Draft Environmental Impact Statement for Livestock Grazing Management on the Washington Department of Fish and Wildlife's Quilomene and Whiskey Dick Wildlife Areas in Kittitas County, Washington

As part of the Greater Wild Horse Coordinated Resource Management Planning Process

January 22, 2009

Prepared for:

Washington Department of Fish and Wildlife
Lands Division, Wildlife Program
600 Capitol Way North
Olympia, Washington 98501

Prepared by:

Ecology and Environment, Inc.
720 3rd Avenue
Seattle, Washington 98104

&

Washington Department of Fish and Wildlife
Lands Division, Wildlife Program
600 Capitol Way North
Olympia, Washington 98501

State of Washington
Department of Fish and Wildlife

Mailing Address: 600 Capitol Way N, Olympia WA 98501-1091, (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building, 1111 Washington Street SE, Olympia WA

January 22, 2009

Dear Interested Parties:

This Draft Environmental Impact Statement (DEIS) describes the effects of implementing or eliminating livestock grazing on Washington Department of Fish and Wildlife (WDFW) managed lands as it relates to the Wild Horse Coordinated Resource Management planning process and area. The project area is located approximately 10 miles east of Ellensburg, Washington, in eastern Kittitas County and encompasses approximately 62,000 acres.

The State Environmental Policy Act (SEPA) provides an exemption to grazing when issuance of new grazing leases covering a section of land or less; and issuance of all grazing leases for land that has been subject to a grazing lease within the previous ten years [WAC 197-11-800(2)(24)(a)]. Because some of the lands (i.e., the WDFW Whiskey Dick Wildlife Area) involved in the planning process have not been grazed in the past ten years and amount to more than a section of land, they are now subject to a SEPA review. Because of strong public interest, both support and controversy, WDFW has chosen to develop this DEIS to ensure the full extent of the public review process has been implemented.

Livestock grazing is being proposed that allows for viable livestock grazing, and is compatible with the goals and objectives of improving range conditions and enhancing wildlife habitat – consistent with existing state rules and WDFW policy on livestock grazing. Alternative 1 [No Action (Current Management)] would continue current grazing management on up to 18,500 acres within the Coordinated Resource Management (CRM) area. Alternative 2 [Proposed Action (CRM Grazing Plan)] would allow livestock grazing on approximately 62,000 acres within the CRM area. Alternative 3 [No Grazing] would eliminate livestock grazing on WDFW managed lands within the CRM area. One additional alternative was considered but eliminated from detailed study.

Issues were identified during public scoping. These issues included the following:
- Water quality impacts.
- Protection of stream corridors (including riparian areas).
- Spread of noxious weeds.
- Impacts to fish and wildlife (i.e., sage grouse, elk, mule deer, steelhead, etc.).
- Soil displacement and compaction.

• Habitat monitoring.

The method and deadline for giving us your comments are: **Written and Fax**.

Written or fax comments should be received at the address listed below no later than

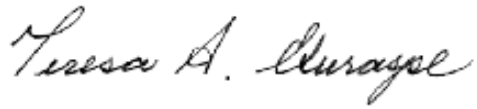
February 23, 2009, at 5:00p.m.

When you send us your comments, please provide the name of the proposal in your comment letter and mail it to:

Washington Department of Fish and Wildlife
SEPA Desk / Habitat Program
600 Capitol Way North
Olympia, Washington 98501-1091

WDFW believes this draft environmental impact statement will assist decision makers to identify the key environmental issues and options associated with this action. Based on comments received from agencies and interested parties during public review of this draft document, WDFW will prepare and distribute a final environmental impact statement.

Sincerely,



Teresa Eturaspe
SEPA Responsible Official
(360) 902-2575

Fact Sheet
Draft Environmental Impact Statement (DEIS)

LIVESTOCK GRAZING MANAGEMENT OF THE QUILOMENE AND WHISKEY DICK WILDFIFE AREA OF THE L.T. MURRAY WILDLIFE AREA COMPLEX, WASHINGTON

Description
The Washington Department of Fish and Wildlife (WDFW) proposes implementation of a grazing management plan within the Quilomene and Whiskey Dick Wildlife Areas (WA) of the L.T. Murray Wildlife Area Complex located in Kittitas County. The proposed grazing is part of the greater Wild Horse Coordinated Resource Management Planning process made up of other public and private owners. This DEIS addresses only those lands owned and/or managed by WDFW. The proposed action would rotate livestock grazing across Lone Star, Rocky Coulee, East Whiskey Dick, West Whiskey Dick, Skookumchuck, Upper Skookumchuck, Wild Horse North, Wild Horse South, Wild Horse Crossing, Vantage Hwy, Whiskey Jim, Lower Parke Creek, and Upper Parke Creek pastures within the wildlife area. The DEIS evaluates the environmental impacts of the Proposed Action, a "No Grazing" alternative, and an alternative that would continue the grazing plan implemented in 2008 (the "No Action" alternative).

Project Proponent
Washington Department of Fish and Wildlife (WDFW)

Tentative Date for Implementation
The date of implementation corresponds to the Fish and Wildlife Commission's review and approval of a grazing permit issued after the close of the DEIS comment period and issuance of the Final Environmental Impact Statement (FEIS).

Lead Agency, Responsible Official, and Contact Person:

The lead agency is Washington Department of Fish and Wildlife.

WDFW Responsible Official:

Teresa Eturaspe, SEPA/NEPA Coordinator
Regulatory Services Section, Habitat Division
Washington Department of Fish and Wildlife

Contact Person:

Jennifer Quan
Lands Division Manager
Washington Department of Fish and Wildlife
Lands Division, Wildlife Program
600 Capitol Way North

Olympia, Washington 98501-1091

Permits and Licenses Required

Per WAC 232-12-181, the Washington Department of Fish and Wildlife will issue a grazing permit for any grazing that occurs on department lands. The director is authorized to enter into grazing permits when the director determines that a grazing permit will be consistent with the desired ecological condition for those lands or the department's strategic plan. Except for temporary permits, or permits that are being renewed or renegotiated with existing permittees, grazing permits shall first be submitted to the commission, which may review the permit to ensure it conforms to commission policy. If, within thirty days, the commission has not disapproved the permit, the director shall be deemed authorized to enter into that permit.

Authors and Principal Contributors

Washington Department of Fish and Wildlife:
Kelly Craig, WDFW Project Manager
Cindi Confer, Wildlife Area Manager
Edd Bracken, Range Specialist
Melissa Asher, Private Lands Biologist
Janet Sutter, Natural Resources Scientist
Wayne Hunt, Assistant Wildlife Area Manager
Teresa Eturaspe, SEPA Coordinator
Leray Stream, Project Fish and Wildlife Biologist
Richard Tveten, Environmental Planner
Jennifer Quan, Lands Division Manager
Ted Clausing, Regional Wildlife Program Manager

Ecology and Environment, Inc. (Contractor):
William Richards, Contractor's Project Manager
James Thornton, SEPA Specialist
Alma Feldpausch, Public Scoping and Comment Analysis
Jerry Barker, Rangeland Specialist
Natalie Seitz, Alternatives Development
Ashley LaForge, Earth and Water Resources
Kathleen Dixon, Air and Noise, Land Use, Cultural and Historic Resources, Transportation, and Energy Resources
Cameron Fisher, Vegetation, Upland Wildlife, and Aquatic Wildlife
Zecca Lehn, Socioeconomic Conditions
Alan Hanson, Geographic Information System Analysis and Mapping

Date of Issuance of Draft EIS

January 22, 2009

Draft EIS Comment Period

The method and deadline for giving us your comments are: Written and Fax.

Written or fax comments should be received at the address listed below no later than:

February 23, 2009, at 5:00p.m.

When you send us your comments, please provide the name of the proposal in your comment letter and mail it to:

Washington Department of Fish and Wildlife
SEPA Desk / Habitat Program
600 Capitol Way North
Olympia, Washington 98501-1091

You can also send your comments via fax to: **(360) 902-2946.**
E-mail comments will NOT be accepted for this DEIS.

Date of Next Actions and Subsequent Environmental Reviews

No specific action date is proposed by Washington Department of Fish and Wildlife at this time. Upon issuance of the FEIS, and review and approval of a final grazing plan by the Fish and Wildlife Commission, subsequent implementation of management strategies will occur.

Location of Copies of this DEIS and Supporting Documents

Washington Department of Fish and Wildlife
Lands Division, Wildlife Program
600 Capitol Way North
Olympia, Washington 98501-1091

Cost/Availability

Copies of the Draft Environmental Impact Statement are available for downloading at no charge from http://wdfw.wa.gov/hab/sepa/sepa.htm .

By phone or written request a limited number of CD copies are available at no charge. (360/902-2515) After these copies are distributed additional copies will be available by downloading from the website.

By written request a limited number of printed copies are available at no charge. After these copies are distributed additional copies will be available only on CD (as supplies last) or by downloading from the website.

Distribution List

Notice of the availability of this DEIS is posted on the WDFW website: http://wdfw.wa.gov/hab/sepa/sepa.htm. Notification has been sent to all local government planning departments (city and county); affected Tribes within the area of project jurisdiction; all state and federal agencies with jurisdiction; selected environmental organizations; and interested parties.

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List of Abbreviations and Acronyms

asl	Above Sea Level
AUMs	Animal Unit Months
AU	Animal Unit
BEA	Bureau of Economic Analysis
BLM	Bureau of Land Management
BMP	Best Management Practices
CFR	Code of Federal Regulations
CRM	Wild Horse Coordinated Resources Management Area Grazing Plan
CWA	Clean Water Act
DAHP	Department of Archeology and Historic Preservation
DEIS	Draft Environmental Impact Statement
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EPA	(U.S.) Environmental Protection Agency
ESA	Endangered Species Act
ESAC	Ecosystem Standards Advisory Committee
ESUs	Evolutionarily Significant Units
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FT	Federal Threatened
GHG	Greenhouse Gas
gpm	Gallons Per Minute
HB	House Bill
HUC	Hydrologic Unit Code
IAC	Office of the Interagency Committee
LGP	Livestock Grazing Plan
mm	Millimeter
NAAQS	National Ambient Air Quality Standards
NRCS	(U.S.) Natural Resource Conservation Service
NRHP	National Historic Register of Places
NPS	National Parks Services
ODW	(Department of Health) Office of Drinking Water
OFM	Office of Financial Management
OHV	Off-highway Vehicle
PA	Proposed Action
PHS	Priority Habitats and Species
PM_{10}	Particulate Matter for Fugitive Dust Emissions
PSE	Puget Sound Energy
PUD	Public Utility Department
RCO	Recreation and Conservation Office
RCW	Revised Code of Washington
RMAs	Road Management Areas
SC	State Candidate
SDWA	Safe Drinking Water Act

List of Abbreviations and Acronyms (cont.)

SEPA	State Environmental Policy Act
SOC	Species of Concern
SWAP	Source Water Assessment Programs
TCPs	Traditional Cultural Properties
TMDL	Total Maximum Daily Load
USGS	United States Geological Service
USFWS	United States Fish and Wildlife Services
WA	Wildlife Area
WAC	Washington Administrative Code
WAUs	Watershed Administrative Units
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WRIAs	Water Resource Inventory Areas

1 Introduction

1.1 Document Structure

The Washington Department of Fish and Wildlife (WDFW) has prepared this Draft Environmental Impact Statement (DEIS) in compliance with the State Environmental Policy Act (SEPA) and other relevant state laws and regulations. This DEIS identifies the direct, indirect, and cumulative environmental impacts that would result from the Proposed Action and alternatives. The document is organized into four (4) chapters, plus appendices.

Chapter 1 - Introduction: Provides the project's background and history, describes the proposed action, purpose, need, public involvement and relationship to SEPA.

Chapter 2 - Alternatives Including the Proposed Action: Describes the Proposed Action and alternatives in more detail. This chapter also provides a table of the alternatives to allow comparisons among key elements and impacts, and the Preferred Alternative.

Chapter 3 - Affected Environment and Environmental Consequences: Summarizes the physical, biological, social, and economic characteristics of the project area and analyzes potential effects of implementing the preferred alternative and other alternatives. The chapter is organized by resource area. Each section includes a discussion of the affected environment, environmental consequences and cumulative effects. This chapter also provides mitigation measures where appropriate.

Chapter 4 - Consultation and Coordination: Provides a list of preparers and agencies consulted during development of the DEIS.

Appendices: Provides more detailed information to support the analyses presented in the DEIS.

1.2 Background and History

WDFW first acquired land (11,180 acres) that would become the Quilomene Wildlife Area (WA) in 1962. In 1966, 17,027 acres (located south of the Quilomene WA) were acquired to establish what is now referred to as the Whiskey Dick WA. In 1974, an additional 343 acres were purchased and added to the Quilomene WA.

Funding for both areas was provided by the Interagency Committee for Outdoor Recreation (IAC Grant Program, now known as the Recreation Conservation Office (RCO)), U.S. Fish and Wildlife Service (USFWS) and National Park Service (NPS) to expand the winter range for the Colockum deer and elk herds and to perpetuate and improve the upland game bird habitat.

Between 2004 and 2007, a total of 17,382-acres of what is referred to as the Skookumchuck property was acquired in four (4) phases. These properties include lands in the Skookumchuck and Parke Creek drainages and Vantage Highway area, which are now managed as part of the Quilomene WA. The property was acquired to connect the Whiskey Dick and Quilomene WA's, as well as to provide habitat for sage grouse and wintering big game. Funding for the

Skookumchuck property was provided by the legislature, Hanford mitigation funds, Grant County Public Utility District (PUD) and the RCO (formerly IAC) and supported by the local community.

In addition, the Washington Department of Natural Resources (WDNR) owns 23,085 acres and Bureau of Land Management (BLM) owns 3,479 acres within the boundaries of the WA. All further references of the Quilomene WA in this document refer to the new acquisitions portions of the Quilomene (i.e., Skookumchuck & Park Creek). Portions of the Quilomene WA acquired prior to 2004 are outside of the proposed action and are not proposed for grazing.

Coordinated Resource Management Process

Coordinated Resource Management (CRM) is a procedure designed to: 1) achieve compatibility between the uses being made of natural resources, which include agriculture, fish and wildlife habitat, forage production and use, forest products, recreation, land development and others; and 2) improve land and water resources and their perpetuation in high quality condition. A Coordinated Resource Management plan covers all ownerships of the planned area. All major uses of the area are considered in an effort to coordinate activities and maximize resource management opportunities. WDFW is party to a Memorandum of Understanding signed by major state and federal regulatory and resource management agencies and an active partner in many CRMs across the state.

WDFW and interested partners in Kittitas County specifically set up the collaborative Wild Horse CRM planning process beginning in January 2006; the project area comprises approximately 62,000 acres in northeastern Kittitas County. The CRM allows for resource planning across ownership and management boundaries to meet multiple needs, including needs of fish and wildlife as well as those of local farmers and ranchers. This process has brought together WDFW, BLM, Puget Sound Energy (PSE), WDNR, the Natural Resource Conservation Service (NRCS), livestock operators and other groups and individuals to collaboratively plan to improve management of the Wild Horse CRM area to ensure healthy plant communities across the landscape.

Ownership in the Wild Horse CRM project area is a mixture of public and private landowners, including WDFW, WDNR, BLM, and PSE. By spreading the grazing across a larger landscape, the Wild Horse CRM process allows for a reduction in the grazing intensity and the potential for recovery and restoration in the areas of the landscape that have been grazed in the recent past.

In 2006, the Wild Horse CRM group developed a consensus goal statement for the entire CRM planning area that addresses social, economic, and ecological needs of stakeholders. The goal statement incorporates a description of the desired landscape that includes: 1) healthy watersheds that support a variety of native plant communities with few invasive/undesirable species, 2) enhanced habitat for wildlife that use the area, 3) improvements to water sources that improve availability across the area for wildlife and livestock, and 4) properly managed and sustainable grazing practices that balance wildlife and livestock use and result in an upward trend in ecological condition for both uplands and riparian areas.

In 2007, legislative support for the Wild Horse CRM resulted in a proviso appropriation of $490,000 in WDFW 2007-2009 biennium for implementation of the CRM (note: in October 2008, $128,000 of these funds were cut from the WDFW's budget).

Please note that unless otherwise identified, any further reference to CRM is referring specifically to the Wild Horse CRM.

1.3 CRM Area

The Wild Horse CRM Area is approximately 10 miles east of Ellensburg, Washington, in eastern Kittitas County. The western boundary of the area is near Spring Gulch, and the eastern boundary is the Columbia River and Ginkgo Petrified Forest State Park (Figure 1-1). Within the CRM area, WDFW owns approximately 35,423 acres, the WDNR owns 15,142 acres, PSE owns 7,943 acres, and the BLM owns 2,869 acres (Figure 1-2).

The CRM area is divided into 13 pastures: Lone Star, Rocky Coulee, East Whiskey Dick, West Whiskey Dick, Skookumchuck, Upper Skookumchuck, Wild Horse North, Wild Horse South, Wild Horse Crossing, Vantage Highway, Whiskey Jim, Lower Parke Creek, and Upper Parke Creek (Figure 1-3). In addition, livestock are grazed on privately owned rangeland and irrigated pasture adjacent to the CRM area.

1.4 Purpose and Need for Action

Purpose:

The WDFW proposes to permit livestock grazing on portions of the Quilomene WA and the Whiskey Dick WA that will facilitate implementation of the greater Wild Horse CRM.

Need:

In Kittitas County, agriculture, including livestock grazing, has a long history and is both economically and culturally a valuable part of the community. WDFW is a significant landowner in Kittitas County.

As a landowner, WDFW strives to be a responsible neighbor and community member supporting the community's economies and values where compatible with its mandates and obligations to the greater public it serves.

In between 2004-2007, as WDFW acquired the 17,382 acres (Skookumchuck acquisition) of land adjacent to the Quilomene WA, the agriculture constituents in the community made clear the need for those lands to continue to support livestock grazing.

To blend the needs of the local community with the WDFW statewide mandates, in 2006 WDFW engaged in the Wild Horse CRM process to achieve this. These partnerships are supported by the WDFW's Domestic Livestock Grazing on Department Lands Policy #C-6003 that specifically identifies CRM participation as a stand-alone purpose for grazing on WDFW lands.

SEPA provides an exemption to grazing when issuance of new grazing leases covering a section of land or less; and issuance of all grazing leases for land that has been subject to a grazing lease

within the previous ten years (WAC 197-11-800(2)(25)(b)). Because some of the lands (Whiskey Dick WA) involved in the planning process have not been grazed in the past ten years and amount to more than a section of land, they are now subject to a SEPA review. Because of strong public interest, both support and controversy, WDFW has chosen to develop this DEIS to ensure the full extent of the public review process has been implemented.

1.5 Proposed Action

WDFW is proposing to authorize grazing for 5-years on WDFW managed lands within the CRM area. The Proposed Action (PA) would involve managed livestock grazing on 10 of 13 pastures (excluded are two PSE pastures and the WDFW Skookumchuck pasture which is being deferred for fish protection and cultural resource issues) fall within the boundaries of the Wild Horse CRM Area (Figure 1-2). The terms and conditions of grazing use would include a forage utilization standard, different seasons-of-use, and selected range improvements and maintenance projects. The grazing system proposed would be a rotational system that changes the frequency of use in pastures during sensitive seasons, to benefit shrub-steppe obligate species (i.e., sage grouse) and big game species such as mule deer and elk. The action would also implement adaptive management utilizing objectives as identified in the livestock-grazing plan for the Wild Horse CRM area. The PA was developed in partnership through the CRM process. This is discussed further in Chapter 2 of this document.

1.6 Areas of Controversy and Uncertainty

The beneficial and/or deleterious effects of livestock grazing on wildlife habitat and forage quality are an area of controversy identified in this DEIS. Moderate grazing has been shown to maintain healthy and diverse plant communities (Lyon and Christenson 2002, Hayes and Holl 2003). Furthermore, several additional studies have shown moderate livestock grazing to improve habitat by increasing plant diversity (Rambo and Faeth 1999, Vavra 2005, Holechek et al. 1999). However, there is also evidence that livestock grazing can cause decreased plant diversity (Olff and Ritchie 1998), and in some cases can be identified as the primary cause of plant community decline (Kauffman and Krueger 1984, Belsky 1992, Fleischner 1994). The timing, intensity, and duration of livestock grazing, as well as the plant community in which it occurs, all play a role in determining the magnitude of impacts to wildlife habitat and forage quality.

The effects of livestock grazing on riparian areas and water quality are also an area of controversy and some uncertainty. It has been demonstrated that livestock grazing can reduce or eliminate vegetation in riparian areas (Platts and Nelson 1985, Platts 1991). Furthermore, it has been shown that livestock grazing can impact water quantity and quality (Fleischner 1994, Belsky et al. 1999). However, it has also been shown that light rest-rotation grazing in riparian areas has limited impacts on vegetation (Platts 1991, Kauffman et al. 1997).

1.7 Public Involvement and Issues

Scoping initiates public involvement in the SEPA process. It has three purposes: (1) to narrow the focus of the DEIS to significant environmental issues; (2) to eliminate issues that would have insignificant impacts or that are not directly related to the proposal; and 3) to help identify reasonable alternatives, consistent with the purpose and need of the proposed action, to be analyzed in the DEIS. The scoping process alerts the public, the project proponent, and the lead

agency to areas of concern and potential controversy early in the process. For this DEIS, WDFW is both the project proponent and the lead agency.

WDFW initiated SEPA public scoping for this DEIS on July 14, 2008 and the period extended through August 5, 2008. A public scoping meeting was held in Ellensburg, Washington, on July 15, 2008. Oral comments were provided to WDFW during the public scoping meeting. In addition, many interested stakeholders and individuals provided written comments. The issues raised by these comments are addressed in this DEIS.

The public scoping comments have been categorized according to topic area. The comments generally fall into the categories of Water Resources, Vegetation/Habitat, Fish, Wildlife, Cultural Resources, Socioeconomics, and Alternatives. A summary of the primary issues raised in the oral and written scoping comments is provided below.

1.7.1 Water Resources

- Inventory and maps of all springs and surface water features should be included in the DEIS.
- Methods to limit livestock in streams should be included.
- Impact analysis for water resources should consider:
  - Water quality impacts from livestock use of surface water and grazing in proximity to streams, including sedimentation, temperature, nutrients, and fecal coliform.
  - Water quality impacts from construction/maintenance of range improvements.
  - Water developments and return-flows to streams.
  - Water availability for wildlife and riparian vegetation.

1.7.2 Vegetation/Habitat

- Inventory and maps of native plant species should be included.
- Impact analysis for vegetation and habitat should consider:
  - Effects on native riparian and upland vegetation cover.
  - Effects on the spread of noxious weeds.
  - Effects on microbiotic crusts.
  - Vegetation monitoring and restoration plan.

1.7.3. Land Use/Recreation

  - Effects to recreation, including hunting and bird watching

1.7.4 Fish

- Inventory of fish species should be included.
- Impact analysis for fish should consider:
  - Water quality impacts on fish habitat.

1.7.5 Wildlife

- Inventory of wildlife species should be included.
- Impact analysis for wildlife should consider:
  - Effects on wildlife forage.
  - Effects on wildlife breeding, rearing, and movement.

- Emphasis on sage grouse and other state and federal listed species.
- Effects of water developments on wildlife.
- Effects of fences on wildlife.

1.7.6 Cultural Resources

- Impact analysis for cultural resources should consider:
  - Effects to potential cultural resources.

1.7.7 Socioeconomics

- Impact analysis for socioeconomics should consider:
  - Economic effects of grazing vs. no grazing

1.7.8 Alternatives

- The EIS should include a "no grazing" alternative.
- The EIS should include habitat monitoring in the alternatives.
- The EIS should include a "no action" alternative that includes no grazing where cattle have not been grazed recently.

1.8 Relationship to SEPA

The WDFW recognizes the importance of SEPA as part of its land and resource management decisions. The Environmental Impact Statement (EIS) process under SEPA provides opportunities for other agencies, stakeholders, the Tribes, and the public to participate in developing and analyzing information related to WDFW decisions. This process, as detailed in Chapter 197-11 of the Washington Administrative Code (WAC), ensures that the environmental consequences of decisions are documented, and that appropriate mitigation is considered. The EIS process includes:

- Scoping;
- Preparing a DEIS, which analyzes the probable impacts of a proposal and reasonable alternatives;
- Issuing the DEIS for review and public comment;
- Preparing a Final Environmental Impact Statement (FEIS), which includes analyzing and responding to comments on the DEIS;
- Issuing the FEIS; and
- Using the FEIS in decision-making.

2 Description of the Alternatives

2.1 Introduction

This chapter describes and compares the alternatives. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

This chapter describes the following:

- Brief Summary of Alternatives
- Actions Common to All Alternatives
- Actions Common to Alternatives 1 and 2
- Alternatives Considered in Detail
- Alternatives Considered But Eliminated From Detailed Analysis
- Comparison of Alternatives
- Preferred Alternative

2.1.1 Alternatives

The alternatives presented represent different grazing options. All alternatives except Alternative 3 are consistent with the purpose and need (see Section 1.4). They include:

Alternative 1-No Action (Current Management): Livestock grazing would continue on pastures that have been grazed in the recent past (less than 10 years).

Alternative 2-Proposed Action (CRM Livestock Grazing Plan): Livestock grazing would continue on pastures that have been grazed in the recent past (less than 10 years). In addition, grazing would be allowed on several pastures on the Whiskey Dick WA, which have not been grazed within the recent past.

Alternative 3-No Grazing: No livestock grazing would occur. While Alternative 3 does not meet the purpose and need, based on the public scoping comments WDFW has not eliminated Alternative 3 from analysis.

2.2 Actions Common to All Alternatives

Actions common to all alternatives are discussed in section 2.2.1. For the sake of simplicity, pastures with full or partial WDFW ownership will be referred as "WDFW managed pastures," even though many of these pastures also include DNR and BLM parcels. The checkerboard ownership pattern of these pastures necessitates a comprehensive planning effort. Accordingly, acreage and proposed livestock numbers given for each pasture reflect all ownerships.

2.2.1 Wildlife Area Management Goals and Objectives

Under all alternatives, WDFW would manage the Quilomene and Whisky Dick WAs in accordance with the agency goals and objectives outlined in the Draft L.T.

Murray/Whiskey Dick/Quilomene WA Management Plan (WDFW 2006a). These specific goals and objectives include:

Goal: Healthy and diverse fish and wildlife populations and habitats

- Objective: Protect, restore and enhance fish and wildlife populations and their habitats.
- Objective: Ensure that WDFW activities, programs, facilities, and lands are consistent with local, state, and federal regulations that protect fish, wildlife, and their habitats and contribute to their recovery.

Goal: Sustainable fish and wildlife-related opportunities

- Objective: Provide sustainable fish- and wildlife-related recreational and commercial opportunities compatible with maintaining healthy fish and wildlife populations and habitats.
- Objective: Improve the economic well-being of Washington communities by providing diverse, high quality recreational and commercial opportunities.

Goal: Operational Excellence and Professional Service

- Objective: Provide sound operational management of WDFW lands, facilities, and access sites.

2.3 Actions Common to Alternatives 1 and 2

The following actions are part of Alternatives 1 and 2 and are listed here to avoid repeating them in the description of each alternative. Actions listed below are specific to range improvements and maintenance and do not apply to Alternative 3.

2.3.1 Grazing System

Prescribed livestock grazing is objective-driven; management objectives determine the number of livestock grazed, the duration of grazing, as well as whether a pasture is grazed, deferred or rested in a given year. If management objectives are not being met, the strategy is adapted to meet the objectives defined for the area. Flexibility is maintained to meet resource needs, as well as social and economic demands.

In addition, both grazing alternatives include multiple herds of cattle in a rotational and time-controlled grazing system. Rotational grazing involves moving livestock from one pasture to another, the timing and sequence of which is based on the rotation schedule, utilization triggers and phenology. Pastures will be systematically deferred or rested, according to NRCS Prescribed Grazing Standards.

NRCS Prescribed Grazing Standards provide the following guidance for livestock grazing on rangeland dominated by the jointed, cool-season bunchgrasses native to eastern Washington (NRCS Washington Technical Notes 34 and 35).

- Defer each pasture one out of every three years during the growing season.
- Defer each pasture two out of three years during the critical period (boot through seed formation). NRCS defines “boot stage” as the growth stage when a grass seed head is enclosed by the sheath of the uppermost (flag) leaf (NRCS 2003).

- Graze no pasture more than half the growing season (generally March to early July).

Pastures with no stock water available during the dormant season will be rested; pastures with stock water available during the dormant season may be deferred or rested.

2.3.2 Grazing Use and Stocking Capacity

The term "Animal Unit Month" (AUM) measures livestock grazing use. The NRCS defines an AUM as the amount of forage required by one animal unit per month, which equates to 900 pounds of air-dried forage. An animal unit (AU) is defined as a 1,000-pound cow with a calf under weaning age (approximately six months) (NRCS 2003).

Forage production estimates for the various pastures were developed using data from a draft soil survey for Kittitas County provided by the local NRCS office. During 2006, 2007 and 2008, range specialists from WDFW, WDNR, NRCS, and BLM conducted a range inventory on almost 62,000 acres of the CRM project area, including the pastures in both grazing alternatives, to verify the condition and areal extent of various ecological sites in the grazing area. (An ecological site is a kind of land with specific physical characteristics, which differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and in its response to management.) Information gathered during this effort and field inspections of various ecological sites were used to assess rangeland health and to develop an estimate of forage production for the grazing area. The methods utilized during this inventory, and results summarized by pasture, are presented in Appendix B.

The total available production of palatable species was calculated for each pasture, and available production for livestock was calculated using the following utilization targets: 35 percent for grasses, 10 percent for forbs, and 0 percent for sagebrush and bitterbrush. Available production was then converted into AUMs. An accessibility factor was then applied to the available AUMs to calculate Allowable AUMs. Livestock accessibility calculations were based on Table 2-1. Available AUMs are presented in Table 2-2.

Table 2-1 Forage Accessibility Based on Slope and Distance from Water

Distance from Water (m)	Percent Slope				
	0 - 5	6 - 15	16 - 45	46 - 60	60+
	Percent Accessibility				
0 - 200	100	100	90	60	0
201 - 400	100	100	80	50	0
401- 600	100	90	70	50	0
601 - 1500	90	80	70	40	0
1500+	0	0	0	0	0

Source: CRM 2008

Table 2-2 Production and AUM Calculations by Pasture

Pasture	Acreage	Total Production of Palatable Species (lbs)[1,6]	Available Production (lbs)[2]	Annual Available AUMs[4]	Access-ibility[3] (%)	Allowable AUMs[4]
East Whiskey Dick	10,225	2,774,041	811,400	902	59	532
Lone Star	5,378	1,212,040	359,547	399	41	164
Lower Parke Creek	1,752	432,880	128,648	143	78	111
North Wild Horse	5,478	2,162,048	457,042	508	74	376
Rocky Coulee	3,049	1,035,623	310,951	346	42	145
South Wild Horse	3,837	955,236	269,111	299	39	117
Upper Parke Creek	1,894	605,122	174,683	194	66	128
Upper Skookumchuck[5]	3,974	1,054,933	310,586	345	66	228
Vantage Highway	5,988	1,252,924	349,628	388	59	229
West Whiskey Dick	9,250	2,601,912	774,106	860	45	387
Whiskey Jim	3,277	1,034,138	298,568	332	70	232
Wild Horse Crossing	1,615	535,186	153,321	170	73	124

Source: CRM 2008

[1]Palatable species include forbs and grasses

[2]Proper available production was calculated by applying proper use factors to the total production. Use of grasses: 35 percent; of forbs: 10 percent; of bitterbrush and sagebrush: 0 percent

[3]Percentage of forage that would be available to livestock due to slope and distance from water

[4]AUM calculations assume 1,100-pound cows

[5]Rangeland inventory is incomplete; productions are estimates based on a partial inventory and the soil survey

[6]Production based on average year

2.3.3 Utilization Levels

Forage utilization, or consumption of the current year's growth, is one way to gauge the intensity of livestock grazing. Forage utilization is measured at the end of the growing season when the total annual production can be accounted for and the effects of grazing in the whole management area can be assessed.

Use of a pasture before the end of the growing season is "seasonal utilization." Under both grazing alternatives, pasture moves will be determined by the measures of seasonal

utilization listed in Table 2-3, while considering any additional growth that might occur that year.

Table 2-3. Utilization Measurements

Area/ Vegetation Type	Key Species[1]	Stubble Ht /% Use	Monitoring Method
Riparian	Key grasses	4 inches	Stubble Height Method[2]
Riparian	Browse species	35%	Landscape Appearance
Uplands; within the area accessible to livestock	Bluebunch wheatgrass, Idaho fescue	35%	Key Species Method, Grazed-Class Method
Uplands; within 100 yards of developed stock water	Bluebunch wheatgrass, Idaho fescue	60%	Key Species Method, Grazed-Class Method

[1] Key species vary by site, but are typically dominant and/or the most palatable.
[2] BLM Technical Reference 1734-3, Utilization Studies and Residual Measurements.

2.3.4 Guidelines

2.3.4.1 HB 1309 Ecosystem Standards

Passed by the state legislature in 1993, House Bill (HB) 1309 maintains that WDFW (state agencies) "shall implement practices to meet the standards on agency-owned and managed agricultural and grazing lands." The 26 Ecosystem Standards created by the Ecosystem Standards Advisory Committee (ESAC) are intended to maintain and restore fish and wildlife habitat by improving ecosystem health. These standards include noxious weed control, stream temperature, fish passage, soil stability and watershed function, plant community status/condition, and stream channel width to depth ratios, among others. The intent of each Ecosystem Standard is achieved by implementing practices that maintain or make measurable progress towards achieving the desired ecological conditions. Listed below is a selection of "desired ecological conditions" that apply to grazing alternatives (ESAC, 1994):

- Land managers must comply with state and local weed control laws.
- Land managers must meet state water temperature requirements, based on classes defined in the regulations.
- Mass soil movement, e.g., mudslides, slumps, debris torrents, does not occur.
- Native plant species dominate uplands and riparian areas. Non-native plant species, not classed as noxious weeds, which provide habitat benefits to fish and wildlife comparable to native plant species are acceptable.
- Limited areas, (e.g., oak woodlands, prairies, wetlands, natural seepages), and structural features (e.g., cliffs, caves, and snags) that provide benefits to fish and wildlife are preserved and increased (where feasible).
- Stream bank erosion dynamics approximate natural/geologic rates.

- Plant community structural complexity, vegetative cover and plant species diversity approximates site potential for native species, in both uplands and the riparian management zone. Non-native plants can be used if they provide equivalent habitat benefits to fish and wildlife.
- Active gully erosion does not occur.
- Soil erosion beyond natural geological rates is not discernible.
- Width to depth ratio of streams is 12 to 1 or less to the extent possible given site and stream potential.

2.3.5 Adaptive Grazing Management

Adaptive grazing management involves monitoring and evaluating livestock grazing activities, and incorporating new scientific research into future grazing management. As needed, monitoring results are used to modify the timing, intensity and duration of livestock grazing. Both grazing alternatives will utilize an adaptive grazing approach to ensure management goals are achieved.

2.3.6 Livestock Grazing Permit

Domestic livestock grazing on WDFW managed lands may be permitted if determined to be consistent with desired ecological conditions for those lands (WAC 232-12-181). Grazing permits are of agency-wide interest. WDFW has procedures that include a cross-program review to ensure all grazing permits are subject to the best available science. In addition, new grazing permits are made available for the Fish and Wildlife Commission review before being forwarded to the WDFW director for approval. All grazing permits, excluding temporary permits lasting less than two weeks, must include a domestic livestock grazing management plan that includes a description of ecological impacts, fish and wildlife benefits, a monitoring and evaluation schedule, and a description of the desired ecological conditions.

Roles and Responsibilities

The WDFW has several roles and responsibilities as part of implementing the grazing permit. The WA Manager determines the “on” and “off” dates and any necessary alterations in AUMs for the WDFW managed pastures based on weather conditions, seasonal vegetation growth, the needs of the permittee, and other circumstances. A minimum of one week’s notice would be given to the permittee for the dates. WDFW would repair and maintain the boundary fence, will provide all construction and repair materials for pasture fences, and install temporary electric fencing, to protect riparian habitat and minimize sedimentation to creeks, prior to livestock turn-out.

The permittee also has multiple grazing permit responsibilities. The permittee is required to pay annual grazing fees to WDFW; gather stray cattle immediately upon notification; and keep livestock well distributed across the pastures using riders, salt, protein blocks, or other means. The permittee would also keep livestock as far away as practical from watering points to minimize overuse of the area and would be required to repair and maintain all perimeter and boundary pasture fences to contain cattle in designated areas; all repairs and improvements would be pre-approved by the WA manager.

Multiple Ownerships

When a grazing plan involves multiple ownerships, each landowner involved in the CRM process is responsible for issuing a permit or lease for their land; the permittee assumes the responsibility of obtaining permits or leases from each landowner.

2.3.7 Range Improvements and Maintenance

Existing boundary fences (approximately 53.2 miles) that extend around the exterior of the CRM area would be maintained to prevent livestock trespass. Pasture fences (approximately 83.2 miles) that extend along pasture boundaries will be maintained for livestock management).

Approximately 4.2 miles of new boundary fence will be constructed. Roughly 3.6 miles of new boundary fences would be installed along the northern boundary of the Upper Parke Creek pasture, and approximately 0.6 miles would be installed along the southeast boundary of Vantage Highway pasture. The location of all current and proposed fences is provided in Figure 2-2.

In addition, the following springs are considered high-priority for re-development under Alternatives 1 and 2: Vantage Spring #2 and #3, Vantage Trough #1, Parke Creek #1 and #2, and Little Parke Artesian. Figure 2-3 shows the location of the springs. NRCS constructions standards will be followed for range improvements and spring redevelopments.

This project may also necessitate the use of temporary fencing. The length of temporary fences will vary depending on which pastures are being utilized each year.

