impact	No Impact
Rosy Owl Clover** *Orthocarpus bracteosus* ** not currently listed as Sensitive, but likely to be listed with next list revision.	Will Impact	Will Impact	May Impact (with corral and no grazing in prairie) OR Will Impact if grazing allowed in prairie.	No Impact
"Survey Impractical Sensitive Fungi" species	May Impact	May Impact	May Impact	No Impact
"Survey Impractical Lichen Species" *Chaenotheca subroscida*	No Impact	No Impact	No Impact	No Impact

May Impact = May Impact Individuals or Habitat, But Will Not Likely Contribute To A Trend Towards Federal Listing Or Loss Of Viability To The Population Or Species

Will Impact = Will Impact Individuals Or Habitat With A Consequence That The Action May Contribute To A Trend Towards Federal Listing Or Cause A Loss Of Viability To The Population Or Species

Forest Service Region 6 Sensitive Species

Pale blue-eyed grass

General Impacts

Habitat Loss

Habitat loss is a major threat to pale blue-eyed grass across the range of species. Most likely, its habitat was more extensive in prehistoric times (prior to fire suppression) when natural meadows and forest canopy openings were maintained by fire. The species' current fragmented, isolated populations are likely remnant islands of formerly widespread pale blue-eyed grass habitat. This "island effect" has left few dispersal corridors for population migration or expansion.

During the mid 1900s, the common practice of clearcutting on federal lands artificially 'opened up' areas that now host some populations of pale blue-eyed grass, including Cave Creek and Lost Creek drainages. These areas also provided transitional range for livestock grazing. As vegetation re-growth occurs in these areas, they no longer provide the moist, open habitat necessary for pale blue-eyed grass to thrive. On the Gifford Pinchot National Forest, many populations are

established in ephemeral habitats that are shrinking as conifers encroach—these habitats will not persist in the long term without active management.

Potential future habitat for this species is also shrinking. Within the Ice Caves Grazing Allotment, where 82 to 90 percent of all individuals occur, 43 percent of the landscape is designated as Late Successional Reserve (LSR) or Managed Late Successional Area (MLSA**)**. This means that silvicultural management of this landscape must be designed to promote late successional forest conditions which are unlikely to support populations of this meadow species (USDA and USDI 1994a). In addition, few other management actions are planned or likely to be planned within potential pale blue-eyed grass habitat that might produce suitable habitat for this species (i.e., controlled burns, heavy thinnings and clearcuts).

Habitat that currently supports this species often hosts small populations that are unlikely to be self-sustaining in the long term. Only five populations across the species' range are currently considered large enough to be self-sustaining. The populations include three on Gifford Pinchot National Forest (all within the Allotment) and two on the Mount Hood National Forest (Raven 2003a).

Hybridization

Hybridization between the relatively common species *Sisyrinchium idahoense* and the rare species *S. sarmentosum* appears to be occurring in a number of populations on Gifford Pinchot and Mount Hood National Forests. These include Cave Creek, Peterson Prairie and Little White Salmon populations (Gifford Pinchot). The genetic integrity of pale blue-eyed grass is at risk by the introduction of alleles from the more common species into the rare species' genome.

Motor Vehicles, Recreation, and Road Maintenance

Motor vehicle use has been observed at a number of pale blue-eyed grass sites. During 1999 – 2000 surveys of known sites, Raven (2000) observed tire tracks into the South Prairie meadow complex, some having passed over pale blue-eyed grass plants. In 2003, numerous vehicle tracks were observed at South Prairie (Ruchty and Scott pers. comms. 2003). In one area of the meadow, vehicle use had been concentrated to such an extent that by September, an estimated 50-plus plants previously observed growing in the area had apparently been destroyed by wheel ruts (South Prairie photos, September 2003).

Observation of this area by Forest Service personnel during 2004 – 2005 has revealed that the density of plants at South Prairie does not appear to have recovered, and there are noticeably fewer plants growing in this area than previous to 2003 (Ruchty pers. comm. 2006). Vehicle tracks have also been noted at the Little Mosquito Lake population (Gamon 1991). Currently, the access road to this population is closed.

In addition, at the smaller pale blue-eyed grass subpopulation at Cave Creek, a fire pit has been present since 1991, when John Gamon (1991) identified camping as a threat at this site. Evidence of camping, including a fire ring, has also been observed near the Little White Salmon population (Raven 2003a) and within South Prairie meadow complex (Frey pers. comm. 2004).

Road maintenance activities also have the potential to impact roadside populations of pale blue-eyed grass, including some of the small satellite populations located near South Prairie and at Falls Creek Horse Camp.

Livestock Grazing

Livestock grazing comprises a major threat to pale blue-eyed grass. Six of nine pale blue-eyed grass populations on Gifford Pinchot National Forest are subject to permitted livestock grazing. The four pale blue-eyed grass populations within the Allotment, which comprise 82 to 90 percent

of all individuals (Raven 2006a), have been subject to persistent (and sometimes intensive) livestock grazing during the past century (refer to botanical Biological Resource Report for grazing history on the Allotment). Livestock have both direct and indirect impacts on pale blue-eyed grass.

Direct Effects/Impacts

Direct impacts of livestock grazing on pale blue-eyed grass include mortality by uprooting, leaf, flower and fruit herbivory, and trampling.

In a study of livestock grazing effects on pale blue-eyed grass at Cave Creek, Raven (2003a) found that grazing by cattle, even for brief periods and with few cattle (fewer than 25) present, caused direct plant mortality and dramatically increased herbivory. These events compromised the ability of individuals to grow and sexually reproduce.

During the monitoring period from 1997 – 2000, Raven found that approximately five percent of pale blue-eyed grass individuals were grazed and pulled up completely (including roots/rhizomes), resulting in the death of these plants.

In monitoring levels of herbivory, Raven found that, by late July 1997 (the first year of field monitoring), plants subject to livestock grazing had 46 percent of their leaves removed compared to plants excluded from livestock grazing, which had five percent removed. In 1998, 58 percent of pale blue-eyed grass leaves had been consumed by late July, compared to only three percent of leaves on plants protected from livestock grazing. During 1999 – 2000, 84 percent of unfenced plants showed "high" levels of leaf herbivory (defined as between 51 and 100 percent vegetation removed), whereas fenced plants showed high levels of leaf herbivory on only 28 percent of plants.

