Land Health Evaluation Report
Douglas Creek Watershed

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Bureau of Land Management
Wenatchee Field Office
915 N. Walla Walla Avenue
Wenatchee, WA 98801

BLM

Wenatchee Field Office. Spokane District. Oregon/Washington

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1. Introduction

This evaluation report describes a land health assessment of the public lands administered by the Bureau of Land Management (BLM) within the Douglas Creek Watershed (DCW) and reports the condition and function of BLM-administered land resources in the watershed to the authorized officer. Findings of this land health assessment and evaluation will be used by the authorized officer to determine whether the BLM lands in the DCW meet Rangeland Health Standards. The DCW is located on the Columbia Plateau in Douglas County, Washington (see Appendix A).

1.1 Assessment and Evaluation Process and Regulatory Background

This assessment and evaluation was done in accordance with all BLM regulations and direction regarding rangeland health standards, including:

- 43 Code of Federal Regulations, Subpart 4180, Fundamentals of Rangeland Health and Standards and Guidelines for Grazing Administration (Fundamentals of Rangeland Health)
- BLM Manual 4180-1, Rangeland Health Standards (H-4180-1) (USDI BLM 2001a)
- IM 2009-007, Process for Evaluating Status of Land Health and Making Determinations of Causal Factors When Land Health Standards are Not Achieved (USDI BLM 2008)
- Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the States of Oregon and Washington (Standards for Rangeland Health hereafter) (USDI BLM 1997)

The report evaluates the status of each unit (allotment or watershed) evaluated, with respect to the following five standards:

- Standard 1 Watershed Function-Uplands
- Standard 2 Watershed Function-Riparian/Wetland Areas
- Standard 3 Ecological Processes
- Standard 4 Water Quality
- Standard 5 Native, Threatened and Endangered (T&E), and Locally Important Species

The authorized officer will consider the findings of this report to determine if all five land health standards are currently being achieved for the evaluation area. The authorized officer will complete a determination document if this evaluation documents that standards are not being achieved in the assessment area (USDI BLM 2008).

The standards are described in detail in Standards for Rangeland Health (1997) and are expressions of the physical and biological conditions or degree of function necessary to sustain healthy rangeland ecosystems at the time of the assessment. Although these standards originally focused on livestock grazing on BLM lands, the BLM has developed land health standards that are more broadly applicable, and management decisions must consider the effects and impacts of all uses on land health (USDI BLM 2005). The objectives of the rangeland health regulations are to promote healthy sustainable rangeland ecosystems; to accelerate restoration and improvement of public rangelands to properly functioning conditions and to provide for sustainability of the western livestock industry and communities that are dependent upon productive, healthy public

rangelands (USDI BLM 1997). Technical Reference1734-6, *Interpreting Indicators of Rangeland Health* (Pellant et al. 2005), defines rangeland health 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. This is consistent with the definition of land health provided in BLM Handbook 4180-1 (USDI BLM 2001a), which defines rangeland health as the degree to which the integrity of the soil and the ecological processes of ecosystems are sustained. Unhealthy rangelands are defined as rangelands on which degradation has resulted in the loss of properly functioning ecological processes, and the loss of the capacity to provide values and commodities such that external inputs are required to restore land health (NRC 1994).

In this document the Standards for Rangeland Health findings are summarized for each grazing allotment and all unleased areas in the assessment area for Standards 1 and 3. Standard 2 findings are summarized for streams and wetlands within allotments. Standard 4 is summarized at the watershed scale. Standard 5 is summarized by species or community within allotment.

The Spokane District Resource Management Plan Record of Decision (RMP ROD) approved in 1987 provides program guidance for BLM management in the DCW for the life of this document. Management in portions of the assessment area acquired by BLM after adoption of the RMP is addressed in later analyses. Management in the Duffy Creek allotment is specifically addressed in the Duffy Creek Allotment Management Plan and Environmental Assessment (EA) (USDI BLM 1999a). Management in the Titchenal Canyon allotment is addressed in the EA for the State Land Exchange (USDI BLM 1999b) and the EA for Central Washington Assembled Land Exchange (CWALE) (USDI BLM 2001b). Management in some north-central portions of the assessment area is addressed in a separate analysis of Land and Water Conservation Fund (LWCF) land purchases (USDI BLM 2004).

2. Assessment Area Existing Conditions

The approximate boundary for the DCW includes the Douglas Creek fifth-field hydrological unit (131,137 acres), as well as all grazing allotment boundaries and unleased BLM parcels that lie primarily in the watershed (USGS 2013). The addition of BLM-administered lands outside the hydrological unit boundary brings the DCW to approximately 132,056 acres in size (Appendix A, Map A-1). The DCW includes approximately 14,530 acres of BLM-administered lands and less than 1,000 acres of Washington State Department of Natural Resources (DNR) lands, all in the Lower Douglas Creek sub-watershed. The Nature Conservancy (TNC) manages approximately 1,800 acres in the DCW. The remaining lands (approximately 114,000 acres) in the DCW are privately owned. Acreages described in the majority of this document are based on GIS analysis, and should be considered estimates; trends described should be accurate although acreages may not be exact. Acreages described in grazing management history (see Section 2.6) are based on legal descriptions of grazing leases.

This assessment and evaluation will focus on BLM-administered lands in the DCW. The influence of non-BLM managed lands on the standards will be considered generally and cumulatively, but will not be analyzed in depth. In the remainder of this document, the term "assessment area" will refer to BLM-administered land within the DCW boundary.

Below we describe soils and ecological sites, fire regimes, vegetation, riparian conditions and management in the DCW; wildlife species are described separately in Standard 5 (Section 3.5).

2.1 Soils and Ecological Sites

Soils in the DCW are primarily affected by climate (temperature and precipitation), topography (slope and aspect), and parent material (geology and geomorphology). Geology in the DCW is dominated by Grande Ronde basalts. Soils in the assessment area are almost exclusively Mollisols with aeolian origins. Lands in the assessment area are mapped as receiving 9 to 15 inches of average annual precipitation and fall into the Xeric soil moisture regime (USDI NRCS 2013). Measured precipitation at the closest weather station in Wenatchee, WA (approximately 30 miles away), ranged from 5 to 12 inches from 2003 to 2012 (NOAA 2013). The assessment area is at a higher elevation and receives more precipitation than Wenatchee. Conditions during field assessments were considered to reflect average growing conditions for the 9 to 15 inch precipitation zone.

Elevations in the assessment area range from about 1,200 to 3,000 feet. Major landforms include hills, escarpments, coulees, and small coverage by riparian flood plains and stream terraces. Slopes range from nearly level and undulating (1 to 8%), rolling and hilly (8 to 30%), to steep and very steep (25 to more than 45%).

Soil textures are predominately loamy with varying depths and amounts of coarse rock fragments. Rock fragments, both on the soil surface and within the soil profile, range from zero to more than 65 percent. Soil depths vary from shallow (less than 3 inches to a restrictive rock layer) to moderately deep (greater than 20 inches to bedrock).

Ecological Site Descriptions (ESDs) are used to describe rangeland ecological sites for use in inventory, monitoring, evaluation, and management of rangeland. ESDs document the characteristics of an ecological site and provide a consistent framework for describing and communicating information about land capability and suitability for various land uses. ESDs provide baseline resource information and/or benchmark data, plus alternate site resource information that can facilitate the planning process. They are a framework for stratifying and describing rangelands and their soil, vegetation, and abiotic features (USDI BLM, USDA FS, USDA NRCS 2013). The Natural Resource Conservation Service (NRCS) has developed ESDs based on specific soil types, precipitation zones, and location. They describe various characteristics and attributes including vegetative species and relative percent of production expected to be present on the site and how this vegetation responds to various disturbances. The IDT used these ESDs to evaluate departure from reference conditions, using the evaluation matrix for each soil type in the assessment area.

BLM-administered lands in the DCW support a range of ecological sites (Table 1 below). ESDs describe land units with distinctive types and amounts of vegetation (USDI BLM, USDA FS, USDA NRCS 2013), and are correlated to soil map units (Yanoff et al. 2007). ESDs often describe more than one soil series, and often have soil inclusions with conditions different than the dominant conditions described. ESDs are generally applied at small (site) spatial scales, and are based on expert knowledge and scientific literature (Yanoff et al. 2007).

Table 1. Ecological Sites Associated with the Assessment Area

ESD	Soil Type	Percent of BLM Lands
8XY102WA	Loamy 9-15 PZ	31
8XY103WA	Cool Loamy 9-15 PZ	11
8XY201WA	Dry Stony 9-15 PZ	8
8XY202WA	Stony 9-15 PZ	12
8XY301WA	Very Shallow 9-15 PZ	32
8XY602WA	Semi-wet Meadow 9-15 PZ	1
Rock Rubble	Rock Rubble	2
7XY102WA 8XY101WA 8XY203WA 8XY501WA 8XY502WA 8XY601WA	Loamy 6-9 PZ Dry Loamy 9-15 PZ Cool Stony 9-15 PZ Sandy 9-15 PZ Sands 9-15 PZ Wet Meadow 9-15 PZ	3

ESDs do not model succession, but instead describe reference states and transitions to and from departed states, as well as major disturbances that drive transitions between states (Yanoff et al. 2007). Reference condition is considered to be similar to the historic potential for the site (Yanoff et al. 2007). ESDs in this assessment were used in combination with other modeling and mapping products, in coordination with NRCS and applied IDT experience to inform standards. In this assessment, ESDs were used extensively to provide reference conditions against which sites were judged for Standards 1, 3 and 5 conditions. Support of native and sensitive wildlife species was also based on an independent habitat analysis (see Section 3.5 and Appendix C). Specific use of ESDs to inform standards is described in Section 3 by individual standard.

2.2 Vegetation

BLM-administered uplands in the DCW support shrub-steppe and steppe vegetation in a range of seral stages and ecological states. Shrub and herbaceous vegetation in the assessment area are detailed in ESDs (USDA NRCS 2013), and described as associations in Daubenmire (1970). On deeper soiled (greater than 10 inches) loamy and stony sites, shrub overstories are usually dominated by Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) and three-tip sagebrush (*A. tripartita)* with bitterbrush (*Purshia tridentata*) on mesic microsites. Typical associations include *Artemisia tridentata-Agropyron spicatum* and *Artemisia tridentata-Festuca idahoensis* (Daubenmire 1970).

Steppe vegetation in eastern Washington includes areas which are cool and moist and support occasional tree species, particularly on north-facing slopes, stream margins and draws, where snow melt provides appropriate soil moisture (Daubenmire 1970). Tree species in these moist areas include ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*).
The shrub-steppe ecosystem is dominated by perennial bunchgrasses and forbs (greater than 25% cover) with shrubs ranging from open to moderately dense (5 to 30%) cover. Daubenmire (1970) recorded that the average sagebrush cover in one sample site in Douglas County was 12 percent,

with a range of 5 to 26 percent for 15 sites within this *Artemisia tridentata - Agropyron spicatum* association. Daubenmire also indicated that in this association, sagebrush population density becomes static at 5 to 25 percent sagebrush cover when there is cover of perennial grasses (e.g. greater than 25%), but increases when these grasses are removed and increased soil moisture becomes available.