Range maintenance would include upkeep of all boundary and pasture fences, installation and removal of temporary fencing, and maintenance of springs for livestock and/or wildlife use. Range improvements and maintenance on WDFW managed land are within the scope of this EIS; improvements and maintenance on some portions of Wild Horse North and Wild Horse South, and other non-WDFW managed land is not included.

In addition to the improvements and maintenance common to Alternative 1 and 2, Alternative 1 would require increased infrastructure in Vantage Highway, Whiskey Jim, Lower Parke Creek, Upper Parke Creek, Wild Horse Crossing, Wild Horse North, Wild Horse South and Upper Skookumchuck pastures.

2.3.8 Rangeland Vegetation Monitoring

Both short-term and long-term monitoring, to determine whether objectives are being met, will be employed. Short-term monitoring will include utilization (measuring the amount of plant cover remaining after grazing), implementation and cover monitoring. Long-term monitoring will include photo-monitoring, line-point intercept (for species cover and composition), belt transect (for measuring perennial invasive plants), forage palatability, and grass phenology monitoring. Other monitoring techniques could also be used. In addition, indicators of key ecosystem attributes (soil and site stability, hydrologic

function, and biotic integrity) would be monitored either by WDFW staff or contractor (Herrick et al. 2005). The monitoring plan is described in more detail in Appendix C.

2.3.9 Weed Management

The goal of weed control on WDFW lands is to maintain and improve habitat for wildlife, meet legal obligations, provide good stewardship and protect adjacent private lands. Importantly, WDFW will continue to be a good neighbor and partner regarding weed control issues on adjacent lands. Weeds do not respect property boundaries. The agency believes the best way to gain long-term control is to work cooperatively on a regional scale. As funding and mutual management objectives allow, WDFW will find solutions to collective weed control problems.

Weed Management Approach

State law (RCW 17.15) requires that WDFW use integrated pest management (IPM), defined as a coordinated decision-making and action process that uses the most appropriate pest control methods and strategy in an environmentally and economically sound manner to meet agency pest management objectives, to accomplish weed control.

Invasion of non-native species is a major concern on the Quilomene and Whiskey Dick WA within the CRM area; weed control consumes a large portion of the WA budget each year. Therefore, it is important to minimize ground disturbance that could facilitate invasion by non-native plants. WDFW will continue to control weeds in accordance with the L.T. Murray/Quilomene/Whiskey Dick WA, Weed Management Plan. In addition, the monitoring of weeds would be a component of the rangeland vegetation monitoring as described in section 2.3.8.

2.3.9 Fire Management

While periodic wildfires are normal processes in shrub-steppe ecosystems, the Quilomene and Whiskey Dick WA are priority wildfire suppression areas due to fire sensitive habitats that are critical to the survival of shrub-steppe obligate (dependent) wildlife species. If a fire occurred on the livestock-grazed portions of the WA within the CRM area, grazing would be deferred on all or portions of the pastures for up to three years at the discretion of the WA manager to allow adequate recovery of the vegetation. WDFW would continue to suppress fires in accordance with the L.T. Murray/Quilomene/Whiskey Dick WA Management Plan.

Fire Restrictions

Fire restrictions put in effect on WDFW lands shall be consistent with fire restrictions set by the Washington State Department of Natural Resources, which evaluates fire risk for much of the state's public lands.

2.4 Alternatives Considered in Detail

2.4.1 Alternative 1: No Action (Current Management)

Alternative 1 is the No Action (Current Management) strategy as described in the 2008 Parke Creek Livestock Grazing Plan (LGP) (WDFW 2008). Under Alternative 1,

livestock grazing would continue on pastures that have been grazed in the recent past (i.e., grazed within the last 10 years). Livestock grazing would occur on 8 pastures, of which 6 are WDFW-managed pastures. Two additional pastures which may also be considered part of the rotation schedule are owned by PSE, from whom the permittee would obtain approval prior to turnout.

The WDFW-managed Vantage Highway, Whiskey Jim, Lower Parke, Upper Parke, Wild Horse Crossing, and Upper Skookumchuck pastures as well as the PSE-managed Wild Horse North and Wild Horse pastures would be grazed under this alternative. Figure 2-1 illustrates these pastures within the Quilomene and Whiskey Dick WA. The 2008 grazing plan was intended to be an interim short-term plan. However, implementation of this alternative would necessitate a 5-year grazing permit, as WDFW policy dictates that any livestock grazing activities lasting longer than 1-year obtain a regular grazing permit (WAC 232-12-181).

2.4.1.1 2008 Livestock Grazing Plan Objectives

The goals of the 2008 Livestock Grazing Plan (LGP) would continue for subsequent years under the No Action (Current Management) Alternative.

The 2008 LGP Objectives are:

- Improve rangeland health and initiate changes in rangeland trends such that ecological sites more closely resemble the historical plant communities that occurred in this area.
- Meet or exceed sage grouse management guidelines identified in the Priority Habitat System (PHS) Program and the Sage Grouse Recovery Plan, which recommend that livestock grazing be managed so that average utilization is light (<35 percent) and average height of forbs and grasses is greater than 7 inches, livestock are seasonally rotated, and use is periodically deferred. This would provide habitat for other ground-nesting birds including sage thrashers, sage sparrows and blue grouse.
- Protect existing riparian and wetland vegetation through timing of livestock use and use of temporary fencing that does not modify the environment, where appropriate.

2.4.1.2. Grazing Rotation

The grazing rotation proposed under the Alternative 1 would allow cattle grazing on approximately 27,815 acres, including 6 WDFW managed pastures and 2 PSE managed pastures. Livestock use will generally occur from April through August. Table 2-4 presents the proposed 5-year rotation schedule.

Table 2-4 Alternative 1 [No Action (Current Management)] Grazing Rotation

Year 1	April	May	June	July	Aug	On	Off	Season	AUs	Days	AUMs
Vantage Highway	1					4/21	5/1	EG	160	10	53
Lower Parke		1 1	1			5/10	6/5	CP	40	20	27
Wild Horse Crossing		2 2				5/1	5/15	EG	160	15	80
Whiskey Jim		2 2	2 2			5/15	6/15	CP	160	30	160
North Wild Horse[1]			2 2	2 2 2 2	2	6/15	8/10	CP	160	55	293
South Wild Horse[1]					2 2 2	8/10	8/30	DG	160	20	107
Lower Parke		3 3 3	3			5/15	6/5	CP	60	25	50
Upper Parke			3 3 3			6/5	6/30	CP	100	25	83
Upper Skookumchuck								RESTED			
											853

Year 2	April	May	June	July	Aug	ON	OFF	SEASON	AUs	DAYS	AUMs
Lower Parke	1 1					4/1	4/14	EG	230	14	107
Whiskey Jim	1 1					4/14	5/1	EG	230	15	115
Vantage Highway		1 1				5/1	5/20	CP	240	20	160
South Wild Horse[1]		1 1				5/20	6/1	CP	260	10	87
North Wild Horse[1]				1 1 1	1	7/5	8/6	DG	260	31	269
Wild Horse Crossing								RESTED			
Upper Skookumchuck								RESTED			
Upper Parke								RESTED			
											738

Year 3	April	May	June	July	Aug	ON	OFF	SEASON	AUs	DAYS	AUMs
Upper Skookumchuck		1 1 1	1			5/6	6/5	CP	230	30	230
Upper Parke			1 1			6/5	6/20	CP	230	15	115

Table 2-4 Alternative 1 [No Action (Current Management)] Grazing Rotation

North Wild Horse[1]				1 1 1	1	7/5	8/12	DG	230	37	284
South Wild Horse[1]			1	1		6/20	7/5	DG	230	15	115
Vantage Highway								RESTED			
Lower Parke								RESTED			
Wild Horse Crossing								RESTED			
Whiskey Jim								RESTED			
											744

Year 4	April	May	June	July	Aug	ON	OFF	SEASON	AUs	DAYS	AUMs
Vantage Highway	1 1 1 1					4/1	5/1	EG	160	30	160
Lower Parke		1 1 1				5/1	5/15	CP	160	15	80
Upper Skookumchuck	2 2 2 2					4/1	4/29	EG	230	29	222
Wild Horse Crossing		2 2				4/29	5/15	EG	230	16	123
Whiskey Jim		2 2	2 2			5/15	6/11	CP	260	26	225
North Wild Horse[1]			2 2	2 2 2		6/11	7/24	CP	260	43	373
South Wild Horse[1]				2	2	7/24	8/9	DG	260	15	130
Upper Parke								RESTED			
											1153

Year 5	April	May	June	July	Aug	ON	OFF	SEASON	AUs	DAYS	AUMs
North Wild Horse[1]				2 2 2	2 2	7/5	8/15	DG	260	40	347
Lower Parke	1 1 1					4/1	4/21	DG	160	20	107
Vantage Highway	1	1 1				4/21	5/15	CP	160	25	133
South Wild Horse[1]			2	2		6/20	7/5	DG	260	15	130
Whiskey Jim								RESTED			
Upper Skookumchuck								RESTED			
Upper Parke								RESTED			
											717

	Early Grazing Season
	Critical Period

Key: EG = Early Growing Season, CP = Critical Period, LS = Late season, DG = Deferred grazing, Rested = Not grazed
[1]North Wild Horse and South Wild Horse pastures are Puget Sound Energy majority-owned pastures.
1 = Herd #1; 2 = Herd #2; 3 = Herd #3

2.4.1.3 Range Improvements and Maintenance

NRCS Prescribed Grazing Standards for native bunchgrasses recommend that each pasture be deferred one out of every three years during the growing season. Due to water shortages during the mid to late-summer grazing period (after the growing season), deferred grazing is not possible on several pastures; therefore these pastures will be rested.

Additional range improvements and maintenance under Alternative 1 include the priority redevelopment of up to six springs (depending on funding availability) and the installation and removal of up to 5.5 miles of temporary fence. The length of temporary fences will vary depending on which pastures being utilized each year. Figure 2-3 shows the location of the springs. Figure 2-2 shows the location of fences that would be improved and maintained.

2.4.1.4 Current Grazing Permit

Under Alternative 1, a 5-year grazing permit would be issued with a range of 240 to 650 AUMs available annually on six WDFW managed pastures. Puget Sound Energy would issue a separate agreement for two additional pastures. A total of eight pastures would be available for grazing, with an annual range of 717 to 1153 AUMs.

WDFW would work in conjunction with Puget Sound Energy to schedule "on" and "off" dates and any necessary alterations in AUMs for pastures within the No Action Alternative area, based on weather conditions, vegetation growth and monitoring data.

2.4.2 Alternative 2: Proposed Action (CRM Grazing Plan)

This alternative incorporates the livestock grazing management strategy developed in the CRM Grazing Plan (CRM 2008). The CRM committee seeks to collaboratively manage up to 62,000 acres across multiple land ownerships. This alternative would allow livestock grazing on 10 WDFW managed pastures under a five-year grazing permit, as well as two PSE managed pastures. The proposed action would implement more management objectives, allow more AUMs, and require more rangeland infrastructure improvements and maintenance than Alternative 1. Alternative 2 would allow livestock grazing on West Whiskey Dick, East Whiskey Dick, Rocky Coulee, and Lone Star pastures in addition to the pastures that would be grazed under Alternative 1. Figure 2-1 delineates the pastures that would be grazed under the CRM Grazing Plan (all pastures except Skookumchuck). Of the 62,000 acres within the CRM area, grazing would be allowed on approximately 55,720.

2.4.2.1 CRM Grazing Plan Objectives

The objectives of the CRM grazing plan are listed below. The CRM uses adaptive grazing management, which requires monitoring and evaluation of grazing strategies and incorporation of new knowledge into management approaches.

The CRM Grazing Plan objectives include:

- Meeting NRCS management guidelines for native bunchgrasses and HB 1309 Ecosystem Standards.
- Meeting guidelines from the Washington State Recovery Plan for the Greater Sage Grouse (Stinson et al. 2004):
  - A maximum of 35 percent use of palatable plants species. Palatable plant species as defined by NRCS are, "a desirable forage plant that makes up at least 15 percent of the plant community", and will generally provide clues as to how much the remaining plant community is responding to grazing management. Palatable plant species are generally limited to 1 or 2 grasses.
  - Where site potential allows, maintain at least 15-18 cm of grass/forb height for breeding (March to mid-April) and brood-rearing periods.
- Increasing bluebunch wheatgrass palatability for the Colockum elk herd.
- Increasing forb cover and/or diversity.
- Maintaining sensitive plant populations.
- Promoting stable or declining weed populations.
- Maintaining or improving health of riparian communities.
- Maintaining or improving rangeland health, as measured by the following indicators:
  - Cover of native plant species
  - Basal cover of native species
  - Amount of bare ground
  - Presence of lichen and mosses
  - Species richness

2.4.2.2 Grazing Rotation

The CRM grazing committee has developed a five-year grazing rotation for 12 of the 13 pastures in the CRM area. The projected rotation would allow grazing on approximately 55,720 acres, including 10 WDFW managed pastures (46,400 acres) and 2 PSE managed pastures (9,320 acres). The Skookumchuck pasture will be rested indefinitely to protect cultural resources along Columbia River and critical fish habitat in Skookumchuck Creek. Table 2-5 presents the proposed 5-year rotation schedule.

Table 2-5 Alternative 2 [Proposed Action (CRM Grazing Plan)] Grazing Rotation

Year 1	April	May	June	July	Aug	On	Off	Season	AUs	Days	AUMs
Vantage Highway	1					4/21	5/1	EG	160	10	53
Lower Parke		1 1	1			5/10	6/5	CP	40	20	27
Wild Horse Crossing		2 2				5/1	5/15	EG	160	15	80
Whiskey Jim		2 2	2 2			5/15	6/15	CP	160	30	160
North Wild Horse[1]			2 2	2 2 2 2	2	6/15	8/10	CP	160	55	293
South Wild Horse[1]					2 2 2	8/10	8/30	LS	160	20	107
Lower Parke		3 3 3	3			5/15	6/5	CP	60	25	50
Upper Parke			3 3 3			6/5	6/30	CP	100	25	83
E. Whiskey Dick								RESTED			
Lone Star								RESTED			
Rocky Coulee								RESTED			
Upper Skookumchuck								RESTED			
W. Whiskey Dick								RESTED			
											853
Year 2	April	May	June	July	Aug	ON	OFF	SEASON	AUs	DAYS	AUMs
Lone Star	1 1 1					4/1	4/21	EG	160	20	107
Rocky Coulee	1	1 1 1				4/21	5/18	CP	160	27	144
Lower Parke	2 2					4/1	4/14	EG	230	14	107
Whiskey Jim	2 2					4/14	5/1	EG	230	15	115
Vantage Highway		2 2				5/1	5/20	CP	230	20	153
Vantage Highway		2 2				5/18	5/20	CP	30	2	2
South Wild Horse[1]		2 2				5/20	6/1	CP	260	10	87
W. Whiskey Dick			2 2 2 2	2		6/1	7/5	CP	260	34	295
North Wild Horse[1]				2 2 2	2	7/5	8/6	DG	260	31	269
Wild Horse Crossing								RESTED			

Table 2-5 Alternative 2 [Proposed Action (CRM Grazing Plan)] Grazing Rotation

E. Whiskey Dick								RESTED				
Upper Skookumchuck								RESTED				
Upper Parke								RESTED				
												1279

Year 3	April	May	June	July	Aug	ON	OFF	SEASON	AUs	DAYS	AUMs
Rocky Coulee	1 1 1					4/1	4/20	EG	160	20	107
Lone Star	1	1 1				4/20	5/19	CP	160	29	155
W. Whiskey Dick	2 2 2 2	2				4/1	5/6	CP	230	36	276
Upper Skookumchuck		2 2 2	2			5/6	6/5	CP	230	30	230
Upper Parke			2 2			6/5	6/20	CP	230	37	115
North Wild Horse[1]				2 2 2	2	7/5	8/12	DG	230	37	284
South Wild Horse[1]			2	2		6/20	7/5	RESTED	230	15	115
E. Whiskey Dick								RESTED			
Vantage Highway								RESTED			
Lower Parke								RESTED			
Wild Horse Crossing								RESTED			
Whiskey Jim								RESTED			
											1282

Year 4	April	May	June	July	Aug	ON	OFF	SEASON	AUs	DAYS	AUMs
Vantage Highway	1 1 1 1					4/1	5/1	EG	160	30	160
Lower Parke		1 1 1				5/1	5/15	CP	160	15	80
Upper Skookumchuck	2 2 2 2					4/1	4/29	EG	230	29	222
Wild Horse		2 2				4/29	5/15	EG	230	16	123

Table 2-5 Alternative 2 [Proposed Action (CRM Grazing Plan)] Grazing Rotation

Crossing												
Whiskey Jim		2 2	2 2				5/15	6/11	CP	260	26	225
North Wild Horse[1]			2 2	2	2 2		6/11	7/24	CP	260	43	373
South Wild Horse[1]					2	2	7/24	8/9	DG	260	15	130
E. Whiskey Dick									RESTED			
Lone Star									RESTED			
Rocky Coulee									RESTED			
W. Whiskey Dick									RESTED			
Upper Parke									RESTED			
												1313

Year 5	April	May	June	July	Aug	ON	OFF	SEASON	AUs	DAYS	AUMs
E. Whiskey Dick	2 2 2 2	2 2				4/1	5/15	CP	230	45	345
E. Whiskey Dick		2 2				5/15	6/1	CP	260	15	130
W. Whiskey Dick			2 2 2 2	2		6/1	7/5	CP	260	34	295
North Wild Horse[1]				2 2 2	2 2	7/5	8/15	DG	260	40	347
Lower Parke	1 1 1					4/1	4/21	EG	160	20	107
Vantage Highway	1	1 1				4/21	5/15	CP	160	25	133
Lone Star								RESTED			
Rocky Coulee								RESTED			
South Wild Horse[1]								RESTED			
Whiskey Jim								RESTED			
Upper Skookumchuck								RESTED			
Upper Parke								RESTED			
											1357

	Early Grazing Season
	Critical Period Season
Source: CRM 2008	

Key: EG = Early Growing Season, CP = Critical Period, LS = Late season, DG = Deferred grazing, Rested = Not grazed
[1]North Wild Horse and South Wild Horse pastures are Puget Sound Energy majority-owned pastures.
1 = Herd #1; 2 = Herd #2; 3 = Herd #3

2.4.2.3 Range Improvements and Maintenance

In addition to the range improvements and maintenance (section 2.3.7) common to both Alternatives 1 and 2, Alternative 2 would require additional improvements to and maintenance of 4 pastures (West Whiskey Dick, East Whiskey Dick, Rocky Coulee, and Lone Star pastures). This alternative would also necessitate the maintenance of up to 78.9 additional miles of pasture fences, the installation and removal of up to 12.8 additional miles of temporary fences (Figure 2-2) and the priority re-development of up to 14 springs (depending on funding availability) (Figure 2-3).

2.4.2.4 Grazing Permit

A five-year grazing permit with an annual range of 560 to 1,010 AUMs (Year 1-5) would be available for WDFW managed pastures under Alternative 2. Additional AUMs would be available for 2 PSE managed pastures, bringing the total annual range of AUMs available on the CRM area to 853 to 1,357. The length of the permit and the consistency of the allowable AUMs and management over multiple years would likely provide at least one applicant every permit cycle.

Given that the CRM grazing plan involves multiple ownerships, each landowner involved in the CRM process will issue a permit or lease for their land; it's the responsibility of the permittee to get authorization from each landowner before turnout.

The CRM Grazing committee, which includes WDFW, would recommend "on" and "off" dates and any necessary reductions in AUMs for pastures under all ownerships in the CRM area based on weather conditions and vegetation growth. The WA manager would consider the recommendations of the CRM committee in determining the exact on/off dates and AUMs allowed within WDFW managed pastures.

2.5 Alternative 3: No Grazing

Alternative 3 is the "No Grazing" alternative, and no livestock grazing would be permitted on the Quilomene and Whiskey Dick WA, within the CRM area. No term grazing permits would be issued. No new actions would be proposed.

Structural improvements to pasture fences and water developments would not occur. Existing boundary fences would be maintained. Existing water developments would remain in place for wildlife but would not be maintained in support of livestock management. Dilapidated fences and non-functioning springs may be removed over time as funding and staff becomes available. Other authorized activities and administration including, but not limited to, fire protection, recreation, weed management, and road maintenance would continue.

The elimination of grazing would limit some of the ability to meet management goals and objectives.

2.6 Alternatives Eliminated from Detailed Analysis

An alternative involving overall forage utilization of up to 50 percent on each pasture in the Quilomene and Whiskey Dick WA within the CRM area was considered for inclusion in this EIS. This alternative was eliminated from detailed analysis because it was determined not to be "reasonable" due to possible adverse effects of forage utilization on sage grouse habitat and native perennial grasses. Livestock forage utilization in shrub-steppe ecosystems exceeding 35 percent would likely result in adverse effects to sage grouse habitat, and would not be consistent with WDFW's Greater Sage Grouse Recovery Plan (WDFW 2004). Native perennial grass utilization levels of 25–35 percent are recommended to maintain healthy plants in arid landscapes (Holecheck et al. 1999, Galt et al. 2000, Mueggler 1975).

2.7 Comparison of Alternatives

This section provides a summary of the alternatives and effects of implementing each alternative. Information in Table 2-6 is focused on activities proposed within each alternative. Table 2-8 summarizes the effects to resources where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2-6 Comparison of the Alternatives

Key Elements	Alternative 1: No Action	Alternative 2: Proposed Action	[1]Alternative 3: No Grazing
Management Objectives	Current Management and Draft L.T. Murray/Whiskey Dick/Quilomene WA Management Plan	CRM Grazing Plan and Draft L.T. Murray/Whiskey Dick/Quilomene WA Management Plan	Draft L.T. Murray/Whiskey Dick/Quilomene WA Management Plan
Grazing Rotation	-Allow grazing on 6 WDFW managed pastures & 2 PSE owned pastures (approximately 27,815 acres). -435 average AUMs, with a maximum of	-Allow grazing on 10 WDFW managed pastures & 2 PSE owned pastures (approximately 55,720 acres) (includes the 6 pastures associated	-Not Applicable

Key Elements	Alternative 1: No Action	Alternative 2: Proposed Action	[1]Alternative 3: No Grazing
	650 AUMs during 5-year rotation.	with Alternative 1). -837 average AUMs, with a maximum of 1,010 AUMs during a 5-year rotation.	
Range Improvements & Maintenance	-Construct 4.2 miles & maintain up to 57.4 miles (includes the 4.2 miles) of boundary fence. -Maintain 83.2 miles of pasture fences. -Install and remove up to 5.5 miles of temporary fences. -Priority redevelopment and maintenance of up to 6 springs.	-Construct 4.2 miles & maintain up to 57.4 miles (includes the 4.2 miles) of boundary fence. -Maintain 162.1 miles of pasture fences (includes 83.2 miles of pasture fence associated with Alternative 1). -Install and remove up to 18.3 miles of temporary fences (includes 5.5 miles of temporary fence associated with Alternative 1). -Priority redevelopment and maintenance of up to 14 springs (includes the 6 springs associated with	-No new structural improvements are proposed under this alternative other than routine maintenance activities associated with the existing boundary fence.

Key Elements	Alternative 1: No Action	Alternative 2: Proposed Action	[1]Alternative 3: No Grazing
		Alternative 1).	
Grazing Permits	-5-year permit	-5-year permit	-Not Applicable
Forage Utilization Levels	-Overall forage utilization will not exceed 35%.	-Overall forage utilization will not exceed 35%.	-Not Applicable
Vegetation Monitoring	-Short-term and long-term monitoring.	-Short-term and long-term monitoring.	-Per the L.T. Murray/Quilomene/Whiskey Dick Wildlife Area Management Plan.

2.8 Preferred Alternative

Alternative 2 is the Preferred Alternative as it more fully addresses the purpose and need as described in section 2.4 and still allows for viable livestock grazing that is compatible with the goals and objectives of improving range conditions and enhancing wildlife habitat.

3 Affected Environment and Environmental Consequences

Introduction

This chapter summarizes the physical, biological, social, and economic environments of the project area. In conjunction with the description of "Alternatives 1 (No Action (Current Management)) and 2 (Proposed Actions (CRM Grazing Plan)) in Chapter 2 and with the predicted effects of the no grazing alternative, this chapter establishes the baseline against which the decision makers and public can compare the effects of all action alternatives.

This chapter also describes the direct, indirect, and cumulative effects of implementing each alternative on the physical, biological, social, and economic environments in the project area. It also presents the scientific and analytical basis for the comparison of the alternatives presented in Chapter 2.

This chapter describes the following:

- Cultural components, including prehistoric and historic sites and artifacts.
- Biotic components, including vegetation, soil, water, air, wildlife, and fish.
- Social and economic components, including recreational uses, social values and economic influence.
- Direct and indirect effects for each resource area by alternative.
- Cumulative effects for each resource area.

3.1 Earth Resources

3.1.1 Affected Environment

Topography

The CRM area is located on the Columbia Plateau, a broad lowland area at the eastern base of the Cascade Range and at the western edge of the Columbia Intermountain physiographic province (Figure 1-1). Prominent geographic features in the vicinity include the Yakima River and the Kittitas Valley to the west and southwest, the Wenatchee Mountains to the northwest and north, the Columbia River to the east, and the Boylston and Saddle mountains to the south (Jones and Stokes 2004). The site is characterized by steep rocky slopes, rolling hills, ridges, and a series of canyons that generally drain toward the east (WDFW 2006, WDFW 2008a). Slopes within the CRM area range from less than eight percent on flat plateaus and ridgelines to over 50 percent on Whiskey Dick Mountain and incised side drainages (Jones and Stokes 2004).

Beacon Ridge forms a north-south topographic divide through the CRM area with streams west of the divide flowing to the Yakima River and streams east of the divide flowing to the Columbia River. Numerous benches and incised stream valleys occur throughout the area. The benches tend to coincide with the locations of seeps and springs, which are generally clustered in the Vantage Highway pasture, Wild Horse North, and along Skookumchuck Ridge between West Whiskey Dick and East Whiskey Dick pastures. The

locations of these benches probably coincide with an interbedded aquifer within the basalt bedrock that has weathered at the ground surface more readily than the surrounding basalts have (Jones and Stokes 2004).

Geology

The parent bedrock material of the CRM area consists of the Miocene-age Columbia River Basalt Group consisting of Grande Ronde Basalt and overlying Wanapum Basalt, as well as fractured and folded lava flows and a variety of interbedded sedimentary units of varying thickness (USGS 2005b). In addition to the Grande Ronde Basalt and Wanapum Basalt (Frenchman Springs Member), mapped geologic units in the area include the Ellensburg Formation, Ellensburg Formation Vantage Member, Alluvium, and landslide deposits (Jones and Stokes 2004). The parent basalt rock has weathered into the coarse gravels, cobbles, and boulders, along with fine silts and clays that are currently in the CRM area. The overlying soil is composed of fine-grained loess, deposits of volcanic ash, sandy loams and silt loams (CRM 2008).

The CRM area has a "low" seismic hazard (earthquake frequency) and there were no recorded earthquakes in the area from 1568 to 2004 (USGS 2005a). Two east-west-trending Quaternary faults pass through the CRM area, roughly parallel to the Whiskey Dick Anticline (USGS 2006, Jones and Stokes 2004).

The CRM area has a "low" risk of landslides and the area is ranked by the Washington Department of Natural Resources as "low" for slope instability (Godt 2001, WDNR 2007). Coarse-grained mass wasting deposits provide evidence of historic and/or slow-moving landslide activity in the CRM Area.

Soils

A variety of soil types and depths occur within the CRM Area. The NRCS database identifies 106 mapped soil units in the CRM area (NRCS 2008). General characteristics of the dominant soil types are shown in Table 3-1. "Rubble land" refers to areas of cobbles, stones, and boulders. The most common soil series/complexes include the Nevo-Fortyday complex, the Drino-Sohappy-Fortyday complex, the Argabak-Vantage complex, the Rubble land-Fortyday-Rock outcrop complex, the Camaspatch-Whiskey Dick complex, Argabak very cobbly loam, and the Vantage-Clerf complex, which together cover approximately 31 percent of the area (NRCS 2008).

Table 3-1 Major Characteristics of Dominant Soils in the CRM Area

Soil	Description	Thickness	Drainage Class	Hydrologic Group
Nevo	Very cobbly loam	Very shallow to bedrock	Well-drained; medium to very rapid runoff; moderately slow permeability	D

Table 3-1 Major Characteristics of Dominant Soils in the CRM Area

Soil	Description	Thickness	Drainage Class	Hydrologic Group
Fortyday	Very gravelly silt loam	Shallow	Well drained; runoff is medium; permeability is moderate	B
Drino	Very stony loam	Moderately deep	Well-drained; runoff is medium to very rapid; moderate permeability	B
Sohappy	Coarse-loamy	Deep	Well drained; medium to rapid runoff; moderate permeability	B
Argabak	Very cobbly loam	Very shallow to bedrock	Well drained; slow to very rapid runoff; slow permeability	D
Vantage	Very cobbly loam	Shallow	Well drained; slow to rapid runoff; slow permeability	D
Camaspatch	Very cobbly silt loam	Shallow	Well drained; slow to rapid runoff; moderate permeability	D
Whiskey Dick	Very cobbly loam	Moderately deep	Well drained; slow to very rapid runoff; slow permeability	D
Clerf	Very cobbly clay loam	Moderately deep	Well drained; slow to very rapid runoff; slow permeability	D

Source: NRCS 2008
Hydrologic Soil Group Codes:
(A) Soils with low runoff potential; these soils have a high infiltration rate, even when thoroughly wetted.
(B) Soils with moderate infiltration rate when wetted.
(C) Soils with low infiltration rate when wetted.
(D) Soils with a high runoff potential; these soils have a very slow infiltration rate when thoroughly wetted.

Existing Conditions

Surface geology is dominated by a combination of rocky lithosols on shallow ridge tops and deeper stony loams on the slopes. Within the CRM area there are no soil types known to be of unique value or identified as priorities for conservation.

Predominant ecological sites in the CRM area per pasture are provided in Table 3-2. All the pastures are characterized by very shallow soil depths and stony soil texture. Many pastures are also characterized by loamy soil textures, which have a mixture of particle size including very fine particles (WDFW 2008a).

Table 3-2 Predominant Ecological Sites

Pasture	Characteristics Ecological Sites
East Whiskey Dick	Very Shallow, Dry Stony, Cool Stony, Loamy, Rock
Lone Star	Very Shallow, Cool Stony, Dry Stony
Lower Parke Creek	Very Shallow, Stony, Loamy, Dry Stony
Rocky Coulee	Very Shallow, Loamy, Dry Stony, Stony
Upper Parke Creek	Very Shallow, Stony, Cool Stony, Loamy
Upper Skookumchuck	Very Shallow, Rock Rubble, Stony, Loamy
Vantage Highway	Very Shallow, Dry Stony, Loamy, Stony
West Whiskey Dick	Very Shallow, Dry Stony, Cool Stony, Loamy
Whiskey Jim	Very Shallow, Cool Stony, Stony
Wild Horse Crossing	Very Shallow, Dry Stony, Loamy, Cool Stony

[1]Predominant Ecological Sites are sites that cover more than 5 percent of the pasture.
Source: WDFW 2008

Hydric soils support elevated water tables and are saturated, frequently ponded, and/or frequently flooded during the growing season. The presence of hydric soils can indicate sensitive areas and habitats, such as wetlands. Hydric soils are susceptible to compaction and rutting. Four soils are identified as "partially hydric" in the CRM area: Nitzel-Weirman complex (2 to 5% slopes), Haploxerolls-Weirman-Aquolls complex (0 to 5 percent slopes), Esquatzel silt loam (0 to 2 percent slopes), and Esquatzel-Weirman complex (0 to 2 percent slopes) (NRCS 2008).

In semi-arid landscapes, biological crusts can occupy up to 70 percent of the surface area of un-cultivated dry lands (Belknap 2001). The soil surface in the CRM area supports biological crusts composed of mosses, lichens, and a variety of soil algae and bacteria (WDFW 2008a). Biological crusts serve several functions in rangelands; they help to retain soil moisture, discourage annual weed growth, reduce wind and water erosion, fix atmospheric nitrogen, and contribute to soil organic matter (Belknap 2001). A recent study of biological crust communities on a rested livestock grazing area in the Columbia Basin in Washington found biological crust species richness and cover to be positively correlated with the cover of native bunchgrasses and inversely related to the cover of invasive annual cheatgrass (Ponzetti 2007).

Current conditions, to varying degrees, are a result of past management activities (including overgrazing, fire suppression, etc.) in the past 100 years. Livestock tended to congregate and remove vegetation on level areas, increasing wind and water erosion in some places. Ground cover in shallow-soiled areas is reflective of a variety of past activities (including past grazing) that have affected soil quality and influenced the vegetation that has become established. Where the area is characterized by steep slopes, shallow soil and some deposits of volcanic ash, soil disturbing activities could potentially lead to adverse impacts.

3.1.2 Environmental Consequences

Livestock grazing can impact soil structure and composition by compacting soil, decreasing vegetative cover, changing vegetative composition, and loading water pollutants directly through fecal matter. Compaction from trampling reduces soil pore space, which diminishes the soil's infiltration capacity. Water that would otherwise be absorbed into non-compacted soil becomes surface runoff. Compacted soils that are subjected to repeated runoff typically develop rills and ruts that channel surface flow. Channeled runoff has greater erosive power, leading to degradation of water quality and fish habitat. Compacted soil also inhibits plant root growth (Castellano 2007).

The risk of soil compaction from grazing is greatest in areas where large numbers of livestock or wildlife (deer, elk) are concentrated for long periods on areas such as trails, watering areas, bedding grounds, salt locations, and isolated areas with canopy cover. Rotating livestock between pastures, limiting grazing duration and number of livestock per pasture, and optimizing the distance between shade, water, and mineral supplements may minimize the extent of livestock-related soil compaction over the landscape by influencing cattle distribution (Bailey 2005).

Livestock trails often channel runoff and can cause soils to erode as evidenced in some portions of the CRM area. Because livestock tend to prefer existing trails over creating new trails, higher grazing intensities do not typically result in more trails, but, the degree of compaction along livestock trails increases with their use. Trails created on steep slopes are the most susceptible to increased rates of soil erosion (Clarke 2008). However, livestock tend to avoid steep slopes and typically consume forage on slopes less than 40 percent (Ganskopp and Vavra, 1987). Locating attractants (e.g. water developments, salt) on lower gradients can minimize creation of livestock trails in steep topography.

Concentrations of livestock can be detrimental to biological crusts, which are poorly adapted to disturbances such as trampling. Trampling breaks the sheaths and filaments of the lichens, algae, mosses, and bacteria making up the crusts. Trampling also indirectly disturbs biological crusts by breaking their spatial integrity, increasing susceptibility to wind and water erosion over a landscape. Eroded material can be moved long distances and may eventually cover intact crusts. Crust organisms tolerate shallow burial by extending sheaths to the surface to begin photosynthesis again, but deeper burial by eroded sediment can kill crust organisms (Belknap 2001). Belknap (2001) recommends the following strategies be used to minimize disturbance to crusts: 1) livestock grazing should occur during wet season, to allow re-growth of damaged crusts before summer droughts, 2) a rest-rotation grazing system should be used to allow for periods of recovery, 3) livestock should be well dispersed throughout a given pasture, to limit localized, heavy disturbance. Livestock grazing typically occurs during dryer times of the year when crusts are less able to recover from disturbances (WDFW 2004).

Erosion is largely influenced by slope and soil texture. Well-drained and course-textured soils, such as those that occur in the CRM area are relatively resilient to erosion. Slopes can exceed a 60 percent gradient in some areas (Asher 2008). Heavy grazing (>50 percent forage utilization) can contribute to erosion by wind and water runoff through reduction of vegetative cover and soil litter (Fleischner 1994). However, light to moderate grazing and rest periods between rotations would likely allow vegetative cover to be maintained, thereby protecting the soil from erosion (Holechek et al. 1999).

Livestock can influence the nutrient composition of soil by contributing manure (Fleischner 1994) but the effects of manure in light to moderate grazing regimes have been poorly studied. Nutrient cycling is one of the criteria evaluated under the rangeland health inventory for the CRM Grazing Plan and would be monitored as part of the Land EKG monitoring protocol (Orchard and Mehus, 2001; CRM 2008).

3.1.2.1 Alternative 1: No Action (Current Management)

Direct and Indirect Effects

Grazing would be implemented at reduced AUMs compared to both recent and historic use. The average stocking rate of 26 acres per AUMs and light grazing intensity (<35 percent forage utilization), is unlikely to increase soil erosion in the coarse-grained shallow soils in these pastures. In addition, the maintenance of vegetative cover and vegetation recovery allowed through rotational grazing would also minimize soil erosion. The density of livestock grazing in areas of potentially sensitive soil conditions would be relatively low because of accessibility (based on distance from water and percent slope).

Overall, soil compaction will be minor to moderate under Alternative 1 due to timing and intensity of grazing. Compaction will occur in discrete areas throughout the grazing area, primarily close to water developments and at salting/protein stations where animals tend to congregate. This will continue under Alternative 1, but no increase in compaction is expected given the proposed grazing system, livestock distribution, and permitted AUMs.

Biological crusts throughout the Alternative 1 grazing area occupy areas between native bunchgrasses and lithosol sites with little to no vegetation/forage. Effects to biological crusts would occur when livestock cross them seeking forage, and will be greatest near high intensity use sites, such as water developments and salting/protein sites. Overall, grazing intensity will be light, and effects to biological crusts will parallel the grazing intensity. Due to the spatial distribution of crusts the overall impact to biological crusts is expected to be minor to moderate. The following strategies as recommended by Belknap (2001) will be utilized to minimize disturbance to crust: 1) livestock grazing should occur during wet season, to allow re-growth of damaged crusts before summer droughts, 2) a rest-rotation grazing system should be used to allow for periods of recovery, 3) livestock should be well dispersed throughout a given pasture, to limit localized, heavy disturbance.