Four years of field data collection studying grazed versus ungrazed areas of land, showed that livestock grazing caused the removal of 79 percent ($4/5^{th}$) of flowers and fruits by late July at the Cave Creek study site resulting in dramatically reduced opportunities for sexual reproduction (Raven 2003a). This is most likely a conservative estimate of grazing impacts, since this average includes data from years when cattle breached the fence and grazed inside of the exclosure (about three weeks in 1999 and one week in 2000).

Plants protected from livestock grazing showed increased recruitment during four years of field data collection with twice as many new plants located within the fenced area than outside of it and increased seed production. In addition, plants outside the cattle exclosure were consistently shorter and broader than those protected from grazing.

The differential grazing effects observed inside and outside the livestock exclosure at Cave Creek are clearly attributable to livestock. The exclosure fence at Cave Creek was constructed as a 'wildlife friendly fence.' Early spring surveys of Cave Creek during 2004 (before cattle turn out), showed extensive signs of elk inside and outside the exclosure.

Fieldwork for Raven's entire study was carried out during late June and July, which is the major pale blue-eyed grass blooming period at Cave Creek from 1997 – 2000. According to the Annual Operating Instructions for the Allotment, 1997 – 2005 (years of the study to present) livestock are permitted to graze from the 'turn on' date between June 15^{th} and September 30^{th}. Undoubtedly, livestock consumes a substantial additional proportion of vegetation and fruits remaining at the end of July (six weeks into the grazing season) during the following eight weeks of permitted grazing.

During 1998, Raven (2003a) compared the growth form of plants inside and outside the livestock exclosure at Cave Creek and found that fenced pale blue-eyed grass plants with no herbivory

were 72 percent taller than unfenced plants with no herbivory. Photographs and descriptions of Suksdorf's 1893 collections of *S. sarmentosum* from South Prairie (New York Botanical Garden, isotype specimens 319488 and 319487) provide us with additional evidence to suggest that *S. sarmentosum* plants, particularly at South Prairie, may have been larger and more productive late in the 19th century, compared to present. For example, earlier plants had numerous leaf bases and copious foliage production.

These observational accounts suggest that long-term grazing of this species may have caused a reduction of the stature of plants at multiple sites. This may be a result of phenotypic plasticity, loss of genetic information (resulting from competitive exclusion of taller statured plants by shorter statured plants over time), or both. If the pattern is a result of loss of genetic information, plants may now be less competitive with both native and nonnative plants that occupy the same habitat.

Raven's study demonstrates that livestock grazing at Cave Creek has largely eliminated the ability of pale blue-eyed grass to sexually reproduce. Since grazing levels at other populations within the Allotment have been permitted at the same level as Cave Creek, it is likely that these populations experience similar impacts as a result of livestock grazing.

With decades of season-long grazing permitted on the Allotment, the pale blue-eyed grass populations that currently exist within the Allotment are likely the product of decades of vegetative reproduction (cloning) (Raven 2003a). The implication of this finding is that plants cannot recombine alleles within, or between, populations, nor can they produce offspring that are genetically different from themselves under grazing regimes that cause the removal of pale blue-eyed grass flowers and fruits before seeds reach maturity,.

Over time, this trend will cause greater vulnerability to loss of genetic diversity, which reduces the ability of plants to respond to environmental challenges and diminishes future evolutionary options. In addition, persistent loss of leaf area through grazing minimizes the photosynthetic potential of plants and causes plant stress that reduces opportunities for plants to reproduce, both sexually and asexually. Persistent loss of vegetation also lowers resistance to disease and insects attacks.

The 1994 report titled "Monitoring Results for *Sisyrinchium sarmentosum* at Little Crater Meadow on the Bear Springs Ranger District, Mt. Hood National Forest" concludes that "There is reason to suspect that grazing (particularly early season grazing) does adversely effect *Sisyrinchium sarmentosum*," despite the fact that the study design and collection methods did not allow for "strong conclusions." (Holmberg 1994)

Since livestock tend to congregate near water, and pale blue-eyed grass habitat is largely restricted to streambanks and wet meadow edges, plants may be subject to greater trampling than might be expected based on livestock numbers alone. A study carried out in northeastern Oregon by Kauffman, et al. (1983) found that significantly greater streambank erosion and disturbance occurred in grazed areas than in cattle exclosure areas. Pale blue-eyed grass populations within the Allotment, including those at Cave Creek and South Prairie, have been identified as high use areas where cattle congregate and remain throughout the grazing season (Frey pers. comm. 2003, 2005; B. Scott, pers. comm. 2003 – 2005).

Indirect Effects/Impacts

Indirect effects of grazing on pale blue-eyed grass include the introduction and spread of invasive plants, and changes in plant community dynamics. Possible indirect effects include impacts to pollinator diversity (resulting from changes in plant communities), soil nitrification and alteration of hydrology.

Livestock exacerbate the introduction and spread of invasive plants by: (1) causing soil disturbance, which creates exposed seed bed for weed establishment at new sites; and (2) introducing and/or dispersing weed seeds, by transporting them in their hooves, fur or gut.

It is unknown to what extent livestock have influenced plant community dynamics, pollinator diversity and abundance, caused soil compaction, nitrification, or altered hydrology within pale blue-eyed grass habitat. In 1983, Wilhelm Suksdorf's made the "type" collection for *S. sarmentosum* from "Gerstenwiese," which means Barley Meadow in German. Based on Suksdorf's description of South Prairie as "Barley Meadow," it may be that the genus *Hordeum* was a major component of the community there, whereas *Hordeum* is not a major component of today's meadow. It is likely that livestock grazing over the past century has altered the plant community at South Prairie by placing selective (grazing) pressure on palatable species, leaving less palatable species with a competitive advantage. A 2004 study conducted in Europe by Carvell, et al. found that the abundance of foraging bumblebees was influenced by the temporal availability of suitable flowers. By removing a substantial proportion of flower heads, including those of pale blue-eyed grass, grazing may impact pollinator abundance and diversity.