Very shallow sites (lithosols) include rigid sagebrush associations (*Artemisia rigida-Poa secunda*), as well as thyme buckwheat (*Eriogonum thymoides-Poa secunda*) associations on summits and north slopes, as described by Daubenmire (1970). Very shallow sites often support "biscuit-and-swale" topography, with mounded soils and rocky areas. These soil complexes include both thin-soiled plant associations and deep-soil associations.

Prominent herbaceous native grass species in the assessment area include bluebunch wheatgrass (*Pseudoroegneria spicata*), Idaho fescue (*Festuca idahoensis*), Sandberg's bluegrass (*Poa secunda*), and needle and thread grass (*Hesperostipa comata*). Prominent native forb species include several buckwheats (*Eriogonum spp.*), desert parsleys (*Lomatium spp*.), and lupine (*Lupinus spp*.) species. Common invasive plants in BLM-administered uplands in the DCW include annual bromes (*Bromus tectorum, Bromus squarrosus*), bulbous bluegrass (*Poa bulbosa*), and tall tumble mustard (*Sisymbrium altissimum*). Identified noxious weeds on BLM-administered uplands within the DCW include several species of knapweeds (*Centaurea diffusa, C. stoebe, Acroptilon repens*), Dalmatian toadflax (*Linaria dalmatica*), Canada thistle (*Cirsium arvense*), Russian olive (*Elaeagnus angustifolia*) and bull thistle (*Cirsium vulgare*). Noxious weeds and invasive species are further discussed under Standards 1, 2 and 3; special status plants are further discussed under Standard 5. Introduced grasses (*Thinopyrum spp., Agropyron cristatum*) have been planted in portions of the assessment area and are described in Management History (Section 2.6 below).

2.3 Fire Ecology and Fire Regimes

The variety and distribution of plant communities and seral stages in the DCW is a function of climate, geology, landform, and soil combined with:

- Disturbance regimes, particularly fire, but also drought, floods, and herbivory
- Historic uses (e.g. agriculture, grazing, mining)
- Short term weather patterns

Understanding the historic role of fire helps inform decisions on ecological status, trend, and treatment needs. Fire regimes have been mapped across the U.S. by LANDFIRE, also known as Landscape Fire and Resource Management Planning Tools, an "interagency vegetation, fire, and fuel characteristics mapping program, sponsored by the U.S. Department of the Interior (USDI) and the U.S. Department of Agriculture (USDA) (LANDFIRE n.d.).

Biophysical Settings (BpS) are the described native vegetation communities present in the pre-Euro-American era that developed under the influence of natural disturbances such as fire. BpS describe vegetation communities at a larger scale than ecological sites and are applied to characterize broad areas such as watersheds. Each BpS description characterizes the historic composition and dominance of seral stages for that setting, as well as the historic fire frequency

and severity. This historic condition can then be compared to the current condition to depict landscape trends in vegetation and fire regime departure. This departure is described by Vegetation Condition Class (VCC), the amount that current vegetation has departed from the simulated historical vegetation reference conditions, and is applied at coarse spatial scales (Yanoff et al. 2007).

The two dominant mapped BpS in the assessment area are Inter-Mountain Basins Big Sagebrush Steppe and the Columbia Plateau Steppe and Grassland, occurring at generally lower elevations and higher elevations, respectively. Based on predictions from the LANDFIRE description for Inter-Mountain Basins Big Sagebrush biophysical setting (NatureServe 2009) and from Evers (2010), the best estimates of fire regime for this setting includes return intervals of 35 to 200 years with mixed/low severity on warm dry sagebrush sites, and 200 years in shallow dry sites[1]. Several ESDs describing conditions in the assessment area suggest a 50-100 year fire frequency in the reference state (USDA NRCS 2013). In the Columbia Plateau Steppe and Grassland setting at higher elevations, more frequent fire was thought to maintain larger areas of grass dominated steppe. Fire return intervals may have been as short as 20 years in this setting (NatureServe 2009). The Spokane District BLM has documented less than 200 acres burned in the assessment area in the last 20 years. Over 50,000 acres have burned in multiple fires in Douglas County since 1972, including large recent fire complexes north of the DCW (Tucker and Bloch 2013).

2.4 Stream, Riparian Area, Spring and Wetland Conditions

Riparian systems in the DCW drain approximately 131,000 acres of private, BLM-administered, and State-managed land. Approximately 21.5 stream miles flow through BLM-administered lands within the DCW in two main creeks: Douglas Creek and Duffy Creek (Appendix A, A-2). Perennial and intermittent tributaries contribute to these creeks, some developing from springs. Due to the semi-arid climate and well-drained soils of the assessment area, few wetlands are present outside of riparian areas.

Streams and Riparian Areas

Streams in the DCW are sustained by groundwater, including perennial springs (Behne 2005). Higher flows occur in springtime, often associated with snowmelt. Douglas Creek is the largest riparian system in the assessment area, including approximately 13 stream miles in the assessment area and 29 miles in total. Duffy Creek is a tributary to Douglas Creek. The majority of Duffy Creek reaches flow through BLM-administered lands. Two other small, perennial riparian systems include BLM-administered lands in DCW. McCue Springs has a short (less than 0.5 mi.) riparian corridor contributing to Douglas Creek. Titchenal Canyon drains through a 2.1 mile perennial creek. These systems are described in Standard 2 (see Section 3.2) and summarized in Appendix B, Table B-1.

Douglas Creek supports stream types most closely resembling Rosgen E3 and E4 morphologies (Rosgen 1996). E3 and E4 type streams are characterized as entrenched, with low width/depth ratios (less than 12), occurring in alluvial valleys. Unlike typical E3 and E4 streams, Douglas

[1] Fire rotation, which is more commonly used in fire regimes with a high proportion of high severity fire, estimates the number of years it would take to burn an area equal to the size of the assessment area. However, within that area, a portion of the landscape burns only once, a portion burns more than once, and a portion does not burn (Agee 1993).

Creek occurs in a canyon-type valley (Rosgen type IV), and is less sinuous. Douglas Creek stream banks are stabilized by large materials (cobble and boulders). Douglas Creek is intermittent above the tributary junction with Duffy Creek. An abandoned railroad corridor (see Section 2.6), including its fill slope constrains channel morphology, limiting stream potential; however, valley width index (valley width/bank full width) is still over 5 in the majority of the drainage, allowing some channel evolution. Douglas Creek daily mean stream flow averages 12.7 cubic feet per second (cfs) with a standard deviation of 1.2 cfs and a range during the measurement period of 12 to 25 cfs (Behne 2005). This drainage has a large basin and can be flashy during thunderstorms and snowmelt events. Riparian vegetation along Douglas Creek supports streamside wetlands dominated by invasive populations of reed canary grass (*Phalaris arundinaceae*). The prevalence of reed canary grass, historic channelization, and current high density of beavers may limit overstory tree cover in Douglas Creek. Historic overstories probably supported more water birch (*Betula occidentalis*), aspen (*Populus tremuloides*), and cottonwood (*P. trichocarpa*) and included closed canopies (Crawford 2013, pers. comm.). Beavers have felled numerous overstory trees in the Douglas Creek riparian corridor limiting overstory shading opportunities (Behne 2011). Douglas Creek would meet Interim Riparian Management Objectives for the Inland Native Fish Strategy other than the lack of large woody debris (USFS 1995, p. 8). Douglas Creek has a healthy introduced rainbow trout (*Oncorhynchus mykiss*) population, as well as speckled dace (*Rhinichthys osculus*) and crayfish (*Pacifastacus lenisculus*) populations. Water quality in Douglas Creek is quantified below in Standard 4 (see section 3.4).

Duffy Creek supports morphology best classified as Rosgen E3 (Rosgen 1996) based on entrenchment, width/depth ratios, and slope. Reaches in Duffy Creek are less sinuous than typical E type streams and have slightly higher gradients. Banks are stabilized by large materials (cobble and boulders). Duffy Creek is spatially intermittent and includes a perennial spring-fed reach. Much of the length of this stream is dry for a significant amount of the summer season. Riparian vegetation along Duffy Creek is well developed. Overstories are dominated by hawthorn (*Crataegus douglasii),* and rose (*Rosa woodsii*); water birch (*Betula occidentalis*), white alder, and black cottonwood (*Populus trichocarpus*) are present in some reaches. Conifers (*Pseudotsuga menziesii* and *Pinus ponderosa*) are rare in this drainage. Both Douglas and Duffy creeks' riparian areas provide breeding habitat for migratory song birds.

Springs and Wetland Conditions

The BLM Spokane District has not developed its own wetland inventory, but instead relies on the U.S. Fish and Wildlife Service's (USFWS) National Wetland Inventory (NWI) data to classify wetland resources in the DCW assessment area. Based on the NWI mapping, in addition to field review and remote imagery, wetlands rarely occur in the assessment area (USFWS 2013).

No wetlands were encountered outside of stream riparian margins in the assessment area during field reviews. NWI mapping identified approximately 10.5 acres of wetlands in the assessment area including 6.5 acres of palustrine scrub/shrub and forested wetlands associated with the Douglas Creek riparian corridor, and 2 acres in the McCue Springs riparian corridor, analyzed in Section 3.2 below. Less than 1 acre of palustrine emergent wetland was identified and

approximately 1 acre of palustrine scrub/shrub and forested wetlands were identified associated with headwater tributaries to Douglas and Duffy Creeks.

A number of isolated springs, including McCue Springs, exist within the assessment area and directly contribute to Douglas and Duffy Creek. Developed springs in assessment area were not inventoried by the IDT. However, the BLM's Spokane District range program maintains information on these features. Documented developed springs are listed and described in the Findings and Analysis section for Standard 2 (See Section 3.2).

2.5 Prehistory and History

A Paleo-Indian presence on the mid-Columbia Plateau has been dated to approximately 12,000 years before present (B.P.) at the Roberts site (45DO482) in East Wenatchee, Washington. Though the physical evidence for these early human populations is sparse on the Columbia Plateau, it is believed that human groups were highly nomadic generalized foragers and hunters who relied upon seasonally available resources. Later periods in prehistory are better represented in the region's archaeological record which shows that the nature of early human populations on the mid-Columbia Plateau changed over time, partly in response to a shift from a more moist to a drier climate. The pattern of cultural adaptation shows a change from small nomadic foraging and hunting groups who relied primarily upon upland resources to larger, socio-organizationally complex, semi-sedentary populations that established winter settlements along river corridors and stream confluences. Subsistence relied very heavily, though not exclusively, upon riverine resources. Such was the nature of indigenous Plateau cultures at the time of Euro-American contact in the early 19th century.

Ethnohistorians place the DCW within the traditional territory of the Sinkayuse (Moses-Columbia) tribe which presently holds constituent membership in the Colville Confederated Tribes and for whom the area has traditional significance; historically, territories were often shared with neighboring tribes. A regional tribal trading center existed near the present-day town of Waterville and Indian place names still exist for numerous localities in the watershed. Large numbers of Euro-Americans migrated to the west between 1805-1850 leading to conflicts over land and resources between indigenous populations and settlers; these reached an apex by the mid-19th century. The US government, eager to end the controversies, negotiated with Plateau Tribes for the establishment of Indian reservations. In the Treaty of 1855, the Yakama Nation (a confederacy of 14 Plateau tribes) ceded lands in the Douglas Creek watershed to the federal government, but retained the right to acquire resources (gather, hunt, and fish) on their ceded lands in what is now Washington State.