Construction of fencing under Alternative 1 would have a minimal impact to soil conditions. There will be some ground disturbance from construction activities, (including compaction from driving onsite) however it will be a short-term effect. Existing fences would be maintained within the original footprint resulting in negligible impacts. In addition, maintaining springs would help disperse livestock and minimize trampling (Figure 2-3). Spring redevelopment would occur within the original footprint and springs would not be redeveloped on steep slopes, minimizing the risk of "trail collapse" (trail use and erosion on steep slopes). Minor soil disturbance would be associated with spring infrastructure improvements, including ground clearing and compaction by construction equipment/trucks. Structural improvements, as proposed, will improve livestock management by influencing livestock distribution. Overall, disturbance from structural improvements would be short-term, localized, and occur within the existing footprint.

Cumulative Effects

Historical grazing resulted in compaction and loss of effective ground cover. Cattle numbers, however, have been greatly reduced since the turn of the early 1900's. Some impacts occurred from deer and elk but most were due to the historical concentrated herds of cattle, horses, and sheep. Areas where livestock congregated around water sources (ponds, troughs, and springs), bedding areas, salting areas, trails along fences, and pasture corners are less productive due to compaction, displacement, and trampling. In addition, past activities such as road construction have resulted in detrimental soil conditions. Currently, recreation (i.e., wildlife viewing, hunting, and off-highway vehicle use) activities occur within the area. Soil erosion has occurred from the combined activities of land use and is expected to contribute to the cumulative impacts.

3.1.2.2 Alternative 2: Proposed Action (CRM Grazing Plan)

Direct and Indirect Effects

Direct and indirect effects on soil resources resulting from livestock grazing would be the same as described in Alternative 1, except it would occur across a broader landscape (up to 55,720 acres) The average stocking rate of 26 acres per AUMs and light grazing intensity (<35 percent forage utilization) is unlikely to cause soil erosion. Due to the low forage utilization in grazed areas, maintenance of vegetative cover, and the shallow coarse-grained soils, overall soil compaction would be minimal. Effects to biological crusts are expected to be minor due to spatial distribution (Belknap, 2001). Though more spring redevelopment would occur under Alternative 2, effects would be the same as described under Alternative 1.

Cumulative Effects

Cumulative impacts under Alternative 2 would be the same as described under Alternative 1, except that grazing would occur over a larger area.

3.1.2.3 Alternative 3: No Grazing

Direct and Indirect Effects

The elimination of livestock grazing would lessen the impacts to soils associated with trampling; limiting impacts to those resulting from deer and elk. Compaction and displacement around water developments and salt/protein stations would be reduced as vegetation recovers. Some erosion may continue to occur on some of the major stock trails because of use by people or wildlife. Vegetation litter would increase and provide a greater source of organic matter and protection of soils.

Cumulative Effects

Because there are no livestock permitted that would affect the soil resources, and no other activities are planned that would affect soil resources, there are no effects to accumulate. With the elimination of livestock grazing, cumulative impacts under Alternative 3 would be limited to those caused by current use of recreationists and wildlife.

3.2 Water Resources

3.2.1 Affected Environment

Water resources in the CRM area include creeks, seeps, springs, wetlands and ponds. Infrequent small palustrine wetlands are located throughout the CRM area, primarily associated with riparian areas and springs but occasionally occurring around man-made stock ponds (CRM 2008). Wetland features are described in Section 3.4.1 of this DEIS.

The primary beneficial use of surface water and groundwater within the CRM area is to provide water for fish, wildlife and livestock.

Watersheds

The CRM area is comprised of six sub-watersheds: Rocky Coulee, Spring/Cayuse Creek, Whiskey Dick Creek, and Skookumchuck Creek, which are tributary to the Columbia River, and the Upper Parke Creek sub-watershed, which is tributary to the Yakima River (WDOE 2008b). The conditions of the watersheds within the CRM area are satisfactory based on Ecology's 2004 Clean Water Act Water Quality 303(d) list.

Surface Water

Numerous intermittent streams originate within the CRM area (Figure 3-1). These streams are divided into two principal drainage systems, streams flowing southwest into Parke Creek to the Yakima River and those flowing east and southeast to the Columbia River. CRM area streams tend to be steep, narrow, incised, and intermittent or ephemeral. They typically originate at headwalls, seeps, and

springs. Some of the larger tributaries transition to perennial flow in their lower reaches. Whiskey Dick Creek is perennial from its confluence with North Fork of Whiskey Dick (BLM 2008). The principal drainages in the CRM area are listed in Table 3-3.

Table 3-3 Streams in the Whiskey Dick and Quilomene WA

Stream	Stream Type	Pasture Location	GIS Miles
Rocky Coulee	Intermittent	Rocky Coulee & Lone Star	10.5
Schnebly Coulee	Intermittent	Wild Horse South, Rocky Coulee, & Lone Star	3.1
Spring Cayuse Creek	Intermittent	East Whiskey Dick	4.0
Whiskey Dick Creek	Intermittent**	West Whiskey Dick & East Whiskey Dick	13.0
Skookumchuck Creek	Intermittent**	Upper Skookumchuck & Wild Horse Crossing	10.1
Jackknife Creek	Intermittent	Upper Skookumchuck & East Whiskey Dick	5.3
North Fork Whiskey Dick Creek	Intermittent	East Whiskey Dick	7.3
North Fork Skookumchuck Creek	Intermittent	Upper Skookumchuck	2.8
Rollinger Creek	Intermittent	West Whiskey Dick	4.1
Hartman Creek	Intermittent	West Whiskey Dick	4.1
Bryant Creek	Intermittent	West Whiskey Dick & East Whiskey Dick	5.1
Little Bohinkleman Creek	Intermittent	Upper Skookumchuck	3.0
Black Rock Canyon	Intermittent	Whiskey Jim	2.4
Whiskey Jim Creek	Intermittent	Whiskey Jim	4.1
Parke Creek	Intermittent**	Upper Parke Creek, Whiskey Jim, & Lower Parke Creek	5.4
		Total	87.0

Source: BLM 2008
**Perennial in lower portions

None of the stream segments within these watersheds are on Ecology's 2004 Clean Water Act Water Quality 303(d) list for exceeding state water quality standards (WDOE 2007). However, the Columbia River, downstream of the CRM area, is listed for exceeding state temperature standards (Wanapum Lake) (WDOE 2008b, PSMFC 2007). None of the CRM area water bodies are proposed for listing in the 2008 assessment (WDOE 2008b).

Groundwater

The CRM area is underlain by the Columbia Plateau Regional Aquifer System. Most of the system is composed of the Grande Ronde Basalt and the overlying Wanapum and Saddle Mountains Basalt, which together form the Columbia River Basalt Group. The basaltic-rock aquifers are as much as 15,000 feet thick in places and are overlain by unconsolidated-deposit aquifers that also are part of the aquifer system. Near the CRM area, these unconsolidated-deposit aquifers are relatively thin, 50 feet thick or less, and generally unsaturated. The general movement of water in the aquifer system is from recharge areas near the edges of the plateau toward the Columbia River (Whitehead 1994).

Ground-water levels in the Columbia Plateau, including the CRM, area have been altered by irrigation practices. Water diverted or pumped from streams or reservoirs can cause water levels to rise whereas irrigation from groundwater can cause groundwater levels to decline. In Washington water levels have risen as much as 300 feet in some areas and lowered by 150 feet in other locations (Whitehead 1994). It is unknown if agricultural practices in the vicinity of the CRM area have altered the water table.

Based on soil survey data, 94 percent of the soils covering the CRM area support a seasonal elevated water table less than 5 feet deep near topographic benches and stream valleys (NRCS 2008). Numerous springs throughout the CRM area have been developed for stock watering and typically are associated with these benches and valleys (Figure 2-3). In May 2003, the flow was approximated for a sample of developed springs in the CRM area. The observed flow rates ranged from 1 to 5 gallons per minute (gpm) (Jones and Stokes 2004). Current, estimated flow rates for selected springs in the CRM area range from 0.05 to 2.8 gpm (Table 3-4).

Table 3-4 Flow Rates for Select Springs in the CRM Area

Site	Pasture	Flow (gpm)
Hell's Kitchen Spring	Lone Star	2.8
Section 15 Spring	Lone Star	0.4
Cayuse Spring	East Whiskey Dick	0.8
Rollinger Spring	West Whiskey Dick	2.8
South Wild Horse #1	South Wild Horse	0.22
Government	North Wild Horse	1.5
Pine	North Wild Horse	0.1

Table 3-4 Flow Rates for Select Springs in the CRM Area

Site	Pasture	Flow (gpm)
Section 28 #1	North Wild Horse	0.07
Section 4	North Wild Horse	0.2
Skookumchuck Heights	North Wild Horse	1.4
Thorn	North Wild Horse	0.05
Wild Horse #1	North Wild Horse	1.0
Parke Creek #2	Whiskey Jim	1.5
Parke Creek #1	Upper Parke Creek	2.0

Floodplains

Streams in the CRM area generally do not support well-developed floodplains; however, the lower reaches of Whiskey Dick Creek and Skookumchuck Creek are designated by Federal Emergency Management Agency (FEMA) as "Special Flood Hazard Areas." These areas have a 1 percent annual chance of flooding to base flood elevations (the elevation to which floodwater is anticipated to rise during a 100-year flood) (WDOE 2007, FEMA 2007). According to FEMA Flood Zone Overlay maps, the nearest 100-year flood zone occurs along Parke Creek, well downstream of the CRM area (Jones and Stokes 2004).

3.2.2 Environmental Consequences

Livestock affect water quality by increasing sedimentation in streams and by direct contamination. Livestock grazing can increase the temperature and increase the amount of sediment entering surface water by removing riparian vegetation and disturbing stream banks. Sedimentation can alter the levels of dissolved oxygen, the pH, and the nitrite concentration in the stream. Sedimentation may occur where livestock have access to stream banks or in areas of steep slopes, where livestock trails have the potential to collapse or undercut slopes.

The primary contaminants from direct contact with livestock are bacteria and ammonia. In areas where livestock would have access to stream channels, direct contamination of the water or sediments could occur, degrading downstream waters. Contamination from livestock can extend downstream into mainstem streams during peak flow events. Restricting livestock access to surface water greatly reduces the risk of direct contamination.

Livestock grazing can indirectly affect water quality and stream channel conditions by removing upland vegetation, compacting soil, and/or disturbing biological crusts. Removing vegetation and biological crust in upland areas increases the potential for erosion by exposing soil to wind and water. An intact biological crust helps reduce soil erosion and aids in the infiltration and absorption of rainfall. Areas that are heavily grazed can quickly transport soil into adjacent streams. The potential for sedimentation from upland

livestock grazing depends on the frequency, magnitude, and timing of runoff events; watershed condition; number of livestock; proximity of livestock to surface water; season of use; and duration of grazing (GWEB 1999).

Over the short term, water quantity to streams from precipitation events and overland flow would increase in grazed areas, which may result in increased erosion and a temporary increase in sedimentation from high intensity summer storms. This sediment transport may impact water quality over the short term in drainages associated with the CRM area. However, erosion caused by snowmelt and gentle rainfall would be limited. Physical indicators of erosion, such as flow patterns, rills, gullies, wind scour, and deposition of sediment and litter, were not observed on upland areas during the assessment of rangeland health.

Rest-rotation grazing systems favor recovery by allowing time for vegetation to recover between grazing periods, decreasing soil compaction, improving infiltration, and decreasing sediment production (Bohn and Buckhouse 1985). An increase in infiltration rates would provide more water for vegetation as well as longer water availability through the summer. Decreased compaction would allow more water to infiltrate into the soils providing the same benefits. Finally, a decrease in sediment would improve water quality in streams.

3.2.2.1 Alternative 1: No Action (Current Management)

Direct and Indirect Effects

Livestock will be turned out in the early spring when soils are firm enough to prevent compaction. Turning livestock out earlier would improve cattle distribution and minimize livestock use of riparian areas because the upland vegetation will have higher water content. Also, water developments will draw cattle away from riparian areas, decreasing damage to riparian vegetation and stream banks.

Direct impacts on water quality under Alternative 1 would be greatest where livestock can directly access stream channels. To help prevent direct impacts to streams, temporary fencing would be used to avoid or minimize these impacts (Figure 2-2) (CRM 2008). In addition, pasture fencing would keep livestock distributed on assigned pastures and ensure no direct impacts to stream corridors from unauthorized grazing. Water developments and salt or protein supplements would be used to draw livestock out of riparian areas onto adjacent uplands (CRM 2008). Improving livestock distribution will reduce the disturbance to vegetation that provides shade to streams.

Alternative 1 could result in a minor to moderate increase in sediment delivery to streams.

Because the streams in the Alternative 1 grazing area are generally intermittent and most already naturally lack substantial riparian cover, livestock grazing would have negligible impacts on stream temperatures.

Runoff from grazing would be minimized in the Alternative 1 using a rotation system. However, a small increase in surface runoff could occur under Alternative 1 due to increased soil compaction. However, given that most of the soil is coarse-grained and resilient

to soil displacement, overall compaction from the use of existing livestock trails and in areas where livestock congregate is expected to be minor to moderate. Encouraging livestock to disperse throughout the pasture by spacing attractants and herding would help eliminate areas of greater compaction. Overall compaction by livestock is expected to have a minor to moderate impact on runoff volumes.

Potential effects to water quality and riparian/wetland areas from range improvements and maintenance could consist of short-term surface disturbances from construction/installation of fences (includes temporary fence), spring redevelopments, etc.

In addition, grazing livestock typically consume 10-30 gallons of water per day. Based on a maximum of 420 cows, and assuming a nursing cow consumes the higher end of this range, roughly 12,600 gallons of water could be consumed daily by livestock. Under Alternative 1 the water consumed by livestock could potentially reduce flow rates at the source by up to 0.02 cubic feet per second (CFS). Based on seasonal elevated water tables and numerous springs in the Alternative 1 grazing area, the overall impact on water quantity is likely to be minor to moderate.

Cumulative Effects

Past activities such as domestic livestock grazing, fire suppression, timber harvest, road construction and recreation, have influenced current hydrologic conditions. These conditions include reduced riparian plant diversity, composition, and vigor; down cut and degraded stream channels; changes in upland vegetation; and altered stream flows. Although many of the historical practices have been halted or modified, stream banks still show evidence of these practices. Activities that are currently ongoing and expected to continue into the future include road maintenance, weed control, and recreational use.

Over the course of the grazing season, with an annual average of 435 AUMs approximately 391,500 gallons of water (or approximately 0.61 CFS annually) will be consumed by livestock.

3.2.2.2 Alternative 2: Proposed Action (CRM Grazing Plan)

Direct and Indirect Effects

Direct and indirect effects on water resources resulting from livestock grazing would be the same as in Alternative 1, except that there could potentially be more impacts associated with additional water developments and livestock could potentially have increased access to additional stream channels. Similar to Alternative 1, temporary fencing would be used to avoid or minimize impacts to riparian areas and streams, and pasture fencing would keep livestock distributed on assigned pastures to minimize direct impacts to stream corridors in unauthorized areas. Salt and protein supplements and water developments would be used to draw livestock away from stream corridors (CRM 2008).

In addition, grazing livestock typically consume 10-30 gallons of water per day. Based on a maximum of 420 cows, and assuming a nursing cow consumes the higher end of this range, roughly 12,600 gallons of water could be consumed daily by livestock. Under Alternative 2 the water consumed by livestock could potentially reduce flow rates at the source by up to 0.02 cubic feet per second (CFS). Based on seasonal elevated water tables and numerous springs in the Alternative 2 grazing area, the overall impact on water quantity is likely to be minor.

Cumulative Effects

Cumulative effects under Alternative 2 would be the same as Alternative 1, except that over the course of the grazing season, with an annual average of 837 AUMs approximately 753,300 gallons of water (or approximately 1.17 CFS annually) will be consumed by livestock.

3.2.2.3 Alternative 3: No Grazing

Direct and Indirect Effects

There will be no direct and indirect effects to the water resources from livestock grazing if alternative 3 is implemented.

Cumulative Effects

Because there are no direct and indirect effects under this alternative, there would be no cumulative effects.

3.3 Air Quality and Noise

3.3.1 Affected Environment

Air quality in the geographic area is good, with prevailing westerly winds. The National Ambient Air Quality Standards have not been exceeded, meaning there are no non-attainment or maintenance areas. However, smoke from wildfires occasionally impact air quality in the geographic area.

Existing noise levels in the CRM area are generally low, as the primary noise sources are recreational uses (vehicles, hunting) and ambient noise from the wind turbines on Wilde Horse North and South, as well as distant sounds such as roads, highways, and noise from the Yakima Training Center. There are no sensitive noise receptors within the CRM area. Sensitive noise receptors are generally where there is human habitation or substantial use and the intrusion of noise could adversely affect use or enjoyment of the area.

3.3.2 Environmental Consequences

Livestock grazing can directly impact air quality primarily through the generation of fugitive dust emissions (PM_{10}). Soil disturbance from the trampling action of livestock can increase PM_{10} emissions. Indirectly air quality would be impacted from vehicles/equipment used to implement structural improvements, routine operation and maintenance for administrative purposes and recreation activities.

The production of methane, a greenhouse gas (GHG), which is released from cattle, is not being assessed in this EIS because methane gas would be expected to be released from cattle grazing on land whether in the CRM area, on WDFW managed lands or private adjacent lands. Methane gas production and release would be negligible.

Livestock grazing can directly impact ambient noise levels primarily through cattle bellowing.

3.3.2.1 Alternative 1: No Action (Current Management)

Direct and Indirect Effects

Direct effects to air quality and noise could result from Alternative 1. Minor adverse effects to air quality could result from fugitive dust released from cattle herding and vehicle/machinery used to implement range improvements and maintenance activities. However, these emissions would be negligible and would fall far below regulatory standards for particulate matter. In addition to fugitive dust emissions, minor adverse effects to air quality would result from vehicle exhaust from those vehicles used to undertake range improvement and management activities throughout the CRM. Vehicle exhaust would be short-term and localized in geographical extent.

The primary noise effects would be minor effects from cattle bellowing, recreation (hunting, wildlife viewing, etc), and vehicles/machinery. The cattle bellowing would be spatially extensive. Construction-related effects such as motors and the sounds of fence construction and spring redevelopment would also be direct but would be localized and would be short term in duration. Noise increases from bellows and construction activities would be negligible.

Cumulative Effects

The potential direct and indirect effects to air and noise are minimal and of very short duration. There are no effects to accumulate if Alternative 1 is implemented.

3.3.2.2 Alternative 2: Proposed Action (CRM Grazing Plan)

Direct and Indirect Effects

Effects on air quality and noise under Alternative 2 would be the same as those for Alternative 1 (dust emissions, vehicle exhaust, and cattle bellowing and construction noise), except that grazing would occur across a greater area (up to 55,720 acres).

Cumulative Effects

Cumulative effects for Alternative 2 would be the same as those discussed for Alternative 1, except that grazing would occur across a greater area.

3.3.2.3 Alternative 3: No Grazing

Direct, Indirect and Cumulative Effects

Since grazing would be eliminated under this alternative, there would be no direct, indirect and cumulative effects to air and noise if alternative 3 is implemented.

3.4 Vegetation

3.4.1 Affected Environment

Vegetation within the CRM Area is dominated by a mosaic of shrub-steppe and scablands (e.g. rocky outcrops, talus slopes, and cliffs). Minor vegetation communities include Ponderosa pine and riparian areas along some streams and palustrine wetlands (Figure 3-2).

Climate

The CRM area lies in the dry, shrub-steppe habitat along the Columbia River northeast of Ellensburg. Annual precipitation ranges from 5.1 to 10 inches; average annual temperature is 59ºF (National Atlas, USDOC 2005). Precipitation at Ellensburg, approximately 10 miles west of the CRM area, averages 8.9 inches annually. Most precipitation occurs in late autumn, winter, and early spring (Kittitas County Conservation District 2001).

Shrub-steppe

Within the Columbia Basin of Washington State, a cold desert and semi-arid region, shrub-steppe is the dominant natural vegetation type. Dominant shrubs in this region include big sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), rabbit brush (*Chrysothamnus*), and other species of sagebrush (*Artemisia arbuscula, Artemisia rigida*). These shrubs capture litter and provide shade, which influences the herbaceous layer (grasses and forbs) of the plant community. Dominant grasses include bluebunch wheatgrass (*Pseudoroegneria spicata*), Idaho fescue (*Festuca idahoensis*), needlegrasses (*Stipa* spp.), and Sandberg bluegrass (*Poa secunda*). Another important component of the shrub-steppe are cryptobiotic soil crusts (i.e., a protective layer composed of lichens, mosses, and algae), which fix nutrients and retain soil stability, allowing plants to germinate and become established (WNPS 2008).

Shrub-steppe within the CRM area ranges from poor to excellent condition (WDFW 2008b). Condition is generally poor in many of the valley bottoms, fair to good on canyon slopes and benches, and good to excellent on ridge tops. More specifically, valley bottoms and canyon slopes are generally more degraded from past disturbance than the ridge tops. This is particularly true in the valley bottoms where season-long cattle grazing and road impacts have created large areas dominated by non-native invasive species. Lithosols generally occur on ridge tops and canyon slopes, and are typically in 'good' condition, containing a relatively intact vegetative structure and few non-native species. The deeper-soiled ridge top habitats are generally in 'fair' condition, with certain areas dominated or co-dominated by non-native species in the grass layer.

The shrub-steppe habitat within the CRM area ranges from poor to good condition (WDFW 2008b). Habitat quality is generally, poor in many of the valley bottoms, fair to good condition on the ridge top habitats and flats and good on some of the canyon slopes. More specifically, the non-ridge top habitats are generally more degraded from past disturbance than the ridge top areas. This is especially true in the valley bottoms where cattle grazing (season-long) and road impacts have created large areas dominated by non-native invader species. Where there are lithosols ridge top habitats are typically in 'good' condition, containing a relatively intact vegetative structure and few non-native species. The deeper-soiled ridge top habitats are generally in 'fair' condition, with certain areas dominated or co-dominated by non-native species in the grass layer.
Shrub-steppe condition tends to be poorest on sites that are most accessible to livestock and wildlife, and generally improves away from water and where slopes steepen. Poor-condition sites are generally less than 5 acres, and are dominated by cheatgrass (*Bromus tectorum*), weedy forbs, and bulbous bluegrass (*Poa bulbosa*). Because livestock typically forage infrequently on sagebrush, it often increases in density in grazed areas, replacing native bunchgrasses in badly degraded rangeland (Dobler et al. 1996).

Scablands

Rocky outcrops and talus slopes are common on the shoulders of drainages and the breaks of ridges within the CRM area. Plants found in these habitats include serviceberry (*Amelanchier alnifolia*), thick-leaved thelypody (*Thelypodium laciniatum*), and wax currant (*Ribes cereum*) (WDFW 2006, WDFW 2008). Due to accessibility and the lack of forage, potential impacts to scablands will not be addressed in the DEIS.

Ponderosa Pine

Ponderosa pine generally occurs at lower elevations of the Cascade Range on drier climes. Within the CRM moist micro sites provide Ponderosa pine site suitability. However, Ponderosa pine is considered a minor vegetation type within the CRM area. Canopy closure is somewhat correlated with tree densities and varies from open stands with a crown closure of 10-20 percent, to closed canopies of 60-80 percent, with a mean closure somewhere in between. Less than 80 acres of ponderosa pine occurs within the CRM. Dominant understory plants in the CRM area include big sagebrush, bitterbrush, Idaho fescue, western needlegrass (*Stipa occidentalis*), buckwheats (*Eriogonum* spp.) and bluebunch wheatgrass. Due to the similarity of plant species in shrub-steppe and Ponderosa Pine understory, impacts to the Ponderosa Pine vegetation type will be included with shrub-steppe for this DEIS.

Riparian Areas and Wetlands

Riparian areas provide food and shelter for a variety of wildlife species. Riparian areas affect the quantity and quality of water for on-site and downstream water uses, such as irrigation, water for wildlife and livestock, and for recreation. Riparian areas also help store water and reduce risk of flash floods. For riparian areas to provide these benefits, they must have the plant species diversity, structure, and abundance appropriate for the area.

Streams within the CRM Area have low flow and most are dry for a portion of the year. As a result, these streams tend to support narrow bands of riparian habitat. These riparian areas are typically comprised of shrubs and grasses within and near the streambeds, including Wood's rose (*Rosa woodsii*), mock orange (*Philadelphus lewisii*), reed canarygrass (*Phalaris arundicancea*), and Great Basin wildrye (*Leymus cinereus*). Small- to medium-sized trees dominate the riparian overstory in the region, and include black hawthorn (*Crataegus douglasii*), aspen (*Populus tremuloides*), and alder (*Alnus* spp.). Scattered shrubs occur in the understory (e.g., squaw current (*Ribes cereum*) and big sagebrush), along with grasses and forbs such as bulbous bluegrass (*Poa bulbosa*) and fern-leaved lomatium (*Lomatium dissectum*) (WDFW 2006, WDFW 2008). Some riparian areas have lost or are losing native vegetation due to invasion by noxious weeds and other exotic species.

Riparian areas are generally in satisfactory condition along Skookumchuck Creek, Whiskey Dick Creek, and the lower reaches of Parke Creek (WDFW 2008b). However, there are areas where recovery from past season-long grazing has not occurred.

Palustrine wetlands are found sporadically within the CRM Area. They are primarily associated with riparian areas and springs, but are also found around man-made stock ponds. There are approximately 2.2 acres of palustrine wetlands found in the Lower Parke Creek pasture. This includes a 0.5-acre man-made stock pond that was developed within the Little Parke Creek drainage and a 1.7-acre wetland adjacent to Parke Creek (WDFW 2008b).

Although riparian areas and wetlands cover less than 0.5 percent of the CRM area, their ecological significance far exceeds their limited physical area. Riparian and wetland areas are major contributors to ecosystem productivity and structural and biological diversity, particularly in drier climates (Elmore and Beschta 1987).

Sensitive and Special Status Species

There are three sensitive or special status plant species known to occur in the CRM Area (Table 3-5).

Table 3-5 Washington Natural Heritage Sensitive Species that are Known or Suspected in the Area

Common Name	Scientific Name	State Status

Hoover's tauschia	*Tauschia hooveri*	Threatened
Pauper milk-vetch	*Astragalus misellus* var. *pauper*	Sensitive
Hedgehog cactus	*Pediocactus simpsonii* var. *robustior*	State Review Group 1

Source: WNHP 2008; WDFW 2008

Hoover's tauschia is listed as a threatened species by Washington State and as a species of concern by the USFWS. This species occurs on shallow, rocky soils (lithosols) along ridge tops and is often associated with Sandberg bluegrass (*Poa secunda*), stiff sagebrush (*Artemisia rigida*), spinescent fameflower (*Talinum spinescens*), scilla-like onion (*Allium scilloides*), sagebrush violet (*Viola trinervata*), bitterroot (*Lewisia rediviva*), Canby's lomatium (*Lomatium canbyi*), and cushion fleabane (*Erigeron poliospermus*) (WNHP 1999). This species was observed on the Whiskey Dick and Quilomene WAs, within the CRM area, during plant surveys conducted in May 2007 and 2008 by the Washington Native Plant Society (WNPS (Marsh 2008)).

Pauper milk-vetch is listed as a sensitive species by Washington State and occurs primarily on upper slopes and ridge tops. This species is often associated with stiff sagebrush (*Artemisia rigida*), rock buckwheat (*Eriogonum sphaerocephalum*), bluebunch wheatgrass (*Pseudoroegneria spicata*), bluegrass (*Poa secunda*), line-leaf fleabane (*Erigeron linearis*), long-leaved phlox (*Phlox longifolia*), largefruited lomatium (*Lomatium macrocarpum*), and western hawksbeard (*Crepis occidentalis*) (WNHP 1999). This species was not observed during recent plant surveys in spring of 2007 and 2008 conducted by the Washington Native Plant Society (WNPS) (Marsh 2008).

Hedgehog cactus, a State Review Group 1 species, primarily occurs on shallow, rocky soils along ridge tops, desert valleys, and low mountains and has also been found on dry, rocky, south-facing hillsides. This species is often associated with *(Artemisia rigida),* thyme-leaf wild buckwheat *(Eriogonum thymoides),* curly blue grass *(Poa secunda),* hairy balsamroot *(Balsamorhiza hookeri),* onion *(Allium* spp.*),* desert-parsley *(Lomatium* spp.*),* desert yellow fleabane *(Erigeron linearis),* narrow-leaf mock goldenweed *(Haplopappus stenophyllus),* carpet phlox *(Phlox hoodii),* and Douglas' cluster lily *(Brodiaea douglasii)* (WNHP 2005). The species was observed on the Whiskey Dick and Quilomene wildlife areas during plants surveys conducted in May 2007 and 2008 by the WNPS (Marsh 2008). This species was also frequently encountered during the Wild Horse CRM rangeland inventory (2006 – 2008).

Noxious Weeds

A noxious weed is a plant that has been introduced to Washington State that is difficult to control and damaging to the economy and natural resources. These weeds can invade natural areas and out compete native plants, reducing biodiversity, threatening rare plants, and altering forage and wildlife habitat. Noxious weeds and invasive species are a major concern within the CRM. The goal of weed control on WDFW lands is to maintain and improve the habitat for wildlife, meet legal obligations, provide good stewardship and protect adjacent private lands.

Based upon current information found in the wildlife area weed management plan, roads, trails, and parking areas are the major pathways for the spread of invasive plant species on the Quilomene and Whiskey Dick WA. All open roads in the area are conduits for invasive plants that can cause various problems to ecosystem health. Invasive plants will persist, especially if recreation use of the area expands. Weed seeds are easily dispersed via vehicle activity and tend to follow and spread along road corridors, trailheads, trails, and campgrounds.

Weeds of concern on the Quilomene and Whiskey Dick WA include Dalmatian toadflax (*Linaria dalmatica ssp.dalmatica*), diffuse knapweed (*Centaurea diffusa*), Russian knapweed (*Acroptilon repens*), whitetop (*Cardaria pubescens*), perennial pepperweed (*Lepidium latifolium*), kochia (*Kochia scoparia*), musk thistle (*Carduus nutans*), purple loosestrife (*Lythrum salicaria*), Canada thistle (*Cirsium arvense*), Russian thistle (*Salsola iberica*) and cheat grass (*Bromus tectorum*). This list is based on species that have been documented on the WA, within the CRM area.

Many of the weeds listed above are found in low elevation shrub-steppe environments to higher elevation forested zones and often occur along riparian zones in major creeks and streams. Most are commonly found along roadsides, as well as in and around agricultural fields, old homestead areas, and degraded rangelands. Ongoing control efforts through the implementation of the WA weed management plan has reduced the overall population size and density of weeds in general over the past several years. However, controlling some aggressive species has been complicated due to their remote locations, proximity to high value riparian areas, and high annual seed production. Infestations are expected to continue for the foreseeable future regardless of control efforts. However, current weed control, reduction and eradication efforts appear to be successful in reducing existing populations and preventing new occurrences.

Rangeland Health and Condition

Current rangeland health and condition in the CRM area reflects historical grazing practices and vegetation management, including fire and agriculture. Grazing practices have changed over time and stocking rates have generally decreased. On the recently acquired portions of the Quilomene WA, grazing management has gone from season-long grazing to deferred- or rest- rotation grazing. In the recent past, use was rotated across pastures, but pastures were infrequently rested on deferred during the critical period of bunchgrass growth. On the Whiskey Dick WA, livestock numbers and the amount of use decreased from an average stocking rate of around 15 acres per AUM from 1967 to 1980, to around 30 acres per AUM in 1987 to 1989. No livestock grazing has occurred on the Whiskey Dick WA since 1989. The diagram below is a comparative look at the amount of grazing over time on the Whiskey Dick WA. In general, this represents the overall trend for livestock grazing management on WDFW managed pastures. See Appendix B for a description of current rangeland condition and health for each pasture.

Rangeland health and condition differ markedly from recently acquired portions of the Quilomene WA, to the Whiskey Dick WA. In general, range condition is poorer and rangeland health attributes tend to deviate from expected conditions to a greater extent on these recent acquisitions. Percent composition by weight of native bunchgrasses was generally less on newly acquired parcels, particularly on sites with gentle terrain that were close to stock water. It is likely that frequent grazing during the critical period has damaged bunchgrasses to a greater extent in these areas, as compared to the Whiskey Dick WA. In addition, the lengthy rest period (around 20 years) following grazing on the Whiskey Dick WA has likely allowed some recovery.

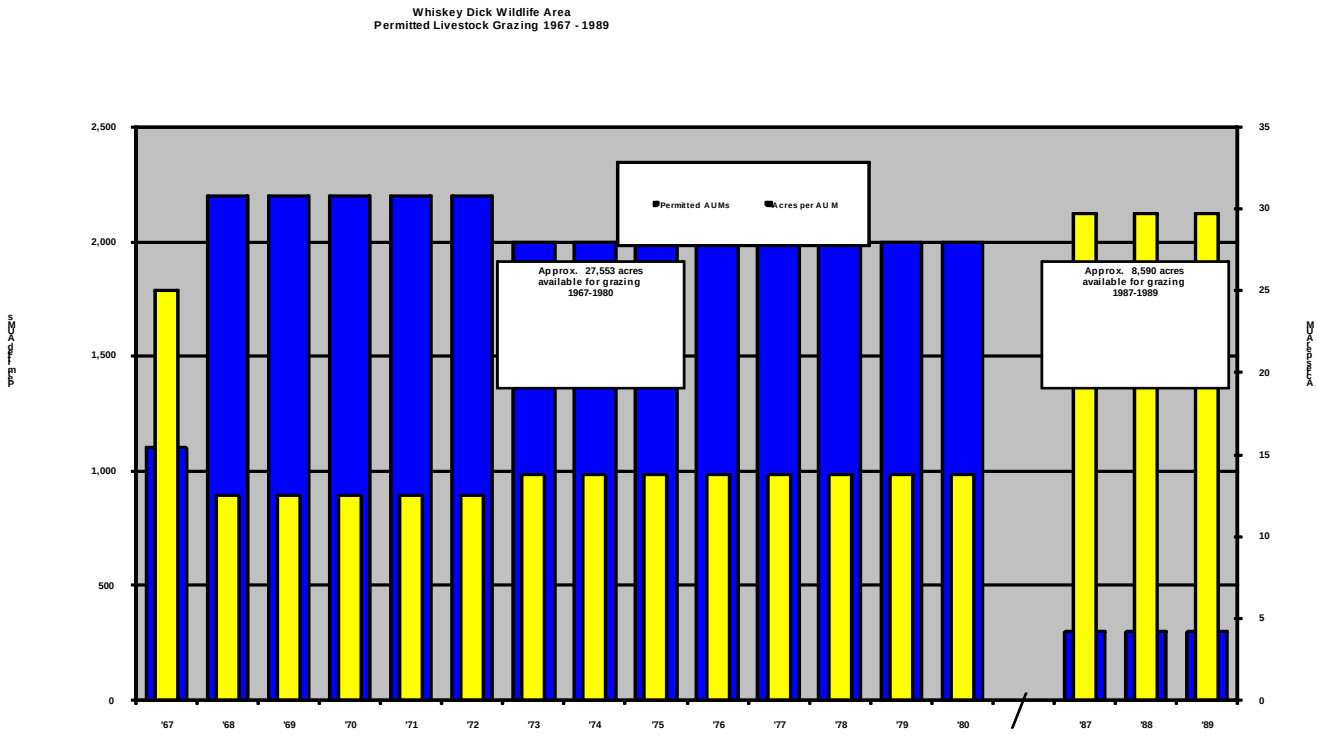
Severely degraded rangeland across the CRM area has likely reached an alternate stable state characterized by the dominance of annual grasses such as cheatgrass. Recovery from this state will likely require substantial management inputs, including seeding and weed control (Rouse 2004). The size and frequency of such sites tends to be greater on recently acquired land in the Quilomene WA, as compared to the Whiskey Dick WA.

Under both grazing alternatives, WDFW allocates a maximum of 35 percent of forage production to livestock, with average stocking rates around 26 acres per AUM. WDFW monitors forage utilization and residual stubble height based on criteria prescribed by the NRCS Guidelines and HB 1309 Ecosystem Standards. Such low intensity grazing, with proper management, should support native vegetation, and maintain or improve ecological condition in upland and riparian areas.

Fire disturbance has also changed over the last century from infrequent to more frequent fire disturbance. Big sagebrush, the dominant shrub in most shrub-steppe communities in eastern Washington, is fire intolerant, so the abundance of sagebrush reported by early European explorers suggests that fire was infrequent (WDFW 2004). Historically, late summer and early fall fires were estimated to have occurred every 30 to 70 years (WNPS 2008).

The CRM area has experienced several recent fires. In 2001 and 2003, two fires burned approximately 100 acres in the Whiskey Dick along Vantage Highway (WDFW 2006a).

Whiskey Dick Wildlife Area Permitted Livestock Grazing 1967 – 1989



3.4.2 Environmental Consequences

Livestock grazing can affect vegetation by: 1) altering species composition by decreasing density and biomass of individual species, reducing species richness, and changing community organization; 2) disrupting ecosystem functioning by interfering with nutrient cycling and ecological succession; and, 3) altering ecosystem structure by changing vegetation stratification, contributing to soil erosion, and decreasing availability of water to biotic communities (Fleischner 1994).

Although the effects of poorly managed livestock grazing are well documented (Belsky 1992, Fleischner 1994, Donahue 1999, Vavra et al. 2007, as cited in WDFW 2008), it is evident that healthy and diverse plant communities with forb, grass, and shrub components important for wildlife can be maintained with light to moderate grazing (Lyon and Christensen 2002, Hayes and Holl 2003, Rambo and Faeth 1999, Holecheck et al. 1999 as cited in WDFW 2008). Managed grazing can change the species composition of plant communities, increase production of selected species, improve the nutritive quality of forage species, and increase habitat diversity by changing plant community structure across the landscape (Vavra 2005).