Cumulative Effects/Impacts

In summary, pale blue-eyed grass is considered imperiled to critically imperiled across its range. Pale blue-eyed grass populations are subject to numerous threats, including:

- natural succession, which (in the absence of fire or active management) continues to reduce the amount and quality of pale blue-eyed grass habitat, and increase habitat fragmentation;
- small population sizes, limited potential habitat and fragmented habitat;
- road maintenance activities such as mowing and brushing that directly impact a number of small roadside populations;
- recreational use of habitat, including camping, motor vehicles and off-road vehicles (ORVs) that may destroy individuals and disturb habitat;
- hybridization;
- alteration of hydrology through road building, ditch construction or stream incising;
- invasive species, which compete with native species for resources;
- livestock grazing, which significantly reduces the number of flowers and seed capsules able to reach maturity. This results in the plant's inability to sexually reproduce, threatens long-term viability of the species, and compromises the health of individuals (and by extension populations), through the consumption, trampling and uprooting of plants, leaving them more susceptible to attack by insects and disease.

Alternative Comparisons

Current conditions will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species (WIFV).

Current livestock grazing conditions do not provide *Sisyrinchium sarmentosum* individuals or populations with opportunities for genetic exchange sufficient for long-term population viability. In addition, current livestock grazing conditions cause direct and indirect impacts to populations that increase population vulnerability to extirpation. Since 82 to 90 percent of all *S. sarmentosum*

individuals reside within the Allotment (Raven 2006a), and are directly impacted by domestic livestock grazing, these impacts threaten the viability of the species as a whole.

Alternative A – Limited Change to Current Management

Alternative A *may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.* This determination is only valid if improvements and mitigations designed to protect pale blue-eyed grass are implemented in full, and to the specifications provided.

By creating livestock exclosures around individual major populations of this species, this alternative provides limited protection to all major known pale blue-eyed grass populations within the Allotment. However, this alternative does not protect every individual from livestock grazing. The individual exclosures will exclude livestock from entering South Prairie proper, the Lost Creek drainage population, and the Forest Road 6610 population, but will not exclude grazing from other small satellite populations found within the South Prairie area.

This alternative does not provide for protected (ungrazed) dispersal corridors for the species within the Allotment. Under this alternative, the livestock exclosure at Cave Creek would not be expanded to include up to 15 additional acres of pale blue-eyed grass habitat (as would occur under Alternative B). This would leave pale blue-eyed grass individuals outside the current exclosure fence, and on the south side of Forest Road 8631, subject to annual, season-long grazing. Under this alternative, late season grazing (30 percent utilization) of Peterson Prairie during “round up” (mid to late September) would be permitted.

It is important to note that late season grazing occurring in Peterson Prairie causes fewer impacts to pale blue-eyed grass than season-long grazing does in other open range portions of the Allotment. This is because livestock only graze during mid to late September in Peterson Prairie, at which time many pale blue-eyed grass fruits have matured and dropped to the ground. As a result, grazing does not impact the ability of this pale blue-eyed grass population to share genetic information through cross-pollination. Grazing does continue to impact individuals at this site by trampling and herbivory. From the perspective of pale blue-eyed grass conservation at this site, Alternatives B and C, which do not allow grazing within Peterson Prairie, are more desirable.

In summary, Alternative A provides minimal protection to pale blue-eyed grass by focusing protective measures on individual populations (rather than metapopulations, habitat or landscapes). It does not provide for dispersal corridors for the species, or protected areas for population expansion. This alternative is the least desirable from a pale blue-eyed grass conservation perspective.

An adaptive management feature of this alternative is that grazing could occur periodically within livestock exclosures based on the discretion of the Forest Service. This analysis is based upon the supposition that adaptive management would only occur within livestock exclosures designed to protect pale blue-eyed grass when a peer-reviewed conservation strategy for this species specifies that grazing shall benefit pale-blue eyed grass, and identifies under what conditions such grazing will occur (timing and intensity). The botanical effects analysis for this alternative is only valid under these circumstances.

Alternative B – Drift Fence (Adaptive Management)

Alternative B *may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.* This determination is only valid if mitigations designed to protect pale blue-eyed grass are implemented in full, and to the specifications provided.

This alternative provides substantial protection to all major known pale blue-eyed grass populations within the Allotment, though it does not protect every individual from livestock grazing. The drift fence will exclude livestock from entering South Prairie and associated satellite populations, the portion of the Lost Creek drainage that hosts pale blue-eyed grass, and the pale blue-eyed grass population that occurs adjacent to Forest Road 6610.

The livestock exclosure at Cave Creek would be expanded to include up to 15 additional acres of pale blue-eyed grass habitat, leaving only the individuals found directly adjacent to, and on the south side of Forest Road 8631 road subject to yearly grazing. This option provides protected (ungrazed) dispersal corridors for pale blue-eyed grass within the vicinity of South Prairie, Lost Meadow and the Forest Road 6610 population. Under this alternative, there are two separate options to manage Peterson Prairie: Option A would allow late season grazing (30 percent utilization) of Peterson Prairie during "round up" from mid to late September. Option B would expand the holding corral that currently exists within the prairie to about one acre, and grazing would not be permitted within the remaining Peterson Prairie.

Option A would allow for livestock impacts to pale blue-eyed grass, whereas Option B would prevent livestock impacts. It is important to note that late season grazing occurring in Peterson Prairie causes fewer impacts to pale blue-eyed grass than season-long grazing does in other open range portions of the Allotment. This is because livestock graze only during mid to late September in Peterson Prairie, at which time many pale blue-eyed grass fruits have matured and dropped to the ground.

As a result, grazing does not impact the ability of this pale blue-eyed grass population to share genetic information through cross pollination. However, grazing continues to impact individuals at this site by trampling and herbivory. From the perspective of pale blue-eyed grass conservation, Option B within this alternative is the more desirable option because it mitigates for these impacts.

In summary, Alternative B provides substantial protection to pale blue-eyed grass by focusing protective measures on metapopulations and pale blue-grass habitat. By doing so, this alternative provides dispersal corridors for the species and protected (ungrazed) areas that may allow for population expansion. This alternative is more desirable than alternative A from a pale blue-eyed grass conservation perspective.

An adaptive management feature of this alternative is that grazing would occur periodically within livestock exclosures based on the discretion of the Forest Service. this analysis is based upon the supposition that adaptive management would only occur within livestock exclosures designed to protect pale blue-eyed grass when a peer-reviewed conservation strategy for this species specifies that grazing would benefit pale-blue eyed grass, and identifies under what conditions such grazing would occur (timing and intensity). The botanical effects analysis for this alternative is only valid under these circumstances.