Henceforth, settlement and development of the Washington Territory was encouraged by the US government as it sold parcels and issued homestead and railroad grants, and mining patents. Homesteading in the Douglas Creek area began in 1893 when Edward Duffy purchased 160 acres of land; homesteading and agricultural development in the area would continue expanding well into the 1930s. The Northern Pacific Railroad was issued a grant for nearly 90,000 acres in Washington State in 1901, including large areas of Douglas County. The Great Northern Railroad constructed its Mansfield spur through Douglas Creek and down Moses Coulee to the Columbia River between 1908 and 1909. The rail line sustained significant damage during severe flooding in 1948; though numerous repairs were completed over the years, it was not

economically sustainable and the line was decommissioned in 1985. The GNRR-Mansfield spur was evaluated for listing in the National Register of Historic Places and was found to be ineligible, lacking sufficient integrity. Today, the rail line's remnants are managed for recreational and historical interpretive values.

Existing Washington State Department of Archaeology and Historic Preservation databases and records on file with the BLM Spokane District office indicate that cultural resources inventories have been completed in approximately 40 percent of BLM lands in the watershed; these areas have been examined at intensive Class III levels for cultural resources and have identified numerous pre-contact and historic period archaeological sites.

2.6 Management History

Much of the assessment area was acquired under the Land and Water Conservation Fund (LWCF) Act in the period from 1994 to 2004. The LWCF was directed towards acquiring land for natural resource benefits including open space, wildlife habitat, and recreation. The RMP direction for the Douglas Creek Management Area follows the LWCF direction and emphasizes management of lands for recreation, wildlife habitat, grazing, and soil and water (in order of emphasis) (USDI BLM 1987). This order of emphasis reflects the priority in which funds for the different resource management programs would be allocated in annual work plans (USDI BLM 1987, p. 8). To meet habitat management goals, the RMP also directed improvement of wildlife habitat in the Douglas Creek riparian area. Improvements included management of plant cover such as directed planting of shrubs and grasses, controlling noxious weeds, and excluding livestock grazing from specific areas (USDI BLM 1987).

Livestock Grazing

The DCW includes five grazing allotments and a small parcel of grazing allotment 0770, incorporating approximately 11,496 acres (Table 2). Four of the five allotments are currently authorized for livestock grazing use. Because the majority of grazing allotment 0770 is outside the watershed boundary, it will not be assessed in this analysis. Allotment 0770 will be assessed as part of the Lower McCartney Creek Watershed (Appendix A, Map A-3).

Livestock grazing has been analyzed for the BLM lands in the DCW in the following documents:

- Spokane District Resource Management Plan Record of Decision (RMP ROD 1987)
- Duffy Creek Allotment Management Plan and Environmental Assessment (EA) (USDI BLM 1999a)
- Environmental Assessment for the State Land Exchange (USDI BLM 1999b)
- Environmental Assessment for the Central Washington Land Exchange (CWALE) (OR-134-00-03) (USDI BLM 2001b)
- Categorical Exclusion for purchasing four separate tracts of private land within the Moses Coulee Land and Water Conservation Fund Project Area (OR-134-04-CX-05) (USDI BLM 2004)

All allotments in the Spokane District have been categorized as *Improve* (I), *Maintain* (M), or *Custodial* (C), based on resource values and opportunities for improvement (USDI BLM 1987, p. 24-25). The Spokane District RMP/ROD describes these categories as follows: "I allotments are usually areas which have a potential for resource improvement where BLM manages enough land to implement changes. M allotments are usually those where satisfactory management has

already been achieved through conservation plans or cooperative agreements with adjoining landowners. C allotments are unfenced, small tracts which are intermingled with much larger acreages of non-BLM rangelands, thus limiting BLM management opportunities" (RMP ROD USDI BLM 1987, p. 24-25).

Table 2. Grazing Allotments: Summary of Current Permitted Use

Douglas Creek	0778	Improve	4/01-7/15	200 Cattle	8 Ac/ AUM	3,840	480
Duffy Creek	0779	Improve	4/15-11/10	105 Cattle	8.6 Ac/ AUM	6,070	709
Rimrock[2]	0790	Custodial	3/21-5/31	250 Cattle	13 Ac/ AUM	229	17
Slack Canyon	0774	Custodial	6/01-7/31	30 Cattle	13 Ac/ AUM	40	3
Titchenal Canyon	0773	Custodial	4/5-10/31	53 Cattle /2 Horses	9.9 Ac/ AUM	647	65

[1] Total livestock stocking, including all ownerships.
[2] The Rimrock allotment is currently closed and not grazed by livestock.

Douglas Creek Allotment
Allotment 0778, the Douglas Creek allotment, encompasses 3,840 acres and is located approximately 25 miles east of Wenatchee, Washington. The allotment ranges in elevation from approximately 1,600 to 3,400 feet. Topography varies from gentle to steep, with approximately five miles of stream that runs through the allotment. This allotment includes five pastures: One, Two, Three, Four, and Five (Appendix A, Map A-3). This allotment is classified as an I (Improve) selective management category allotment for the purposes of management.

Historically (prior to BLM management) the Douglas Creek riparian area was heavily grazed by cattle throughout the spring and summer months, while surrounding uplands were grazed in the spring and early summer. After BLM's acquisition of the allotment in 1974, a Habitat Management Plan (HMP) was developed. However, the plan was not implemented due to drought years during the mid-seventies and the lack of water developments. Construction of a fence in 1976 excluded livestock from the riparian area along a portion of Douglas Creek. Riparian vegetation along this shoreline is well established. An Allotment Management Plan (AMP) was implemented for this allotment in 1980. In 1981, grazing preferences were cut in half due to the uneven distribution of grazing patterns. The seeded areas and areas adjacent to watering facilities were heavily grazed while other portions of the allotment were not grazed. At that time, the Douglas Creek Habitat Management Plan was revised and expanded to protect some of the heavily grazed upland and riparian areas. Protective fencing was constructed in 1983 around selected areas allowing significant recovery of the upland and riparian vegetation.

In 1983, the grazing lessee lost control of the base property and the grazing lease was canceled. The allotment was rested for two years between 1983 and 1984. In 1985 a local rancher leased the allotment under the stipulation that an Allotment Management Plan (AMP) would be implemented in the future. Interim management prescribed two years of spring grazing followed by two years of fall grazing.

The Douglas Creek AMP was signed in the fall of 1987 and called for the construction of fences and water developments in order to implement a rotational grazing system. Two springs were developed to provide water for livestock, thus improving distribution. Shade structures were also constructed to improve livestock distribution.

The permitted use on the Douglas Creek allotment is 480 AUMs. The current management plan is for spring grazing of 200 cattle, rotating through the five pastures from May 1st to July 15th.

Douglas Creek Canyon, the unleased area east of the Douglas Creek allotment, has not been included in a grazing lease since 1974 (Appendix A, Map A-3). The Douglas Creek Canyon (approximately 1,613 acres) will be addressed as a separate management unit in this land health evaluation.

Duffy Creek Allotment

In 1995, approximately 5,584 acres were donated to the BLM by the Richard King Foundation. Portions of these donated lands and other lands were combined to form Allotment 0779, known as the Duffy Creek allotment, is a part of BLM's Douglas Creek Management Area. The Duffy Creek allotment encompasses approximately 6,070 acres and is located approximately 23 miles east of Wenatchee, Washington. The allotment ranges in elevation from approximately 2,100 feet near the mouth of Duffy Creek to 3,600 feet. This allotment includes eight pastures: North, South, Breeding, Corral, CRP, Front, Hay, and Well (Appendix A, Map A-3).

Historically (prior to BLM management), the Duffy Creek allotment was grazed season long, from spring to early winter. Stocking rates were moderate to high. In 1985, a conservation plan was developed by the Natural Resources Conservation Service (NRCS) and rotational grazing was applied to promote range recovery. In 1995, the BLM acquired the property and offered the same lessee a non-renewable lease that reduced the stocking rate and continued rotational grazing until a current AMP could be developed. In 1999, that AMP was developed. It included improvements such as fence construction and repairs to help with the planned grazing rotation, water developments to aid in better cattle distribution and to provide water in areas that had none, and fence to exclude livestock from the Douglas Creek riparian area. This allotment has several previously farmed fields that were seed under the Conservation Reserve Program (CRP). Seedings occur in the Well and CRP pastures (CRP seedings and program described below).

Currently, the 6,070 acre allotment is managed as an I category allotment with a permitted use of 709 AUMs. Cattle are grazed on a rotational schedule through the eight pastures from April 15th to November 10th.

The AMP directing management in the Duffy Creek CRP pasture assumed that 200 acres of this pasture would be seeded with native grasses, shrubs and forbs (USDI BLM 1999a). In 2000, approximately 84 acres of the CRP pasture were excluded from grazing for shrub-steppe restoration. This area has been excluded from livestock grazing since that time, through voluntary actions of the lessee, and restoration activities have continued in the enclosed area. For the purposes of this analysis, these 84 acres are included with the adjacent Unleased West area, since its management is similar to management in the Unleased West area (described below).

Over the past eight years, several of the water developments in this allotment have failed due to lack of water in the system. Because of this lack of water availability, the grazing use on the allotment has been voluntarily reduced by the grazing lessee to 40 cattle from April 22nd to November 3rd, only utilizing 302 of the 709 AUM authorized. The Front and CRP pastures are grazed together as water is unavailable in the CRP pasture (discussed below in Section 3.2.3).

New Acquisition
North-central portions of the BLM-administered lands in DCW were acquired in 2004 and are herein referred to as the "New Acquisition" (Appendix A, Map A-3). The New Acquisition is approximately 1,000 acres in size and is not currently authorized for grazing. Prior to BLM acquisition of this parcel, the area was used for grazing and dryland wheat production. During that time, grazing occurred during the spring or fall on agricultural areas (approximately 300 acres) and the remaining land was grazed season long.

In the 1960s, the wheat field was enrolled in the CRP and seeded by the private landowner, and grazing occurred in the spring or fall only on areas outside of the CRP field. From 1985 to the present, this area has been used as the trailing access to the Douglas Creek allotment and there is an existing application for livestock grazing in this area. The proposed use by the applicant is to graze the New Acquisition in the late winter/early spring; this area would be managed as part of the Douglas Creek Allotment.

Rimrock Allotment
Allotment 0790, known as the Rimrock allotment, encompasses 229 acres of BLM land (Appendix A, Map A-3). The allotment is located in Douglas County, and is approximately 13 miles southeast of Waterville, Washington. The allotment is currently not leased and is not grazed by livestock. Historically, the allotment was managed as a C allotment and was grazed by cattle from 1983 to 1991. The allotment historically had a permitted use of 17 AUMs, grazed in spring seasons. Approximately 350 acres of unleased BLM-administered lands east of the Rimrock Allotment are included with the Rimrock Allotment for purposes of evaluation (Appendix A, Map A-3).