Research has shown that managed livestock grazing in upland grassland areas can result in higher plant richness than in un-grazed areas (Rambo and Faeth 1999). With a rest period following a grazing season, grazing can contribute to restoring plant vigor. Research from various studies comparing continuous (or season-long) and rotational grazing systems showed forage production can be up to 7 percent higher under a rotation system (Holechek et al. 1999). Research also indicates that un-grazed grasslands have comparable levels of plant diversity as compared to areas where managed livestock grazing occurred (Olff and Ritchie 1998).

Properly timed, seasonal, and rest rotation grazing, as proposed in the CRM area, are important to maintain the balance between early season use to reduce older, standing dead grass and later-season use that favors seed production and recruitment of bunchgrasses and native forbs. Livestock grazing in spring when seed heads are being formed removes live green forage as well as standing dead plant material and forces bunchgrasses to re-initiate efforts to produce seed. When timed properly, sufficient soil moisture remains so that the plants are able to re-grow nutritious new foliage, but they enter summer dormancy before they are able to produce new seed heads. The nutritious new growth provides more palatable forage for wildlife that use these areas the following fall, winter, and spring (Ganskopp et al. 2006 as cited in WDFW 2008). A similar management strategy, involving periodic deferment and rest, has been effective to ensure bunchgrasses remain healthy and productive and complete their life cycle (Frisina and Morin 1991, Frisina 1992, Evans 1986 in Vavra 2005, Vavra and Sheehy 1996, Grover et al. 1986, Yeo et al. 1993, all as cited in WDFW 2008).

It is generally accepted that unmanaged, heavy grazing adversely affects riparian vegetation growth and stability. Impacts to riparian vegetation can include consumption, soil compaction, and trampling. However, it appears that rest-rotation grazing systems and/or specialized grazing schemes in which riparian zones are treated as special use pastures have been the most successful (Kaufman & Kruger 1984). Properly managed livestock grazing in the riparian area removes

older, standing dead growth, thereby increasing the abundance and availability of more palatable and nutritious spring and fall re-growth (WDFW 2008; Platts 1991, Kauffman et al. 1997).

The spread of noxious weeds and invasive species is a concern within the CRM area. Research shows that changes in plant community species composition due to grazing do not necessarily lead to invasion of noxious weeds (Augustine and McNaughton 1998). However, livestock grazing can help the spread of these undesirable species by reducing competition from native species by direct consumption, disturbing and opening up native habitat to weeds, and dispersing seeds through dung and fur (Fleischner 1994).

Wildland fire can convert late-seral vegetation to early- and mid-seral vegetation, which would provide diversity in habitat, forage, and cover. In late-successional vegetation communities, fire would return the vegetative community to an earlier stage of succession. This conversion could displace species adapted to late-seral vegetation types in the CRM area.

In general, wildland fires consume most of the vegetation throughout upland areas. However, native bunchgrasses and forbs are often dormant during fires, and can recover from low to moderate intensity fires in subsequent growing seasons. Wildland fires may directly impact wildlife (mortality) or destroy habitat, forcing species to relocate. However, wildland fire can be both beneficial and detrimental to wildlife and their habitats. Because wildland fires create ideal habitats for weeds, there is a strong potential for the introduction and spread of invasive species in burned areas. Furthermore, fire-sensitive vegetation such as bitterbrush, which is an important browse species for big game, is often eliminated by fire.

3.4.2.1 Alternative 1: No Action (Current Management)

Direct and Indirect Effects

Grazing under Alternative 1 would be implemented at reduced levels than what had occurred prior to WDFW acquisition of the Skookumchuck. Grazing would occur on up to 27,815 acres, (WDFW managed pastures) with an average stocking rate of 26 acres per AUM. Forage utilization would be light, with a maximum of 35 percent of annual forage consumed. Grazing at the planned intensity and timing would do little to adversely impact existing vegetative communities.

Under this Alternative, livestock grazing could have minor to moderate effects to vegetation during the grazing period, due to livestock distribution management (i.e., herding, salt/protein sites, etc.), accessibility factors (i.e., steep slopes and fencing), forage utilization standards (35 percent or less) and rangeland vegetation monitoring (i.e., adaptive management). These impacts could include decreased biomass and ground cover, as well as, minor disturbance of biological crusts.

Potential moderate and localized impacts could occur to vegetation near water developments, bedding areas, or salt/protein supplements where livestock congregate for longer periods of time, providing disturbance for invasive plant establishment. However, ongoing weed control efforts and rangeland vegetation monitoring would reduce the risk of invasive plant establishment by early detection and treatment measures. Livestock grazing in un-fenced stream corridors and wetlands could have minor to major impacts to vegetation through trampling and consumption.

However, under Alternative 1, streams, wetlands and riparian areas would be protected. Temporary fencing would be used to eliminate access to streams and riparian areas; therefore there would be a negligible to minor effect of livestock grazing on riparian areas. Additional measures that would reduce the potential impact of livestock to riparian areas include the use of herding and salt and protein blocks to distribute the livestock across the pasture and draw them away from sensitive areas.

Potential impacts from livestock grazing to sensitive plant species such as Hoover's tauschia, Pauper milk-vetch, and Hedgehog cactus are unlikely. Habitat for these species is found on shallow, rocky soils (i.e., lithosols) on ridge tops and slopes. Generally, livestock avoid these habitats due to the difficulty for livestock to access them due to often the steep topography and paucity of available forage on these sites; impacts to sensitive plant species from livestock grazing under this alternative would be negligible.

Because of the seasons of use, incorporation of rest and deferred periods in all pastures, reduced AUMs, and careful management of the maximum utilization levels, all in accordance with NRCS and HB 1309 guidelines, the grazing system outlined for this alternative is expected to maintain current upward trends in vegetation condition, with the exception of severely degraded sites.

Cumulative Effects

Combined, the WDFW and WDNR manage approximately 12 percent of Washington's remaining shrub-steppe. Furthermore, several extensive areas of continuous shrub-steppe are primarily on federal holdings (Yakima Training Center, Hanford Nuclear Site, and the Yakama Nation).

The dramatic conversions to dryland agriculture, which occurred prior to 1940, and use of irrigation to expand farming and orchards, which has occurred from 1950 on, have reduced the once-expansive native grasslands and shrub-steppe of eastern Washington to a fragmented landscape with very few large areas of native vegetation. Shrub-steppe communities are continually being lost due to population growth and cultivated agriculture. At the state level, the area of historical shrub-steppe habitat that has been lost due to conversion to agriculture is estimated to be 50 percent (Vander Haegen 2007). In central Washington, 75 percent of the shrub-steppe regions containing loamy soils have been converted to agriculture or other land uses, where less than 15 percent of shrub-steppe growing in shallow soils have been converted (Knick et al. 2003).

Human population growth and associated development in Kittitas County and Kittitas Valley, expansion of existing road networks, and future regional energy projects needed to support growth, would all be sources of ground disturbance and habitat fragmentation. These effects could occur on 2,200 square miles, or the total area of Kittitas County. The impacts to the shrub-steppe habitat in the region would not be exacerbated by Alternatives 1, as grazing can be used as a management tool for the maintenance and improvement of shrub-steppe habitat.

3.4.2.2 Alternative 2: Proposed Action (CRM Grazing Plan)

Direct and Indirect Effects

Direct and indirect effects on vegetation resulting from livestock grazing would be similar as described in Alternative 1. Planned stocking rates of 26 acres per AUM are comparable to Alternative 1; however, grazing would occur on a larger area (up to 55,720 acres). Because of the seasons of use, incorporation of rest and deferred periods for each pasture, and proposed careful management of maximum utilization levels, the grazing system outlined for this Alternative is expected to promote an upward trend in vegetation condition, with the exception of severely degraded sites.

Cumulative Effects

Cumulative effects under Alternative 2 would be the same as Alternative 1, except grazing would occur across a larger area.

3.4.2.3 Alternative 3: No Grazing

Direct and Indirect Effects

Under this alternative, livestock grazing would not occur. Therefore, there would be no direct and indirect effects to vegetation resulting from the implementation of Alternative 3.

Cumulative Effects

Because livestock grazing would not occur there are no cumulative effects from this Alternative.

3.5 Upland Wildlife

3.5.1 Affected Environment

Washington's shrub-steppe communities support a wide diversity of wildlife (Dobler et al. 1996). Wildlife in the CRM area includes elk (*Cervus elaphus nelsoni*), mule deer (*Odocoileus hemionus)*, California bighorn sheep (*Ovis canadensis californiana*), white-tailed and black-tailed jackrabbit (*Lepus townsendi* and *L. californicus*, respectively), and Townsend's ground squirrel (*Spermophilus townsendii*). Bird species include golden eagle (*Aquila chrysaetos*), ferruginous hawk (*Buteo regalis*), bald eagle (*Haliaeetus leucocephalus*), prairie falcon (*Falco mexicanus*), peregrine falcon (*F. peregrinus*), burrowing owl (*Athene cunicularia*), sage thrasher (*Oreoscoptes montanus*), sage sparrow (*Amphispiza belli*), loggerhead shrike (*Lanius ludovicianus*), chukar (*Alectoris chukar*), and sage grouse (*Centrocercus urophasianus*). Amphibians and reptiles that may potentially occur in the area include the Columbia spotted frog (*Rana luteiventris*), short-horned lizard (*Phrynosoma douglassii*), yellow-bellied racer (*Colubor constrictor mormon*), rattlesnakes (*Crotalus* spp.), and striped whipsnake (*Masticophis taeniatus*).

The CRM area is characterized by steep, rocky slopes, and a series of ridges (WDFW 2006b), with several WDFW Priority Habitats known to occur in the area, including shrub-steppe, riparian, cliff, and talus habitats. The area provides important winter and spring habitat for mule deer and elk and year-round use by bighorn sheep. Cliffs and talus provide key habitat for various species including golden eagles, and peregrine falcons.

Big Game

There are regular, large concentrations of mule deer (700 to 800 animals) using the CRM area during the winter and spring, mid-November to April (WDFW 2006a, 2008b).
One of the most important habitat factors affecting deer in this area is the availability of suitable forage to survive harsh winter conditions and in preparation for fawning. The CRM area is characterized by moderate winter temperatures and provides shrub species that are suitable forage for mule deer.

There are also regular, large concentrations of elk (1,500 to 2,000 animals) that are part of the Colockum Elk Herd using the CRM area during the winter and spring (WDFW 2006a, 2008b). Wintering elk forage on native grass species including Sandberg's bluegrass, which greens up with fall rains. Elk use of forage and cover depends on the season, land use influences, and human disturbance.

After bighorn sheep populations declined in the 1970s, 43 California bighorn sheep were released at the mouth of Quilomene Creek between 1993 and 1996 (WDFW 2006b). Bighorn sheep are now distributed along the Columbia River from Malaga to the Skookumchuck drainage. The current population ranges from 148 to 182 sheep (WDFW 2008b) with regular, large concentrations of bighorn sheep occurring adjacent to the Skookumchuck pasture (WDFW 2008b). Suitable habitat exists south from East Whiskey Dick pasture unto Ginko State Park. Use by sheep is documented in these areas, although at lower levels than seen to the north. The threat of most concern regarding bighorn sheep continues to be an outbreak of disease such as pneumonia from domestic sheep.

Shrub-steppe Dependent Species

Many shrub-steppe-dependent wildlife species that use the CRM area are state listed (Table 3-6). State candidate species include white-tailed and black-tailed jackrabbits, Townsend's ground squirrel, burrowing owl, golden eagle, loggerhead shrike, sage sparrow, and sage thrasher. In addition, the wildlife area is within the largest core habitat for the striped whipsnake.
Three-quarters of all known snake species in Washington occur in this region of the state, as well as five known lizard species of lizard and five known amphibian species.

Black-tailed and white-tailed jackrabbit have been documented in and adjacent to the project area. Suitable sagebrush and shrub habitats are present to support jackrabbit populations. Townsend's ground squirrels have also been documented in the project area. Pygmy rabbits occurred in native shrub-steppe habitat in five Washington counties but have not been documented in Kittitas County (WDFW 1995).

Raptors

Raptors are common and diverse in the CRM area. The project area is located within the Pacific Flyway, one of four principal north-south bird migration routes in North America. To the east of the project area is the Columbia River, an area that supports raptors, including bald eagles. Because of the close proximity to Columbia River, bald eagles are likely to utilize the project area. Golden eagles, a state candidate species, are known to nest and forage within and adjacent to the CRM area. Other raptors in the area include the American kestrel, prairie falcon, ferruginous hawk, peregrine falcon and the burrowing owl. Kestrels, Peregrine and prairie falcons are known to nest on and adjacent to the CRM area, utilizing cliffs proximal to the

Columbia River for nesting and perching. Ferruginous hawk has been documented in the vicinity and prefer the open areas with less than 50 percent cover. Burrowing owls have also been documented in the area and are associated with the open grasslands that have a high rodent population. Small rodent burrows (i.e., ground squirrels, white-tailed and black-tailed jackrabbits) are common. In short, raptor mammalian food sources appear to be relatively stable.

Table 3-6 Special Status Species that Occur or Have Potential to Occur in the CRM Area

Listing	Species
FC	Sage grouse
F-SOC	Burrowing owl, ferruginous hawk, loggerhead shrike, bald eagle, peregrine falcon
ST	Ferruginous hawk and sage grouse
SC	Black-tailed and white-tailed jackrabbit, Townsend's ground squirrel, burrowing owl, golden eagle, loggerhead shrike, sage sparrow, sage thrasher, Columbia spotted frog, and striped whipsnake
SS	Bald eagle and peregrine falcon

Key:
FC – Federal Candidate
F-SOC – Federal Species of Concern
ST – State Threatened
SC – State Candidate
SS – State Sensitive Species

Source: WDFW 2008c

Mature shrub habitat structure, landscape connectivity, and generally favorable understory conditions in the area likely account for good diversity and relative abundance of shrub-steppe associated birds. More than 100 bird species forage and nest in sagebrush communities (Dobler et al. 1996). Shrub-steppe habitat with greater structural complexity tends to support a more diverse assemblage of bird species than areas deprived of a shrub component (Dobler et al. 1996). For example, both the sage sparrow and sage thrasher are typically found where shrubs are the dominant structural feature in the landscape (Dobler et al 1996). The loggerhead shrike is primarily a breeding resident of the shrub-steppe zone, whose Washington distribution is the Columbia River Basin, including the project area (Vander Haegen 2004). Loggerhead shrikes occur in the project area from March to September, as they use grasslands or pastures with short or patchy grasses for foraging (Vander Haegen 2004).

Sage Grouse

Sage grouse are a state threatened species and a federal candidate species. Sage grouse have been observed on and near the area, with winter, spring and summer use documented. The CRM area lies within the 146,565-acre Colockum Sage grouse Management Unit. The Colockum unit has potential to connect the Moses Coulee and Yakima Training Center sage grouse management units, although "it is handicapped by relatively rugged terrain, much of which may be unsuitable for sage grouse" (Stinson et al. 2004). In September 2007 a sage grouse nest was located on the Wild Horse Wind Power Facility, which along with occasional sage grouse sightings in recent year's points to the importance of area in fulfilling the tenants of the sage grouse recovery plan.

Reptiles and Amphibians

The CRM area is located within the largest core habitat for the striped whipsnake and within the potential range of the Columbia spotted frog. The Columbia spotted frog is limited to wetlands or springs, all of which would be protected under each alternative.

3.5.2 Environmental Consequences

Livestock grazing can be used as a habitat management strategy to enhance wildlife habitat. Managed grazing by livestock can change the species composition of plant communities, increase production of selected species, improve the nutritive quality of forage species, and increase habitat diversity by changing plant community structure across the landscape (Vavra 2005). Indirect improvement of forage quality occurs when a grazing treatment is used to remove standing, mature vegetation that impedes the ability of an herbivore to access new spring growth or fall re-growth (Vavra 2005). Under a well-managed grazing strategy, livestock removes older, standing dead grass and increases the availability of the more palatable and nutritious spring or fall re-growth.

Big Game

Since cattle and elk have different foraging preferences (Stewart et al. 2003), dual use by both species can produce increased plant community structural diversity as a result of forage selection choices by each species and the patchy nature of their use of the landscape. Cattle grazing during the early season could improve the quality of winter forage for elk. This early season grazing could improve vegetation composition, productivity, and quality for elk, but cattle would be removed early enough to allow plants to re-grow (Vavra 2005). Managing the timing and intensity of grazing is critical to maintain quality shrub-steppe habitat. Frequent grazing during the critical period could affect bunchgrass vigor and health, decreasing its abundance and push the community toward and earlier seral condition that would decrease elk forage. One study showed that during winter and spring, elk preferentially selected feeding sites where cattle had grazed moderately during the previous summer, but in fall, elk selected sites where cattle use in summer had been light (Crane 2002 as cited in Vavra 2005).

Shrub-steppe Dependent Species

WDFW management recommendations for sage thrasher, sage sparrow, and loggerhead shrike suggest that livestock grazing be kept at low to moderate levels (25 to 40 percent) and that more than 50 percent of the current year's perennial bunchgrass production be allowed to persist through the following breeding season (Vander Haegen 2004a, b, c). For example, because sage thrashers frequently nest and forage at ground level, Altman and Holmes (2000 as cited in Vander Haegen 2004c) state that grazing levels should be kept at low intensities (<25 percent).

Sage Grouse

Sagebrush provides food and cover throughout the year for sage grouse, while the grass-forb understory supplies food and cover from spring through fall (Sveum et al. 1998, Stinson et al. 2004). The effects of grazing in sage grouse habitat depends on the timing and intensity of defoliation. Beck and Mitchell (2000) identified both positive and negative direct effects of livestock grazing on sage grouse habitat. Managed grazing by cattle can improve both quantity and quality of summer forage (forbs) for sage grouse. But if overgrazing is allowed, cattle may reduce nesting habitat by opening up ground cover, and reduce forage by removing important forbs and allowing weed invasion as well as possibly trampling nests.

Raptors
Additional boundary fences would provide additional perch sites and potential injury from collisions. Temporary fences would minimize these affects. The potential for collisions is likely minimal. PHS guidelines will be implemented where disturbances from construction are likely to occur.

Reptiles and Amphibians
Management recommendations for striped whipsnake (Nordstrom and Whalen 1997) encourage conservation of rodent burrow systems. Optimal habitats for this species are near talus slopes, rocky canyons, and dry rocky streambeds, these areas would be unlikely to attract livestock concentrations. The Columbia spotted frog is limited to wetlands or springs. If impacts develop they would be mitigated through adaptive management (e.g., fencing, grazing timing and intensity, etc.).

3.5.2.1 Alternative 1
Direct and Indirect Effects

Big Game
Under Alternative 1, livestock grazing can result in competition between livestock, deer, elk, and bighorn sheep for the available forage resources, however, the utilization standards include the cumulative annual use of forage by big game and domestic livestock. During the grazing season, mule deer and elk may avoid areas where cattle are present. While avoidance over cattle could occur during spring, the preference of elk for habitats not occupied by cattle appears to be related to intensity of the vegetation removal by cattle rather than a social intolerance of cattle (Frisina 1992). Cattle would not disrupt elk or deer in winter, as cattle would not be present. Elk calve only in the springtime (May through June), just as the food supply booms. Elk would more likely avoid cattle and inhabit the steeper slopes in pastures being grazed. Bighorn sheep prefer steeper slopes which cattle typically avoid. The Skookumchuck pasture falls within the mapped range of the Quilomene bighorn sheep population; no livestock grazing in this pasture is proposed under Alternative 1. Therefore, there would be negligible effect to bighorn sheep by cattle grazing under this alternative.

Livestock grazing during the spring, summer, and early fall can leave winter/early spring range areas with insufficient forage reserves to carry the desired numbers of big game through the critical winter/early spring period. Cattle grazing during the early season could improve the quality of winter forage for elk. This early season grazing could improve vegetation composition, productivity, and quality for deer and elk, but cattle would have to be removed early enough to allow plants to re-grow (Vavra 2006). Managing the timing and intensity of grazing is critical to maintaining quality shrub-steppe habitat. Frequent grazing during the critical period could affect bunchgrass vigor and health, decreasing its abundance and push the community toward an earlier seral condition that would decrease elk forage. The level of grazing proposed under this alternative would have minor, short-term effects on habitat quality for mule deer and elk. Impacts to big game winter range is not expected because adherence to the proposed season of use, forage utilization standards, effective removal, and effective monitoring for compliance would help minimize the potential effects to big game species. In addition, wildlife friendly fencing, which includes high bottom wires and low top wires, will be used to facilitate movements by deer and elk.

Shrub-steppe Dependent Species

Livestock use has the potential to alter bird behavior, habitat, and productivity. Grazing of shrubs, forbs, and grasses, combined with the potential spread of noxious weeds reduces the overall amount of high quality habitat available for many avian species. There would also be a slight risk that nesting vegetation, eggs, and young would be trampled by large-hoofed livestock. Individual birds could be disturbed by cattle presence, potentially leaving nests unattended for longer periods than normal. Livestock grazing impacts to sage grouse habitat would likely be negligible. Because sage grouse feed almost exclusively on sagebrush in winter, grazing would have little effect on sage grouse winter habitat. Livestock grazing in riparian areas in Lower Parke, Whiskey Jim, and Upper Skookumchuck pastures could impact wildlife species, including sage grouse (during brood rearing), as well as reptiles and amphibians in these areas. Cattle could compete with wildlife for forage. Grazing impacts would be most pronounced during dry periods (mid-summer) when cattle are more likely to target riparian areas for shade, water, and forage. However, impacts to the species utilizing the riparian habitat would be negligible and short-term due to the short grazing duration and frequency of livestock grazing, and temporary fencing. Riparian areas would be fenced to avoid cattle entering these areas, while grazing would be ending in mid-summer. Ground squirrels would be relatively unaffected by the grazing proposed under Alternative 1. Ground squirrels would tolerate grazing if sufficient perennial grasses and forbs remain in May and June to meet their nutritional needs during aestivation and hibernation (Fehmi et al. 2005, Tarifa and Yensen 2004).

A very slight increase in fence-related conflicts with wildlife would occur due to new fencing. The introduction of new fences (including temporary fences) could adversely impact ground birds. Mortality from collisions and increased perches for raptors (predators) could occur. New fences could limit big game movement throughout the pastures. Fencing impacts would be long-term (for the life of a fence); however, impacts from fencing under this alternative would be minor as wildlife friendly fences would be implemented.

Sage Grouse

Livestock grazing could potentially reduce vegetative cover. In addition, overgrazing would allow weed invasion and reduce perennial grass and forb components that is important for nesting, foraging and brood rearing. However, impacts from livestock grazing would be minimized through the implementation of the sage grouse recovery plan recommendations. Refer to section 3.12 (Best Management Practices (BMP) and Mitigation Measures) for more detail.

Raptors

Proposed grazing would not measurably affect habitat conditions or prey resources for bald eagle, golden eagle, burrowing owl, peregrine falcon, prairie falcon and ferruginous hawk, nor cause long-term movements of any sensitive species. While it is possible for short-term disturbance to occur, the likelihood is relatively low because of the small percentage of area affected relative to the habitat distributions. Golden eagles and prairie falcons nest on talus and cliffs, as well as trees, in the area. Prey abundance for this species would not be expected to change by implementing this alternative.

Reptiles and Amphibians

Livestock typically would not use striped whipsnake habitats (i.e., talus slopes, rocky canyons, and dry rocky streambeds); therefore, impacts to these species would be negligible. Impacts to the Columbia spotted frog could potentially occur in or adjacent to project area wetlands and springs. This species is not known to occur within the project area; however, potential suitable habitat does exist. Therefore, any impacts would be mitigated through adaptive management (e.g., fencing, grazing timing and intensity, etc.).

Cumulative Effects

Combined, the WDFW and WDNR manage approximately 12 percent of Washington's shrub-steppe habitat. Furthermore, several extensive areas of continuous shrub-steppe are primarily on federal holdings (Yakima Training Center, Hanford Nuclear Site, and the Yakama Nation). The Colockum, Quilomene and Whiskey Dick WA's provide 146,565 contiguous acres of shrub-steppe habitat.

The dramatic conversions to dryland agriculture, which occurred prior to 1940, and use of irrigation to expand farming and orchards, which has occurred since 1950, have reduced the once-expansive native grasslands and shrub-steppe of eastern Washington to a fragmented landscape with very few large areas of native vegetation. Shrub-steppe communities are continually being lost due to population growth and cultivated agriculture. At the state level, the area of historical shrub-steppe habitat that has been lost due to conversion to agriculture is estimated to be 50 percent (Vander Haegen 2007). In central Washington, 75 percent of the shrub-steppe regions containing loamy soils that have been converted to agriculture or other land uses, where less than 15 percent of shrub-steppe growing in shallow soils have been converted (Knick et al. 2003).

Population growth and associated development in Kittitas County and Kittitas Valley, which could be associated with expansion of existing road networks, development of both residential and commercial areas, and well as future regional energy projects needed to support increased population and growth, would all be sources of ground disturbance and habitat fragmentation. These effects would be seen on a spatial scale of upwards of 2,200 square miles, which is based on the total area of Kittitas County.

These impacts to the shrub-steppe habitat in the region would not be exacerbated by Alternatives 1 or 2 as grazing can be considered a management tool for the maintenance and improvement of shrub-steppe habitat. Low intensity, seasonal, and rest rotation grazing can influence the species composition of plant communities, increase production of selected species, improve the nutritive quality of forage species, and increase habitat diversity by changing plant community structure across the landscape (Vavra 2005).

3.5.2.2 Alternative 2

Direct and Indirect Effects

Direct and indirect effects on wildlife species resulting from livestock grazing in Alternative 2 would occur over a larger landscape (up to 55,720 acres) than described under Alternative 1. An additional 27,500 acres will be grazed resulting in an additional annual average of 402 AUMs, under this alternative. Alternative 2 would continue to improve a relatively moderate level of

upland habitat quality and quantity. Forage, cover and nesting habitat would continue to be provided on uplands for wildlife dependant on this habitat type.

Cumulative Effects

Cumulative impacts under Alternative 2 would be the same as described under Alternative 1, except grazing would occur across a larger area.

3.5.2.3 Alternative 3: No Grazing

Direct and Indirect Effects

Livestock grazing would be eliminated if Alternative 3 is implemented, and therefore no direct and indirect effects would occur.

Cumulative Effects

There would be no additional cumulative impacts under this alternative.

3.6 Aquatic Wildlife

3.6.1 Affected Environment

Parke Creek contains rainbow trout (*Oncorhynchus mykiss*) and speckled dace (*Rhinichthys osculus*) in the Lower Parke and Whiskey Jim pastures. Rainbow trout, which are indistinguishable from the federally endangered Upper Columbia River summer-run Steelhead (*Oncorhynchus mykiss*), are known to occur in the lower end of Whiskey Dick Creek, Skookumchuck Creek and in the North Fork of Skookumchuck Creek, approximately 1 mile upstream of the Upper Skookumchuck Pasture (Figure 3-3). Upper Columbia River summer steelhead and their redds have been documented in the lower end of Skookumchuck Creek and habitat for inland redband trout (*Oncorhynchus mykiss gairdneri*) extends up to the confluence of the Skookumchuck and Upper North Fork Skookumchuck, within the Wild Horse Crossing pasture. No other streams in the CRM area contain any other federally listed fish species.

Table 3-7 presents a list of fish species with federal and/or state status identified by the USFWS, National Oceanic and Atmospheric Administration Fisheries, and/or WDFW as potentially occurring in these streams.

Table 3-7 Special Status Fish Species that Could Occur in the CRM Area

Common Name	Scientific Name	Status	Occurrence within CRM Area
Bull trout	*Salvelinus confluentus*	FT/SC	Suitable stream habitat not present in CRM area*
Chinook salmon	*O. tshawytscha*	FT/SC	Suitable stream habitat not present in CRM area*
Mountain sucker	*Catostomus platyrhynchus*	SOC	Suitable stream habitat not present in CRM area*
Pacific lamprey	*Lampetra tridentate*	SOC	Suitable stream habitat not present in CRM area*
Redband	*O. m. gairdneri*	SOC	Suitable stream habitat exists in CRM area but species not

Table 3-7 Special Status Fish Species that Could Occur in the CRM Area

Common Name	Scientific Name	Status	Occurrence within CRM Area
			documented
Steelhead	*O. mykiss*	FE/SOC	Occurs onsite
Westslope cutthroat	*O. clarki lewisi*	SOC	Suitable stream habitat exists in CRM area but species not documented

*Species may occur transiently
FT – Federal Threatened; SDC – State Candidate; SOC – Species of Concern

3.6.2 Environmental Consequences

Riparian areas function as buffers for materials such as sediment moving from the uplands toward a water body. Vegetation increases stream bank stability, binding bank materials and reducing erosion and sedimentation. Maintenance of riparian vegetation is essential for controlling stream temperature, providing cover, and protecting against erosion. Increased sedimentation contributes to the loss of spawning habitat and decreases the diversity of food items (Platts 1991).

Limiting factors include high stream temperatures, lack of spawning habitat, high sedimentation in spawning areas, and/or lack of preferred food items. A decrease in riparian vegetation coverage could increase water temperature above those favorable for fish. These conditions could force fish to migrate to other stream reaches or harming remaining stocks. Degradation of riparian vegetation may also increase sediment deposition in the interstitial spaces of spawning gravels because of the increasing overland flow (including runoff) and stream bank erosion. This increased sedimentation reduces available fish spawning habitat and potentially smothers eggs and fry already spawned, reducing survival of local stocks (Hartman and Brown 1987, Hartman et al. 1987, Waters 1995).

Riparian areas are often grazed more heavily than upland areas because they offer water, shade, and more succulent vegetation (Platts and Nelson 1985, Platts 1991). Livestock grazing can change the riparian and stream environment by reducing or eliminating vegetation or degrading stream bank integrity (Kauffman and Krueger 1984, Platts 1991). Cattle grazing in streams or on stream banks can also change channel morphology. Their presence can collapse stream banks from grazing on riparian vegetation, leading to fewer plant roots to anchor soil. Less plant cover to protect the soil surface from erosion, disturbance, and the sheer force of trampling hooves can widen the stream channel and increase fine sediments entering a stream. Generally, grazing in these areas could alter water flow in a stream reach and potentially leading to streambed scouring and reduced fish habitat.

Un-grazed stream zones generally have better fish habitat, and fish are typically more successful and more numerous in un-grazed zones than in heavily grazed zones with degraded habitat. However, research suggests livestock grazing on a rest-rotation schedule has limited impacts, such as trampling and stream bank disturbance, to adjacent stream quality and fish habitat (Platts 1991).

Structural range improvement projects such as fences have the potential for short-term negative effects on aquatic habitat through surface disturbance and the possibility of erosional inputs to streams or wetlands. Long-term negative effects could occur if livestock movement patterns parallel to the fence line create pathways denuded of vegetation and prone to ablation.

3.6.2.1 Alternative 1: No Action (Current Management)

Direct and Indirect Effects

Rotational, early season grazing and fencing would lessen the impact on riparian vegetation, trampling of stream banks and redevelopment of springs. The amount of time that livestock spend in riparian areas would be reduced, because grazing would not occur during the heat of the summer. In a study in Idaho, Platts and Nelson (1985) observed that cattle dispersal was good and cattle were more likely to use uplands during spring and early summer until upland forage plants became less succulent. Marlow and others (1989) also noted good dispersal of livestock from early May through early July; they noted the poorest dispersal was during the "hot season" (July to mid-September).

Clary and Webster (1989) noted spring grazing of riparian areas has several advantages. Grazing early usually results in a better distribution of use between the riparian area and adjacent uplands. This is likely because vegetation in upland areas is more succulent, temperatures are cooler, and, in some cases, livestock may avoid streamside areas that are often wet in the spring. Early grazing, followed by complete livestock removal, allows riparian plants to re-grow before the dormant period in the fall (USDA 2006).

The more riparian vegetation is present, the more vegetation there is to filter out sediment. As riparian vegetation increases, the amount of sediment delivery to streams would be reduced. Insect populations, which are food sources for fish, would also increase as the amount of riparian vegetation increases.

Trampling in springs and riparian areas by livestock would decrease, reducing potential mortality of fish. Early season grazing along with rest and deferred rotation would improve spotted frog habitat and increase survival because there would be a reduction in trampling, improvement in water quality, and expansion of habitat with increased riparian vegetation. With improved habitat and an increased food base, populations of summer-run Steelhead and other aquatic wildlife would be expected to increase.

Shade would increase as long-rooted riparian vegetation (woody species and riparian grasses) expands where it exists and becomes established in some areas where it does not currently exist. Riparian woody vegetation and grasses are expected to increase in both height and percent cover. As vegetation grows taller, it provides more shade along the stream banks.

Cumulative Effects

Past activities such as domestic livestock grazing (sheep, horses and cattle), road construction and maintenance, and recreation have resulted in the stream conditions in the CRM. These conditions include reduced riparian plant composition and vigor, down cut and degraded stream channels, changes in upland vegetation, and altered stream flows. Although many of the

historical practices have been halted or modified, stream banks and riparian vegetation still show evidence of these practices.

Present activities such as habitat improvement projects (e.g., weed control and shrub steppe restoration projects) combined with the changes in livestock grazing practices, are anticipated to result in more riparian vegetation, more stream shade, lower water temperatures, and lower amounts of cutbank.

Other activities that are ongoing and are expected to continue into the future include weed control, and recreational use. With the exception of Off Highway Vehicles (OHV) that are driven in sensitive areas and dispersed camping that occur along and on stream banks, these activities are not expected to adversely affect shade and stream banks.

3.6.2.2 Alternative 2: Proposed Action (CRM Grazing Plan)

Direct and Indirect Effects

Direct and indirect effects on aquatic wildlife resulting from livestock grazing would be same as under Alternative 1, except that grazing would occur across a larger area (up to 55,720 acres).

Cumulative Effects

Cumulative impacts for Alternative 2 would be the same as those discussed for Alternative 1, except that grazing would occur across a larger area.

3.6.2.3 Alternative 3: No Grazing

Direct and Indirect Effects

Alternative 3 would eliminate all effects of livestock grazing to aquatic habitat on WDFW managed land in the CRM area. However, wildlife would continue to graze in riparian habitats and along fish-bearing streams. The elimination of livestock grazing could accelerate recovery of woody and herbaceous vegetation, allowing the spread and growth of young plants, aiding in the stabilization of channels and banks and a reduction in erosion.

Cumulative Effects

There would be no additional cumulative impacts under this alternative.

3.7 Land Use and Recreation

3.7.1 Affected Environment

Land use in the CRM area consists largely of fish and wildlife conservation, open space, and livestock grazing. A relatively new land use, industrial/wind energy production has been expanding in the area. Overall population density in the CRM area is zero, as there are no residences within the area. Lands are primarily publicly owned, by WDFW, WDNR, and BLM. Areas within Wild Horse North and South pasture are owned by Puget Sound Energy and used for the Wild Horse Wind Farm. Table 3-8 provides a summary of the land ownership within the CRM area and Figure 1-2 provides a graphical representation of the land ownership.

Table 3-8 Land Ownership Summary

Owner	Acres Owned
WDFW	35,423
WDNR	15,142
BLM	2,869
Puget Sound Energy	7,869
Other	351

Recreational activities in the CRM area include bird watching, hiking, horseback riding, mountain biking, fishing, and hunting. Primitive road networks throughout the CRM area are suitable for four-wheel drive vehicles, mountain bikes, and horses (Bentler 2008). The Washington Audubon Society designated the Colockum-Quilomene area as an Important Bird Area in Eastern Washington.

Recreation is dispersed throughout the CRM area. Off-road vehicle use occurs throughout the CRM area, and hunting activities coincide with big game and upland bird hunting seasons. Motorized vehicle use is allowed on designated roads, except during winter closures.

Gingko State Park Recreation Site, east of the CRM area, is the only developed campground and day use site in the near vicinity. This fee site has pull-in units with tables, grills, and vault restrooms.

3.7.2 Environmental Consequences

Livestock grazing can be considered an incompatible use with certain land uses, such as residential and commercial uses. Direct impacts can be visual, olfactory, and noise related. The impacts of grazing are highly dependent upon existing land uses; however, in most cases existing land use is agriculture or open space, which are considered compatible uses with grazing.

Livestock grazing can directly impact recreation primarily through the overlap of users. If grazing exists in the same areas used by hunters and other users, interference in the form of delays or temporary inaccessibility may result. By minimizing the interface of grazing with these uses, these impacts can be reduced. Livestock grazing can also affect recreational activities through a reduction in the quality of the recreational experience. This is done primarily through the physical alteration of wildlife habitat, including vegetation removal and erosion. Fencing associated with livestock grazing could obstruct access and could prevent or discourage recreational activities.

3.7.2.1 Alternative 1: No Action (Current Management)

Direct and Indirect Effects

The existing extent and diversity of dispersed recreation settings and the associated quality of dispersed recreation experiences would remain the same. Over the long term, proposed vegetation manipulations and fencing would enhance habitats for various game and nongame animal species, allowing for improved wildlife viewing and hunting opportunities over the long term. The extent of new fencing (pastures, riparian corridors, etc.) would cause an insignificant increase of inconvenience for hunters and hikers in traversing them. Range improvements and maintenance could involve temporary and localized delays to recreational users.

Cumulative Effects

Analysis of cumulative impacts to land use and recreation primarily considers population growth in Kittitas County, as well as future regional wind energy projects. Existing uses and activities would not be affected by future wind power projects, as agriculture and open space uses are compatible with wind power. The visual impacts of future wind projects may affect users recreating in the area through a decrease in overall scenic quality; however, hunting, wildlife viewing, and other activities could still occur.

Population growth in the region could adversely affect existing land use and recreation, as additional roads and other infrastructure would be needed. However, because most of the lands in the region are publicly owned, none of the alternatives would contribute to future regional development to an extent that would result in substantial effects to either resource.