Alternative C – No Grazing

Alternative C would have *no impact.*

Under Alternative C (No Grazing), there would be no negative impacts to pale blue-eyed grass due to livestock grazing within the Ice Caves Grazing Allotment.

Golden Chinquapin

Threats to chinquapin include overtopping by conifers, exposure of plants to windthrow (through adjacent timber harvest), fungal parasites and inadvertent destruction of plants through project

activities. There are no reports of livestock grazing effects upon this species in scientific literature. It is likely that livestock may use forested areas with chinquapin as travel corridors, but that no grazing has been observed.

Cumulative Effects/Impacts

Grazing does not appear to have any direct or indirect impacts on golden chinquapin since sites and potential habitat for this species do not appear to overlap with areas that livestock tend to use within the Allotment. If livestock do occasionally travel through areas with chinquapin, it is likely they are using the area as a travel corridor and spending little time grazing the area. For this reason, it seems likely that viability of chinquapin within the Allotment is not influenced by the presence of livestock at this time.

Alternative Comparisons

Alternatives A – C are consistent in having *no impact* upon *Chrysolepis chrysophylla.*

Grazing does not appear to have any direct or indirect effects on golden chinquapin since sites and potential habitat for this species do not appear to overlap with areas that livestock tend to use within the Allotment. If livestock do occasionally travel through areas with chinquapin, it is likely that they are using the area as a travel corridor, and spending little time grazing the area. For this reason, it seems likely that, at the present time, viability of chinquapin within the Allotment is not influenced by the presence of livestock.

Rosy owl clover

Direct and Indirect Effects/Impacts

Since Rosy owl clover is an annual that regenerates solely through seed production, the species is very vulnerable to extirpation through short-term disturbance or disruption of its annual life cycle. The species blooming period typically ends in August, with seed release beginning in late August and extending into winter months (COSEWIC 2004). Examination of plants at Peterson Prairie during 2004 revealed mature seeds that easily dropped on 8/16/2004, with some flowers still in bloom. (Ruchty, pers. comm. 2005). Recognized threats to populations of this species include disturbance that has the potential to uproot or kill plants before seed set and release, removal of seed heads before seed release, changes in hydrology that would cause the prairie to become unsuitable habitat (too dry or too wet), competition with invasive plants, habitat loss and fragmentation, and pollinator limitations (COSEWIC 2004, Washington Natural Heritage Program 2005).

Livestock grazing

Under the current AOI (2005), livestock grazing at Peterson Prairie occurs during the last two weeks of September during “round up” when the prairie has generally been grazed to less than three-inch stubble height (Ruchty, Scott, pers. comms. 2003, 2004). The Rosy owl clover population has persisted at the site under this grazing regime from at least 2001 through 2004. (The population was first identified at the site in 2001.). Field observations of the population’s phenological succession at this site suggest that plants are generally able to grow, flower and release seeds before livestock are released into the meadow. During years when the population may take longer to progress through its life cycle, there is a possibility that the plants may not have the opportunity to set and release seed before ‘round up’ when livestock consume the top portions of plants, including flowers and seed heads.

Invasive plants

Invasive plants also potentially pose a threat to Rosy owl clover. Aggressive alien grasses are hypothesized to have compromised the quality of potential habitat for this species in Canada (COSEWIC 2004).

Habitat Loss and Fragmentation

Habitat fragmentation is of great concern. A COSEWIC assessment summary for Rosy owl clover (2004) reports that this species may have low dispersal ability. Therefore, the two extant populations known to occur in Washington may be essentially stranded in islands of habitat. When habitat loss occurs through encroachment of conifers into meadow habitat (a recognized threat at Peterson Prairie), or through alteration of habitat by development, or alteration of the physical environment such as the hydrology of the area, the species has little ability to persist or distribute itself to other suitable habitat.

Pollinator Limitations

Though not confirmed, Rosy owl clover is most likely an outbreeder; it tends to form compact masses, which may improve cross-pollination efficiency (COSEWIC 2004). This implies that Rosy owl clover needs pollinators to distribute pollen between individuals. According to Atsatt in 1970 (*as cited in* COSEWIC 2004), outbreeding owl-clovers are pollinated primarily by honeybees and other native bee species**.**

Cumulative Effects/Impacts

With only two extant sites, Rosy owl clover is at high risk of extirpation within Washington State. However, livestock grazing does not appear to have substantially impacted the population during 2001 – 2004, the years in which Rosy owl clover apparently set and released seed by the time livestock were released into the prairie (Ruchty, pers. comm. 2004). In cooler, wetter years when plants may mature later, short-term, intensive grazing during "round-up" could heavily impact this population by removing flowers and seed heads before seed dispersal. If this occurred during even a single year, the population would be threatened with extirpation. For this reason, livestock grazing within Peterson Prairie could compromise the viability of this population, causing a trend towards Federal listing.

Alternative Comparisons

Alternative C (no grazing) is the most desirable from the standpoint of rosy owl clover conservation. No livestock grazing would maximize seed set and release by this species at Peterson Prairie. Alternative B (with grazing only within a corral at Peterson Prairie) is superior to Alternative A (with continuation of late season grazing during round-up throughout Peterson Prairie), but slightly less desirable than the no grazing alternative since housing livestock within Peterson Prairie corral would still necessitate driving through the meadow to load the cattle for transport and the access road to the corral passes through the Rosy owl clover population. Because Alternative A allows for annual grazing of the rosy owl clover population, this alternative *will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species.* Alternative B prevents annual grazing of this population by causing livestock to be corralled, except during the time it takes to drive cattle in and out of the corral. For this reason, this alternative *may impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.* Under Alternative C, no grazing would occur within Peterson Prairie and there would be *no impact* to rosy owl clover.

Survey Impractical Sensitive Species

Lichen and Fungi

Direct and Indirect Effects/Impacts

There is little information available in the scientific literature directly addressing the effects of livestock grazing on lichen and fungi species. In a study set in Midwest tallgrass prairie, moderate and intense grazing increased root colonization by arbuscular mycorrhial fungi, but decreased diversity (Eom, et al. 2001). According to the authors, "grazing of aboveground vegetation may influence plants directly and indirectly through the alteration of mycorrhizal symbiosis and other below-ground processes, and mycorrhizae in turn can influence plant responses to defoliation." Since livestock within the Allotment concentrate their grazing in open areas dominated by grasses and forbs, rather than in the forest understory where these Sensitive species are found, it is likely that livestock have little impact upon their mycorrhizal associations.