Slack Canyon Allotment
Allotment 0774, known as Slack Canyon allotment, encompasses 40 acres of BLM land (Appendix A, Map A-3) and is grazed in conjunction with private lands owned by the lessee and The Nature Conservancy lands that surround the allotment. The allotment is located in Douglas County, and is approximately 11 miles southeast of Waterville, Washington. Season of use on the allotment is from June 1st to July 31st, utilizing 3 AUMs on BLM land. The allotment is currently classified as a C allotment.

Titchenal Canyon Allotment
Allotment 0773, known as Titchenal Canyon allotment, encompasses approximately 647 acres of BLM lands (Appendix A, Map A-3) intermingled with 1,120 acres of private lands owned by the lessee. The allotment is located in Douglas County and is approximately 7 miles southeast of Waterville, Washington.

Historically, the allotment has been grazed season long, from spring to early winter, with a moderate stocking rate. Currently, Titchenal Canyon is classified as a C allotment, with a permitted use of 65 AUMs.

Unleased West
In addition to Douglas Creek Canyon and the New Acquisition area, the western edge of the assessment area includes approximately 675 BLM-managed acres not currently leased for grazing (Appendix A, Map A-3). For the purposes of this assessment, 84 acres in the adjacent CRP Pasture of Duffy Creek is analyzed with this Unleased West area, since its management is similar to management in the Unleased West area. This brings the total area analyzed for the Unleased West area to 759 acres. Management history prior to BLM acquisition includes limited grazing and CRP seeding. BLM restoration activities including removal of non-native grasses, herbicide application, seeding of native grasses and forbs have occurred on over 175 acres in this area.

Vegetative Treatments

Approximately 61percent of the DCW (all ownerships) and 12 percent of the assessment area (1,744 acres of BLM-administered land) is modeled as agricultural by LANDFIRE (USDI and USDA 2009). Much of the land modeled as agriculture in private ownership is farmed for dryland wheat. All BLM-administered lands modeled as agriculture have been tilled and planted with non-native grasses, primarily under the CRP, with a historic management goal to improve wildlife habitat and stabilize soil (USDA FSA 2013). BLM and NRCS records indicate that only 722 acres of the assessment area were enrolled in the CRP program prior to BLM management. However, these historic records are incomplete.

Historic grass seedings in the assessment area included crested wheatgrass (*Agropyron cristatum*), tall wheatgrass (*Thinopyrum ponticum*), intermediate wheatgrass (*Thinopyrum intermedium*), alfalfa (*Medicago sativa*), and smooth brome (*Bromus inermis*). Crested wheatgrass was chosen because it was marketed as a good soil stabilizer. It was also known as good spring forage for livestock (as it could withstand moderate to heavy spring grazing) and was inexpensive to purchase.

Since 2003, the BLM Wenatchee Field Office (WFO) has retreated more than 175 acres of these non-native grass seedings with the goal of restoring native shrub-steppe ecosystems. Re-treatment has included removal of non-native grasses and planting of native grasses and (occasionally) forbs. Succession/phase transition has also occurred in CRP fields not receiving restoration. Cover by native shrubs, grasses, and forbs have increased in these maturing CRP stands. Cover by invasive annuals and bare ground has also increased. The BLM has also treated invasive species in approximately 400 acres of the assessment area, including 2.5 acres of the Douglas Creek floodplain (Appendix B, Tables B-2 and B-3). The influence of these

different vegetation treatments (e.g. native and non-native seedings, weed treatments) on range health is discussed in Section 3.1 below.

Special Management Designations

No Wilderness, Wild and Scenic, Areas of Critical Environmental Concern, or comparable special management areas have been designated in the assessment area.

Mining, Mineral and Abandoned Mine Lands

The assessment area is not heavily mineralized and therefore has little mineral activity within it. Currently there are no 43 CFR 3809 Mining Plans of Operation, mineral material sites, or sales in the assessment area, nor is there any oil and gas activity in the assessment area.

Recreation

The assessment area has two main areas of recreation use; 1) the Douglas Creek riparian corridor and, 2) the Duffy Creek uplands and riparian corridor. Visitor use in the Douglas Creek riparian corridor includes hiking, camping, mountain biking, equestrian riding, bird watching, swimming, fishing, and hunting. Additionally, three watchable wildflower areas have been described in this watershed. The Douglas Creek riparian corridor has two watchable wildflower areas – one at each end of the creek, and the Duffy Creek uplands have one in the corral pasture area.

Approximately 8,500 people visit the Douglas Creek area every year (USDI BLM 2012). Most of the visitor use occurs along the Douglas Creek riparian corridor, from May through to October, with use concentrated in the pools and dispersed camping areas. The majority of visitors come in relatively small groups for day use or short-term stays, focused along the main access road near the creek. Visitors are mainly from the North Central Washington, though some visitors come from further across the state.

There are three main dispersed camping areas (no facilities) located in the Douglas Creek riparian corridor. These and several other less-used dispersed camping sites are located in the riparian zone immediately adjacent to the creek. Visitors access the Douglas Creek corridor from the north via Slack Canyon, or from the south off of Palisades Road in Moses Coulee. A high-clearance vehicle is needed to get through the middle section of Douglas Creek and its many creek crossings. As a result, many people visit either the north or south end of the corridor.

The north end of the Douglas Creek riparian corridor primarily receives camping, hunting, fishing, and hiking use. The perennial stream creates a desert oasis which makes the Douglas Creek area attractive for wildlife and wildflower viewing throughout the year, and the area is a known neotropical migrant bird route. At the south end of the Douglas Creek riparian corridor, there is a succession of deep pools carved into the bedrock along the creek that attract day use visitors for swimming, picnicking, and hiking.

The majority of hikers use the trailhead at the junction of Slack Canyon and Douglas Creek to access the eight mile rail-trail that lies primarily on BLM land. Trailhead facilities include a parking area and information kiosk that provides public information about BLM regulations and a map of the recreation opportunities in the area. The rail-trail is designated non-motorized and

is mainly used by hikers and mountain bikers. Hikers also explore the ridges, cattle trails, and old roads in the area.

Off-road vehicles are limited to designated roads and trails in the Douglas/Duffy Creeks area. However, unauthorized OHV use is prevalent, near the south (and to a lesser extent, the north) ends of Douglas Creek, where numerous OHV roads cross the landscape. Some OHV roads access an old road, providing a route around a road collapse, while others cut through the sagebrush, creating new roads and trails in the Douglas Creek Canyon and the New Acquisition.

Visitors are drawn to the Duffy Creek area for its views of the Cascade Range, Waterville Plateau and the blankets of wildflowers across the land, which make it a popular spot in the early spring. Approximately 1,000 people visit the Duffy Creek area each year (USDI BLM 2012), mainly from May through October. Visits are primarily day use and from the local North Central Washington area. Access into Duffy Creek is from the Titchenal Canyon Road to the north, Rock Island Road to the west, or by non-motorized use from the Douglas Creek area to the east. There is a kiosk with public information about BLM regulations and a map of the recreation opportunities in the area posted at the Titchenal Canyon access point. Visitors hike and hunt in the uplands and near Duffy Creek along old roads and cattle trails that meander across the meadows and down into the Duffy Creek and Douglas Creek riparian corridors. OHV use in this area is limited to designated roads and trails, primarily Sheehan Road and an unnamed road accessing Duffy Creek. The Duffy Creek main access road is closed to vehicle travel east of the corrals at NE ¼ SE ¼ Sec. 12, T. 23N, R. 22E, although there is evidence of recent unauthorized OHV use.

3. Standards

In this report, units are evaluated against the Standards for Rangeland Health and Guidelines for Livestock Grazing for Oregon/Washington (USDI 1997); these Standards are included in Appendix D. Evaluation findings are summarized for each grazing allotment and all unleased areas in the DCW for Standards 1, 3, and 5. Standard 2 findings are summarized for streams and wetlands within allotments in the DCW. Standard 4 is summarized at the watershed scale.

For each Standard, available monitoring data, existing inventories, historical and recent photographs, and the Technical Reference 1734-6 (Pellant et al. 2005) protocol are used by the Interdisciplinary Team (IDT) to assess condition and function of BLM-administered lands. This process is further described by standard in Sections 3.1 through 3.5. Results of this process, including technical references, BLM policy and procedure handbooks, and monitoring guidelines and methodologies, are available for review at the BLM WFO. This assessment will not report forest health conditions since BLM-administered lands in the DCW functionally support no forested stands.

Evaluations regarding system or unit function are made for each Standard 1, 3, 4 and 5, using the following classes: “Achieving Standard”, “Not Achieving Standard”, or “Making Significant Progress” towards meeting standards. In general, systems achieving standards have conditions that can sustain natural biotic communities and processes. Achievement of standards is equivalent to properly functioning condition as defined for both upland and riparian systems (USDI 1997, p. 17). Systems or units not achieving standards have moderate or greater

departure from expected conditions in identified, standard-specific indicators. Conclusions regarding riparian-wetland function are made for Standard 2 using the following classes: “Proper Functioning Condition (PFC)”, “Functioning at Risk (FAR)”, or “Nonfunctioning Condition (NF)”, as defined and detailed Prichard (1998) and Prichard (2003). Criteria for classifying allotments, streams, watersheds or habitats supporting species as Achieving Standards or Not Achieving Standards and as PFC, FAR, or NF are described by Standard in Sections 3.1 through 3.5.

Consideration of the five land health Standards in this assessment will include the following components:

- **Definition** of range land health standards, as provided by the Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the States of Oregon and Washington (USDI 1997)

- **Methods** used to assess Standards within the DCW

- **Findings and Analysis** of the condition of the assessment area conducted by the IDT during field assessment and subsequent evaluation

3.1 Standard 1: Watershed Function-Uplands

3.1.1 Definition

Upland soils exhibit infiltration and permeability rates, moisture storage, and stability that are appropriate to soil, climate, and landform (USDI BLM 1997, p.7).

Potential indicators of Watershed Function-Uplands noted in Standards for Rangeland Health (USDI BLM 1997) include:

- Amount and distribution of plant cover (including forest canopy cover)
- Amount and distribution of plant litter
- Accumulation/incorporation of organic matter
- Amount and distribution of bare ground
- Amount and distribution of rock, stone, and gravel
- Plant composition and community structure
- Thickness and continuity of A horizon
- Character of micro relief
- Presence and integrity of the soil profile
- Biological activity (plant, animal, and insect)
- Absence of accelerated erosion and overland flow

Indicators used in this analysis are described in Section 3.1.2.

3.1.2 Methods to Determine Conformance with Standard 1

Uplands in the DCW assessment area were assessed primarily using Interagency Technical Reference 1734-6, *Interpreting Indicators of Rangeland Health* (Pellant et al. 2005). This process evaluates 17 "indicators" (e.g. soil compaction, water flow patterns, and plant community composition) to assess three interrelated components or "attributes" of rangeland health-namely soil/site stability, hydrological function, and biotic integrity. These 17 Indicators of Rangeland Health (IRH) include and are an enhancement of the potential indicators for Standard 1 described in the Standards for Rangeland Health (USDI BLM 1997, p. 7) (see Appendix B, Table B-4). Classification of indicators was informed through collecting of several site-scale quantitative measures (as described below) by the IDT at most sites assessed.