3.7.2.2 Alternative 2: Proposed Action (CRM Grazing Plan)

Direct and Indirect Effects

Direct and indirect effects on dispersed recreation resulting from livestock grazing would be same as under Alternative 1, except that grazing would occur across a larger area (up to 55,720 acres).

Cumulative Effects

Cumulative impacts for Alternative 2 would be the same as those discussed for Alternative 1, except grazing would occur across a larger area.

3.7.2.3 Alternative 3: No Grazing

Direct and Indirect Effects

Under Alternative 3, livestock grazing would not occur, and therefore no direct or indirect effects would occur.

Cumulative Effects

Since there are no direct effects, implementation of Alternative 3 would have no cumulative effects.

3.8 Cultural and Historical Resources

3.8.1 Affected Environment

Cultural Setting

The CRM area lies on the Mid-Columbia Plateau and is situated within the ceded territory of the Confederated Tribes and Bands of the Yakama Indian Nation; the Yakama, Kittitas, and Wanapum Tribes, in particular, are historically associated with the locale. The CRM area is also within the traditional-use territories of the Wenatchi and Sinkayuse, members of the Colville Confederated Tribes (BLM 2008).

Larger villages that are known to have existed near the CRM area include the Wanapum villages sháp'tĭlĭk and pná, situated above and below Priest Rapids, respectively, and three other villages north of sháp'tĭlĭk, all approximately 1 mile apart. Kittitas, Sinkayuse, and Wenatchi villages are located on the east and west sides of the Columbia River (BLM 2008). There were regionally important fisheries along the Columbia at Rock Island (north of the CRM area) and Priest Rapids

as well as important root and berry gathering grounds above the Kittitas Valley that were shared by neighboring tribes. Biscuit root, yellow bell, balsamroot, serviceberry, and chokecherry were economically important crops that were potentially gathered in the CRM area. The Kittitas Valley was a focal point for the region's tribes, and there is a system of trails along the Quilomene, Skookumchuck, and Whiskey Dick creeks that connect the valley to the Columbia River (BLM 2008).

Members of the present-day Yakama Indian Nation and the Colville Confederated Tribes (CCT) continue to use the area for plant resource gathering and hunting. The Yakama Nation has treaty hunting rights within the boundaries of the Colockum Herd (WDFW 2006b). Tribal harvest from the Colockum Herd is unknown, although field checks, meat locker forms, and population surveys/modeling suggest that tribal harvest is less than 40 animals annually (WDFW 2006b).

Archaeology and Historical Resources

Eastern Washington University undertook a Cultural Resources Survey for the WDFW's Wild Horse Spring Project in June 2008. This survey included searching site files at the Washington State Department of Archaeology and Historic Preservation (DAHP) in Olympia, contacting the Confederated Tribes of the Colville Reservation and the Confederated Tribes and Bands of the Yakama Indian Nation, reviewing General Land Office records, and undertaking a cultural resources survey (Eastern Washington University 2008).

Results

No traditional cultural properties (TCPs) within the CRM boundaries were identified by the survey. A total of 13 cultural resource sites were recorded or revisited as part of the WDFW's Wild Horse Spring Project. These sites include nine prehistoric archaeological sites, one prehistoric isolate, and three sites with historic and prehistoric components (Eastern Washington University 2008).

Sites eligible for listing on the National Historic Register of Places (NRHP) must have the potential to provide important information about history or prehistory. All 13 sites identified as part of the WDFW Wild Horse Spring Project are potentially eligible for the NRHP because they could have intact buried cultural deposits and could provide important information regarding history and prehistory (Eastern Washington University 2008).

3.8.2 Environmental Consequences

Livestock grazing can serve to exacerbate the effects of natural agents, such as wildfires, flooding, and weathering, in degrading cultural and historical resources. Potential effects to cultural resources include trampling leading to displacement of archaeological and historic remains and artifact breakage, at sites locations used by livestock. Since grazing has occurred in CRM area for the past 100 years, it is likely that archaeological surfaces in the area have already been affected. For example, range structures (i.e., fencing and water developments) already in place highlight the fact the area has previously been disturbed and given that range improvements and maintenance activities will take place within previously disturbed site, impacts to cultural resources should be minimal. However, effects are most likely to occur to sites around water resources or at salt/protein stations, where livestock tend to congregate. To the extent that any alternative reduces grazing impacts in sensitive locations adjacent to riparian

areas or water sources, reduces soil erosion, and results in better distribution of livestock, then the potential short- and long-term effects to cultural resources is reduced.

Maintenance of existing projects would help alleviate congregation of livestock along riparian corridors and improve livestock distribution. In cases where no cultural resources are located at or near to existing projects, maintenance would probably have no effect on sites. Where cultural resources may be present at existing projects and may be affected by stock use or maintenance, these effects would be ongoing until mitigation measures are applied. Mitigation measures for existing projects may include project redesign, relocation, or fencing to exclude livestock from the site.

3.8.2.1 Alternative 1: No Action (Current Management)

Direct and Indirect Effects

Alternatives 1 would include the construction of new fences and the installation and removal of some temporary fences. No new water developments would be constructed on archaeological sites. There are some existing water developments that occur on or near known sites. Redevelopment, maintenance or relocation of these water developments would be coordinated with DAHP to avoid or protect known sites. Alternative 1 would not change the effects to cultural resources as a result of livestock grazing over the last 100 years. There would be no new direct effects to cultural resources from activities in Alternatives 1.

Under Alternative 1, livestock would continue to graze and no new water developments or changes to pasture fences would occur. Livestock would continue to water at the same spring developments they are familiar with. Livestock distribution is not expected to change.

Implementing utilization standards, a rotational grazing system, and reduced AUMs under Alternative 1, would result in a shorter the amount of time livestock would spend in congregation areas and could have less affect on archaeological sites. This would result in a lower density of livestock per acre, 26 acres per AUM than grazing prior to 2008. The livestock would be causing the same effect to cultural resources along the trail or fence line. There would no effect to cultural resources during the period of non-use Improvement over existing conditions would occur more rapidly over the short-term due to better upland distribution of livestock provided by water developments, salt/protein stations, and fencing. Mitigation of grazing impacts at these areas of congregation should help to stabilize site soils and vegetation.

Cumulative Effects

Wildfires, flooding, erosion, and weathering are just some of the natural damage agents that deteriorate archaeological sites. The cumulative effects of past grazing, road building, surface collecting and/or illegal digging, and fire suppression have accelerated the effects from natural causes. All of these activities would still be reflected in the integrity of these sites. With that said, archaeological sites would continue to be damaged from natural causes, and also from illegal human disturbances unless protective measures are implemented.

Most range improvements (such as fences and troughs) were constructed by the 1940s and damage to archaeological sites occurred by 1940. Current grazing continues to effect portions of the sites that have been altered since the early 1900s. The effect to archaeological sites has previously occurred and continued grazing is not increasing the amount of damage or leading to

the loss of cultural resources. In recent times, projects have been designed to avoid or protect archaeological sites. For the past 10-15 years, all new range improvements have been coordinated to manage for cultural resources.

Ongoing land management uses and activities would continue. Recreational users would continue to drive and recreate in the area. There would be effects to archaeological sites by dispersed camping, artifact collecting, and off-road vehicle use. Projects like road maintenance, weed control, fire suppression, and fencing would continue.

3.8.2.2 Alternative 2: Proposed Action (CRM Grazing Plan)

Direct and Indirect Effects

Direct and indirect effects on cultural resources resulting from livestock grazing would be the same as under Alternative 1. However, this alternative would be implemented across a larger area (up to 55,720 acres).

Cumulative Effects

Cumulative effects under Alternative 2 would be the same as those discussed under Alternative 1, except that grazing would occur across a larger area.

3.8.2.3 Alternative 3: No Grazing

Direct and Indirect Effects

Alternative 3 would have no direct and indirect effects to cultural resources because grazing would be eliminated under this alternative. There would be no further direct and indirect effects to archaeological sites from trailing, hoof action, or soil disturbance and displacement. However, cultural resources in the CRM area would continue to degrade from natural agents and potential disturbance from humans, past effects would not change.

Cumulative Effects

Since there are no direct effects, implementation of Alternative 3 will have no cumulative effects.

3.9 Transportation

3.9.1 Affected Environment

In general, all roads across public lands are open to travel by the public unless they are closed specifically for management purposes or during an emergency.

Due to the rural nature of the CRM area and WDFW ownership of the lands, there are very few roads open to motorized vehicle use. Vantage Highway is the primary roadway, forming the southern boundary of the CRM area. Once a state highway but now classified as a rural minor collector, it is maintained by Kittitas County (EFSEC 2004).

Roads within the southeastern portion of the CRM area are associated with the Quilomene-Whiskey Dick Road Management Areas. These Green Dot roads are open to motor vehicles and are delineated with round green reflectors. Within the CRM area, Road Management Areas

(RMAs) associated with the Green Dot system include the following pastures: West Whiskey Dick, East Whiskey Dick, Rocky Coulee, Lone Star, Skookumchuck, Upper Skookumchuck, Wild Horse Crossing, Upper Parke Creek, Whiskey Jim, and Wild Horse North pastures. All other roads and trails within these pastures are closed to all motor vehicles. The roads designated as Green Dot roads include (see Figure 3-4):

- Pumphouse Road
- Whiskey Dick Ridge Road
- Whiskey Dick Creek Road
- Hartman Road
- Cayuse Road

These roads are closed to all motor vehicles between February 1 and April 30. The total mileage of the Green Dot roads within the CRM is 42.7 miles.

3.9.2 Environmental Consequences

Livestock grazing impacts to transportation include (1) direct impacts to transportation routes, which comprise roads and trails (BLM Tech Note 2006), and (2) direct impacts to travel, including the movement of users. Livestock grazing on unpaved roadways can result in physical impacts primarily through rutting. Trampling of the roads can lead to compaction, and compacted soils are subjected to runoff. Livestock grazing across transportation routes, (in the case of the CRM, these routes are primary the Green Dot Roads) can create delays for those using these roadways, and can contribute to temporary inaccessibility of the roadways. The level of impact is highly dependent upon intensity of use of the cattle within the grazed areas and the overlap with the roads and trails, as well as the intensity of use by other users, i.e., recreational users.

3.9.2.1 Alternative 1: No Action (Current Management)

Direct and Indirect Effects

Direct effects on Green Dot roads and transportation within the Alternative 1 grazing area would include delays along or temporary inaccessibility of certain roads or trails during livestock herding, and during completion of range improvements and maintenance activities. Construction of 4.2 miles of new boundary fencing, and re-development of six springs would result in a temporary increase in travel by heavy equipment and administrative vehicles. These direct effects would be seen on 42.7 miles of Green Dot roads within the CRM.

Cumulative Effects

Regional development such as upgrades at the Yakima Training Center, future wind energy projects, or regional transportation networks could impact transportation, if several of those projects were implemented simultaneously. Additional vehicles associated with construction activities and commuters could cause congestion. However, none of the alternatives would add substantially to cumulative adverse impacts. Future transportation network upgrades associated with population growth could beneficially impact local roads by allowing easier access for those recreating in the region.

3.9.2.2 Alternative 2: Proposed Action (CRM Grazing Plan)

Direct and Indirect Effects

Under Alternative 2, 35,423 acres of WDFW managed pastures in the Alternative 2 grazing area would be opened up for grazing. Green Dot roads are located in eight of the 10 pastures open to grazing under this alternative. Green Dot roads in West Whiskey Dick, East Whiskey Dick, Rocky Coulee, and Lone Star pastures, as well as the pastures noted in Alternative 1, would be affected by livestock grazing under Alternative 2. Cattle grazing in these pastures would likely lead to direct effects including delays and temporary inaccessibility.

In Alternative 2 direct effects to transportation would include delays along or temporary inaccessibility to certain roads or trails during livestock grazing and herding, and during completion of range improvements and maintenance activities. Under Alternative 2, 4.2 miles of new boundary fencing would be constructed, 57.4 miles of boundary fence would be maintained, 162.1 miles of existing pasture fence would be maintained, and fourteen springs would be re-developed. The construction and maintenance activities associated with Alternative 2 would result in a temporary increase in travel by heavy equipment and administrative vehicles delays or temporary inaccessibility would be adverse, short-term direct effects throughout the 42.7 miles of Green Dot roads within the CRM.

Cumulative Effect

Cumulative effects under Alternative 2 would be the same as those discussed for Alternative 1.

3.9.2.3 Alternative 3: No Grazing

Direct and Indirect Effects

Under Alternative 3, no grazing would occur on WDFW-managed land in the CRM area. There would be no increase in travel by administrative vehicles or travel delays caused by livestock or herding activities. Therefore, there would be no direct and indirect effects to transportation if Alternative 3 is implemented.

Direct adverse effects would result from construction of 4.2 miles and maintenance of 57.4 miles of boundary fencing. These activities would introduce additional vehicles to the CRM area, which could cause delays or interference for those recreating in the area.

Cumulative Effects

There would be no cumulative effects on transportation if Alternative 3 is implemented.

3.10 Energy Resources

3.10.1 Affected Environment

The Wild Horse Wind Power project, located on Wild Horse North and South pastures provides renewable energy within the CRM. The project consists of 127 turbines and is on approximately 8,600 acres. A permanent footprint of approximately 165 acres is required to accommodate the turbines and supporting infrastructure (EFSEC 2004). Nonrenewable resources are gravel mines (EFSEC 2004). Gravel mining pits and quarries are located in the CRM area, and their output is used locally, primarily for construction projects (EFSEC 2004).

3.10.2 Environmental Consequences

To determine the effects of the alternatives on energy resources, the analysis considered the extent to which energy resources would be consumed to implement the actions under each alternative.

Livestock grazing has no direct or indirect effects on energy resources, as no such resources are consumed by grazing. Grazing management activities and support infrastructure, such as electric fences and pumps for water infrastructure, can consume energy resources.

3.10.2.1 Alternative 1: No Action (Current Management)

Direct and Indirect Effects

The grazing and associated range improvements and maintenance activities under Alternative 1 would not consume significant energy resources. Energy resources needed to implement the actions under this alternative would be limited to fuel for vehicles and construction equipment. No electricity would be needed, as the electric fence within the CRM is solar-powered. Thus, no direct or indirect effects on energy resources would result from implementing Alternative 1.

Cumulative Effects

The proposed action for Alternative 1 would not impact local energy resources. However, population growth and associated development would contribute to local energy demands. Planned projects, such as wind energy projects, would create a local/regional supply of power. Construction activity and vehicle use associated with road development, wind farm development, and rural residential housing would require non-renewable energy resources, primarily in the form of gas and other fuels. The demands of all of these projects and uses are not anticipated to result in significant cumulative impacts to energy resources.

3.10.2.2 Alternative 2: Proposed Action (CRM Grazing Plan)

Direct and Indirect Effects

Direct and indirect effects on energy resources resulting from livestock grazing would the same as under Alternative 1, except that grazing would occur across a larger area (up to 55,720 acres).

Cumulative Effects

Cumulative effects for Alternative 2 are the same, as those discussed for Alternative 1, except that grazing would occur across a larger area.

3.10.2.3 Alternative 3: No Grazing

Direct and Indirect Effects

Since there are not direct and indirect effects resulting from the implementation of Alternative 3, there would be no cumulative effects.

Cumulative Effects

There would be no cumulative effects if Alternative 3 is implemented.

3.11 Socioeconomic Conditions

3.11.1 Affected Environment

Kittitas County has a rich history of ranching and farming, and both are important to the social and economic setting of the area. Ranching in the area began in the 1860s. The abundance of native grasses and the clear streams of the Kittitas Valley gave rise to a prosperous cattle industry. Cattle production continued steadily through the 20th century, as railroads provided more effective transportation to the nation's eastern markets (Cochran 2008). Today, ranching and sheep production has declined in the county, yet it is still significant as an industry and as a cultural activity.

Social Setting

Population estimates for Kittitas County and Washington State are displayed in Table 3-9 (OFM 2008). The April 2008 population estimate for the county was 39,400 people. The population increased at an average annual growth rate of 2.1 percent from 2000 to 2008, whereas the rate for the state of Washington for this period was 1.4 percent. The Office of Financial Management (OFM) projects that from 2008 to 2030 both the population of Kittitas County and the population of the state will increase by approximately 2.4 percent annually. Population growth centers within Kittitas County are primarily located in the Cities of Ellensburg, Cle Elum, Rosyln, Kittitas, and the Town of South Cle Elum, as these have been designated as urban growth areas by the county and are where the majority of the growth will occur in the future (Kittitas County Community Development Services 2006).

Table 3-9 Kittitas County and Washington State Population Trends

	Census	Current Population estimate	Average Annual Growth Rate	Projections		
	2000	2008	2000-2008	2010	2020	2030
Kittitas	33,362	39,400	2.10%	43,901	52,265	60,322
State	5,894,121	6,587,600	1.40%	7,372,751	8,713,386	10,026,660

Source: State of Washington Office of Financial Management (OFM)/Forecasting October 2007
http://www.ofm.wa.gov/cenpro90/county/default.asp#kitt

Many outdoor activity opportunities exist within Kittitas County. These activities include, but are not limited to, hunting, fishing, cross-country skiing, off-road vehicle use, and mountain biking. Hunting for Colockum elk within the county has been a significant recreational activity, but it has shown a decline since the 1980s. The average number of hunters during the 1980s was 11,196, compared with 10,373 in the 1990s (see Table 3-10). This represents a 7.3 percent decline in the number of hunters. The average number of hunters from 2000-2007 was 7,575, a 26 percent decrease from the 1990s.

Table 3-10 Elk Harvest and Hunter Trends for the Colockum Elk Herd, 1985-2007

Year	Antlered	Antlerless	Total	Hunters	Hunter Days
1960s AVG	**544**	**332**	**876**		

Table 3-10 Elk Harvest and Hunter Trends for the Colockum Elk Herd, 1985-2007

Year	Antlered	Antlerless	Total	Hunters	Hunter Days
1970s AVG	**617**	**464**	**1081**		
1980	580	305	885		
1981	520	280	800		
1982	580	310	890		
1983	560	208	768		
1984	658	272	930	8,886	36,692
1985	743	231	974	12,266	52,134
1986	717	450	1,167	11,087	46,447
1987	567	581	1,148	10,509	54,761
1988	806	735	1,541	11,543	57,012
1989	983	537	1,520	12,884	61,299
1980s AVG	**671**	**391**	**1,062**	**11,196**	**51,391**
1990[a]	621	681	1,302		
1991	611	657	1,268	13,811	61,598
1992	809	616	1,425	13,253	59,169
1993	561	445	1,006	13,815	62,561
1994	559	741	1,300	11,338	53,154
1995	472	663	1,135	11,371	52,409
1996	471	596	1,067	12,553	54,939
1997	343	268	611	8,388	40,327
1998	496	247	743	9,776	53,563
1999	393	235	628	9,428	65,341
1990s AVG	**534**	**515**	**1022**	**10,373**	**50,306**
2000	438	293	731	8,374	37,522
2001	433	398	831	7,660	36,317
2002	436	593	1029	9,436	49,334
2003	424	393	817	7,756	39,571
2004	445	221	666	7,847	38,257
2005	412	302	714	6,768	29,758
2006	360	280	640	6,216	29,033
2007	276	270	546	6,543	31,611

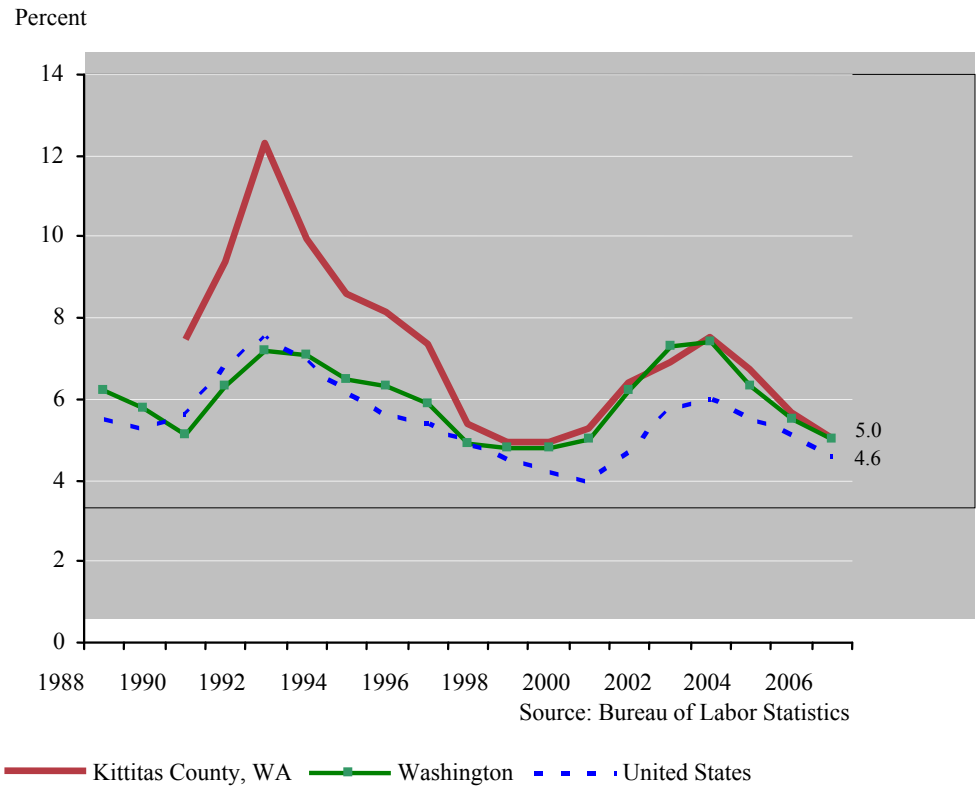
[a]Harvest estimated from report cards.
Source: Clausing 2008
.

Economic Conditions

Kittitas County has a relatively diverse employment base. People are employed in professional work, services, construction, government, manufacturing, mining, and agriculture. Agricultural employment makes up approximately one-tenth of the total employment in the county. However, as mentioned earlier, agriculture has a long history in the county both economically and culturally and is an important part of the community.

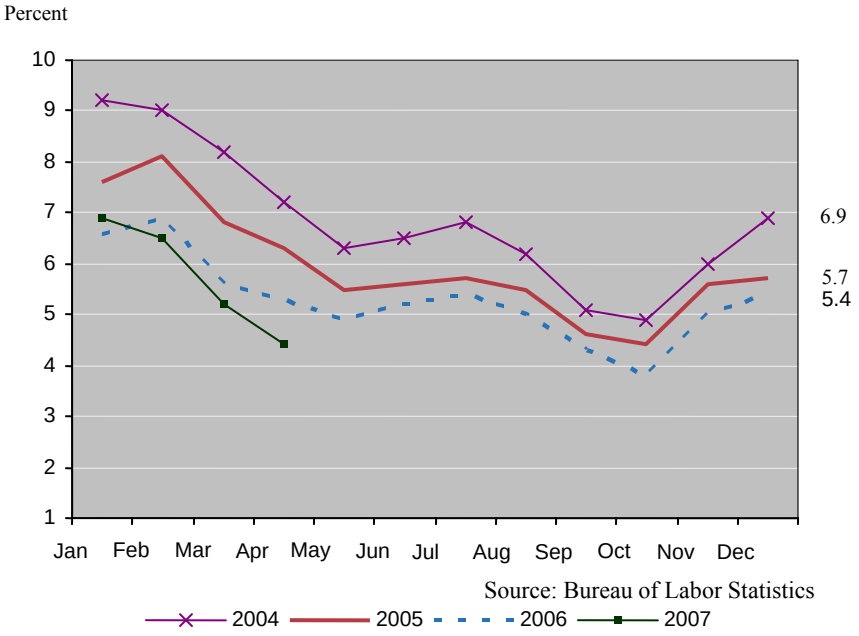
In general, a diverse employment base is linked to the health of an economy. The Bureau of Economic Analysis (BEA) recognizes both farm and agricultural services (includes ranching) as components of economic diversity (BEA 2008). Furthermore, employment in a particular area is often linked to prices for the products of that area. When the prices go up, the employment in that field tends to increase. This general principle is consistent with the trends found in Kittitas County in the farming and ranching sectors.

From 1970 to 2005, there were 8,611 new jobs created within the county. In general, the unemployment rate decreased between 1988 and 2006 (see diagram below). Although unemployment was highest (over 12 percent) in 1993, since then it has been steadily declining. In September 2008, the Washington Employment Security Department reported a 5.5 percent unemployment rate in the county, which was slightly below the national unemployment rate at that time. A general increase in job opportunities will likely be followed by economic diversity, or the distribution of employment across various sectors, which can affect ranching and farming.



Unemployment Rates in Kittitas County, Washington State, and the US from 1988 to 2006

Unemployment rate varies seasonally within the county, as the diagram below shows for 2004-2007. Farming and ranching are primarily seasonal and likely contribute to the seasonal unemployment rate in Kittitas County.



Unemployment Rate Seasonality in Kittitas County 2004-2007

Farming and Agriculture Services industry employment (which includes ranching) continues to grow within the county, but at a slower rate than other industries (see Table 3-11). In 1970, the Farm and Agricultural Services labor category of the county was 13.22 percent of total employment. By 2000, it was 10.95 percent. This is a substantial decrease in the rate of growth within the farming and ranching industry. Sectors that expanded at a quicker rate over the same period include Services/Professional and, to a lesser extent, Mining. With the projected population increase, the ratio of farming and ranching to other industry sectors is likely to decline, but farming and ranching will continue to be both culturally and economically important.

Table 3-11 Employment by Industry in Kittitas County, 1970 and 2000

	1970	% of Total	2000	% of Total
Total Employment	10,215		17,541	
Farm and Agricultural Services	1,350	13.22	1,920	10.95
Farm	1,253	12.27	1,517	8.65
*Agricultural Services**	97	0.95	403	2.30
Mining	5	0.05	41	0.24
Manufacturing (including forest products)*	671	6.57	991	5.65
Services and Professional	4,836	47.34	9,533	54.34
Transportation & Public Utilities	701	6.86	650	3.71
Wholesale Trade	302	2.96	538	3.07
Retail Trade	1,889	18.49	3,546	20.22
Finance, Insurance, & Real Estate	479	4.69	802	4.57
Services (Health, Legal, Business, Others)	1,465	14.34	3,997	22.79
Construction	528	5.17	832	4.74
Government	2,827	27.67	4,224	24.08

*Agricultural Services includes soil preparation services, crop services, and so forth, as well as forestry services, such as reforestation services, and fishing, hunting, and trapping. Manufacturing includes paper, lumber, and wood products manufacturing.

Source: BEA REIS 2005 CD Table CA25

Median income in Kittitas County increased in real terms from 1989 to 1999, as jobs increased and economic diversity expanded. Table 3-12 shows the average gain in inflation-adjusted income for both the median household income and the median family income from decade to decade. These indicators are a general measure of income distribution within the population.

Table 3-12 Income Change in Kittitas County, 1989-1999

	1989	1999	Gain
Median household income (adj. for inflation, in 2000 $)	26,995	32,546	5,551
Median family income (adj. for inflation, in 2000 $)	37,595	46,057	8,462

Source: Census Total population, Households, Families

Provided by Sonoran Institute

Personal incomes from ranching compared with the larger BEA Farming and Agriculture total income category have shown a notable decline within Kittitas County over the past few decades. The gross income of ranchers decreased by 37 percent from 1970 to 2004, while the state income decreased only 8 percent over the same period. It appears that ranching was replaced by farming, because income from crops increased by 7 percent on the state level and 36 percent on the county level. In 2005, income from ranching accounted for just 4.4 percent of the gross income across all industries within the county, versus 20.6 percent in 1970 (BEA 2008).

3.11.2 Environmental Consequences

Livestock grazing contributes to the local economy through generation of income related to grazing and other dependent uses and products. It also serves to regulate the population base, as

agricultural areas tend to see a more stable population. Increasing or decreasing the level of grazing within a region can affect overall income and population levels.

3.11.2.1 Alternative 1: No Action (Current Management)

Direct and Indirect Effects

Alternative 1 is the current management alternative, where AUMs have been reduced from levels prior to 2008 and acres available for grazing remains limited to 18,500 acres. Although the changes in AUMs would have some economic impact on the permittees, the magnitude of effects depends upon a number of factors, including options available to the permittee and the goals and objectives of the livestock operation. This alternative would have a negligible effect on the socio economic structure of the county. Income generated from ranching accounted for just 4.4 percent of the gross income across all industries within the county in 2005, versus 20.6 percent in the year 1970; the small increase in ranching (livestock grazing) under this alternative would not have a significant effect on this trend. Population, employment, and income are unlikely to be affected as a result of this alternative, because the ranching industry represents a continually decreasing portion of the Kittitas County economy.

Cumulative Effects

The economic influence from implementation of Alternative 1 is likely to be minimal within the economic context of the county area as a whole. In addition, the ranching industry is not tied as directly to public lands as the wood products industry. As a result, the reduction of livestock grazing under Alterative 1 would not have a major impact on the number of people making a living from ranching. In Alternatives 1, although there would be a decrease in permitted numbers, actual use is expected to be relatively similar to the recent past. As a result this action alternative would help to maintain the existing ranching industry and the people who make a living from it.

Employment trends within Kittitas County and throughout the Central Washington area indicate the increased job supply is primarily in construction, services, and trade. Even considering other management activities in the project areas (timber harvest, road construction, agriculture and other projects) the economic influence would be small.

3.11.2.2 Alternative 2: Proposed Action (CRM Grazing Plan)

Direct and Indirect Effects

Under Alternative 2, with approximately two times the available acres available for livestock grazing than Alternative 1, this alternative would still have a negligible effect on the socioeconomic structure of the county, for the same reasons as stated for Alternative 1. As stated above under Alternative 1, income generated from ranching accounted for just 4.4 percent of the gross income across all industries within the county in 2005; thus, even with an increase in approximately twice the amount of ranching under Alternative 2, population, employment, and income are unlikely to be affected as a result of this alternative, given the small and decreasing portion of the Kittitas County economy derived from ranching. Thus, Alternative 2 would have an overall minor effect on the county economy.

Cumulative Effects

Cumulative effects under Alternative 2 would be same as described above for Alternative 1.

3.11.2.3 Alternative 3: No Grazing

Direct and Indirect Effects

Under Alternative 3, grazing would be eliminated and potentially reduce a source of income and possible way of life for the permittee if there's a change. Whether the permittees would continue to maintain their business in a reduced form or supplement the forage loss through other means could depend on several factors. The permittees may choose a number of different options to provide forage previously provided by WDFW. They may choose to: (1) graze on their own properties if they have sufficient grazing land; (2) find and graze on other private lands at a fee; (3) use alternative sources of feed such as purchasing hay; or (4) reduce the size of their herds (i.e. sell cattle) to reduce their demand for forage.

Eliminating cattle from the Quilomene and Whiskey Dick WAs could affect the economic viability of the livestock operations because of the additional costs associated with securing additional range or buying supplemental feed, to accommodate herd sizes consistent with current permitted numbers. Additional costs could include the possibility of additional fencing and establishment of water on newly acquired range, along with increased trucking costs, and labor costs associated with moving and otherwise handling cattle.

Grazing reductions could affect employment and income in three ways: (1) direct effects attributable to employment associated with the ranches; (2) indirect effects attributable to industries that supply materials, equipment, and services to the ranches; and (3) induced effects attributable to personal spending by the ranch owners, employees, families, and related industries.

Cumulative Effects

There would be minimal cumulative effects if this alternative is implemented. There is a potential loss of open space in the area if the permittee decides to sell their property.

3.12 Best Management Practices and Mitigation Measures

The following best management practices and mitigation measures will be implemented to reduce impacts to resources in the CRM Area under Alternatives 1 and 2.

Air Quality

- Dust abatement will be implemented where necessary.

Soil Resources

- Livestock would not be turned out until the soil is firm enough to prevent compaction.
- Existing roads, trails and access points will be used whenever possible.
- The following strategies as recommended by Belknap (2001) will be used to minimize disturbance to crusts: 1) livestock grazing should occur during wet season, to allow re-growth of damaged crusts before summer droughts, 2) a rest-rotation grazing system should be used to allow for periods of recovery, 3) livestock should be well dispersed throughout a given pasture, to limit localized, heavy disturbance.
- Control weeds and minimize ground disturbance from vehicles and machinery that could open up areas to invasion by non-native species.

- Initial turnout of livestock in the spring will be delayed until the soils have dried sufficiently to preclude erosion problems.
- Use only roads and access designated by the Wildlife Area Manager.
- Manage cattle distribution using a combination of natural terrain, fences, herding, salt and protein stations, and water developments.
- Implement low intensity stocking rates (i.e., an average of 26 acres/AUM).

Water Resources

- Adequate buffers will be implemented to protect riparian areas, streams and springs from potential erosion impacts of grazing and construction activities.
- Maintain interior fencing to protect streams and riparian areas.
- Redevelopment and protection of springs in Whiskey Dick and Quilomene WA's prior to grazing, to reduce streamside water use and riparian impacts.

Wildlife

- Temporary electric fences and permanent fences with high bottom wires and low top wires will be used to minimize wildlife impacts and facilitate movements of large ungulates, such as deer and elk.
- The grazing plan incorporates management recommendations included in the Sage Grouse Recovery Plan (Stinson et al. 2004) intended to ensure that livestock grazing is compatible with sage grouse habitat needs:
    - The timing (i.e., spring) and intensity (i.e., light to moderate) of livestock use is intended to remove some of the grass biomass and improve abundance and availability of forbs (Stinson et al. 2004, Crawford et al. 2004).
    - Planned forage utilization by livestock will not exceed 35 percent of current year's growth.
    - A long-term vegetation monitoring effort will be used to ensure that post-grazing vegetation conditions meet sage grouse breeding and brood-rearing habitat requirements (Schroeder et al. 2003).
    - Livestock grazing will occur early in the growing season while there is sufficient soil moisture to minimize impacts on biological crusts (Belnap et al. (2001).
    - Forage utilization will be determined by average use through the entire pasture (Stinson et al. 2004).
    - No new springs are being developed (Stinson et al. 2004). The prioritization for re-development of existing springs incorporates sage grouse concerns. An effort to draw cattle away from riparian areas also protects habitat conditions at those sites.
    - Through the Wild Horse CRM WDFW staff have worked with other landowners to promote the use of management practices that improve sage grouse habitat values.
- The proposed season of use, forage utilization standards, and effective monitoring for compliance will minimize the potential effects to big game species.

Fish

    - Spring redevelopment will reduce erosion and sedimentation by drawing cattle away from riparian areas, while retaining vegetative shading and maintaining temperature regimes in the streams.
- The Skookumchuck pasture will be rested indefinitely, in order to protect critical fish habitat.

Vegetation/Habitat

- Continue to implement rangeland monitoring and habitat evaluation.
- Control weeds and minimize ground disturbance that could open up areas to invasion by non-native species.
- Riparian vegetation along fish bearing streams would be protected with fencing, herding, and salt or protein supplements to draw livestock out of riparian areas.

- Riparian and wetlands areas would be monitored. If specific habitat impacts begin to occur, they would be addressed with fencing or changes to the timing or duration of the grazing period.

- Known locations of sensitive plant populations would be monitored by site inspections and photographs to determine whether impacts occur. Site inspections and photographs would be used in an adaptive management process to change conditions of the grazing permit as necessary to achieve the goals and objectives of the grazing permit.

Land Use

- Implement the land use WAC 232-13 to protect the natural and wildlife resources.

Cultural Resources

- Additional, cultural resource assessments will be conducted prior to excavation or ground disturbance.
- The Skookumchuck pasture will be rested indefinitely to protect cultural resources along the Columbia River.
- If cultural resources were identified during construction or project-related activities, work would be halted in the immediate vicinity of the find and a professional archaeologist would be notified to assess the resource. Consultations would take place with the DAHP and any interested tribes.
- WDFW, through consultations with DAHP and pertinent tribes, would develop a priority list of preservation strategies, mitigation plans, alternative mitigation, or programs for ready consideration for known archaeological sites through the consultation process.

4 Contributors and Coordination

This chapter provides a list of WDFW and Ecology and Environment, Inc contributing authors and editors and Agencies consulted with.

4.1 List of Preparers and Contributing Editors

The following is a list of authors and principal contributors to the EIS process under SEPA and the formation of this DEIS.

4.1.1 Washington Department of Fish and Wildlife (Project Proponent)

Kelly Craig, WDFW Project Manager
Edd Bracken, Range Specialist
Cindi Confer, Wildlife Area Manager
Melissa Asher, Private Lands Biologist
Ted Clausing, Regional Wildlife Program Manager
Teresa Eturaspe, SEPA Coordinator
Janet Sutter, Natural Resource Scientist
Wayne Hunt, Assistant Wildlife Area Manager
Teresa Eturaspe, SEPA Coordinator
Jennifer Quan, Lands Division Manager
Richard Tveten, Environmental Planner
Leray Stream, Project Fish and Wildlife Biologist

4.1.2 Ecology and Environment, Inc. (Contractor)

William Richards, Contractor's Project Manager
James Thornton, SEPA Specialist
Alma Feldpausch, Public Scoping and Comment Analysis
Jerry Barker, Rangeland Specialist
Natalie Seitz, Alternatives Development
Ashley LaForge, Earth and Water Resources
Kathleen Dixon, Air and Noise, Land Use, Cultural and Historic Resources, Transportation, and Energy Resources
Cameron Fisher, Vegetation, Upland Wildlife, and Aquatic Wildlife
Zecca Lehn, Socioeconomic Conditions
Alan Hanson, Geographic Information System Analysis and Mapping

4.2 Coordination/Consultation with Agencies

The following is a list of Agencies the WDFW consulted with in formation of this DEIS.
Bureau of Land Management
Natural Resource Conservation Service
Department of Archeology and Historic Preservation

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GLOSSARY

Adaptive management: A type of natural resource management in which decisions are made as part of an ongoing science-based process. Adaptive management involves testing, monitoring, and evaluating applied strategies, and incorporating new knowledge into management approaches that are based on scientific findings and the needs of society. Results are used to modify management policy, strategies, and practices.