While livestock grazing has the potential to cause soil compaction and nitrification where cattle tend to congregate, lichen and fungi dwell in the forest where livestock do not tend to congregate. Therefore, compaction and nitrification caused by grazing are unlikely to occur within the habitat of these species.

Cumulative Effects/Impacts

The impacts of livestock grazing upon survey impractical species and habitat within the Allotment are low. As a result, these impacts would not contribute substantially to cumulative effects.

Alternative Comparisons

For these reasons, there is a low likelihood that Alternatives A and B *may impact* fungi *individuals or habitat, but would not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.* Alternative C would have *no impact* on fungi species. Alternatives A, B and C would have *no impact* on lichen individuals or habitat. Details of effects/impacts can be found in the botanical resource report in the project file.

Survey and Manage Botanical Species

As part of the ongoing Survey and Manage lawsuit (Northwest Ecosystem Alliance, et al. v. Mark E. Rey, et al.) the Forest Service has been ordered by Judge Pechman to comply with the 2001 Survey and Manage Record of Decision (USDA and USDI 2004), including any amendments or modifications that were in effect as of March 21, 2004. As a result, project analysis must consider project impacts upon Survey and Manage species.

Fungi

Direct and Indirect Effects/Impacts

There are ten known sites of four Survey and Manage fungi species found within the Allotment; all sites are within forested areas. Livestock grazing impacts within the Allotment are concentrated in non-forested areas, particularly natural meadows such as South Prairie and openings created by disturbance found at Cave Creek. In both cases, habitat most impacted by

livestock grazing is early seral or non-forested. When passing through late successional/old-growth habitat to reach preferred grazing areas livestock may have a low impact on the habitat By trailing through forests, livestock may compact soils and deposit manure, which has the potential to impact fungal mycelia, ground dwelling lichens and bryophytes, and understory vascular plants. Some limited grazing may also occur in the forest understory. However, since livestock use of these habitats is transitory and diffuse, it is unlikely that livestock cause substantial impacts upon Survey and Manage species that reside in these areas.

Placement of salt blocks and/or watering stations has the potential to cause more concentrated livestock use and impacts within forested habitat where Survey and Manage species may reside. Avoiding placement of salt blocks and watering stations in areas near known sites would avoid impacts.

Cumulative Effects/Impacts

The impacts of livestock grazing upon Survey and Manage species and habitat within the Allotment are low. Therefore, these impacts would not contribute substantially to cumulative effects.

Alternative Comparisons

Grazing does not appear to have the potential for substantial direct or indirect impacts upon Survey and Manage species and Survey Impractical fungi and lichen species within the Allotment. This is because potential habitat for these species does not tend to overlap with areas that livestock tend to use within the Allotment. If livestock do occasionally travel through forested areas that could host these species, it is likely that they use it as a travel corridor and would spend little time grazing the area. For this reason, it is unlikely that livestock grazing within the Allotment substantially influences the persistence of these species. Project design features that limit the placement of watering stations and salt blocks would provide for persistence of known sites under all grazing alternatives.

Other Botanical Species of Concern

Lesser bladderwort

Livestock grazing may pose a threat to lesser bladderwort since livestock enter the bog during times of late season low water or drought. In this case, livestock have the potential to compromise *Utricularia* habitat by causing soil disturbance, and through defecation, which may impact the aquatic habitat where this species grows. In addition, soil disturbance creates a seedbed for noxious weed seeds, which the livestock may introduce to the site by transporting seeds and reproductive plant parts into the bog via their fur, hooves or gut.

Small bog cranberry

As with lesser bladderwort, livestock grazing may pose a limited threat to small bog cranberry since livestock enter the bog during times of late season low water or drought. Because of this, livestock have the potential to compromise habitat by causing soil disturbance, and through defecation. In addition, soil disturbance creates a seedbed for noxious weed seeds, which the livestock may introduce to the site by transporting seeds and reproductive plant parts into the bog via their fur, hooves or gut.

Special Habitats

Existing Condition

Quaking Aspen

Historically, quaking aspen (*Populus tremuloides*) was more abundant than at present; comparisons of data from historical records show that, since European settlement, the area occupied by aspen in the western United States has declined by 60–90 percent (Kay 1997). Fire suppression is a primary cause for aspen decline; fire suppression allows conifer encroachment into aspen stands, and eliminates a disturbance agent critical for aspen's regeneration. Heavy browse pressure from both domestic livestock and large herbivores also contributes to stand mortality and decline (Kay 1997).

Two aspen groves in Ice Caves Grazing Allotment may be affected by livestock grazing, including the western portion of Peterson Prairie and at South Prairie. The aspen grove at Peterson Prairie is less than one-quarter acre in size and consists of older mature trees and numerous suckers, which are extremely palatable to cattle, elk and deer.

Cattle graze Peterson Prairie in September. Although it is fenced, Peterson Prairie is available to elk and deer from spring to late fall, since they would be able to jump the fence. It is doubtful that Peterson Prairie is used by wild ungulates in the winter due to snow depth. In addition, the presence of roads and a campground adjacent to Peterson Prairie likely limit elk and deer foraging at the site during summer and early fall.

At South Prairie, aspen and cottonwood occur around the fringe of the prairie, especially on the west and south sides. Aspen suckers in South Prairie are more likely to be browsed by elk, deer and cattle because trees are more distant from the road. Cattle have access to this area all summer.

It does not appear that mature trees at these sites are successfully reproducing because there are no sapling-sized trees.

Remnant stands of ponderosa pine

Ponderosa pine-dominated stands are currently in low abundance relative to historic distribution of this habitat type within the Allotment. The understory of open pine stands was graminoid-dominated, with pinegrass (*Calamagrostis rubescens*) as a common component (though remnant stands currently tend to have thick understories of grand fir).

Research has shown that late season cattle grazing of ponderosa pine seedlings, or repeated grazing during a single season, may compromise long-term growth potential of this species (Karl and Doescher 1998). However, it is unlikely that livestock grazing is having a substantial effect on this special habitat type within the Allotment, since livestock concentrate their grazing within natural meadow systems and other open areas.