During the summer of 2012, the IDT collected range health data at 29 plots, including line-point intercept transects quantifying native and invasive plant and bare ground cover, soil stability tests, presence of plant functional/structural (F/S) groups (plants with similar ecological roles), and classification of the 17 IRH. Line-point intercept transects were used to quantify plant composition, cover, bare-ground cover, soil stability and soil crust cover. Plots were established using stratified random sampling; stratification was based on ecological sites within pastures. Plots were assigned to ecological sites within pastures, at a sampling rate of 1-3 plots per pasture except for Douglas Four, which received only observational sampling (Appendix A, Map A-3). Collected data is summarized in Table B-10, Appendix B. Draft ESDs obtained from NRCS were used to rate the 17 IRH.

The rating of each indicator in the evaluation area is based on that indicator's degree of departure from the reference sheet and evaluation matrix included in the draft ESD. The reference sheet describes a range for each indicator based on expected spatial and temporal variability within each ecological site, and is summarized in the "none-to-slight" descriptor in the evaluation matrix. Ratings for individual indicators were then used to determine the degree of departure, based on a preponderance of evidence, for each of the three attributes: soil site stability, hydrologic function, and biotic integrity of rangeland health (Pellant et al. 2005). Classifications for degree of departure include: none-to-slight (NS), slight-to-moderate (SM), moderate (M), moderate-to-extreme (ME), and extreme (E).

Technical Reference 1734-6 (Pellant et al. 2005) recommends obtaining ESDs and associated Reference Sheets from NRCS as they become available to compare to site conditions. In Washington, these documents are still in draft form, but are still considered the best available information and have been used in analysis by other agencies (e.g. USGS, NRCS, and USDA). Potential inconsistencies between draft reference sheets and ecological processes observed in the analysis area were noted; information gathered during this and future analyses will be provided to NRCS for consideration in future ESD revisions.

Upland range health attributes and departures from reference conditions characterized at site scales were summarized at the pasture scale (Appendix B, Table B-5**)** and synthesized at the allotment scale (Table 2 below).

In addition to collected range health data, the IDT used the following data sources and references to describe the condition of uplands in allotments or similarly-sized management units:

- Long term trend data including photographic records and vegetation data (range health transect lines)

- Field reviews to generalize range health plot data (described above) to larger spatial scales, such as pastures. Application of plot results to pasture scales involved the IDT's consensus and observations made during the field assessments

- Plant lists created during pasture-scale reviews. These lists were also relevant for gauging site departure from reference F/S groups

- Remotely-sensed data including satellite imagery

- Plant associations describing the area, developed by Daubenmire (1970)

- Bio-Physical Settings Descriptions (LANDFIRE 2013a)

IRH findings developed for this standard were summarized at allotment or similar spatial scale. Upland function was only assessed for BLM-administered lands in the DCW.

For Standard 1 findings, upland areas that were found to be in none-to-slight or slight-to-moderate departure from expected conditions (for range health attributes) were considered to be "achieving" Standard 1. Areas with a moderate or larger departure from reference conditions were classified as "not achieving" Standard 1.

3.1.3 Findings and Analysis: Standard 1

Table 2 below summarizes attributes of Standard 1 land health and functional rating for allotments and unleased areas in BLM-administered lands in the DCW, where IRH were assessed. All allotments (and similarly sized unleased areas) in the assessment area were found to be achieving Standard 1 by the IDT. In general, allotments had soil site stability and hydrologic function minimally departed from reference conditions. Biotic integrity had slight to moderate departure from reference conditions for all allotments studied in the assessment area, primarily due to invasive species and agricultural practices. The findings in this table are discussed in detail below, by allotment.

Table 2. Assessment of Allotments within BLM-administered Uplands in the DCW. Classifications include none-to-slight (NS), slight-to-moderate (SM), and moderate (M), and status of "Achieving" or "Not Achieving" Standard 1.

Allotment name	**Ecological Sites**[1](%) sample size **(n)**	**Soil site stability**	**Hydrologic function**	**Biotic integrity**	**Status**	**Notes on departure**
Douglas Creek Canyon[2]	Loamy 9-15 (10%) Cool Loamy 9-15 (22%) Stony 9-15 (43%) **(1)**	NS	NS	SM	Achieving	Occasional site-scale dominance of weeds adjacent to road and access points.
Douglas Creek	Loamy 9-15 (50%) **(5)** Cool Loamy 9-15 (16%) **(1)** Stony 9-15 (6%) **(2)**[4] Very Shallow 9-15 (19%)	SM	SM	SM	Achieving	Departed F/S groups and soil condition due to tilling, seeding.
Duffy Creek	Very Shallow 9-15 (50%) **(6)** Loamy 9-15 (19%) **(7)**[5] Dry Stony 9-15 (11%) Stony 9-15 (11%)	NS	NS	SM	Achieving	Lithosols with occasional soil loss, rills. Invasive annual grasses in disturbed areas.
New Acquisition	Loamy 9-15 (32%) **(2)** Stony 9-15 (20%) Very Shallow 9-15 (17%) **(1)** Cool Loamy 9-15 (15%) Dry Stony 9-15 (11%)	NS	NS	SM	Achieving	Seeded portions of the new acquisition departed due to plow pans, rows, non-native species.
Rimrock[3]	Stony 9-15 (45%) **(1)** Rock rubble (25%) Dry Stony 9-15 (12%) Very Shallow 9-15 (11%)	NS	NS	SM	Achieving	Localized OHV use has created compaction and gullies, changed F/S groups.
Titchenal canyon	Very Shallow 9-15 (63%) Loamy 9-15 (24%) **(1)**	SM	SM	SM	Achieving	Portions of lithosols have reduced F/S group diversity.
Slack canyon	Loamy 9-15 Pz (64%) **(1)** Very Shallow 9-15 (28%)	NS	NS	SM	Achieving	Cheatgrass established, but not dominant or changing F/S groups.
Unleased: West	Very Shallow 9-15 (49%) **(1)** Loamy 9-1 (37%)	NS	NS	SM	Achieving	Seeded areas have modified F/S groups, weak plow pans. Native lithosols have rare water flow patterns, rills, square brome.

[1] Ecological sites comprising ≥10% of the allotment or with sample plots are depicted in order of cover amount.
[2] This evaluation unit includes 14 acres of adjacent, contiguous unleased BLM-administered lands in allotment 0770, included here in analysis due to proximity.
[3] This evaluation unit includes approximately 350 acres of unleased BLM-administered lands east of the Rimrock Allotment.
[4] Sample includes one Dry Stony 9-15 PZ plot.
[5] Sample includes one Cool Loamy 9-15 PZ plot.

Douglas Creek Canyon (Unleased Area)

Figure 1. Douglas Creek Canyon. Plot DC-9, Stony ecological site.

Douglas Creek Canyon includes unleased BLM-administered lands east of the Douglas Creek Allotment (Map A-3, Appendix A). A habitat management plan developed in 1974 excluded grazing from this area. A later AMP (USDI 1987) affirmed that cattle grazing would be excluded from this area, and subsequent grazing leases have excluded this area. Therefore, the Douglas Creek Canyon (approximately 1,613 ac.) is treated as an independent unit for analysis in this land health evaluation. Additionally, 14 acres of adjacent, contiguous unleased BLM-administered lands in allotment 0770 are included with Douglas Creek Canyon area for analysis, due to proximity within the watershed.

The IDT determined that Douglas Creek Canyon as a whole is achieving Standard 1 (Watershed Function-Uplands) with near reference conditions for soil and hydrological attributes, and slight-to-moderate departure from ecological site reference conditions for its biotic attribute. Douglas Creek Canyon has small-scale, localized dominance of weeds adjacent to roads and access points (<100 acres). The IDT identified concern that invasive plants could expand from the well-used Douglas Creek Road into lower slope positions in this area, given disturbance. Conditions in the Douglas Creek riparian area are evaluated under Standard 2 and 4.

Douglas Creek Allotment

Figure 2a. Douglas Creek Allotment plot 52, typical conditions.

Figure 2b. Douglas Creek Allotment plot DC-22, typical conditions.

The IDT determined that the Douglas Creek allotment as a whole is achieving Standard 1 (Watershed Function-Uplands) with slight-to-moderate departure from ecological site reference conditions. Much of the Douglas Creek allotment is near reference condition for soil and hydrological indicators (i.e. few rills, open areas, or water flow paths). Several areas had evidence of blocky soil structure within the top 6 inches, an indicator of subsurface soil compaction in loamy soils (Pellant et al. 2005). Other evidence of departure included movement of litter including larger pieces and longer travel, and water flow patterns in excess of expectations.

F/S groups (as defined by Pellant et al. 2005) in the allotment have densities and diversities slightly departed from reference conditions, outside of seeded areas and portions of Pasture One (described below). Reduced F/S diversity appeared to be associated with cover by invasive annual grasses, and reduced shrub covers in some areas.

More than 300 acres (8%) of the allotment have been tilled and seeded with non-native grasses, changing F/S groups and soil conditions. Management changes in F/S groups and topsoil have led to departure from reference conditions in these patches. Seeded non-native grasses occur in portions of Pastures One and Two.

Although Douglas Creek allotment was found to be achieving Standard 1 for upland watershed functions at the allotment scale, departures were found within two pastures:

- **Douglas One:** Pasture One includes a departed south-facing hill slope that is not achieving Standard 1 (approximately 150 acres). F/S groups on this slope have been completely changed and are dominated by cheatgrass and Jim Hill mustard (*Sisymbrium altissimum*). Soil resistance is low.

Figure 3. Douglas Creek Allotment Pasture One, plot DC-11. Departed hillside (foreground) and functional shrub-steppe (distance).

- **Douglas Five:** Portions of loamy ecological sites in Pasture Five include large water flow paths, extensive bare ground, and higher cover by species that increase following disturbance (increasers, see Glossary) than listed in reference states. These departures are not typical for the entire pasture, and departures were not sufficient to identify any portions of this pasture as "Not Achieving" Standard 1.

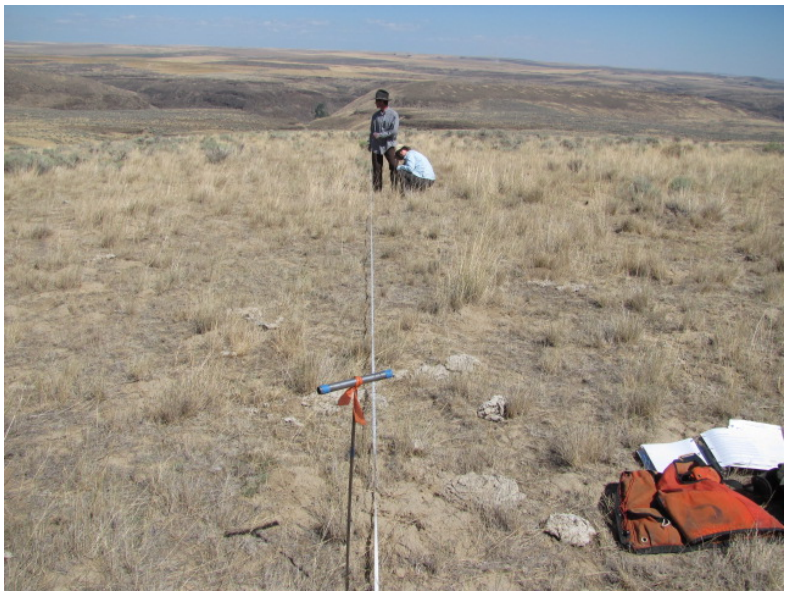

Figure 4. Douglas Creek Allotment Pasture Five, plot DC-65. Localized higher bare ground and Increaser cover, lower cover by Decreasers compared to similar loamy sites in the allotment.