Animal-unit: An animal unit (AU) is one mature cow of approximately 1,000 pounds and a calf up to weaning, usually 6 months of age, or their equivalent.

Animal-unit-month: The amount of forage required by an animal unit for 1 month.

Bunch grass: A grass so-called because of its characteristic growth habit of forming a bunch.

Coordinated resource management planning (CRM): The process whereby various interest groups are involved in discussion of resource uses and collectively diagnose management problems, establish goals and objectives, and evaluate multiple use resource management.

Critical period: The critical period is the plant stage of growth when a plant species is most susceptible to damage. For native bunchgrasses the critical period is from boot stage through soft dough stage (when the plant is trying to produce seed). At Ephrata the average dates of the critical period is from April 13 – June 15. Grazing during the critical period can have a severe impact on native bunchgrasses.

Deferment: Delay of livestock grazing in an area for an adequate period to provide for plant reproduction, establishment of new plants, or restoration of vigor of existing plants. Often meant to delay livestock grazing until after the growing season. See Deferred grazing and Rest.

Deferred-rotation: Any grazing system, that provides for a systematic rotation of the deferment among pastures. The time of the rest period generally changes in succeeding years.

Dormant: A living plant that is not actively growing aerial shoots.

Ecological site: A distinctive kind of land with specific physical characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation.

Ecosystem: Organisms together with their abiotic environment, forming an interacting system, inhabiting an identifiable space.

Fence: A structure that acts as a barrier to livestock, wildlife, or people.

Forage inventory: An estimate of available forage in each pasture and for the operating unit as a whole; used to project stocking rates and feed requirements for specific time periods (i.e., annually, grazing season, rotation cycle)

Forage production: The estimated air-dry weight of palatable species (excludes sagebrush and noxious weeds) produced annually in each pasture.

Forage utilization: The percentage of available forage actually consumed by the grazing animal based on net forage accumulation that occurs prior to and while they occupy the pasture unit.

Forb: Any broad-leafed herbaceous plant other than those in the Poaceae (i.e., grasses), Cyperaceae (i.e., sedges), and Juncaceae (i.e., rushes) families.

Graminoid: Grass or grass-like plant, such as Poa, Carex, and Juncus species.

Grass: A member of the family Gramineae (Poaceae).

Grazing season: (1) The time interval when animals are allowed to use a certain area. (2) On public lands, an established period for which grazing permits are issued. May be established on private land in a grazing management plan

Growing season: That portion of the year when temperature and moisture permit plant growth.

Herbaceous: Vegetative growth with little or no woody component; non-woody vegetation, such as graminoids and forbs.

Historic climax plant community: The plant community that was best adapted to the unique combination of factors associated with the ecological site. It was in a natural dynamic equilibrium with the historic biotic, abiotic, climatic factors on its ecological site in North America at the time of European immigration and settlement.

Introduced species: A species not a part of the original fauna or flora of the area in question.

Key grazing area: A relatively small portion of a pasture or management unit selected because of its location, use, or grazing value as a monitoring point for grazing use. It is assumed that key areas, if properly selected, will reflect the current grazing management over the pasture or management unit as a whole.

Key species: A single plant species (or in some situations two or three similar species) chosen to serve as a guide to the grazing use of the entire plant community. If the key species on the key grazing area is properly grazed, the entire plant community will not be excessively grazed.

Livestock: Domestic animals used for the production of goods and services.

Monitoring: Monitoring is a data-collection process that is used to detect on-the-ground, management-induced changes or responses. Soil cover, animal performance, and the density of bunchgrasses in the plant community are examples of things that can be monitored. Monitoring data are used to evaluate the effectiveness of our grazing practices during the implementation phase. Monitoring is how we detect change. Monitoring involves both record keeping and data collection.

> **Annual Monitoring:** Annual monitoring is used each year to monitor the effects of grazing and to actively manage the grazing animals. Annual monitoring techniques include: livestock use records, a record of observations, a record of photos, utilization monitoring, step-point for cover, and boot-gap for gaps between bunchgrasses.
>
> **Trend Monitoring:** Trend monitoring data is collected at three-year to five-year intervals to detect the changes or responses that have taken place to the plant community or soil surface.

Native species: A species that is a part of the original fauna or flora of the area in question.

Noxious weed: An unwanted plant specified by Federal or State laws as being especially undesirable, troublesome, and difficult to control. It grows and spreads in places where it interferes with the growth and production of the desired crop or native vegetation.

Overgrazing: Overgrazing is continued, heavy grazing that exceeds the recovery capacity of forage plants and causes deterioration of grazing lands.

Overstocking: Placing a number of animals in a given area that will result in overuse if continued to the end of the planned grazing period.

Percent use: Grazing use of current growth, usually expressed as a percent of the current growth (by weight) that has been removed. See **Degree of use**.

Perennial plant: A plant that has a life span of 3 or more years.

Permittee: One who holds a permit to graze livestock on State, Federal, or certain privately-owned lands. (Syn. Lessee)

Photo point: An identified point from which photographs are taken at periodic intervals.

Plant community type: Each of the existing plant communities that can occupy an ecological site. Several plant community types will typically be found on an ecological site, including the historic climax plant community for that site.

Prescribed grazing: The controlled harvest of vegetation with grazing or browsing animals, managed with the intent to achieve a specified objective.

Producer: Rancher or stock farmer.

Proper grazing use: Grazing at an intensity that will maintain enough cover to protect the soil and maintain or improve the quantity and quality of desirable vegetation.

Range improvement: (1) Any structure or excavation to facilitate management of rangeland or livestock. (2) Any practice designed to improve range condition or facilitate more efficient utilization of the rangeland. (3) An increase in the grazing capacity of rangeland (i.e., improvement of rangeland condition).

Rangeland: A type of land, not a use of land. Primarily, rangelands are grasslands, shrublands and savannas, and grasslands with scattered trees and shrubs.

Rangeland health: The degree to which the integrity of the soil, vegetation, water, and air as well as the ecological processes of the rangeland ecosystem is balanced and sustained. Integrity is defined as maintenance of the structure and functional attributes characteristic of a particular locale, including normal variability.

Rangeland inventory: The systematic acquisition and analysis of resource information needed for planning and for management of rangeland.

Rest: The absence of grazing by livestock to benefit plants for re-growth between grazing periods, for critical periods of plant growth and development, or for critical periods of plant establishment.

Riparian ecosystems: Ecosystems that occur along watercourses or water bodies. They are distinctly different from the surrounding lands because of unique soil and vegetation characteristics that are strongly influenced by free or unbound water in the soil.

Similarity index: An assessment of the similarity of the current plant community to the historic plant community or the desired plant community, expressed as a percent similarity.

Soil map unit: A map unit is a collection of soil areas or miscellaneous areas delineated in a soil survey. They may encompass one or more kinds of soil or one or more kinds of soil and a miscellaneous area, such as rock outcrop. They are identified by a unique map symbol in a survey area.

Species composition: The proportions of various plant species in relation to the total on a given area. It may be expressed in terms of cover, density, weight, etc.

Spring: Flowing water originating from an underground source.

Spring development: Improving spring and seeps by excavating, cleaning, capping, or providing collection and storage facilities.

State: A condition of an ecological site's characteristics. As characteristics change, there is a transition to a new state. See Vegetation state.

Triggers: Triggers are indicators used to help decide when to move livestock to a different pasture. Triggers can take several forms: calendar dates, a specified maximum livestock usage in terms of AUMs harvested, a change in plant stage of growth, and the utilization level, or any incidence of use on key plant species.

Use: (1) The proportion of current year's forage production that is consumed or destroyed by grazing animals. May refer either to a single species or to the vegetation as a whole. Syn., degree of use. (2) Utilization of land for a purpose, such as grazing, bedding, shelter, trailing, watering, watershed, recreation, forestry, and wildlife habitat.

Utilization: Syn., use.

Vegetation states: The various plant communities produced by an ecological site within given site characteristics.

In addition to, terms referring to the type, intensity, and duration of effects used in this chapter include the following:

Direct Effect:	an effect that occurs as a result of action on the resource being addressed.
Indirect Effect:	an effect that occurs as a result of actions on other resources.
Cumulative Effect:	an effect that contributes to other past, present, or reasonably foreseeable actions or activities.
Negligible:	the effect is not detectable.
Minor:	the effect is slight but detectable; there would be a small change.
Moderate:	the effect is readily apparent; there would be a measurable change that could result in a small but permanent change.
Major:	the effect is large; there would be a highly noticeable or permanent measurable change.
Localized:	the effect occurs in a specific site or area, generally less than 1 acre.
Short-term:	the effect occurs only for a short time after implementation of an alternative, normally less than one year.
Long-term:	the effect occurs for an extended period after implementation of an alternative; normally an effect that requires annual monitoring or that will extend beyond the period of the permitted activity.
Permanent:	the effect is irreversible; the resource will never revert to current conditions.

Appendix A. Maps (Figures 1-1 to 3.4)

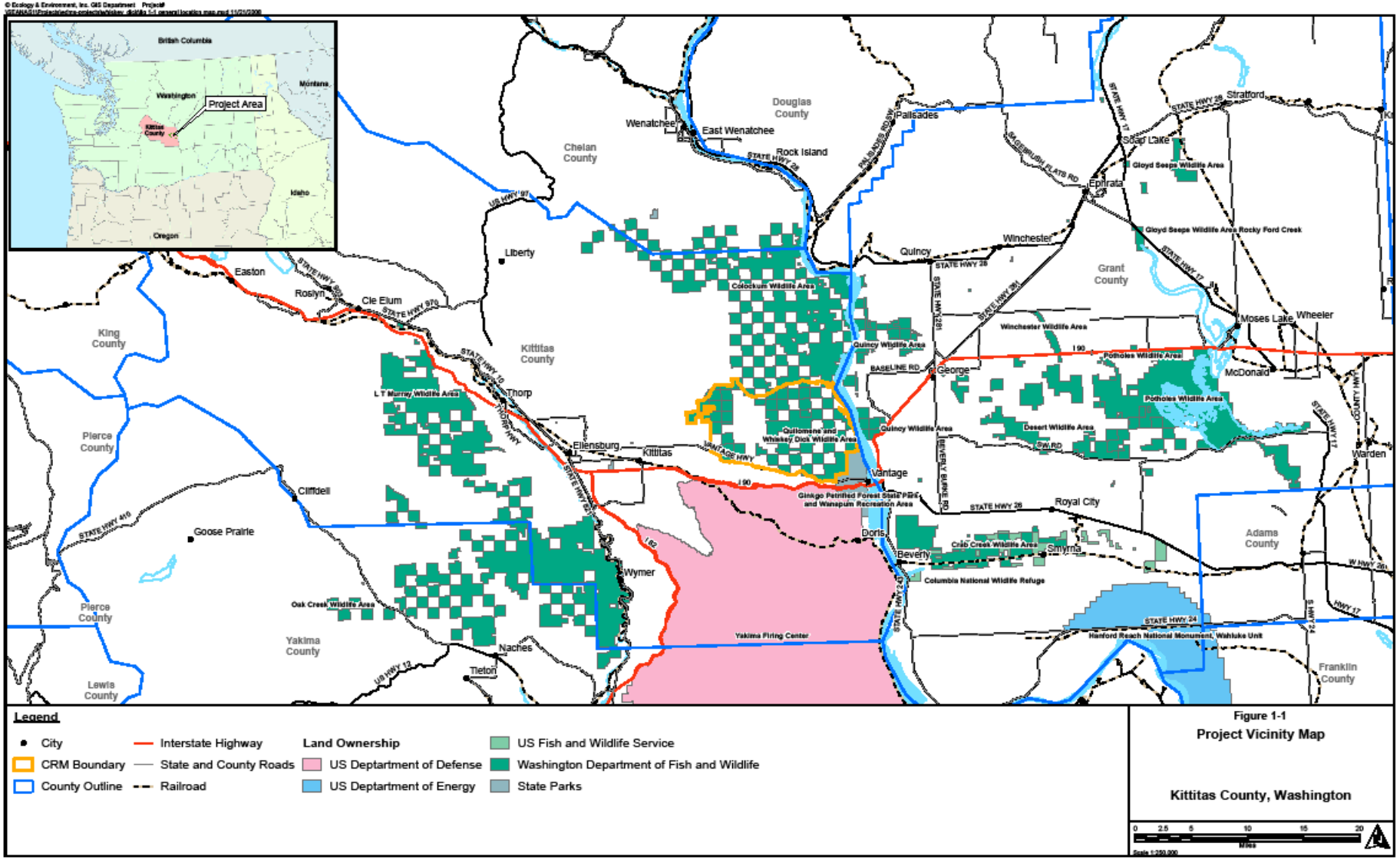


Figure 1-1

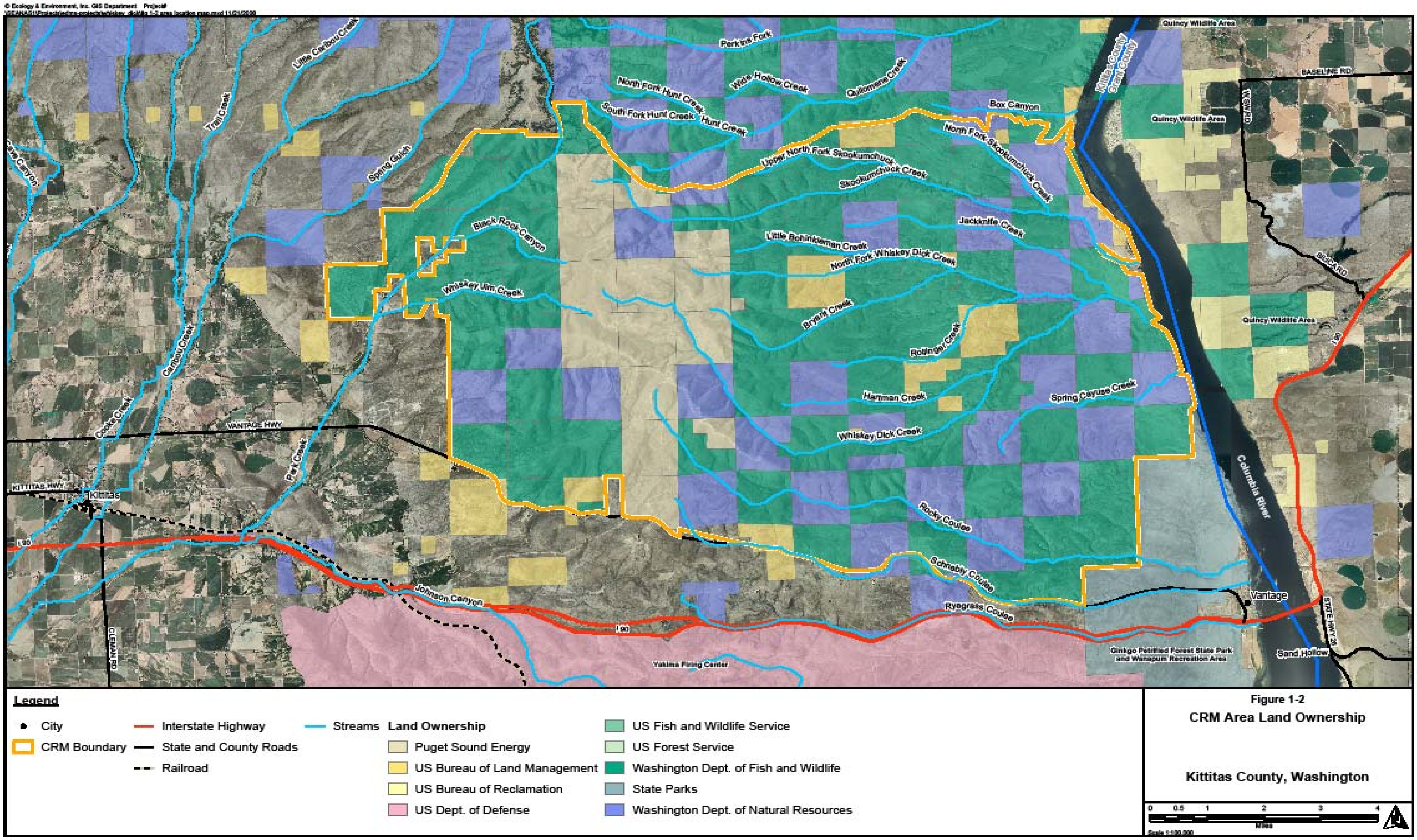

Little Caribou Creek
Trail Creek
Spring Gulch
Caribou Creek
Cooke Creek
Park Creek
Parkins Fork
North Fork Hunt Creek
South Fork Hunt Creek
Hunt Creek
Wide Hollow Creek
Quilomene Creek
Box Canyon
North Fork Skookumchuck Creek
Upper North Fork Skookumchuck
Skookumchuck Creek
Jackknife Creek
Black Rock Canyon
Whiskey Jim Creek
Little Bohinkleman Creek
North Fork Whiskey Dick Creek
Bryant Creek
Rollinger Creek
Hartman Creek
Spring Cayuse Creek
Whiskey Dick Creek
Rocky Coulee
Schnebly Coulee
Ryegrass Coulee
Johnson Canyon
Yakima Firing Center
VANTAGE HWY
KITTITAS HWY
Kittitas
I-90
Vantage
Columbia River
Kittitas County
Grant County
Quincy Wildlife Area
BASELINE RD
Sand Hollow
STATE HWY 26
Ginkgo Petrified Forest State Park and Wanapum Recreation Area
Legend
City
CRM Boundary
Interstate Highway
State and County Roads
Railroad
Streams
Land Ownership
Puget Sound Energy
US Bureau of Land Management
US Bureau of Reclamation
US Dept. of Defense
US Fish and Wildlife Service
US Forest Service
Washington Dept. of Fish and Wildlife
State Parks
Washington Dept. of Natural Resources
Figure 1-2
CRM Area Land Ownership
Kittitas County, Washington
0 0.5 1 2 3 4
Miles

Figure 1-2

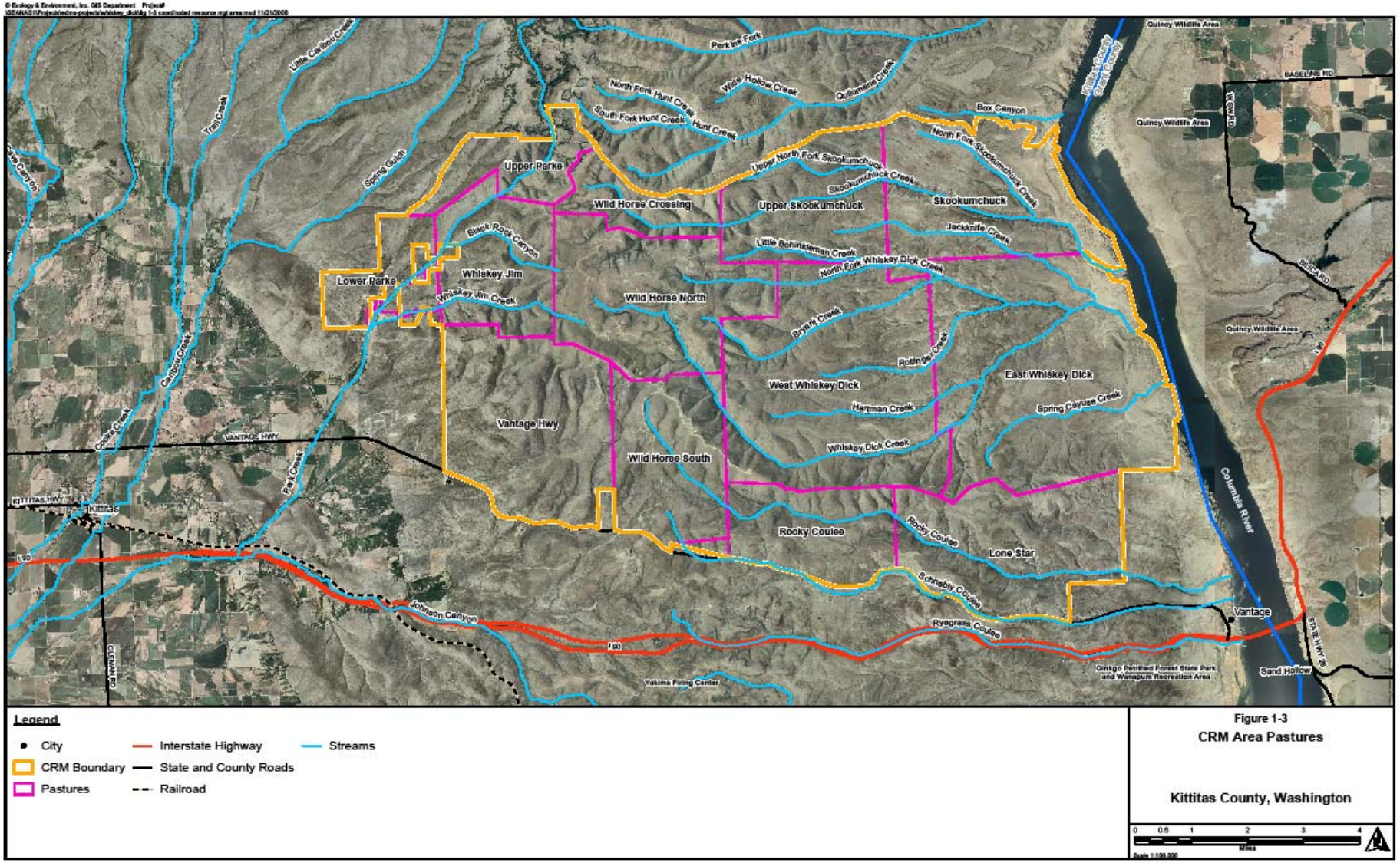

Legend
City
CRM Boundary
Pastures
Interstate Highway
State and County Roads
Railroad
Streams
Figure 1-3
CRM Area Pastures
Kittitas County, Washington
Upper Parke
Lower Parke
Wild Horse Crossing
Upper Skookumchuck
Skookumchuck
Whiskey Jim
Wild Horse North
Wild Horse South
Vantage Hwy
West Whiskey Dick
East Whiskey Dick
Rocky Coulee
Lone Star
Schnebly Coulee
Ryegrass Coulee
Box Canyon
Black Rock Canyon
Whiskey Jim Creek
Jackknife Creek
Bryant Creek
Hartman Creek
Spring Cayuse Creek
Whiskey Dick Creek
Columbia River
Kittitas
Vantage
Sand Hollow
Johnson Canyon
Yakima Firing Center
Quincy Wildlife Area

Figure 1-3

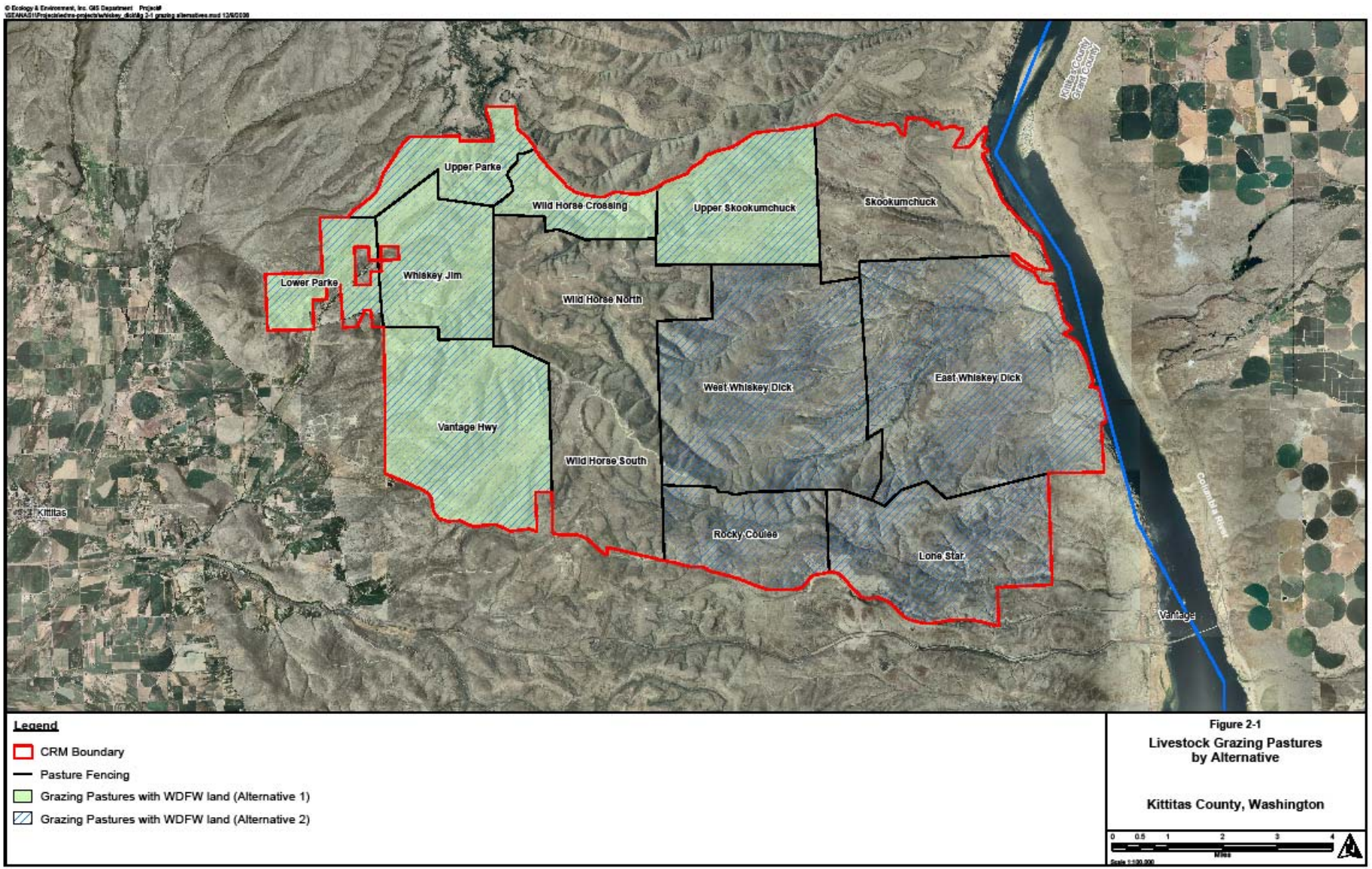

Upper Parke
Wild Horse Crossing
Upper Skookumchuck
Skookumchuck
Lower Parke
Whiskey Jim
Wild Horse North
West Whiskey Dick
East Whiskey Dick
Vantage Hwy
Wild Horse South
Kittitas
Rocky Coulee
Lone Star
Vantage
Columbia River
Legend
CRM Boundary
Pasture Fencing
Grazing Pastures with WDFW land (Alternative 1)
Grazing Pastures with WDFW land (Alternative 2)
Figure 2-1
Livestock Grazing Pastures by Alternative
Kittitas County, Washington
0 0.5 1 2 3 4
Miles

Figure 2-1

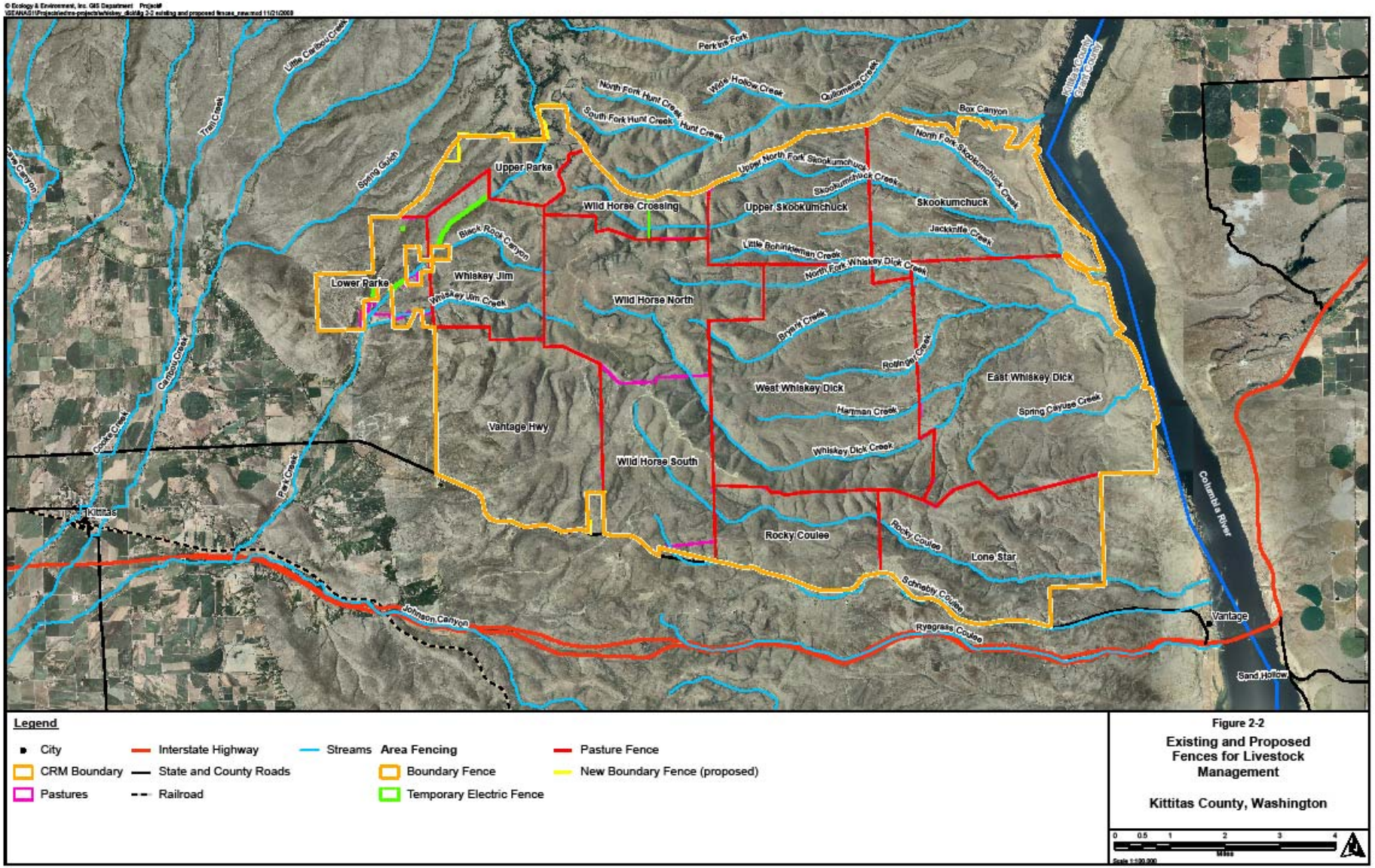

Legend
City
CRM Boundary
Pastures
Interstate Highway
State and County Roads
Railroad
Streams
Area Fencing
Boundary Fence
Temporary Electric Fence
Pasture Fence
New Boundary Fence (proposed)
Figure 2-2
Existing and Proposed Fences for Livestock Management
Kittitas County, Washington
Upper Parke
Lower Parke
Wild Horse Crossing
Upper Skookumchuck
Skookumchuck
Whiskey Jim
Wild Horse North
West Whiskey Dick
East Whiskey Dick
Vantage Hwy
Wild Horse South
Rocky Coulee
Lone Star
Kittitas
Vantage
Sand Hollow
Columbia River
Perkins Fork
North Fork Hunt Creek
South Fork Hunt Creek
Hunt Creek
Wide Hollow Creek
Quilomene Creek
Box Canyon
Little Carbon Creek
Trail Creek
Spring Gulch
Black Rock Canyon
Whiskey Jim Creek
Upper North Fork Skookumchuck
Skookumchuck Creek
North Fork Skookumchuck Creek
Jackknife Creek
Little Bohrnkeman Creek
North Fork Whiskey Dick Creek
Bryant Creek
Rohinger Creek
Hartman Creek
Spring Cayuse Creek
Whiskey Dick Creek
Carbon Creek
Cooke Creek
Park Creek
Johnson Canyon
Schnebly Coulee
Ryegrass Coulee

Figure 2-2

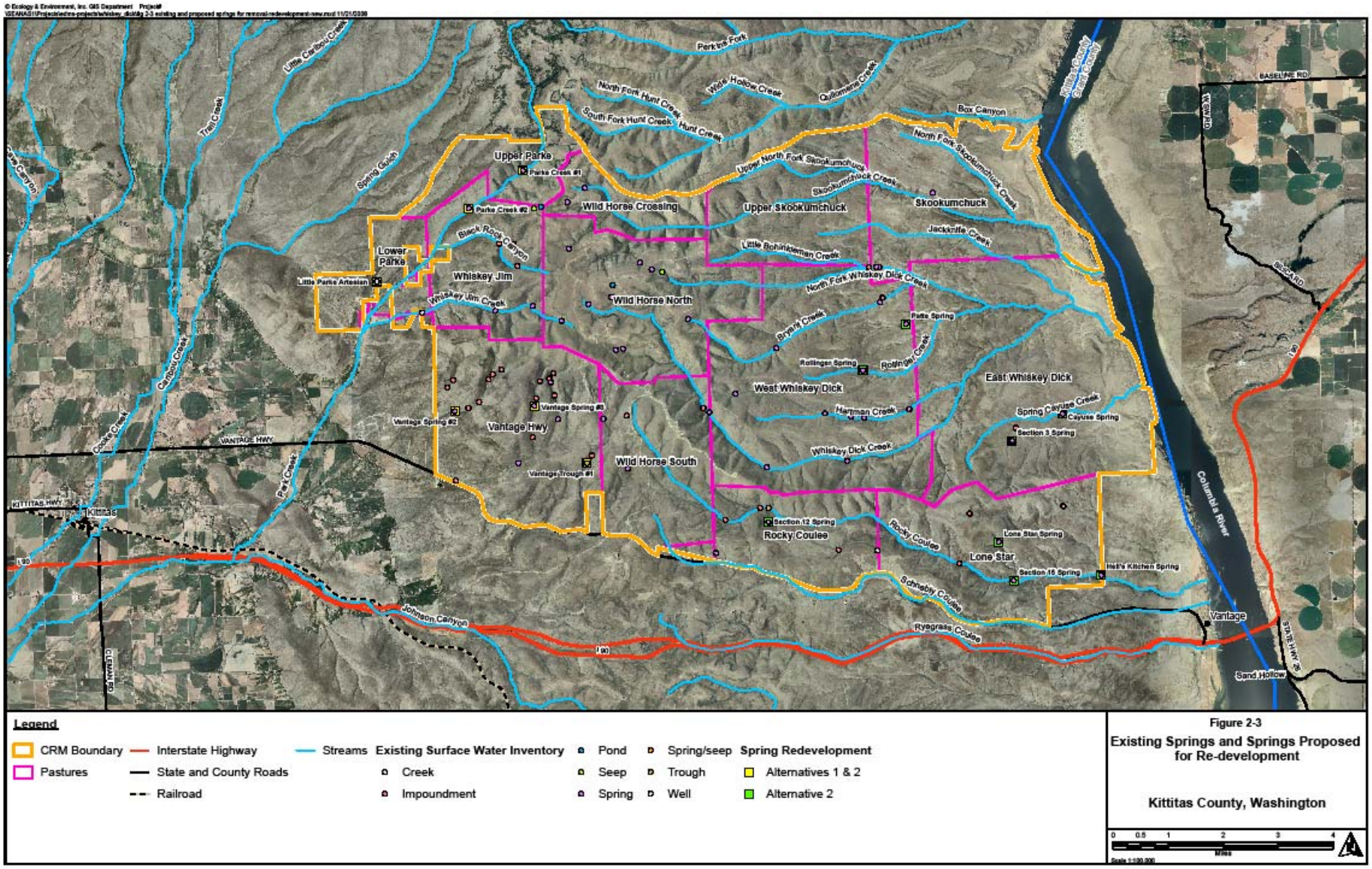

Legend
CRM Boundary
Pastures
Interstate Highway
State and County Roads
Railroad
Streams
Existing Surface Water Inventory
Creek
Impoundment
Pond
Seep
Spring
Spring/seep
Trough
Well
Spring Redevelopment
Alternatives 1 & 2
Alternative 2
Figure 2-3
Existing Springs and Springs Proposed for Re-development
Kittitas County, Washington
Upper Parke
Lower Parke
Wild Horse Crossing
Upper Skookumchuck
Skookumchuck
Whiskey Jim
Wild Horse North
West Whiskey Dick
East Whiskey Dick
Vantage Hwy
Wild Horse South
Rocky Coulee
Lone Star
Vantage
Kittitas
Columbia River
Perkins Fork
North Fork Hunt Creek
South Fork Hunt Creek
Hunt Creek
Wide Hollow Creek
Quilomene Creek
Box Canyon
Little Carbon Creek
Trail Creek
Spring Gulch
Upper North Fork Skookumchuck
Skookumchuck Creek
North Fork Skookumchuck Creek
Jackknife Creek
Little Rohrbaugh Creek
Black Rock Canyon
Little Parke Artesian
Whiskey Jim Creek
North Fork Whiskey Dick Creek
Bryant Creek
Patte Spring
Rollinger Spring
Rollinger Creek
Carbon Creek
Cooke Creek
Vantage Spring #3
Vantage Spring #2
Hartman Creek
Spring Cayuse Creek
Cayuse Spring
Section 3 Spring
Whiskey Dick Creek
Vantage Trough #1
Section 12 Spring
Rocky Coulee
Lone Star Spring
Section 16 Spring
Hell's Kitchen Spring
Schnebly Coulee
Ryegrass Coulee
Johnson Canyon
Sand Hollow
Parke Creek #1
Parke Creek #2
Baseline Rd
Vantage Hwy
Kittitas Hwy
Cleman Rd
I-90
SR 26
Miles