Meadows

Natural meadow systems in the Pacific Northwest are hotspots of plant diversity. On Gifford Pinchot National Forest, natural meadows are a rare and special ecosystem type that provide habitat for many Sensitive plant species. Within the Allotment, natural meadows comprise less than 400 acres of the total area of 33,525 acres, or about 1 percent of the landscape.

Livestock use of these areas is out of proportion with the frequency of natural meadows on the landscape because these areas are used as primary range, and are heavily grazed from mid-June

through September annually. Livestock effects upon natural meadow systems are varied. In all grazed areas, livestock use increases the risk of invasive plant introduction and spread. In moderately to heavily grazed areas, livestock may cause plant mortality, soil compaction, soil erosion and/or nitrification. This level of use may change the dynamics of plant interactions, causing shifts in plant communities.

In natural meadow systems historically maintained by fire, livestock may also help maintain the open character of the meadows. Livestock may graze encroaching shrubs and trees (that would historically have been killed by fire), resulting in more open meadow systems. When livestock seek out shrubs and young trees to graze, however, this may indicate that the preferred forage supply (graminoids) has been exhausted, which represents an undesirable situation for the reasons mentioned above. For example, wild ungulates switch to browsing on shrubs in the late summer and fall since grasses are cured out by then and usually do not contain as much nutrition.

Grazing effects upon specific meadow systems within the Allotment are discussed below. Further discussion of livestock effects upon meadow environments can be found in the discussion of the Sensitive plant species, pale blue-eyed grass (*Sisyrinchium sarmentosum*)..

South Prairie

South Prairie is a large natural meadow complex located within the Allotment. Unlike most natural meadows on the Mount Adams District, which have historically been maintained by fire, the open nature of this prairie is maintained primarily by the unique hydrology of the area. During late fall, winter and early spring, South Prairie is a shallow lake. In late spring, the water on the prairie drains through a lava tube, leaving South Prairie an open, dry meadow. South Prairie provides important habitat for the Regional Forester's Sensitive plant species pale blue-eyed grass (see discussion, above).

Presently, South Prairie comprises a substantial portion of the high quality grazing land available to livestock within the Allotment (Esteves, pers. comm. 2003). Most likely, utilization of South Prairie by livestock has risen proportionally as existing transitional range (open ponderosa pine forest and clearcut areas) has been reduced through natural succession (in the absence of fire and reduction of timber harvest in the area). Domestic livestock have grazed South Prairie since the 1880s. It was presumably an important native ungulate grazing area before the introduction of domestic livestock. South Prairie is a unique habitat on the Mount Adams District of Gifford Pinchot National Forest, which is reflected in its designation as both a Geologic Special Interest Area (GD) and Botanical Special Interest Area (9L) in the current Forest Plan (*Gifford Pinchot National Forest Land and Resource Management Plan Final Environmental Impact Statement* 1990).

From 2003 to 2005, South Prairie has been subject to grazing levels exceeding those specified in the annual operating instructions (AOI) (see additional discussion in under Grazing History). Observational accounts (J. Scott, pers. comm. 2003) indicate that the abundance of *Taraxacum officianale* (common dandelion) may be increasing within the meadow.

During late summer in 2003, surveys revealed areas of the meadow where patches of an unidentified grass species had been pulled up the roots, while shrubs in the understory of black cottonwood (*Populus trichocarpa*) islands appeared to be hedged. The stubble height at the end of the grazing season ranged from 1 inch or less in the north section of the meadow to between three and four inches in the south of the meadow (C. Chandler and J. Scott, pers. comms. 2003). Forbs in the north part of the meadow appeared underdeveloped and short in stature (Raven, Ruchty, J. Scott, pers. comms. 2003).

Islands of black cottonwood found within South Prairie are an important component of this unique ecosystem. Currently, there is a mature stand of black cottonwood within the meadow, showing few signs of recruitment. It is unclear what conditions are preventing the recruitment of cottonwood seedlings into the meadow, but contributing factors may include grazing and fire suppression (Holmes and R. Crawford, pers. comms. 2004).

South Prairie Bog

South Prairie Bog is geographically associated with South Prairie, and is located just across U.S. Forest Road 66 from the east edge of South Prairie. This bog is approximately 35 acres in size, and contains a number of botanically important attributes; it is a *Sphagnum* bog that supports a wild cranberry population, as well as many other species of botanical interest, including lesser bladderwort.

Early in the growing season, the bog is wet enough to discourage livestock incursions, but later in the season, especially during dry years, livestock do range into the bog (Ruchty pers. comm. 2003). Livestock use of the bog is of concern for a number of reasons. Livestock may cause ground disturbance that create seedbeds for noxious weed seeds that may be transported in their fur, hooves or gut. In addition, livestock defecation introduces nutrients that could change the chemistry of the bog, with the potential to affect the acid-loving plant communities that occupy the site. Livestock may also trample lesser bladderwort plants growing in shallow water, or disturb the habitat where this species grows. Through the same mechanisms, livestock may impact other unusual plants within the bog, including *Vaccinium oxycoccos, Drosera spp.* (sundew) and *Sphagnum spp*.

Peterson Prairie

Peterson Prairie is a meadow located near the junction of Forest Roads 60 and 24. The whole prairie comprises approximately 18 acres, split into two lobes, of which the north lobe is the largest.

The north lobe of Peterson Prairie hosts two Sensitive species populations; *Sisyrinchium sarmentosum* and *Orthocarpus bracteosus*. The south lobe of the prairie hosts *S. sarmentosum*, and a reproductive clone of quaking aspen (see section on Quaking Aspen in this section). This meadow experiences shorter term, higher intensity use than the rest of the Allotment, as it is used as a late season round up area (it is completely fenced). There is a livestock corral within Peterson Prairie and a livestock watering station.

Though grazing is restricted within Peterson Prairie, grazing impacts on these rare plant populations are still of concern. During years when pale blue-eyed grass and rosy owl clover is able to produce and release mature seed before mid-September (livestock gather time), the late season, short duration, high intensity grazing regime utilized at the site appears to allow for successful sexual reproduction by these populations. However, this circumstance appears to be highly dependent on year-to-year climatic variation, which influence timing of flowering and seed set.