Duffy Creek Allotment

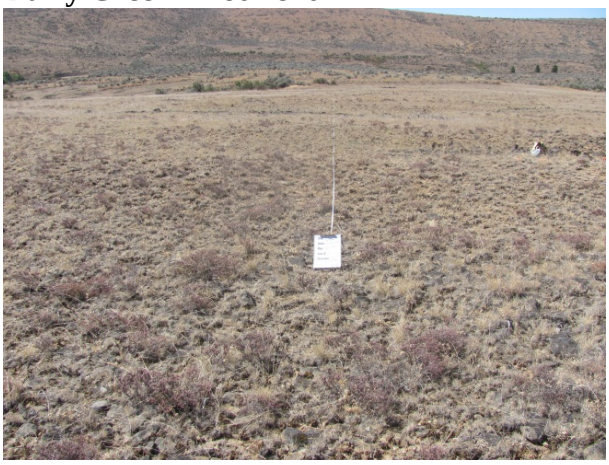

Figure 5a. Duffy Creek Allotment Hay Pasture, plot DU-120. Typical lithosol (very thin soil).

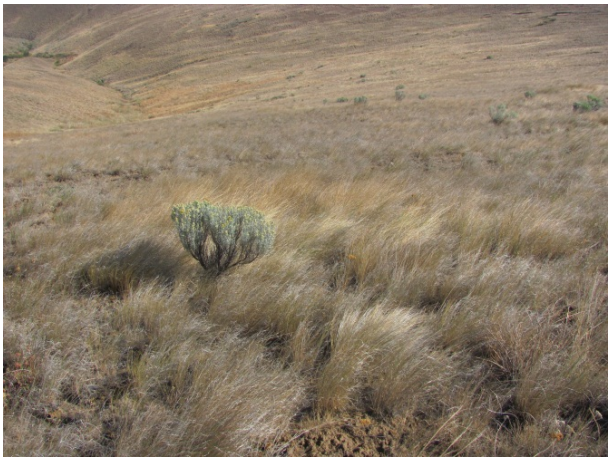

Figure 5b. Duffy Creek Allotment South Pasture, plot DU-85. Typical loamy ecological site.

The IDT determined that the Duffy Creek allotment as a whole is achieving Standard 1 with generally good rangeland health, and little departure from ecological site reference conditions. F/S groups are intact in the majority of the allotment, outside of seeded areas. Dominant cool-season grasses persist.

Approximately 130 acres of the Duffy Creek allotment was historically farmed and then reseeded with crested wheatgrass as part of the CRP. This past management has caused changes in F/S groups and topsoil leading to a departure from reference conditions. The IDT noted that this area was in an apparent upward trend with increasing cover by native shrubs and forbs. Invasive annual bromes have sporadically invaded interspaces.

Invasive annual grasses are present in disturbed patches within the allotment, but do not reduce the diversity or composition of F/S groups in pastures with a few within-pasture exceptions (noted below). Invasive forb species are not frequent in upland portions of the allotment. The most frequently occurring invasive species include tumble mustard (*Sisymbrium altissimum*), salsify (*Tragopogon dubius*), mullein (*Verbascum thapsus*), and prickly lettuce (*Lactuca serriola*).

Although Duffy Creek was found to be achieving Standard 1 for upland watershed functions at the allotment scale and for all individual pastures, areas departed from the reference state were found within several pastures:

- **Duffy Breeding:** Invasive annuals are present in small disturbance patches, predominately on south slopes, throughout the pasture (less than 100 acres). These invasives have minimal effects on F/S group diversity. However, cheatgrass dominates one portion of loamy soils in the northern part of this pasture (near gate), affecting F/S group presence and diversity (approximately 50 acres).

- **Duffy CRP:** F/S groups have been modified in loamy soils in this pasture due to the seeding of crested wheatgrass (approximately 200 acres), however departures were not

sufficient to identify any portions of this pasture as "Not Achieving" Standard 1. The IDT noted that some CRP planted areas in this pasture appear to have a slight upward trend, including increasing cover by native shrubs and forbs. Annual bromes are occasionally present in gaps between perennial bunchgrasses, but are a minor component of F/S groups throughout the pasture.

Figure 6. Duffy Creek CRP Pasture, plot X-2. Historic seeding with big sagebrush invasion.

- **Duffy Hay:** The IDT noted that lithosols in this pasture have some rills in steeper, south-facing areas. Lithosols appear to have lower F/S group diversity than other lithosols in the DCW assessment area. Lithosols in the hay pasture had few forbs and little native grass diversity, and invasive annuals occurred in disturbed areas. One patch of historic seeding (approximately 50 acres in size) occurs in loamy soils in the northern part of this pasture.

- **Duffy Well:** Areas with deep soils within the pasture were historically farmed prior to BLM acquisition, including planting of non-native species as part of the CRP program. This resulted in a departure from F/S groups in the reference state. The IDT noted that some CRP planted areas in Well pasture appear to have a slight upward trend, including increasing cover by native shrubs. However, basal gaps and invasive annual grass cover are also above reference conditions. The IDT found that approximately 150 acres of this pasture has moderately departed biological indicators, but the pasture is achieving Standard 1 based on the weight of all indicators.

New Acquisition (Unleased Area)

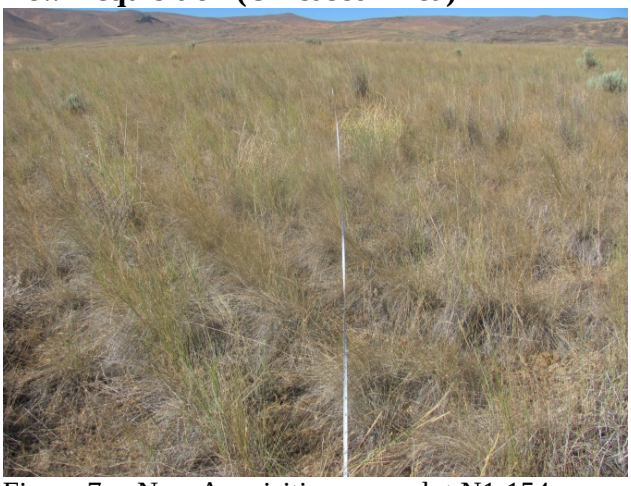

Figure 7a. New Acquisition area, plot N1-154. Seeded loamy ecological site.

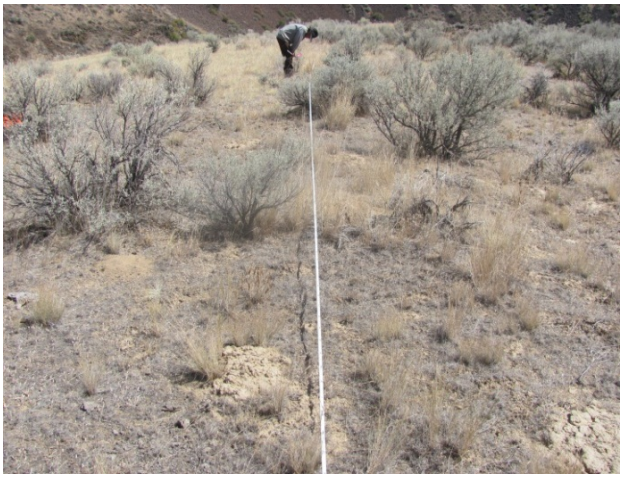

Figure 7b. New Acquisition area, plot N1-155. Lithosol with predominantly native vegetation.

The IDT determined that the New Acquisition area as a whole is achieving Standard 1 with departure from reference conditions in some areas, attributable to past management. Approximately 260 acres (24%) of this area have been seeded with non-native grasses. F/S groups have been modified or replaced. Some native shrubs and forbs are reestablishing in portions of this previously seeded area.

Over 740 acres of the New Acquisition support native F/S groups. Little departure from reference conditions is evident in this portion of the area. These areas are predominantly lithosols.

Rimrock Allotment and Adjacent Unleased Areas

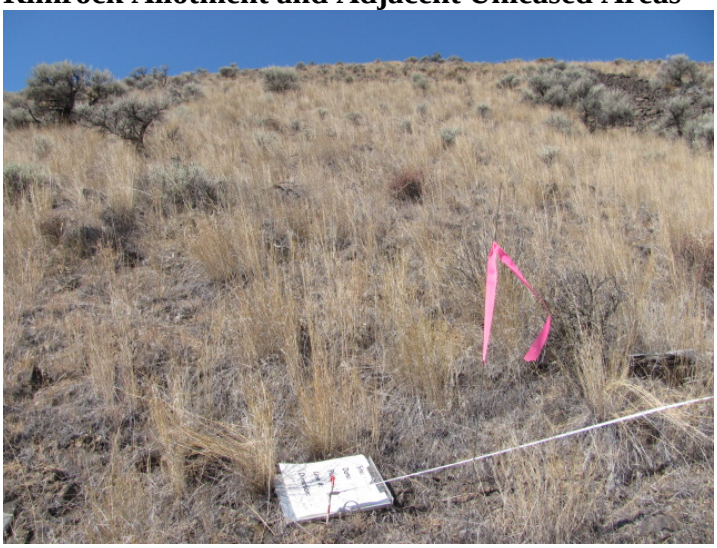

Figure 8. Rimrock allotment, plot RR-169. Stony ecological site, native functional/ structural groups.

Approximately 350 acres of unleased BLM-administered lands east of and adjacent to the Rimrock Allotment are included with this allotment for this evaluation (Appendix A, Map A-3).

The majority of this unleased area is in near-reference condition. The IDT observed no rills, no water flow paths, intact soil horizons, well-represented F/S groups, and few invasive species. Localized OHV use is impacting soil conditions in less than 5 percent of this allotment and is associated with access from Douglas Creek Road. Localized departure from reference conditions in these impacted areas includes open soils, soil compaction, gullies, and loss of F/S groups.