Figure 2-3

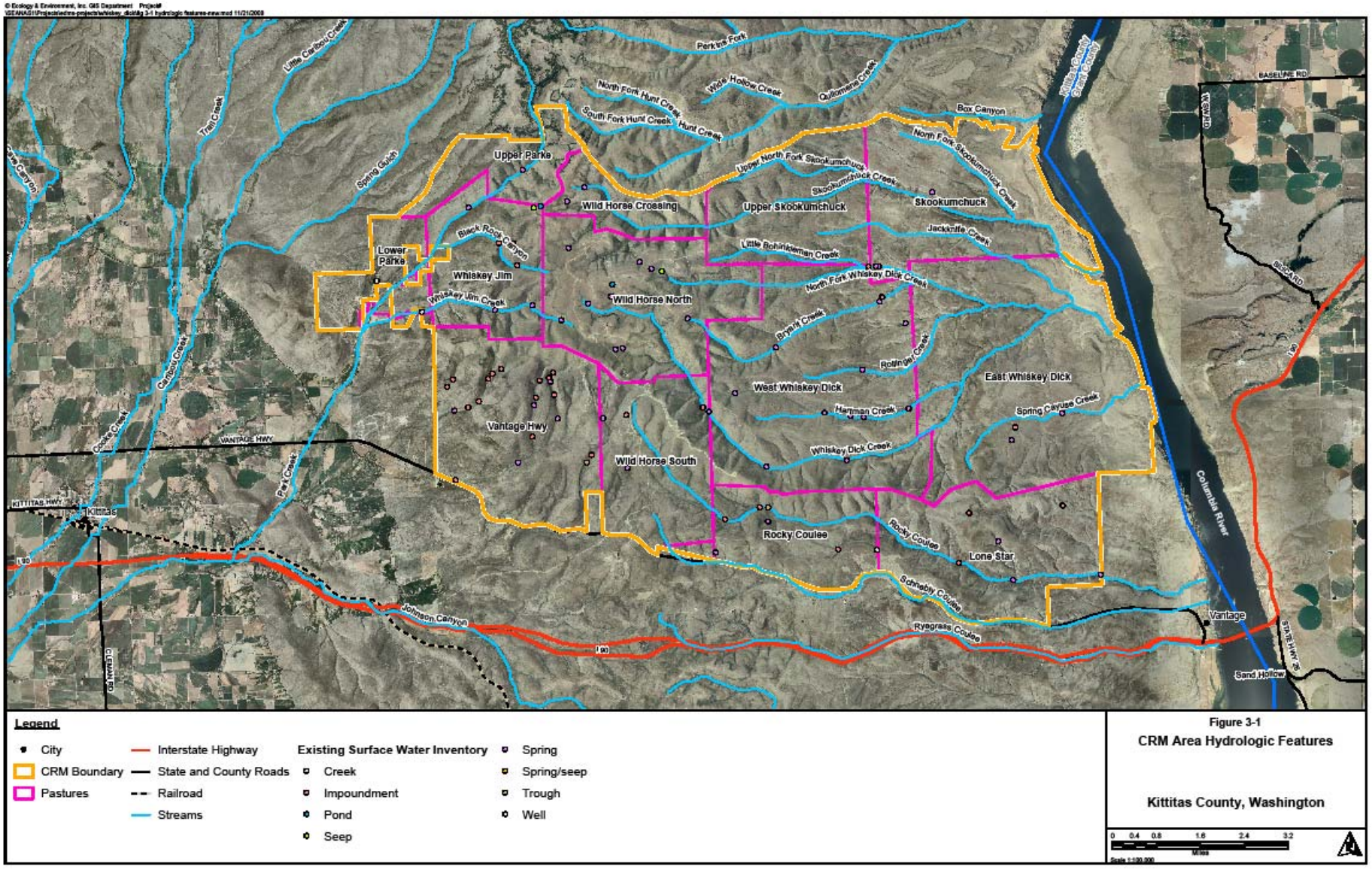

Perkins Fork
Little Carbon Creek
Trail Creek
North Fork Hunt Creek
Wide Hollow Creek
Quilomene Creek
South Fork Hunt Creek
Hunt Creek
Box Canyon
Spring Gulch
Upper Parke
Upper North Fork Skookumchuck
North Fork Skookumchuck Creek
Skookumchuck Creek
Wild Horse Crossing
Upper Skookumchuck
Skookumchuck
Jacknife Creek
Black Rock Canyon
Lower Parke
Little Rohrkeman Creek
Whiskey Jim
North Fork Whiskey Dick Creek
Whiskey Jim Creek
Wild Horse North
Bryant Creek
Rollinger Creek
East Whiskey Dick
West Whiskey Dick
Herman Creek
Spring Cayuse Creek
Vantage Hwy
Whiskey Dick Creek
Wild Horse South
Cooke Creek
Carbon Creek
Park Creek
VANTAGE HWY
KITTITAS HWY
Kittitas
I-90
Rocky Coulee
Lone Star
Schnebly Coulee
Johnson Canyon
Ryegrass Coulee
Vantage
Columbia River
Kittitas County
Grant County
BASELINE RD
WOMAN RD
BECKARD
I-90
STATE HWY 26
Sand Hollow
CLEMAN RD
Legend
City
CRM Boundary
Pastures
Interstate Highway
State and County Roads
Railroad
Streams
Existing Surface Water Inventory
Creek
Impoundment
Pond
Seep
Spring
Spring/seep
Trough
Well
Figure 3-1
CRM Area Hydrologic Features
Kittitas County, Washington
0 0.4 0.8 1.6 2.4 3.2
Miles

Figure 3-1

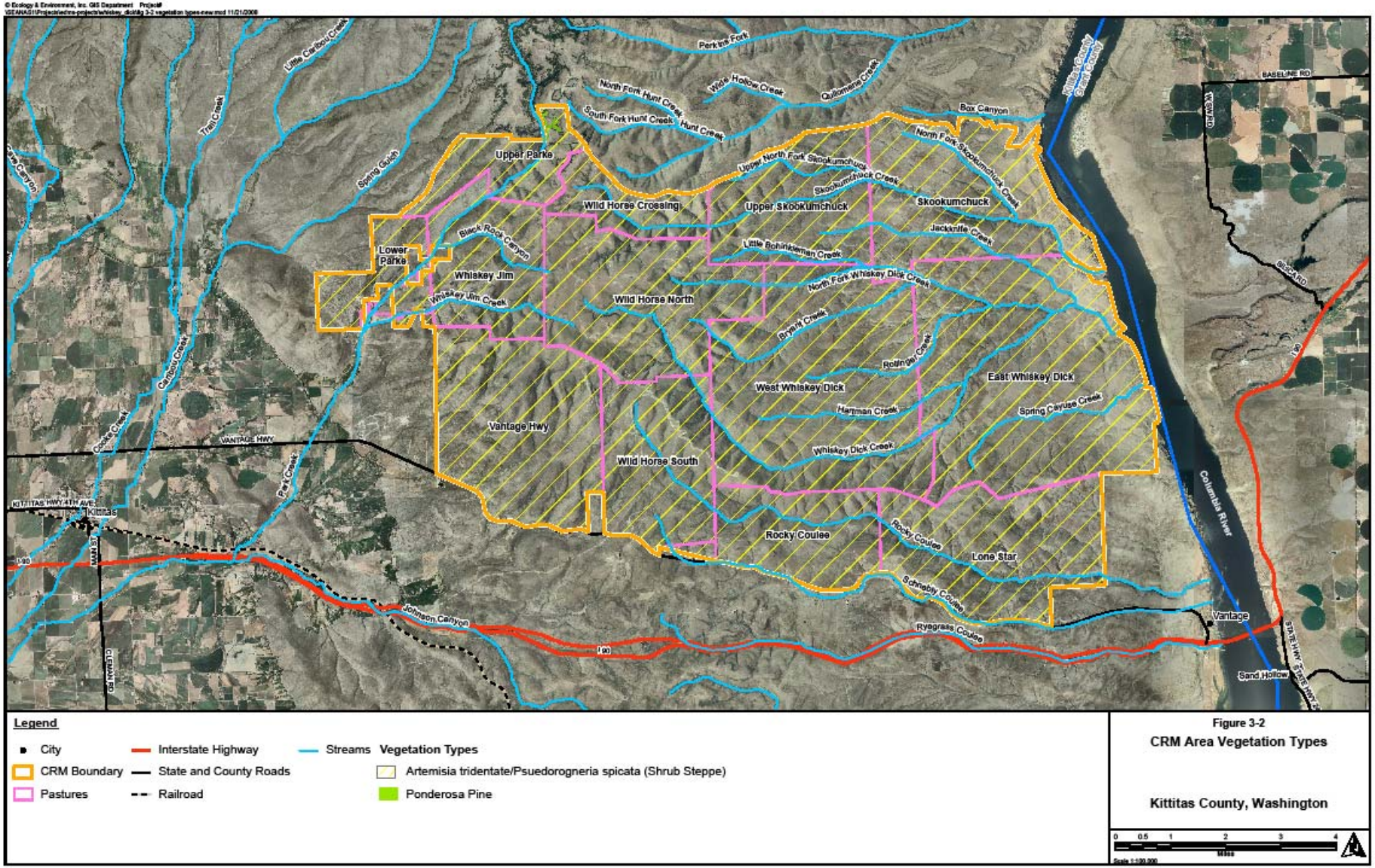

Upper Parke
Lower Parke
Wild Horse Crossing
Upper Skookumchuck
Skookumchuck
Wild Horse North
Wild Horse South
West Whiskey Dick
East Whiskey Dick
Vantage Hwy
Rocky Coulee
Lone Star
Vantage
Columbia River
Whiskey Jim
Whiskey Jim Creek
Black Rock Canyon
Little Rohrkissen Creek
North Fork Whiskey Dick Creek
Whiskey Dick Creek
Hartman Creek
Spring Cayuse Creek
Jackknife Creek
Box Canyon
North Fork Skookumchuck Creek
Skookumchuck Creek
Upper North Fork Skookumchuck
North Fork Hunt Creek
South Fork Hunt Creek
Hunt Creek
Perkins Fork
Wide Hollow Creek
Quilomene Creek
Little Carbon Creek
Trail Creek
Spring Gulch
Carbon Creek
Cooke Creek
Reed Creek
Johnson Canyon
Ryegrass Coulee
Schnebly Coulee
Sand Hollow
BASELINE RD
VANTAGE HWY
KITTITAS HWY/4TH AVE
Kittitas
I-90
MAIN ST
CLEMAN RD
Legend
City
CRM Boundary
Pastures
Interstate Highway
State and County Roads
Railroad
Streams
Vegetation Types
Artemisia tridentate/Psuedorogneria spicata (Shrub Steppe)
Ponderosa Pine
Figure 3-2
CRM Area Vegetation Types
Kittitas County, Washington
Miles

Figure 3-2

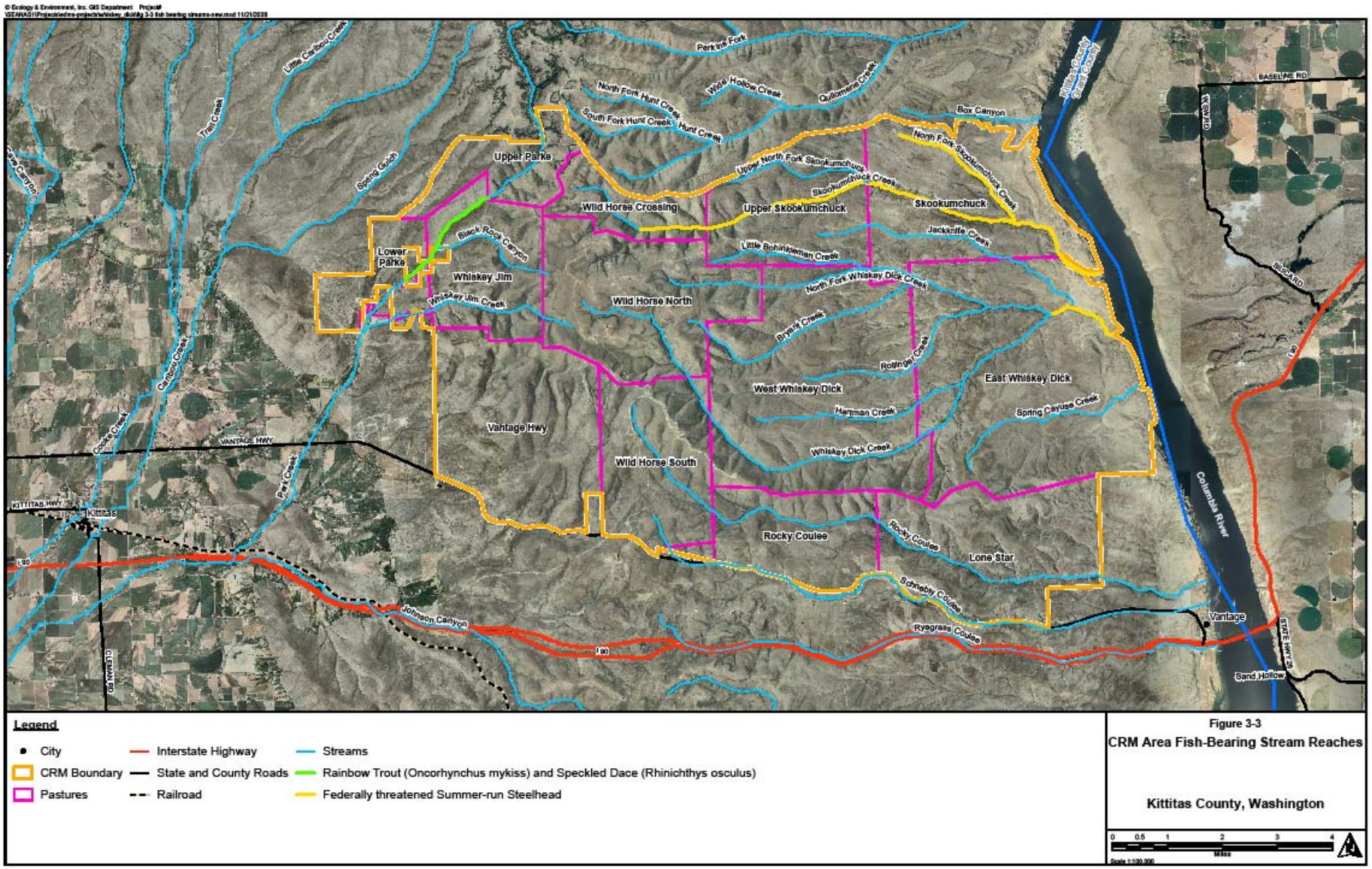

Legend
City
CRM Boundary
Pastures
Interstate Highway
State and County Roads
Railroad
Streams
Rainbow Trout (Oncorhynchus mykiss) and Speckled Dace (Rhinichthys osculus)
Federally threatened Summer-run Steelhead
Figure 3-3
CRM Area Fish-Bearing Stream Reaches
Kittitas County, Washington
Upper Parke
Lower Parke
Whiskey Jim
Wild Horse Crossing
Wild Horse North
Wild Horse South
Upper Skookumchuck
Skookumchuck
Vantage Hwy
West Whiskey Dick
East Whiskey Dick
Rocky Coulee
Lone Star
Columbia River
Vantage
Kittitas
Ellensburg
Sand Hollow
Perkins Fork
North Fork Hunt Creek
South Fork Hunt Creek
Hunt Creek
Wide Hollow Creek
Quilomene Creek
Box Canyon
Little Carbon Creek
Trail Creek
Spring Gulch
Black Rock Canyon
Whiskey Jim Creek
Upper North Fork Skookumchuck
Skookumchuck Creek
North Fork Skookumchuck Creek
Jackknife Creek
Little Rohrishemian Creek
North Fork Whiskey Dick Creek
Bryant Creek
Rollinger Creek
Hartman Creek
Whiskey Dick Creek
Spring Cayuse Creek
Carbon Creek
Cooke Creek
Reed Creek
Johnson Canyon
Schnebly Coulee
Ryegrass Coulee
VANTAGE HWY
KITTITAS HWY
I-90
BASELINE RD
WOW RD
BECKARD
CLERMAN RD
STATE HWY 24

Figure 3-3

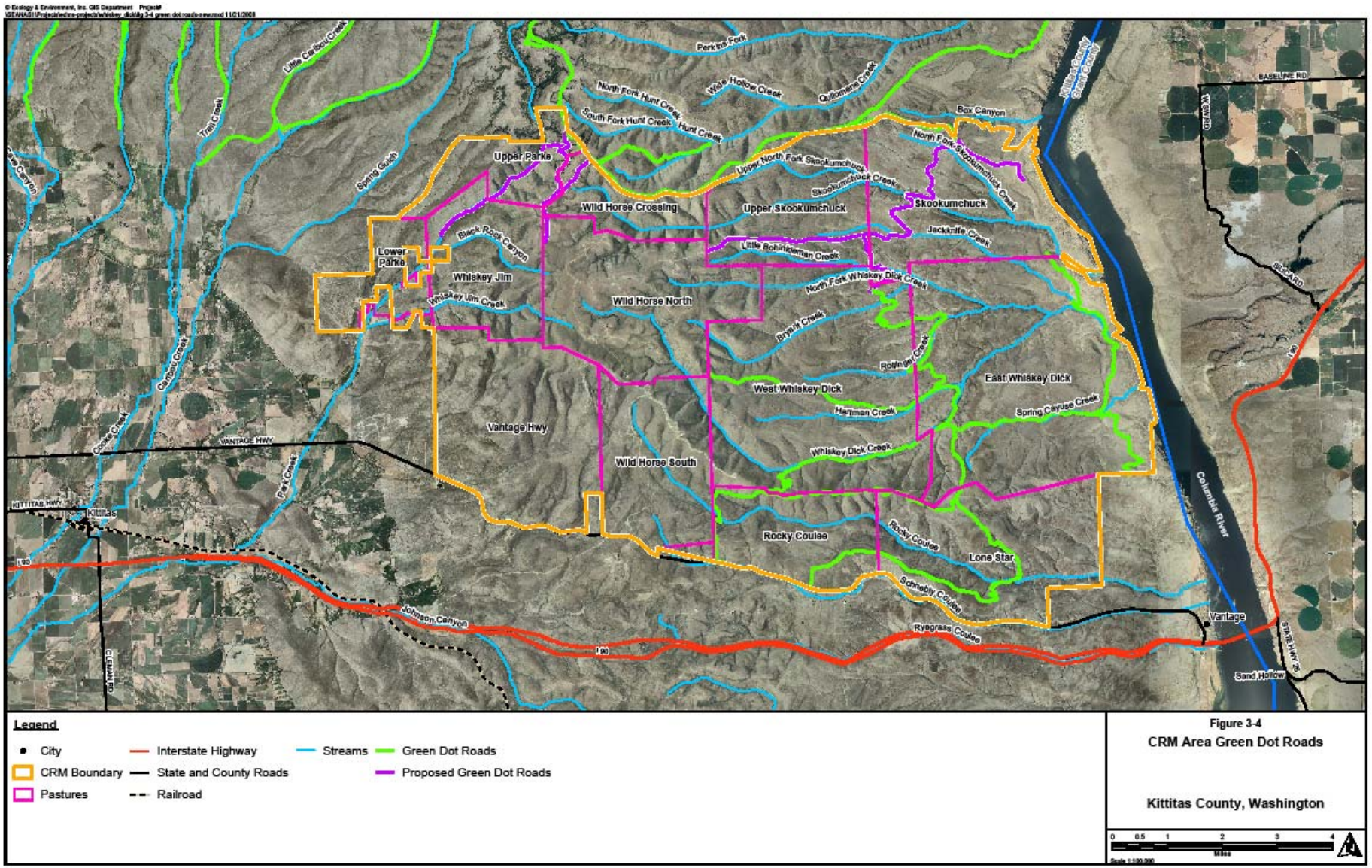

Perkins Fork
Little Caribou Creek
Trail Creek
North Fork Hunt Creek
South Fork Hunt Creek
Hunt Creek
Wide Hollow Creek
Quilomene Creek
Box Canyon
Spring Gulch
Upper Parke
Upper North Fork Skookumchuck
Skookumchuck Creek
North Fork Skookumchuck Creek
Wild Horse Crossing
Upper Skookumchuck
Skookumchuck
Jacknife Creek
Black Rock Canyon
Lower Parke
Little Bohunkeman Creek
Whiskey Jim
Whiskey Jim Creek
North Fork Whiskey Dick Creek
Wild Horse North
Bryant Creek
Robinson Creek
East Whiskey Dick
West Whiskey Dick
Hartman Creek
Spring Cayuse Creek
Vantage Hwy
Whiskey Dick Creek
Wild Horse South
Cooke Creek
Caribou Creek
Park Creek
VANTAGE HWY
KITTITAS HWY
Kittitas
I-90
Rocky Coulee
Lone Star
Schnebly Coulee
Johnson Canyon
Ryegrass Coulee
Vantage
Sand Hollow
Columbia River
BASELINE RD
BECARD
Legend
City
CRM Boundary
Pastures
Interstate Highway
State and County Roads
Railroad
Streams
Green Dot Roads
Proposed Green Dot Roads
Figure 3-4
CRM Area Green Dot Roads
Kittitas County, Washington

Figure 3-4

Appendix B. Rangeland Inventory and Rangeland Health Assessment Methods

The following table summarizes the rangeland vegetation inventory and rangeland health assessment information collected for the pastures included in the Quilomene/Whiskey Dick Wildlife Area grazing permit. The rangeland vegetation inventory was conducted following Natural Resources Conservation Service protocols (USDA, Natural Resources Conservation Service, 2003); the rangeland health assessment was conducted using methods described in Interpreting Indicators of Rangeland Health - Version 4 (Pellant et al. 2005).

A map of the area was prepared using soil survey data for Kittitas County (available at http://websoilsurvey.nrcs.usda.gov/app/) that depicted polygons of the various ecological sites by precipitation zone. An ecological site is "a kind of land with specific physical characteristics which differs from other kinds of land in its ability to produce distinctive kinds and amounts of vegetation and in its response to management" (Pellant et al. 2005). Detailed descriptions of the ecological sites in the table are available at: http://efotg.nrcs.usda.gov/treemenuFS.aspx . Ecological site descriptions include: information about the soils and other physiographic features (e.g., slope, aspect, general topography); climatic features and average monthly precipitation; typical soil features; a state-and-transition model of plant community dynamics; a list of characteristic native plant species typically found on the site and a forage production estimate; an estimate of the cover of vegetation, litter, rock, and bare ground; suggestions about initial stocking rate and grazing guidelines; a list of plant species preferences of ungulates that may use

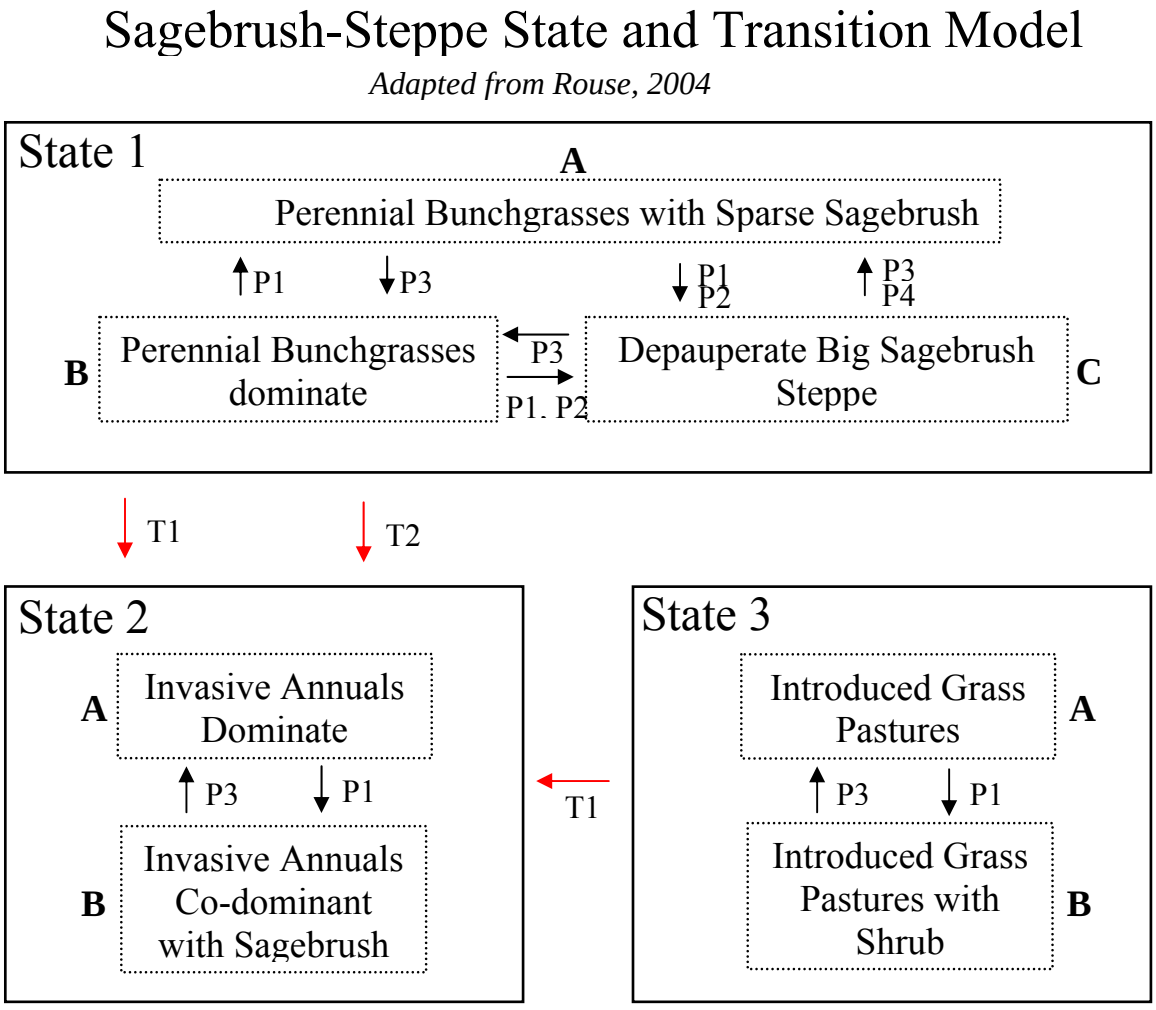
the site; recreational use of the site; and reference information describing the range of conditions for each of the 17 rangeland health indicators.

Ecological sites in each pasture were inspected to note species composition and general condition of the soil surface. A representative area was selected for a clip-plot to determine total annual above ground forage production in pounds per acre. Current species composition information is used to calculate a similarity index comparing the present species composition to the historic climax plant community. The similarity index is expressed as "the percentage, by weight, of the historic climax plant present on the site" (USDA, Natural Resources Conservation Service, 2003). This provides a numeric indication of how much change in composition of the plant community has occurred. Site with 76 to 100 percent of the climax plant community are rated in excellent condition; sites with 51 to 75 percent of the climax plant community are rated as good; site with 25 to 50 percent of climax plant community are considered to be in fair condition; and site with less than 25 percent climax plant community are considered to be in poor condition.

Current species composition was also used to identify the current "State" of each ecological site. A given ecological site can produce various plant communities, depending on site characteristics and management history. A state and transition model for Wyoming big sagebrush/bluebunch wheatgrass steppe is presented in Figure 1-1 (adapted from Rouse, 2004). The historic climax plant community depicted here was based on a study of rangeland relic areas that are relatively undisturbed. This state and transition model illustrates potential plant communities, transition pathways, and ecological thresholds. Transition pathways occur within a state and are generally

reversible. Once ecological thresholds are crossed however, the given state of a plant community is changed, and this is generally irreversible. The model presented in Figure 1-1 was used to assign vegetative states to applicable sagebrush-steppe ecological sites found on the CRM area (Appendix 2). Models are not currently available for scabland or riparian communities.

Figure 1-1. State and transition model for Wyoming big sagebrush/bluebunch wheatgrass sagebrush steppe.



Pathways – *Typically reversible*

- Increasing fire return interval
- Poor grazing practices such as overutilization and/or poor timing of grazing (during critical period).
- Fire and/or Insect Damage
- Prescribed grazing that meets the needs of perennial, cool season bunchgrasses. Fire and/or long time periods may be necessary to reduce shrub dominance.

Transitions – *Typically irreversible*

- Poor grazing practices that are pushed by drought and wildfire
- Decreasing fire return interval caused by the introduction of invasive annual grasses

Rangeland health is defined as "the degree to which the integrity of the soil and ecological processes of rangeland ecosystems are maintained" (Pellant et al. 2005). The ecological processes of interest include: the water cycle, energy flow, and the nutrient cycle. Because direct measurements site integrity and the condition of ecological processes are difficult and/or hard to measure, the rangeland health assessment protocol relies on biological and physical indicators of three interrelated attributes (Pellant et al. 2005). Soil/site stability: this is the capacity of the site to limit redistribution and loss of soil resources (i.e., erosion). Hydrologic function: this is the capacity of the site to capture, store, and safely release various forms of precipitation, to resist a reduction of this capacity, and to recover this capacity after a reduction occurs. Biotic integrity: this is the capacity of the site to support characteristic functional and structural communities (including plants, animals, and microorganisms) in the context of normal variability, and to recover this capacity when losses occur (Pellant et al. 2005).

A collaborative effort by the U.S. Geological Survey, Agricultural Research Service, Bureau of Land Management, and Natural Resources Conservation Service developed a system of 17 indicators that are used to evaluate the three rangeland health attributes. Combinations of the 17 indicators used to estimate the status of soil/site stability, hydrologic function, and biotic integrity are depicted in Table 1-1.

Table 1-1. Rangeland health indicators and attributes.

	Rangeland Health Attribute		
Indicator	Soil/Site Stability	Hydrologic Function	Biotic Integrity
1. Rills	X	X	
2. Water-flow patterns	X	X	
3. Pedestals and/or terracettes	X	X	
4. Bare ground	X	X	
5.Gullies	X	X	
6. Wind-scoured site, blowouts	X		
7. Litter movement	X		
8. Soil surface resistance to erosion	X	X	X
9. Soil surface loss or degradation	X	X	X
10. Plant community composition		X	
11. Compaction layer	X	X	X
12. Functional/structural groups			X
13. Plant mortality/decadence			X
14. Litter amount		X	X
15. Annual production			X
16. Invasive plants			X
17. Reproductive capability of perennials			X

A rangeland health assessment form was completed at each assessment site. The observed condition for each indicator was compared to the range of conditions listed in the rangeland health section of the ecological site description. The rating assigned for each indicator reflects the degree of departure form expected levels described in the ecological site description. Possible attribute ratings for degree of departure are: none to slight, slight to moderate, moderate, moderate to extreme, and extreme to total. Each rangeland health attribute is summarized based on "a preponderance of evidence" (Pellant et al. 2005). The rangeland health assessment does not provide a single rating; a separate rating is given for each attribute.

A brief description of the prominent ecological sites occurring in the included in the Wild Horse CRM Area follows:

- **Very Shallow/ 9 to 15 in. precipitation zone:** This ecological site occurs commonly on benches and hillsides, and is the principal ecological site found along ridges. Stiff sagebrush and Sandberg's bluegrass account for 30 percent and 20 percent of the annual production on this site, respectively. Native forbs such as Hooker's balsamroot, buckwheat, and fleabane daisy contribute up to 30 percent of the annual production. Cheatgrass is typically found on only on disturbed areas in the ecological site.**Very Shallow/ 15 in. + precipitation zone:** This ecological site differs from the previous one primarily in that low sagebrush

replaces stiff sagebrush as the dominant shrub, and Idaho fescue contributes up to 10 percent of the annual production.

- **Stony/ 9 to 15 in. precipitation zone:** This ecological site occurs typically on south-facing hillsides with gentle to moderate slopes. On relatively undisturbed sites more than 70 percent of annual production is from native perennial grasses such as bluebunch wheatgrass, Idaho fescue, Sandberg's bluegrass, and Thurber needlegrass. Shrubs such as big sagebrush and bitterbrush typically account for about 10 percent of annual production; with disturbance and a decrease in native grasses and forbs, the amount of shrubs increases.

- **Stony/ 15 in + precipitation zone:** This site differs from the previous one primarily in having slightly higher annual production as a result of increased effective precipitation.

- **Dry Stony/ 9 to 15 in. precipitation zone:** This site commonly occupies south- and east-facing slopes. On good condition sites most of the annual production comes from bluebunch wheatgrass and Sandberg's bluegrass, while big sagebrush and a variety of native annual and perennial forbs account for about 25 percent and 15 percent of the annual production, respectively.

- **Cool Stony 9 to 15 in. precipitation zone:** This site is commonly found on north-facing hillsides. Bluebunch wheatgrass, Idaho fescue, Sandberg's bluegrass, and Cusick's bluegrass combine to account for about 60 percent of the annual production at this site, while big sagebrush production varies from 5-15 percent. A diverse community of native forbs is typically found on this ecological site, including penstemon, paintbrush, balsamroot, and fleabane daisy.

- **Loamy/ 9 to 15 in. + precipitation zone:** This ecological site typically is found on deeper soils on flats or gentle slopes. On relatively undisturbed sites more than 70 percent of the annual production comes from bluebunch wheatgrass and Idaho fescue, and about 10 percent is comprised of native annual and perennial forbs. On disturbed sites where the amount of native perennial grasses has been reduced big sagebrush can accounts for 25-50 percent of annual production.

- **Loamy/ 15 in. + precipitation zone:** This ecological site is characterized by an understory dominated by bluebunch wheatgrass and Idaho fescue and a variety of perennial forbs. On all but poor condition sites a variety of native perennial forbs account for about 10 percent of annual production. In disturbed areas the amount of big sagebrush, cheatgrass and bulbous bluegrass increases.

Rangeland Inventory Summary Data by Pasture

Table 2-1. Rangeland inventory summary of the Upper Parke Creek pasture, including the percent of the pasture occupied by each ecological site and the accompanying rangeland inventory data. Data collection is currently incomplete; "IC" indicates data that will be collected during the 2008 field season. PZ denotes Precipitation Zone (inches); SI denotes similarity index. For Rangeland Health Attributes, departure from expected conditions is indicated by: N-S (none to slight), S-M (slight to moderate); M (moderate); M-E (moderate to extreme)

					Rangeland Health Attributes				
PZ	Ecological Site	Percent Composition	Total Production (lbs)	SI	Range Condition	Soil and Site Stability	Hydrologic Function	Biotic Integrity	State
9 to 15	Very Shallow	30 - 35%	150	73	Good	S-M	S-M	S-M	-
9 to 15	Stony	10 - 15%	750	27	Fair	S-M	S-M	M	1C
9 to 15	Cool Stony	10 - 15%	900	77	Excellent	N-S	N-S	N-S	1A
9 to 15	Stony	5 - 10%	550	11	Poor	M	M	M	2A
15+	Loamy	5 - 10%	1300	38	Fair	S-M	S-M	S-M	1C
9 to 15	Cool Loamy	1 - 5%	1200	45	Fair	N-S	N-S	N-S	1A
9 to 15	Cool Stony	1 - 5%	900	63	Good	S-M	N-S	N-S	1A
9 to 15	Dry Loamy	1 - 5%	300	6	Poor	S-M	S-M	M	2B
9 to 15	Cool Stony	1 - 5%	900	63	Good	S-M	N-S	N-S	1A
9 to 15	Unclassified Riparian	1 - 5%	IC	NC	IC	IC	IC	IC	-
-	Rock Rubble	1 - 5%	0	-	-	-	-	-	-
15+	Ponderosa Pine Forest	1 - 5%	400	-	-	S-M	S-M	S-M	-
15+	Loamy	1 - 5%	1000	45	Fair	IC	IC	IC	1C
15+	Stony	1 - 5%	600	58	Good	IC	IC	IC	1A
15+	Loamy	1 - 5%	1100	66	Good	IC	IC	IC	1A
9 to 15	Stony	<1%	400	79	Excellent	S-M	S-M	M	1B
9 to 15	Cool Stony	<1%	500	41	Fair	S-M	S-M	M	1A
9 to 15	Loamy	<1%	1100	45	Fair	N-S	N-S	S-M	1C
9 to	Loamy	<1%	1100	17	Poor	M	M	M	2A

15 9 to 15	Dry Stony	<1%	350	34	Fair	S-M IC	S-M IC	S-M IC	2C
15+	Very Shallow	<1%	300	84	Excellent				-
15+	Cool Stony	<1%	800	53	Good	IC	IC	IC	1A
15+	Loamy	<1%	1200	15	Poor	IC	IC	IC	1C
15+	Loamy	<1%	900	9	Poor	S-M	S-M	S-M	2A

Table 2-2. Rangeland inventory summary of the Lower Parke Creek pasture, including the percent of the pasture occupied by each ecological site and the accompanying rangeland inventory data. Data collection is currently incomplete; "IC" indicates data that will be collected during the 2008 field season. PZ denotes Precipitation Zone (inches); SI denotes similarity index. For Rangeland Health Attributes, departure from expected conditions is indicated by: N-S (none to slight), S-M (slight to moderate); M (moderate); M-E (moderate to extreme).