Late season grazing at this site compromises the plant's ability to sexually reproduce during years when seed maturation and deposition occur during mid- to late-September (cooler years). In addition, heavy late-season livestock use of Peterson Prairie creates areas of disturbed soil or bare ground that may act as seedbed for noxious weeds (this is the time of year when weed seeds, particularly thistle seeds, are being freely transported by wind). See more discussion of Peterson Prairie under the Threatened, Endangered and Sensitive Plants section ad elsewhere in the.Special Habitats section.

Lost Meadow

Lost Meadow is a small natural meadow located off of Forest Road 2420. It hosts no known sites plant species of concern, but it is potential habitat for many Sensitive plant species. Livestock heavily utilizes this area. Observations made during field season of 2003 revealed that the meadow had been grazed to approximately 1 inch or less in stubble height (Ruchty and J. Scott, pers. comms. 2003). The graminoid and forb cover at the site was extremely sparse in 2003, and the site appeared compacted. Copious cow-pies observed at the site indicated a period of heavy livestock use.

Environmental Consequences

Aspen

Alternative A – Limited Change to Current Management and *Alternative B - Drift Fence-Adaptive Management B*

Direct, Indirect and Cumulative Effects

With these alternatives, the aspen at South Prairie would be excluded from cattle grazing, but still be subject to browsing by elk and deer. There would be a better chance that suckers could grow due to less grazing pressure. The reduction of grazing pressure would increase the chance that this clone could persist in the long-term since suckers could grow to replace older trees.

The clone at Peterson Prairie would still be subject to grazing by cattle for a short time in the fall, but enforcement of the 30 percent utilization standard would improve the chances that suckers could grow. There would be no cumulative effects.

Alternative C – No Grazing

Direct, Indirect and Cumulative Effects

Under Alternative C, both aspen clones would be protected from cattle grazing, but still be subject to browsing by elk and deer. The reduction of grazing pressure would increase the chance that these clones could persist in the long-term since suckers could grow to replace older trees. There would be no cumulative effects.

Heritage Resource

Existing Condition

A total of 86 cultural resource sites have been documented within the Ice Caves Grazing Allotment boundary, including 13 prehistoric sites, five prehistoric isolates, 39 peeled cedar sites, one historic Indian berry camp, two historic trails, nine cabin remains, three standing historic structures, two former Civilian Conservation Corps Camps, an historic irrigation ditch, and two historic isolates.

Prehistoric and Historic Indian Use

People have used the area within the Allotment for thousands of years. In the distant past, collecting and drying plant foods was the primary focus of activities, along with hunting and

fishing. Within the Allotment boundary, huckleberries were intensively utilized, both as an over-winter staple and as an item of trade. It is likely that Indians utilized fire as a tool to "manage" huckleberry fields, in order to enhance their productivity. The distribution and density of peeled cedar sites are one indicator of the location and intensity of use of former huckleberry fields, as well as indicating general routes of travel. Based on a variety of historic sources, it is likely that the intensity of human use of certain parts of the Allotment was much greater in years past than it is today. This is particularly true for areas around what is now called Mann Butte.

A 1936 publication describing historic Klickitat villages and camps lists two Klickitat summer camps within the Allotment area (Ray 1936, pp.148–149). This information was derived from interviews with Lucy Quaempts, a Klickitat woman who was 80 years old at the time she was interviewed in the 1930s. Her information pertains to the period around 1850. Mrs. Quaempts described *lu'axam*, meaning "burnt ground", as a camp at Deadhorse Meadow. She described a summer camp at Peterson Prairie called *tak ta'k*, meaning "little meadows", where approximately 150 people camped.

Use of the Dead Horse Meadow area by Indians is indicated in historic Forest Service fire records dating to 1904 and 1905 (Allen 1904; 1905). A spot fire was reported in September of 1904 at Dead Horse Meadows, and another in August of 1905, both of which were reported by Rangers as having been started by Indians. An 8-acre fire, 1.5 miles west of Dead Horse Meadows, was also attributed to Indians in September of 1905. A 1911 Forest Service report by Arthur Wilcox (1911, pp. 14–15) states: " In the high open country around the summit of the Cascades the most prolific cause of fire is the method the Indians use in drying huckleberries by means of a burning log."

Several sources describe an Indian camp near the base of Little Huckleberry Mountain, referred to as *Ka-tla-kah-tla*, or *Iskis Kah-tla*. This name translates as "little place where wild sunflowers (i.e. *Balsamorhiza sagittata*) grow."

The 1910 Special Fire Report for the Columbia National Forest describes Patrol District "C" of District No. II, in the vicinity of what we now call South Prairie:

"The Guard in this District will establish his permanent camp at a place known as South Meadows, situated at the foot of Huckleberry Mountain. These meadows and the country surrounding them are frequented by the Indians, since there are numerous berry patches on Huckleberry Mountain" (Stabler 1910).

A common site type within the Allotment is culturally modified cedar trees, or peeled cedars. The association of peeled cedar sites with former huckleberry fields and camps has been documented in other parts of the Gifford Pinchot National Forest, and peeling dates from peeled cedar sites correspond to the dates of use of those particular huckleberry fields. A total of 827 peeled cedars have been documented within the Allotment boundary. The peeled trees cluster in four areas, including South Prairie, the area surrounding Mann Butte, the route of McClellan's Trail and the route of a former Service Trail to Deadhorse Meadow. Peeling dates have been determined through tree ring counting in several of these sites, and dates range from 1787 to 1952. Based on the dates and distribution of peeled cedar sites, it seems likely that the area in the vicinity of Mann Butte was used as a huckleberry field in the early to mid-1800'. Other sources indicate that Little Huckleberry Mountain and the Deadhorse Meadow area were used for huckleberry collection in the early 1900s.

Myth Sites

The Cave Creek Allotment incorporates strong Indian mythological associations, specifically in the lava tube caves. Many of these myths were recorded by the McClellan Party in the mid 1800s, and include tales of mice and large grizzly bears, or combinations of the two.