Slack Canyon Allotment

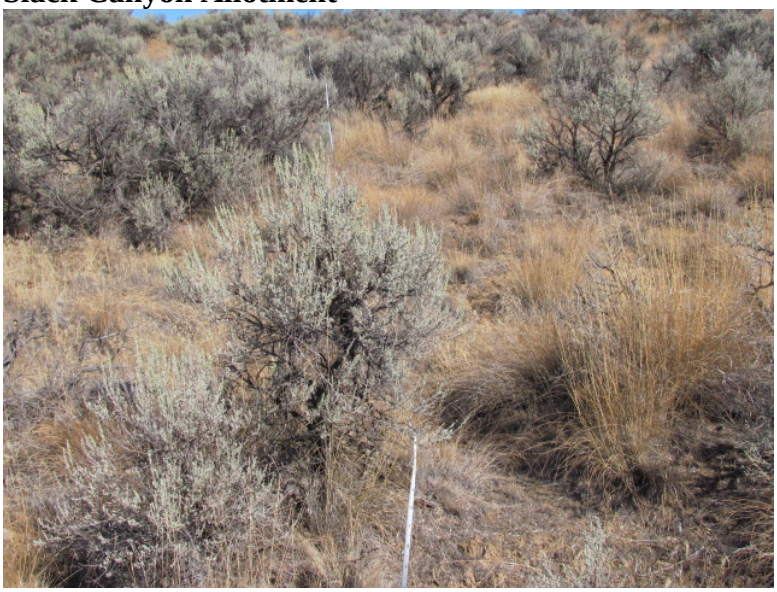

Figure 9. Slack Canyon allotment, plot 0774-172. Intact functional/ structural groups, Wyoming big sage cover.

This small allotment (40 acres) was found by the IDT to be achieving Standard 1. No rills, gullies, compaction or significant bare ground was observed. F/S groups were intact, with good production. Annuals (such as *Bromus tectorum*) were well-established but not dominant or changing F/S groups.

Titchenal Canyon Allotment

Figure 10. Titchenal Canyon allotment, plot MI-146. Loamy ecological site.

This small allotment is dominated by very shallow soils, with approximately 150 acres (24% of the pasture) supporting loamy soils. Some shallow soil areas appear to have lost some component of the soil surface, possibly due to wind scour in exposed locations. These wind scoured areas are dominated by bedrock, and have lower F/S group species diversity than reference conditions. At the allotment scale the IDT determined that this allotment has a slight to moderate departure from reference conditions but it is achieving Standard 1 based on the weight of all indicators.

Unleased Areas: West

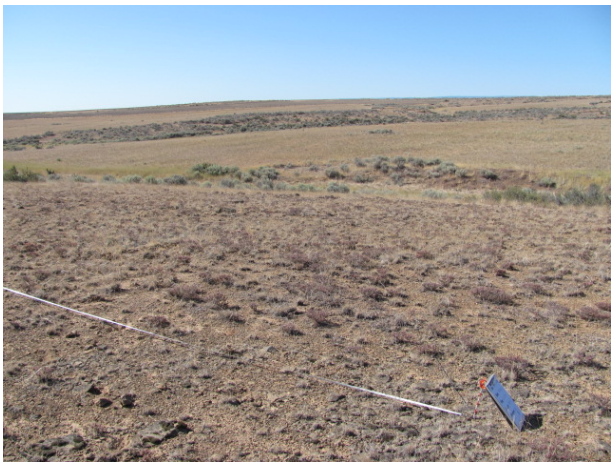

Figure 11a. Unleased west area, plot DU-104. Lithosol, *Eriognum thymoides* community.

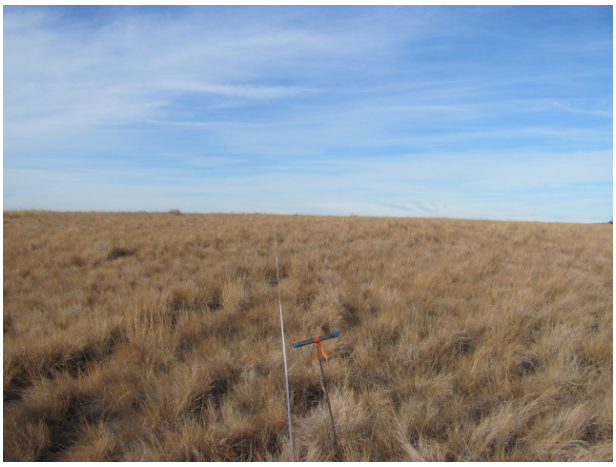

Figure 11b. Unleased west area, plot X-1. Loamy ecological site seeded to native grasses.

Unleased BLM-administered lands in the western portion of DCW include predominantly lithosols and loamy soils achieving Standard 1. Lithosols in this area rarely have evidence of departures, such as water flow patterns, rills, or square brome (*Bromus squarrosus*).

Approximately 190 acres (25%) of the loamy soils in this area have been seeded: 81 acres remain in non-native grasses, and the remainder has been planted by BLM with native grasses and some forbs. Native grass species were seeded in 2004. In pasture Nine, the Duffy Creek terrace (above fluvial disturbance) has been modified. The historic native shrub steppe and swale community has been replaced with a smooth brome (*Bromus inermis*) monoculture.

Agricultural activities in seeded areas have resulted in occasional, weak plow pans. F/S groups have been modified, shrub densities are low and forbs are rare. A number of young (less than ten years old) ponderosa pine trees have established in this area. It is likely that seeds from native parent trees in adjacent riparian draws were blown into the area while an opening from restoration activities occurred and winter snow provided adequate moisture to allow for this establishment.

3.2 Standard 2: Watershed Function – Riparian/Wetland Areas

3.2.1 Definition

Riparian-wetland areas are in properly functioning physical condition appropriate to soil, climate, and landform.

Potential indicators of watershed function-riparian/wetland area noted in Standards for Rangeland Health (USDI BLM 1997) include:

- Frequency of floodplain/wetland inundation
- Plant composition, age class distribution, and community structure
- Root mass
- Point bars re-vegetating
- Stream bank/shoreline stability
- Riparian area with
- Sediment deposition
- Active/stable beaver dams
- Coarse/large woody debris
- Upland watershed conditions
- Frequency/duration of soil saturation
- Water table fluctuation

Riparian-wetland areas are grouped into two major categories: 1) lentic, or standing water systems, such as lakes, ponds, seeps, bogs, and meadows; and 2) lotic, or moving water systems, such as rivers, streams, and springs (Prichard 1998). Riparian areas commonly occupy the transition zone between the uplands and surface water bodies (the aquatic zone) or permanently saturated wetlands. Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions.

Properly functioning riparian and wetland areas support: water quality, capture and retention of sediment and debris, detention and detoxification of pollutants, and moderation of seasonal

extremes in water temperature. Properly functioning riparian areas and wetlands enhance the timing and duration of stream flow through dissipation of flood energy, improved bank storage, and ground water recharge.

PFC should not be confused with Desired Future Condition (DFC). In most cases, it is the precursor to these levels of resource condition and is required for their attainment, but may lack components of historic vegetation or ecosystem components. For example, monotypic reed canary grass bank vegetation provides PFC vegetation characteristics for all except Item 7 (diverse composition), but it is not a component of the DFC for most BLM-administered riparian systems.

3.2.2 Methods to Determine Conformance with Standard 2

The IDT evaluated stream, riparian, and wetland function using Lotic (TR 1737-15) and Lentic (TR 1737-16) Riparian Area Management Assessment Methodologies, also known as the Proper Functioning Condition (PFC) method (Prichard 1998; Prichard 2003). The lotic methodology is used for flowing water systems. The lentic methodology is used for ponds and still water systems. Applicable portions of the lentic methodology are used to assess springs and wet meadows. For this assessment, PFC was performed for streams delineated based on previous BLM mapping of perennial or intermittent drainages. Results of current PFC evaluation were also compared to historic PFC findings for Douglas Creek.

PFC classification is a qualitative process using riparian and wetland attributes and processes that can be judged visually to evaluate how well these attributes and processes are functioning, compared to site potential (Prichard 1998). To function properly, adequate vegetation, landform or woody debris should be present to dissipate energy associated with relatively frequent high flow events and to filter sediment, capture bed load, and aid floodplain development so the stream does not excessively aggrade or degrade (down-cut). Riparian and wetland areas can function properly before they achieve their potential (USDI BLM 1997) and stream reaches or wetlands may meet PFC standards while not meeting specific site objectives.

The IDT used the Rosgen Stream Classification System as a tool to help determine stream potential (Rosgen 1994; Rosgen 1996). This system allows characterization of stream sensitivity and prediction of channel evolution. In this Standard 2 evaluation, systems classified as PFC had stream (or wetland) hydrology, vegetation, and erosion/deposition processes providing resilience sufficient to withstand high flow events and produce desired values such as fish habitat and neotropical bird habitat (Prichard 1998). Systems or reaches identified as FAR had departed conditions that reduced stream or wetland resilience to fluvial disturbance and negatively impacting habitat.

3.2.3 Findings and Analysis: Standard 2

During the 2012 assessment period, 29 reaches totaling approximately 24 miles were assessed for lotic or lentic riparian function. Four riparian areas were assessed: Douglas Creek, Duffy Creek, McCue Springs, and an unnamed creek in Titchenal Canyon. Developed springs and other water developments were not inventoried or assessed during 2012 PFC assessments. No wetlands were encountered outside of riparian stream corridors during stream PFC assessments; no lentic riparian-wetland areas were identified during upland assessments.

All but one of the riparian stream reaches assessed in the DCW were rated as in PFC and achieving Standard 2. Although most reaches were rated as achieving Standard 2, small-scale concerns were noted by the IDT. Within-reach, site-scale concerns included: localized lack of adequate riparian-wetland vegetative cover to protect banks and dissipate energy during high flows (PFC item 11), stream crossings leading to localized sediment delivery, limited sources of large woody debris (PFC item 12), and reduced species diversity and composition.

Table 3 below summarizes the functional status of all surveyed streams in the assessment area; reach-scale findings are included in Appendix B, Table B-1.

Table 3. Functional Status of Stream Reaches within the Assessment Area

Allotment	Creek	Rosgen Type	Veg Community[1]	Flow (mi.)	Functional Rating	Miles	Notes
Douglas Creek Canyon (unleased)	Douglas Creek	E3, F3, G1, E4	BEOC/COSE, Sandbar willow	I (7.4)/ P (6)	PFC	13.4	Grazing excluded lower 8 miles. Pools/glides, cascades in lower reaches. Banks with few trees: reed canary grass understory. Several road crossings.
Duffy Creek	Duffy Creek	E3	CRDO/SYAL, ALIN/ROWO BEOC/SYAL	I (5.6)/ P (2.6)	PFC	8.2	Spatially intermittent. Limited bankside impacts. Includes wetland at Douglas Cr. junction
Douglas Creek Canyon (unleased)	McCue Springs	E1	ROWO	P	PFC	0.4	Spring-fed wetlands within riparian corridor
Titchenal	Unnamed	E6/E3	SALLUT-SALEXI	I(1.1)/ P (1.0)	PFC (1.6)/ FAR (0.2)	1.8	Cobble substrate and well-developed riparian. 1 reach (0.2 miles) FAR: riparian veg removal, bank impacts
Titchenal	Tributary to Unnamed	6	POPBAT/SYMALB	Int	PFC	0.3	Trib has significant flow, well-developed channel

[1]BEOC/COSE is Water birch/ redosier dogwood, CRDO/SYAL is Black hawthorn/ snowberry, ALIN/ROWO is Thinleaf alder/woods rose, SALLUT-SALEXI is Yellow willow-Sandbar willow, POPBAT/SYMALB is black cottonwood/snowberry.

Findings for individual streams, springs, and water developments are detailed below by allotment. Wetlands are addressed separately. Additional data for any of the riparian and wetland areas in the assessment area is available at the BLM Wenatchee Field Office.