					Rangeland Health Attributes				
PZ	Ecological Site	Percent Composition	Total Production (lbs)	SI	Range Condition	Soil and Site Stability	Hydrologic Function	Biotic Integrity	State
9 to 15	Very Shallow	35 - 40%	150	73	Good	S-M	S-M	S-M	-
9 to 15	Stony	10 - 15%	550	11	Poor	M	M	M	2A
9 to 15	Loamy	5 - 10%	1100	45	Fair	N-S	N-S	S-M	1C
9 to 15	Dry Stony	5 - 10%	300	65	Good	N-S	N-S	S-M	1C
9 to 15	Stony	5 - 10%	600	51	Good	S-M	S-M	S-M	1A
9 to 15	Stony	1 - 5%	750	27	Fair	S-M	S-M	M	1C
15+	Loamy	1 - 5%	1000	45	Fair	IC	IC	IC	1C
9 to 15	Stony	1 - 5%	700	34	Fair	S-M	S-M	S-M	1C
9 to 15	Stony	1 - 5%	450	29	Fair	S-M	S-M	S-M	1C
9 to 15	Unclassified Riparian	1 - 5%	NC	NC	NC	IC	IC	IC	-
9 to 15	Dry Stony	1 - 5%	450	42	Fair	N-S	N-S	S-M	2A
9 to 15	Dry Loamy	1 - 5%	300	6	Poor	S-M	S-M	M	2B
-	Rock Rubble	1 - 5%	-	-	-	-	-	-	-
9 to 15	Loamy	1 - 5%	650	66	Fair	S-M	M	M-E	2A
9 to 15	Loamy	<1%	1100	17	Poor	M	M	M	2A
9 to 15	Loamy	<1%	900	70	Good	N-S	N-S	N-S	1A
9 to 15	Cool Stony	<1%	900	63	Good	S-M	N-S	N-S	1A
9 to 15	Loamy	<1%	900	65	Good	S-M	S-M	S-M	1A
9 to 15	Dry Stony	<1%	300	20	Poor	M	M	M	1C
9 to 15	Cool Stony	<1%	900	77	Excellent	N-S	N-S	N-S	1A

Table 2-3. Rangeland inventory summary of the Whiskey Jim pasture, including the percent of the pasture occupied by each ecological site and the accompanying rangeland inventory data. Data collection is currently incomplete; "IC" indicates data that will be collected during the 2008 field season. PZ denotes Precipitation Zone (inches); SI denotes similarity index. For Rangeland Health Attributes, departure from expected conditions is indicated by: N-S (none to slight), S-M (slight to moderate); M (moderate); M-E (moderate to extreme).

Rangeland Health Attributes

PZ	Ecological Site	Percent Composition	Total Production (lbs)	SI	Range Condition	Soil and Site Stability	Hydrologic Function	Biotic Integrity	State
9 to 15	Very Shallow	25 - 30%	150	73	Good	S-M	S-M	S-M	-
9 to 15	Cool Stony	10 - 15%	900	77	Excellent	N-S	N-S	N-S	1A
9 to 15	Cool Stony	10 - 15%	500	41	Fair	S-M	S-M	M	1A
9 to 15	Stony	5 - 10%	750	27	Fair	S-M	S-M	M	1C
9 to 15	Stony	5 - 10%	550	11	Poor	M	M	M	2A
9 to 15	Stony	1 - 5%	450	29	Fair	S-M	S-M	S-M	1C
9 to 15	Cool Loamy	1 - 5%	1200	45	Fair	N-S	N-S	N-S	1A
9 to 15	Loamy	1 - 5%	1100	17	Poor	M	M	M	2A
9 to 15	Loamy	1 - 5%	900	65	Good	S-M	S-M	S-M	1A
9 to 15	Stony	1 - 5%	700	34	Fair	S-M	S-M	S-M	1C
9 to 15	Stony	1 - 5%	400	79	Excellent	S-M	S-M	M	1B
9 to 15	Loamy	1 - 5%	900	70	Good	N-S	N-S	N-S	1A
9 to 15	Dry Loamy	1 - 5%	300	6	Poor	S-M	S-M	M	2B
9 to 15	Dry Stony	1 - 5%	450	42	Fair	N-S	N-S	S-M	2A
9 to 15	Stony	1 - 5%	700	73	Good	S-M	S-M	S-M	1A
9 to 15	Stony	1 - 5%	600	51	Good	S-M	S-M	S-M	1A
9 to 15	Cool Stony	1 - 5%	900	63	Good	S-M	N-S	N-S	1A
15+	Very Shallow	1 - 5%	300	84	Excellent	IC	IC	IC	-
9 to 15	Unclassified Riparian	1 - 5%	NC	IC	IC	IC	IC	IC	-
-	Rock Rubble	1 - 5%	-	-	-	-	-	-	-

9 to 15	Loamy	<1%	750	38	Fair	M	M	S-M	1A
9 to 15	Dry Stony	<1%	350	34	Fair	S-M	S-M	S-M	2C
9 to 15	Cool Stony	<1%	700	46	Fair	S-M	S-M	N-S	1A
9 to 15	Loamy	<1%	1100	45	Fair	N-S	N-S	S-M	1C
9 to 15	Dry Stony	<1%	300	65	Good	N-S	N-S	S-M	1C
9 to 15	Cool Stony	<1%	900	63	Good	S-M	N-S	N-S	1A
15+	Stony	<1%	600	58	Good	IC	IC	IC	1A
15+	Loamy	<1%	1000	45	Fair	IC	IC	IC	1C
15+	Loamy	<1%	1200	15	Poor	IC	IC	IC	1C
15+	Cool Stony	<1%	800	53	Good	IC	IC	IC	1A

Table 2-4. Rangeland inventory summary of the Vantage Highway pasture, including the percent of the pasture occupied by each ecological site and the accompanying rangeland inventory data. Data collection is currently incomplete; "IC" indicates data that will be collected during the 2008 field season. PZ denotes Precipitation Zone (inches); SI denotes similarity index. For Rangeland Health Attributes, departure from expected conditions is indicated by: N-S (none to slight), S-M (slight to moderate); M (moderate); M-E (moderate to extreme).

						Rangeland Health Attributes			
PZ	Ecological Site	Percent Composition	Total Production (lbs)	SI	Range Condition	Soil and Site Stability	Hydrologic Function	Biotic Integrity	State
9 to 15	Very Shallow	45 - 50%	150	73	Good	S-M	S-M	S-M	-
9 to 15	Dry Stony	5 - 10%	300	65	Good	N-S	N-S	S-M	1C
9 to 15	Dry Stony	5 - 10%	700	42	Fair	IC	IC	IC	1A
9 to 15	Loamy	5 - 10%	650	33	Fair	S-M	M	M-E	2A
9 to 15	Stony	5 - 10%	450	29	Fair	S-M	S-M	S-M	1C
9 to 15	Loamy	1 - 5%	900	65	Good	S-M	S-M	S-M	1A
9 to 15	Dry Stony	1 - 5%	350	34	Fair	S-M	S-M	S-M	2C
9 to 15	Dry Loamy	1 - 5%	300	6	Poor	S-M	S-M	M	2B
-	Rock Rubble	1 - 5%	-	-	-	-	-	-	-
9 to 15	Stony	1 - 5%	700	73	Good	S-M	S-M	S-M	1A
9 to 15	Cool Stony	1 - 5%	900	77	Excellen	N-S	N-S	N-S	1A

				t				
9 to 15	Loamy	1 - 5%	1100	17	Poor	M	M	M	2A
9 to 15	Loamy	1 - 5%	450	42	Fair	N-S	N-S	S-M	2A
9 to 15	Stony	1 - 5%	600	51	Good	S-M	S-M	S-M	1A
9 to 15	Stony	1 - 5%	650	25	Fair	S-M	M	M	1C
9 to 15	Stony	1 - 5%	550	11	Poor	M	M	M	2A
9 to 15	Dry Stony	1 - 5%	300	20	Poor	M	M	M	1C
9 to 15	Loamy	1 - 5%	900	70	Good	N-S	N-S	N-S	1A
9 to 15	Cool Stony	<1%	700	46	Fair	S-M	S-M	N-S	1A
9 to 15	Stony	<1%	700	34	Fair	S-M	S-M	S-M	1C
					Excellen				
9 to 15	Stony	<1%	400	79	t	S-M	S-M	M	1B
9 to 15	Dry Loamy	<1%	600	74	Good	M	S-M	M	1C
9 to 15	Cool Stony	<1%	500	41	Fair	S-M	S-M	M	1A
9 to 15	Cool Loamy	<1%	1200	45	Fair	N-S	N-S	N-S	1A
	Loamy								
9 to 15	Bottom	<1%	750	38	Fair	M	M	S-M	1A

Table 2-5. Rangeland inventory summary of the Wild Horse Crossing pasture, including the percent of the pasture occupied by each ecological site and the accompanying rangeland inventory data. Data collection is currently incomplete; "IC" indicates data that will be collected during the 2008 field season. PZ denotes Precipitation Zone (inches); SI denotes similarity index. For Rangeland Health Attributes, departure from expected conditions is indicated by: N-S (none to slight), S-M (slight to moderate); M (moderate); M-E (moderate to extreme).

						Rangeland Health Attributes			
PZ	Ecological Site	Percent Compostion	Total Production (lbs)	SI	Range Condition	Soil and Site Stability	Hydrologic Function	Biotic Integrity	State
	Very								
9 to 15	Shallow	25 - 30%	150	60	Good	IC	IC	IC	-
9 to 15	Dry Stony	15 - 20%	300	65	Good	N-S	N-S	S-M	1C
15+	Loamy	10 - 15%	1000	45	Fair	IC	IC	IC	1C
9 to 15	Cool Stony	5 - 10%	700	46	Fair	S-M	S-M	N-S	1A
15+	Loamy	5 - 10%	1200	15	Poor	IC	IC	IC	1C
	Very				Excellen				
15+	Shallow	5 - 10%	300	84	t	IC	IC	IC	-
15+	Loamy	1 - 5%	900	9	Poor	S-M	S-M	S-M	2A
-	Rock	1 - 5%	-	-	-	-	-	-	-
9 to 15	Loamy	1 - 5%	900	70	Good	N-S	N-S	N-S	1A
15+	Cool Stony	1 - 5%	800	53	Good	IC	IC	IC	1A

15+	Stony	1 - 5%	600	58	Good	IC	IC	IC	1A
15+	Loamy	1 - 5%	1100	66	Good	IC	IC	IC	1A
9 to 15	Stony	<1%	700	73	Good	S-M	S-M	S-M	1A

Table 2-6. Rangeland inventory summary of the North Wild Horse pasture, including the percent of the pasture occupied by each ecological site and the accompanying rangeland inventory data. Data collection is currently incomplete; "IC" indicates data that will be collected during the 2008 field season. PZ denotes Precipitation Zone (inches); SI denotes similarity index. For Rangeland Health Attributes, departure from expected conditions is indicated by: N-S (none to slight), S-M (slight to moderate); M (moderate); M-E (moderate to extreme).

						Rangeland Health Attributes			
PZ	Ecological Site	Percent Composition	Total Production (lbs)	SI	Condition	Soil and Site Stability	Hydrologic Function	Biotic Integrity	State
9 to 15	Very Shallow	30 - 35%	150	73	Good	S-M	S-M	S-M	-
15+	Very Shallow	15 - 20%	300	84	Excellent	NC	NC	NC	-
9 to 15	Cool Stony	5 - 10%	700	46	Fair	S-M	S-M	N-S	1A
15+	Loamy	5 - 10%	1000	45	Fair	NC	NC	NC	1C
15+	Cool Stony	5 - 10%	800	53	Good	NC	NC	NC	1A
-	Rock	1 - 5%	-	-	-	-	-	-	-
9 to 15	Dry Stony	1 - 5%	300	65	Good	N-S	N-S	S-M	1C
15+	Loamy	1 - 5%	1200	15	Poor	NC	NC	NC	1C
15+	Very Shallow	1 - 5%	300	69	Good	NC	NC	NC	-
9 to 15	Stony	1 - 5%	700	73	Good	S-M	S-M	S-M	1A
15+	Stony	1 - 5%	600	58	Good	NC	NC	NC	1A
9 to 15	Loamy	1 - 5%	900	70	Good	N-S	N-S	N-S	1A
15+	Stony	1 - 5%	700	51	Good	NC	NC	NC	1A
15+	Loamy	<1%	900	9	Poor	S-M	S-M	S-M	2A
9 to 15	Stony	<1%	600	51	Good	S-M	S-M	S-M	1A
9 to 15	Dry Loamy	<1%	300	6	Poor	S-M	S-M	M	2B

Table 2-7. Rangeland inventory summary of the South Wild Horse pasture, including the percent of the pasture occupied by each ecological site and the accompanying rangeland inventory data. Data collection is currently incomplete; "IC" indicates data that will be collected during the 2008 field season. PZ denotes Precipitation Zone (inches); SI denotes similarity index. For Rangeland Health Attributes, departure from expected conditions is indicated by: N-S (none to slight), S-M (slight to moderate); M (moderate); M-E (moderate to extreme).

						Rangeland Health Attributes			
PZ	Ecological Site	Percent Compostion	Total Production (lbs)	SI	Condition	Soil and Site Stability	Hydrologic Function	Biotic Integrity	State
9 to 15	Very Shallow	40 - 45%	150	73	Good	S-M	S-M	S-M	-
9 to 15	Dry Stony	10 - 15%	300	65	Good	N-S	N-S	S-M	1C
9 to 15	Loamy	5 - 10%	750	38	Fair	M	M	S-M	1A
9 to 15	Stony	5 - 10%	700	34	Fair	S-M	S-M	S-M	1C
9 to 15	Loamy	1 - 5%	1100	17	Poor	M	M	M	2A
9 to 15	Loamy	1 - 5%	900	70	Good	N-S	N-S	N-S	1A
9 to 15	Dry Loamy	1 - 5%	700	42	Fair	NC	NC	NC	1A
9 to 15	Loamy	1 - 5%	650	66	Fair	S-M	M	M-E	2A
9 to 15	Stony	1 - 5%	700	73	Good	S-M	S-M	S-M	1A
9 to 15	Cool Stony	1 - 5%	700	46	Fair	S-M	S-M	N-S	1A
9 to 15	Stony	1 - 5%	600	51	Good	S-M	S-M	S-M	1A
9 to 15	Stony	1 - 5%	550	11	Poor	M	M	M	2A
9 to 15	Loamy	1 - 5%	900	65	Good	S-M	S-M	S-M	1A
15+	Very Shallow	1 - 5%	300	69	Good	NC	NC	NC	-
15+	Loamy	1 - 5%	1000	45	Fair	NC	NC	NC	1C
9 to 15	Dry Stony	<1%	300	20	Poor	M	M	M	1C
9 to 15	Dry Stony	<1%	450	42	Fair	N-S	N-S	S-M	2A
-	Rock	<1%	-	-	-	-	-	-	-
9 to 15	Stony	<1%	450	29	Fair	S-M	S-M	S-M	1C
9 to 15	Stony	<1%	650	25	Fair	S-M	M	M	1C
9 to 15	Stony	<1%	400	79	Excellent	S-M	S-M	M	1B
9 to 15	Dry Stony	<1%	350	34	Fair	S-M	S-M	S-M	2C
9 to 15	Loamy Bottom	<1%	3000	40	Fair	N-S	S-M	S-M	-
9 to 15	Dry Loamy	<1%	300	6	Poor	S-M	S-M	M	2B
15+	Loamy	<1%	1200	15	Poor	NC	NC	NC	1C
15+	Very Shallow	<1%	300	84	Excellent	NC	NC	NC	-
15+	Stony	<1%	700	51	Good	NC	NC	NC	1A

Table 2-8. Rangeland inventory summary of the Upper Skookumchuck pasture, including the percent of the pasture occupied by each ecological site and the accompanying rangeland inventory data. Data collection is currently incomplete; "IC" indicates data that will be collected during the 2008 field season. PZ denotes Precipitation Zone (inches); SI denotes similarity index. For Rangeland Health Attributes, departure from expected conditions is indicated by: N-S (none to slight), S-M (slight to moderate); M (moderate); M-E (moderate to extreme).

						Rangeland Health Attributes			
PZ	Ecological Site	Percent Composition	Total Production (lbs)	SI	Range Condition	Soil and Site Stability	Hydrologic Function	Biotic Integrity	State
9 to 15	Very Shallow	30 - 35%	150	73	Good	S-M	S-M	S-M	-
-	Rock Rubble	10 - 15%	-	-	-	-	-	-	-
9 to 15	Stony	5 - 10%	600	54	Good	N-S	N-S	S-M	1C
9 to 15	Stony	5 - 10%	750	70	Good	N-S	N-S	N-S	1A
6 to 9	Very Shallow	5 - 10%	150	60	Good	NC	NC	NC	-
9 to 15	Loamy	5 - 10%	900	70	Good	N-S	N-S	N-S	1A
9 to 15	Stony	1 - 5%	700	63	Good	N-S	N-S	N-S	1A
9 to 15	Cool Stony	1 - 5%	1100	53	Good	N-S	N-S	N-S	1A
9 to 15	Dry Stony	1 - 5%	300	35	Fair	N-S	S-M	S-M	1C
6 to 9	Loamy	1 - 5%	1000	88	Excellent	N-S	N-S	N-S	1A
9 to 15	Stony	1 - 5%	900	67	Good	N-S	N-S	S-M	1A
6 to 9	Dry Stony	1 - 5%	400	64	Good	IC	IC	IC	1A
9 to 15	Dry Stony	1 - 5%	300	65	Good	N-S	N-S	S-M	1C
9 to 15	Loamy	1 - 5%	900	24	Poor	S-M	S-M	M	1C
6 to 9	Very Shallow	1 - 5%	100	37	Fair	S-M	S-M	M	-
6 to 9	Dry Loamy	1 - 5%	300	11	Poor	S-M	M	M-E	2A
6 to 9	Dry Loamy	1 - 5%	400	21	Poor	S-M	S-M	M-E	2A
9 to 15	Cool Stony	1 - 5%	1000	18	Poor	N-S	N-S	N-S	1C
9 to 15	Loamy	1 - 5%	650	66	Fair	S-M	M	M-E	2A
9 to 15	Cool Stony	<1%	700	46	Fair	S-M	S-M	N-S	1A
9 to 15	Loamy	<1%	1100	17	Poor	M	M	M	2A
9 to 15	Dry Stony	<1%	450	42	Fair	N-S	N-S	S-M	2A
9 to 15	Dry Loamy	<1%	300	6	Poor	S-M	S-M	M	2B
9 to 15	Stony	<1%	600	50	Good	M	M	S-M	1B
6 to 9	Dry Stony	<1%	300	44	Fair	IC	IC	IC	1C
9 to 15	Stony	<1%	700	66	Good	S-M	S-M	S-M	1A

6 to 9	Very Shallow Desert Pavement	<1%	100	86	Excellent	IC	IC	IC	-
6 to 9	Cool Stony	<1%	550	90	Excellent	N-S	N-S	S-M	1A

Table 2-9. Rangeland inventory summary of the Western Whiskey Dick pasture, including the percent of the pasture occupied by each ecological site and the accompanying rangeland inventory data. Data collection is currently incomplete; "IC" indicates data that will be collected during the 2008 field season. PZ denotes Precipitation Zone (inches); SI denotes similarity index. For Rangeland Health Attributes, departure from expected conditions is indicated by: N-S (none to slight), S-M (slight to moderate); M (moderate); M-E (moderate to extreme).

						Rangeland Health Attributes			
PZ	Ecological Site	Percent Composition	Total Production (lbs)	SI	Range Condition	Soil and Site Stability	Hydrologic Function	Biotic Integrity	State
9 to 15	Very Shallow	25 - 30%	150	73	Good	S-M	S-M	S-M	-
9 to 15	Dry Stony	10 - 15%	300	65	Good	N-S	N-S	S-M	1C
6 to 9	Cool Stony	5 - 10%	550	90	Excellent	N-S	N-S	S-M	1A
9 to 15	Cool Stony	5 - 10%	700	46	Fair	S-M	S-M	N-S	1A
9 to 15	Loamy	5 - 10%	900	70	Good	N-S	N-S	N-S	1A
6 to 9	Very Shallow	1 – 5%	150	60	Good	NC	NC	NC	-
6 to 9	Dry Stony	1 – 5%	300	44	Fair	NC	NC	NC	1C
6 to 9	Dry Stony	1 – 5%	400	64	Good	NC	NC	NC	1A
6 to 9	Dry Loamy	1 – 5%	400	21	Poor	S-M	S-M	M-E	2A
6 to 9	Loamy	1 – 5%	1000	88	Excellent	N-S	N-S	N-S	1A
9 to 15	Stony	1 – 5%	600	54	Good	N-S	N-S	S-M	1C
9 to 15	Stony	1 – 5%	700	66	Good	S-M	S-M	S-M	1A
9 to 15	Very Shallow	1 – 5%	150	55	Good	S-M	S-M	S-M	-
9 to 15	Cool Loamy	1 – 5%	1100	53	Good	S-M	S-M	S-M	1A
9 to 15	Stony	1 – 5%	700	73	Good	S-M	S-M	S-M	1A
15+	Very Shallow	1 – 5%	300	69	Good	NC	NC	NC	-
	Rock	1 – 5%	-	-	-	-	-	-	-
6 to 9	Sandy	<1%	400	38	Fair	NC	NC	NC	1C

6 to 9	Dry Loamy	<1%	300	11	Poor	S-M	M	M-E	2A
9 to 15	Loamy	<1%	650	66	Fair	S-M	M	M-E	2A
9 to 15	Dry Loamy	<1%	300	6	Poor	S-M	S-M	M	2B
9 to 15	Stony	<1%	600	51	Good	S-M	S-M	S-M	1A
9 to 15	Stony	<1%	750	70	Good	N-S	N-S	N-S	1A
9 to 15	Dry Stony	<1%	450	42	Fair	N-S	N-S	S-M	2A
9 to 15	Stony	<1%	400	79	Excellent	S-M	S-M	M	1B
9 to 15	Cool Stony	<1%	750	45	Fair	N-S	N-S	N-S	1C
9 to 15	Dry Stony	<1%	350	34	Fair	S-M	S-M	S-M	2C
9 to 15	Loamy	<1%	1100	17	Poor	M	M	M	2A
9 to 15	Stony Loamy	<1%	550	11	Poor	M	M	M	2A
9 to 15	Bottom	<1%	3000	40	Fair	N-S	S-M	S-M	-
9 to 15	Loamy	<1%	900	65	Good	S-M	S-M	S-M	1A
9 to 15	Loamy	<1%	900	24	Poor	S-M	S-M	M	1C
9 to 15	Cool Loamy	<1%	1200	45	Fair	N-S	N-S	N-S	1A
9 to 15	Stony	<1%	700	63	Good	N-S	N-S	N-S	1A
15+	Very Shallow	<1%	300	84	Excellent	NC	NC	NC	-

Table 2-10. Rangeland inventory summary of the Rocky Coulee pasture, including the percent of the pasture occupied by each ecological site and the accompanying rangeland inventory data. Data collection is currently incomplete; "IC" indicates data that will be collected during the 2008 field season. PZ denotes Precipitation Zone (inches); SI denotes similarity index. For Rangeland Health Attributes, departure from expected conditions is indicated by: N-S (none to slight), S-M (slight to moderate); M (moderate); M-E (moderate to

						Rangeland Health Attributes			
PZ	Ecological Site	Percent Composition	Total Production (lbs)	SI	Range Condition	Soil and Site Stability	Hydrologic Function	Biotic Integrity	State
9 to 15	Very Shallow	30 - 35%	150	73	Good	S-M	S-M	S-M	-
9 to 15	Loamy	20 - 25%	900	70	Good	N-S	N-S	N-S	1A
9 to 15	Dry Stony	15 - 20%	300	65	Good	N-S	N-S	S-M	1C
9 to 15	Stony	5 - 10%	700	73	Good	S-M	S-M	S-M	1A
9 to 15	Dry Loamy	1 - 5%	600	74	Good	M	S-M	M	1C
9 to 15	Dry Loamy	1 - 5%	300	6	Poor	S-M	S-M	M	2B

9 to 15	Loamy	1 - 5%	900	65	Good	S-M	S-M	S-M	1A
9 to 15	Stony	1 - 5%	400	79	Excellent	S-M	S-M	M	1B
	Rock	1 - 5%	-	-	-	-	-	-	-
6 to 9	Cool Stony	<1%	550	90	Excellent	N-S	N-S	S-M	1A
6 to 9	Dry Stony	<1%	300	44	Fair	NC	NC	NC	1C
9 to 15	Cool Loamy	<1%	1100	53	Good	S-M	S-M	S-M	1A
9 to 15	Cool Stony	<1%	750	45	Fair	N-S	N-S	N-S	1C
9 to 15	Cool Stony	<1%	700	46	Fair	S-M	S-M	N-S	1A
9 to 15	Very Shallow	<1%	150	55	Good	S-M	S-M	S-M	-
9 to 15	Loamy Bottom	<1%	3000	40	Fair	N-S	S-M	S-M	-

Table 2-11. Rangeland inventory summary of the Eastern Whiskey Dick pasture, including the percent of the pasture occupied by each ecological site and the accompanying rangeland inventory data. Data collection is currently incomplete; "IC" indicates data that will be collected during the 2008 field season. PZ denotes Precipitation Zone (inches); SI denotes similarity index. For Rangeland Health Attributes, departure from expected conditions is indicated by: N-S (none to slight), S-M (slight to moderate); M (moderate); M-E (moderate to extreme).

PZ	Ecological Site	Percent Composition	Total Production (lbs)	SI	Range Condition	Soil and Site Stabilty	Hydrologic Function	Biotic Integrity	State
6 to 9	Very Shallow	25 - 30%	150	60	Good	NC	NC	NC	-
6 to 9	Dry Stony	15 - 20%	300	44	Fair	NC	NC	NC	1C
6 to 9	Cool Stony	10 - 15%	550	90	Excellent	N-S	N-S	S-M	1A
6 to 9	Loamy	5 - 10%	1000	88	Excellent	N-S	N-S	N-S	1A
6 to 9	Dry Stony	5 - 10%	400	64	Good	NC	NC	NC	1A
6 to 9	Rock	5 - 10%	-	-	-	-	-	-	-
6 to 9	Sandy	1 - 5%	400	38	Fair	NC	NC	NC	1C
6 to 9	Dry Loamy	1 - 5%	400	21	Poor	S-M	S-M	M-E	2A

	Very Shallow Desert				Excellen				-
6 to 9	Pavement	1 - 5%	100	86	t	NC	NC	NC	
9 to 15	Very Shallow	1 - 5%	150	73	Good	S-M	S-M	S-M	-
6 to 9	Sandy	1 - 5%	350	38	Fair	NC	NC	NC	1C
9 to 15	Dry Stony	1 - 5%	300	65	Good	N-S	N-S	S-M	1C
6 to 9	Sandy	1 - 5%	500	58	Good	N-S	S-M	S-M	2A
6 to 9	Stony	1 - 5%	500	46	Fair	S-M	S-M	S-M	1C
6 to 9	Loamy	<1%	800	6	Poor	S-M	M	S-M	2A
9 to 15	Cool Stony	<1%	700	46	Fair	S-M	S-M	N-S	1A
	Loamy								
6 to 9	Bottom	<1%	2500	16	Poor	NC	NC	NC	-
9 to 15	Loamy	<1%	650	66	Fair	S-M	M	M-E	2A
6 to 9	Dry Loamy	<1%	300	11	Poor	S-M	M	M-E	2A
6 to 9	Very Shallow	<1%	100	37	Fair	S-M	S-M	M	-
9 to 15	Dry Stony	<1%	300	20	Poor	M	M	M	1C
6 to 9	Alkali Bottom	<1%	3000	46	Fair	NC	NC	NC	-
9 to 15	Loamy	<1%	900	70	Good	N-S	N-S	N-S	1A
	Loamy								
9 to 15	Bottom	<1%	3000	40	Fair	N-S	S-M	S-M	-
6 to 9	Cool Stony	<1%	350	30	Fair	N-S	S-M	S-M	1C

Table 2-12. Rangeland inventory summary of the Lone Star pasture, including the percent of the pasture occupied by each ecological site and the accompanying rangeland inventory data. Data collection is currently incomplete; "IC" indicates data that will be collected during the 2008 field season. PZ denotes Precipitation Zone (inches); SI denotes similarity index. For Rangeland Health Attributes, departure from expected conditions is indicated by: N-S (none to slight), S-M (slight to moderate); M (moderate); M-E (moderate to extreme).

PZ	Ecological Site	Percent Compostion	Total Production (lbs)	SI	Range Condition	Soil and Site Stability	Hydrologic Function	Biotic Integrity	State
6 to 9	Very Shallow	20 - 25%	150	60	Good	NC	NC	NC	-
6 to 9	Cool Stony	10 - 15%	550	90	Excellent	N-S	N-S	S-M	1A
6 to 9	Dry Stony	10 - 15%	400	64	Good	NC	NC	NC	1A
6 to 9	Dry Stony	10 - 15%	300	44	Fair	NC	NC	NC	1C
9 to 15	Very Shallow	5 - 10%	150	73	Good	S-M	S-M	S-M	-
6 to 9	Dry Loamy	1 - 5%	400	21	Poor	S-M	S-M	M-E	2A
6 to 9	Loamy	1 - 5%	1000	88	Excellent	N-S	N-S	N-S	1A
6 to 9	Sandy	1 - 5%	400	38	Fair	NC	NC	NC	1C

	Very Shallow Desert				Excellen				-
6 to 9	Pavement	1 - 5%	100	86	t	NC	NC	NC	
9 to 15	Cool Stony	1 - 5%	700	46	Fair	S-M	S-M	N-S	1A
9 to 15	Dry Stony	1 - 5%	300	65	Good	N-S	N-S	S-M	1C
9 to 15	Dry Loamy	1 - 5%	300	6	Poor	S-M	S-M	M	2B
9 to 15	Loamy	1 - 5%	900	70	Good	N-S	N-S	N-S	1A
9 to 15	Stony	1 - 5%	700	73	Good	S-M	S-M	S-M	1A
9 to 15	Stony	1 - 5%	400	79	Excellen t	S-M	S-M	M	1B
	Rock	1 - 5%	-	-	-	-	-	-	-
6 to 9	Sandy	<1%	350	38	Fair	NC	NC	NC	1C
6 to 9	Sandy	<1%	500	58	Good	N-S	S-M	S-M	2A
6 to 9	Very Shallow	<1%	100	37	Fair	S-M	S-M	M	-
9 to 15	Dry Loamy	<1%	600	74	Good	M	S-M	M	1C
9 to 15	Loamy	<1%	650	66	Fair	S-M	M	M-E	2A

NRCS 528A: Prescribed Grazing Standards

Native Bunchgrass Guidelines:

- Every pasture is deferred from grazing at least every third year. Deferment means no grazing of the key species during the growing season (approximately March 1st through July 15th)
- Every pasture is grazed no more than 1 in 3 years during the critical period. The critical period is when the key species are in boot stage through seed formation
- No pasture is grazed more than half the growing season.
- The intensity of grazing for every pasture is within proper use standards – no more than 50 percent use during the growing season, no more than 60 percent use during the dormant season. Percent use is measured on a weight basis.

Contingency Planning:

- **Drought:** Reduce numbers – sell older cows (10 percent)
- **Fire:** Plan on 2 year rest and potentially re-seeding depending on intensity

Monitoring Plan:

- Keep records of animal use by pasture including numbers, dates of use
- Establish key grazing areas and key species for each pasture
- Monitor grazing use using grazed class method by pasture annually & keep records
- It is recommended to set up photo monitoring points or nested frequency plots for trend monitoring

Appendix C. Rangeland Vegetation Monitoring Plan

The grazing committee, which includes WDFW, will employ both short-term and long-term monitoring to determine whether our objectives are being met. Short-term monitoring will include trigger, utilization, implementation, and cover monitoring. Long-term monitoring will include photo-monitoring, trend, forage palatability, and grass phenology monitoring. Each of these methods is described below.

Trigger and utilization monitoring will be done primarily in key areas. A trigger will be defined as a resource condition threshold at which time livestock are to be moved from a pasture. Key areas are relatively small portions of the pastures selected because of their location, use, or value as a monitoring point for grazing use. It is assumed that these areas, if properly selected, will reflect the current management of the pasture as a whole. Trend monitoring on PSE ownership will also occur within key areas. Trend monitoring on WDFW and DNR ownership will occur on randomly selected sites, the techniques used for site selection are described below.

Triggers: Several utilization triggers have been developed by the grazing committee to determine the proper date for livestock removal from each pasture. These triggers are listed below. When any of these utilization targets is reached, the livestock operator will be required to remove the herd.

- 35 percent use on key species within zone of accessibility
- 60 percent use on key species within 100 yards of developed stock water
- inches of stubble height for key grass species within the riparian zone
- 35 percent use of browse species within the riparian zone

Utilization: Forage utilization cages will be placed and monitored to document wildlife use and livestock use. Cages will be monitored prior to turnout, immediately after livestock removal, and after the end of the growing season. In addition, utilization mapping will be conducted to identify key monitoring areas. Grazed class utilization transects will also be monitored in key areas.

Photo-monitoring: A series of photo monitoring points will be established; photos will be taken at least twice annually to document change in vegetation condition over time.

Phenology: Six stations have been established across the CRM area to track bluebunch wheatgrass phenology throughout the growing season. These stations are located along Vantage Hwy and Beacon Ridge Road at varying elevations from 600-ft to 3600-ft. Each station will be visited weekly from April 1st to the end of the growing season. Monitoring sites include the Gingko State Parke boat launch (600-ft), 2 stops along Vantage Hwy (1,200 and 1,800-ft), the WDFW corrals (2,400-ft), and 2 stops along

Beacon Ridge Road (3,000 and 3,600-ft). Plants from both north- and south-facing hillsides will be monitored, where possible.

Other Annual Monitoring: Grazing committee members will also record livestock numbers and timing within each pasture, the type of growing season, observations of which plant species elk and cattle are consuming, and conduct step-point transects for plant cover, and step-boot transects for basal gaps at the trend monitoring sites (Herrick et al. 2005).

Trend: The National Research Council developed the rangeland health model to promote a standard method of evaluating rangelands (NRC 1994). Rangeland health is defined as "the degree to which the integrity of the soil, vegetation, water, and air, as well as the ecological processes of the rangeland ecosystem are balanced and sustained" (Task Group on Unity in Concepts and Terminology 1995). Because direct measures of site integrity and ecological processes are difficult and costly to gather, biological and physical components are used as indicators of these processes. Pellant et al. (2005) developed a standardized, qualitative assessment protocol that focuses on three key ecosystem attributes: soil and site stability, hydrologic function, and biotic integrity. To provide the quantitative data necessary to evaluate success in achieving the goals of the CRM, the grazing committee will use a recently developed monitoring approach that provides indicators of the three ecosystem attributes mentioned above (Herrick et al. 2005). This approach includes several long-term methods including photo points (for a visual record of vegetation conditions), line-point intercept (for species cover and composition), and belt transect (for measuring perennial invasive plants), as well as a short-term method (measuring the amount of plant cover remaining after grazing) to monitor rangeland health.

Locations for monitoring on WDFW and WDNR land will be identified using a stratified random selection process based on pastures and ecological sites with a minimum of two monitoring sites per pasture and in riparian areas that accessible to livestock. Locations for monitoring on PSE-owned land were placed in key monitoring areas and should be representative of conditions throughout the pasture. The standard transect layout consists of a radial arrangement of three 50 meter transects that cover an area of approximately one hectare (about 2.5 acres). Transects begin 5 meters from the plot center so that vegetation trampling and soil surface disturbance along the transects (where data is collected) is minimized. The azimuth of the first transect is randomly determined; the remaining two transects are oriented at 120 degree increments. Where the site permits in riparian zones, parallel transects will be established perpendicular to the drainage at 20-25 meter spacing. Greenline transects (Winward, 2000) may be established at sites where the riparian zone is too narrow to permit perpendicular transects. The plot center and beginning and end points of each transect are identified with rebar stakes covered with PVC for safety and visibility. When data are being collected a 50-meter measuring tape is anchored as close to the ground as possible between the beginning and end point stakes. This plot arrangement is used for photo points and for sampling with line-point intercept, basal gap intercept, and belt transect techniques.

Line-point Intercept: For the line-point intercept technique the examiner and recorder begin at the "0" end of the tape (always staying on the same side of the tape). At 1-meter intervals a pin-flag is dropped vertically from a height of about 50 centimeters. Once the pin is flush with the ground surface the PLANTS database species code (http://plants.usda.gov/) of every plant species intercepted (and/or herbaceous litter) is recorded on data form. Each canopy species is recorded only once, even though it may be intercepted more than once. At every fifth sample point vegetation height (in centimeters) is measured and recorded. At each sample point a record is kept of whether the pin flag intercepts a plant base or some other soil surface feature (viz., rock, bedrock, embedded litter, duff, moss, lichen crust, or soil).

Summarization and analysis of the line-point intercept data set provides information on several plant community and ecological site components: plant foliar cover (total as well as by species and plant functional type); plant species composition; average plant height; the amount of bare ground, rock, and bedrock; the amount of soil surface covered by moss, lichen crust, embedded litter, or duff; and the amount of litter covering the soil surface (total litter as well as litter between plant canopies and litter under plant canopies). Effect of the livestock grazing treatment on these parameters will be assessed by comparison of the initial data set with a similar data set gathered after the final year of the grazing treatment. In general, increases in the values that describe foliar and basal cover of desirable species, and a decrease in the amount of bare ground have a positive effect on rangeland health attributes.

Belt Transect: The standard transect layout described above is also used for belt transects for measuring biennial and perennial invasive species. A 50-meter measuring tape is anchored as close to the ground as possible between the beginning and end point stakes. Beginning at the "0" end of the tape a 2-meter section of PVC pipe is centered directly over the tape. The observer and recorder slowly walk the length of the transect and tally the number of perennial invasive species observed inside the sample area (i.e., 2-meters X 50-meters; 100 m^2). This procedure is repeated on all transects at each monitoring plot. Density of perennial invasive species is calculated by dividing the total count of each species by the transect area. Results can be expressed as number of plants/hectare or number of plants/acre. The density of perennial invasive species is a sensitive indicator of the biotic integrity of individual pastures and ecological sites.

Species Richness Plots: Plant species richness is the total number of species in an area, and is an indicator of biodiversity. Species richness will be measured by laying out a 10-m by 30-m macroplot along each of the three transects, and recording all plant species within the macroplot.

Land EKG: Six Land EKG® transects have been installed on the Wild Horse Wind Farm and two in the Parke Creek drainage (Orchard, 2006). Land EKG® is intended to evaluate and graphically portray land health information based on a rapid assessment of ecological processes in a manner that can be done by individuals with a wide range of expertise. The method combines permanent photo points along a 200 ft. transect with

estimates of nutrient cycling, water cycling, plant community, and energy flow attributes within 3 nested zones associated with the transect line and (4) 4.8 sq. ft. hoops.