Each myth explains why the caves exist. For example, one tale describes how a great Chinook chief punished his wife by turning her into a mouse. Out of spite and to cause mischief under cover, the mouse-wife produced and still lives in the caves. A second version attributes the caves to a former race of very strong people called the *Siam*, a Chinook jargon term for grizzly bear And a third version describes how a strong, married man of gigantic stature (grizzly bear) fell in love with another woman named Mouse and ran away with her to a hole in the ground. Various versions have Grizzly Man and Mouse Woman excavate the lava tubes in their flight from Grizzly Woman, the first wife. Another version has Grizzly Woman excavate underground passages in her pursuit of Grizzly Man and Mouse Woman.

Hool-hool (mouse), also spelled *Huhl-huhl-olse* is a Chinook jargon term, and refers to the Cave Creek River (Cooper). A. J. Splawn later provided Indian names for several features encountered within the project area, including *Tach-tach-quie-quie* as the name for the Ice Caves, and the Sahaptin term *La-cas-scon-nee* ("place of the mouse") as the name for other lava tubes in the area (Splawn 1944 pp. 482–483).

Historic Euro-American Use

The Peters family homesteaded at what is now called Peterson Prairie in the late 1880s. They had a house and a barn on the eastern side of the Prairie. They abandoned their homestead in 1890, after a harsh winter resulted in the death of most of their cattle. Their log home was later used as the first Ranger Station at the site.

Lost Creek Ditch was built in 1906 by a group of farmers in the Trout Lake Valley, in order to bring irrigation water to several homesteads in the western end of the valley.

Forest Service Administrative History

Several of the earliest Ranger Stations established on the Columbia National Forest were located within the Allotment, including Peterson Prairie, Dead Horse and Olallie Ranger Stations. Dead Horse and Olallie Ranger Station were abandoned at an early date, but a new Ranger Station was built at Peterson Prairie in 1926, and in the 1930s, a registration and information booth were added. The meadows at Peterson Prairie were fenced to allow use as pasture for Forest Service horses. Fish holding ponds were constructed at Peterson Prairie in the 1930s, in order to facilitate the stocking of backcountry lakes. Water for the ponds was taken from Lost Creek Ditch.

Civilian Conservation Corps Camp F-41 was established at Peterson Prairie in May of 1933. They eventually constructed a mess hall, latrine, bathhouse and water system at Peterson Prairie, with the enrollees living in 16 wall tents.

Environmental Consequences

Since the exact locations of proposed improvements such as cattle fences (described in Alternatives A and B) are unknown at this time, archeological surveys could not be performed. However, these surveys will occur prior to excavation work.

Alternative A - Limited Change to Current Management

Direct and Indirect Effects

Under Alternative A, with the successful implementation of mitigation measures, there would be no immediate direct or indirect effects that grazing has on heritage resources.

Alternative B - Drift Fence- Adaptive Management

Direct and Indirect Effects

Under this alternative, use of the Lost Creek Ditch to provide water for cattle would be discontinued, and water would be piped from the diversion approximately one mile to a water trough location. The Lost Creek Ditch has been determined eligible to the National Register of Historic Places. If this alternative were selected, the new diversion and water pipe would be designed in order to avoid impacts to the historic ditch.

Alternative C - No Grazing

Direct and Indirect Effects

Under Alternative C, there would be no immediate direct or indirect effects to heritage resources. No mitigation or monitoring activities would be necessary.

Environmental Justice

Executive Order 12898 (February 11, 1994) directs federal agencies to focus attention on the human health and environmental condition in minority and low-income communities. The purpose of the Executive Order is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority and low-income populations. The principle behind Environmental Justice is that people should not suffer disproportionately because of their ethnicity or income level.

The communities of Trout Lake, BZ Corners/Husum, and Glenwood are within 15 miles of the Ice Caves Allotment (with Trout Lake only a few miles away). Other communities that may have an interest in the allotment area include White Salmon, Bingen, Lyle, Goldendale, and Stevenson. Census data confirm that the communities have minorities and low-income populations that may be affected by activities on the allotment. However, no specific concerns regarding minorities or low-income populations or communities were identified during the public information process.

The Ice Caves Allotment is located on ceded lands for the Confederated Tribes and Bands of the Yakama Nation. No traditional use areas have been identified in this planning area. No activities are proposed that would preclude any granted rights.

CHAPTER 4 - CONSULTATION AND COORDINATION

The Forest Service consulted with the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this Environmental Assessment:

Federal, State and Local Agencies

National Marine Fisheries Service
There are no listed species within the Ice Caves Allotment; therefore, consultation with the National Marine Fisheries Service is not required.

US Fish and Wildlife Service
It was determined that the Ice Caves Allotment would have no effect to endangered, threatened or proposed wildlife species; therefore, consultation with the US Fish and Wildlife Service is not required.

Washington State Historic Preservation Officer
The National Historic Preservation Act requires consideration be given to the potential effect of federal undertakings on historic resources. This includes historic and prehistoric cultural resource sites. Since exact locations of proposed improvements such as cattle fences are unknown at this time, archeological surveys could not be performed. With the successful implementation of mitigation measures, there would be no immediate direct or indirect effects on heritage resources; therefore, consultation with the Washington State Historic Preservation Officer was not required.

Tribal Consultation

The Confederated Tribes and Bands of the Yakama Nation, the Cowlitz Indian Tribe and the Columbia River Inter-Tribal Fish Commission were contacted during both scoping and the 30-day comment period. No comments were received. In addition, a Forest Service liason from the Yakama Nation serves on the Southwest Washington Province Advisory Committee (PAC) and attended the Forest Service, Forest Plan Monitoring field trip on September 29, 2004 which was a review of activities on the Ice Caves Allotment. The liason also attended the November 9, 2006 PAC meeting in which proposed alternatives for the Ice Caves Allotment were presented.

The Forest Service has a Memorandum of Understanding (MOU) with the Yakama Nation for cooperative management of treaty resources. The MOU includes coordination on grazing activities. Representatives from the Forest Service and Yakama Nation meet annually to discuss on-going activities and necessary management improvements. At the February 15, 2007 MOU coordination meeting, District Ranger Nancy Ryke discussed the status of the Ice Caves Allotment NEPA effort.

Others

A complete list of those individuals and interest groups who received information regarding this proposal can be found in the project file.

List of Preparers

The following is a list of Interdisciplinary Team (IDT) members who assisted in the development of the Environmental Assessment.

Role	**Specialist**
ID Team Leader	Bruce Holmson
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