Douglas Creek Canyon Riparian and Wetland Areas

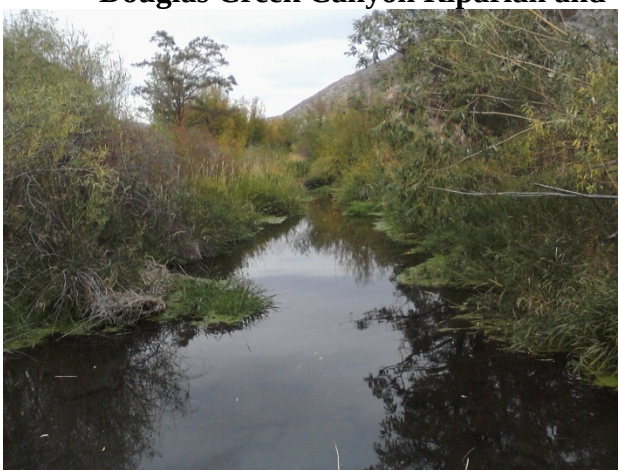

Figure 12a. Douglas Creek, reach 105. Glide with reed canary grass and willows dominating a Water birch/ red osier dogwood community type.

Figure 12b. Douglas Creek, reach 109. Cascade with reed canary grass and willows.

Douglas Creek Conditions: the 14 Douglas Creek stream reaches in the assessment area have been excluded from grazing since 1976. All reaches of Douglas Creek in the assessment area were rated as in PFC. Previous PFC findings by BLM staff also classified all reaches of Douglas Creek as in PFC (USDI BLM 2010). Several within-reach concerns were noted during the 2012 IDT PFC assessment, but these did not lead to classifying entire reaches as FAR. These areas of concern included:

- Reduced species diversity and composition. Reed canary grass dominates most of the perennial, fluvially-influenced riparian corridor of Douglas Creek in the DCW analysis area. Reed canary grass bank stability is rated as 9 (high) (USFS 2000), thus maintaining PFC but not meeting desired future condition (DFC).

- Limited overstory tree cover, compared to historic conditions (Crawford 2013, pers. comm.) and similar riparian areas nearby. Beaver felling of trees, semi-arid climate, and well-drained soils appear to limit tree recruitment in the Douglas Creek riparian corridor. This lack of overstory was identified in several perennial reaches: 105, 106, and 107. See Appendix B, Table B-1, for more information.

- Invasive and noxious weeds, including knapweeds (Russian and diffuse knapweed), were identified in Reaches 101 and 106. Most of these weed species are in terraces and higher floodplains and have limited influence on aquatic functions, but have strong local effects on adjacent upland areas. The BLM has historically treated weeds in approximately 2.5 acres of the Douglas Creek floodplain (Appendix B, Table B-2).

- Probable sediment introduction associated with unmanaged access points. Affected reaches: 106, 107 (Appendix B, Table B-1). Point sources of sediment do not lead to a departure from PFC.

- Road crossings. Douglas Creek Road crosses Douglas Creek three times in BLM-administered portions of the DCW. The BLM does not maintain the road at these crossings. All of these crossings are hardened, low-dip crossings. Vehicle crossings in these locations deposit small amounts of sediment and pollutants (oil, gas) into Douglas Creek, but not enough to lead to a departure from PFC.

McCue Springs Conditions: McCue Springs includes seeps and a lotic drainage to Douglas Creek. The lowest 0.4 miles of this flowing drainage (a single reach) occurs on BLM-administered lands. This reach was assessed using lotic Riparian Area Management Assessment Methodologies (TR 1737-15) and is in PFC. Roads influence the tributary junction and a low-water crossing occurs approximately 200 feet from the tributary junction. This low water crossing is over large cobbles, does not contribute significant sediment downstream, and is physically stable.

Duffy Creek Allotment Riparian and Wetland Areas

Figure 13a. Duffy Creek reach 6. Typical middle reach conditions.

Figure 12b. Duffy Creek reach 8. Water birch/snowberry community.

Duffy Creek Conditions: All reaches were rated as in PFC. Within-reach, site-scale concerns included: localized lack of adequate riparian-wetland vegetative cover to protect banks and dissipate energy during high flows (PFC item 11) due to cattle (hoof shear). This condition occurred in reaches 2 and 4 (Appendix B, Table B-1) over less than 1 percent of reach length. Two historic earthen road crossings modifying channel morphology in Reach 4. Both of these effects occur in intermittent reaches and do not lead to a reach-scale departure from PFC, either locally or downstream.

New Acquisition Riparian and Wetland Areas

There is a spring and well on BLM-administered lands within this area. No creeks or wetlands were identified in this area by the IDT.

Slack Canyon Allotment Riparian and Wetland Areas

There are no riparian resources and no water developments on BLM-administered lands within this allotment.

Titchenal Canyon Allotment Riparian and Wetland Areas

Figure 14a. Unnamed creek in Titchenal Canyon. Reach 1. Seepy, intermittent.

Figure 314b. Unnamed creek in Titchenal Canyon. Reach 4. Impacts including garbage and bank degradation in this short section.

Titchenal Canyon Unnamed Drainage Conditions: An unnamed third-order creek drains the majority of this small allotment. The lower reaches of this creek are perennial and the majority of it within BLM-administered lands supports dense riparian vegetation including shrubs and occasional overstory trees (quaking aspen (*Populus tremuloides*), wild rose (*Rosa woodsii*), willows (*Salix spp.),* common snowberry *(Symphoricarpos albus),* and currant *(Ribes aureum).* Riparian shrubs and small trees in this drainage are very dense and limit access for cattle.

The majority of the BLM-administered portions of this creek system (four reaches and one tributary reach) are in PFC (Table 3). One reach, less than 0.2 miles in length, was classified as functioning at risk (FAR). This reach has several troughs in and adjacent to the creek active margins and a corral area. In this short reach, cattle have impacted stream function including denuding riparian vegetation, breaking down banks, and widening the creek. Additionally, old tires have been used as erosion control devices.

Douglas Creek Allotment Water Developments

Currently pastures One, Three, Four and Five share a common water system that is functioning (Table 4). There are two functioning water sources in Pasture One and another that is a nonfunctioning water source. Pasture Two has two water sources one is functioning and the other is a nonfunctioning water site. All of these water sources are developed springs.

Table 4. Douglas Creek Allotment Watering Sites

One, Three, Four, and Five	Trough	T23N R23E: Sec 21: NE1/4NE1/4	Operational
One	Trough	T23N R23E: Sec 11: SW1/4SE1/4	Operational
Two	Trough	T23N R23E: Sec 24: NE1/4SW1/4	Not Operational
Two	Trough	T23N R23E: Sec 23: SW1/4NE1/4	Operational
One	Trough	T23N R23E: Sec15: SE1/4SW1/4	Not Operational

[1] Watering sources which are not functioning do not provide water and need repair.

Duffy Creek Allotment Water Developments

Currently the Front and CRP pastures are grazed together and cattle water at the Homestead trough system. The South and Well pastures are grazed together and the watering point is a pond where Duffy Creek begins to flow above ground, east of the exclosure. All other pastures have reliable water as outlined in Table 5 below.

Table 5. Duffy Creek Allotment Watering Sites

Well/South	Pond	T23N R23E: Sec 17: N1/2SE1/4NW1/4	Operational
North[1]	Seep/Spring	T23N R23E: Sec 18: NW1/4NW1/4	Undeveloped
North	Trough	T23N R23E: Sec 18: NE1/4NW1/4	Not Operational
Front/Hay	Troughs	T23N R23E: Sec 9: NE1/4SE1/4NW1/4	Operational
Corral	Creek water gap	T23N R23E: Sec 12: S1/S1/2SE1/4	Operational
Breeding	Well/trough	T24N R23E: Sec 31: SW1/4SW1/4	Operational
Front	Spring	T23N R22E: Sec 2: SE1/4SW1/4	Not Operational
Hay	Well	T23N R22E: Corner of sec 11,12,13,14	Not Operational
Homestead	Well	T23N R22E: Sec 11: NE1/4NW1/4	Operational
North	Spring box	T23N R22E: Sec 13: NE1/4NE1/4	Not Operational

[1] This watering site is a riparian exclosure adjacent to the North Pasture.
[2] Watering sources which are not functioning do not provide water and need repair.

Titchenal Canyon Allotment Water Developments

There are several troughs providing off site water for livestock in this allotment. In the northern portion of the allotment there is a corral area approximately 30 by 40 feet in size, with a trough along a seasonal drainage fed by a nearby spring. Livestock are excluded from this riparian areas by a BLM constructed fence.

Wetlands, Springs

No wetlands were encountered outside of stream riparian margins in the assessment area during field reviews. Wetlands associated with water developments are described above. National Wetlands Inventory (NWI) (USFWS 2013) mapping identified approximately 10.5 acres of wetlands in the assessment area (Table 6), including 6.5 acres of palustrine scrub/shrub (PSS) and forested (PFO) wetlands associated with the Douglas Creek riparian corridor and 2 acres in the McCue Springs riparian corridor, analyzed above. The remaining wetland areas (less than 2 acres) are surrounded by upland areas that are only slightly departed from reference conditions; these wetland areas were rated as in PFC, consistent with the functional adjacent uplands surrounding them.

Table 6. Wetlands Identified in the Assessment Area

Allotment	Classification[1]	Size (ac.)	Finding	Notes
Unleased, west of Titchenal Cyn	PSS1A	0.6	PFC	BLM. Unnamed trib to Douglas Creek. No grazing.
Duffy	PFO1C	0.8	PFC	BLM. Unnamed trib to Duffy Creek. Hay Pasture steep area, limited grazing or other disturbance.
Douglas	PEM1C	0.5	PFC[2]	BLM. Unnamed trib to Douglas.
Douglas	PFO/SS1	6.5	PFC	BLM-admin corridor found to be PFC.
Douglas	PSSC1C	2	PFC	Lower McCue Springs. Weeds in upper riparian area.

[1] P is palustrine; SS is scrub-shrub; FO is forested; 1 is temporarily flooded; A is broad leaved deciduous; EM is emergent; C is seasonally flooded.
[2] Functional evaluation based on only slight departure of surrounding upland areas.

3.3 Standard 3: Ecological Processes

3.3.1 Definition

Healthy, productive, and diverse plant and animal populations and communities appropriate to soil, climate, and landform are supported by ecological processes of nutrient cycling, energy flow, and hydrologic cycle.

Potential indicators that Standard 3 is functioning properly (USDI BLM 1997) include conditions where:

- Photosynthesis is effectively occurring throughout the potential growing season, consistent with the potential/capability of the site, as evidenced by plant composition and community structure.

- Nutrient cycling is occurring effectively, consistent with potential/capability of the site, as evidenced by: plant composition and community structure; accumulation, distribution, incorporation of plant litter and organic matter into the soil; animal community structure and composition; root occupancy in the soil profile; and biological activity including plant growth, herbivory, and rodent, insect, and microbial activity.

The role of fire in natural ecosystems should be considered, whether is acts as a primary driver or only as one of many factors. It may play a significant role in both nutrient cycling and energy flows (USDI BLM 1997, p.10), and strongly influences ecological processes.

3.3.2 Methods to Determine Conformance with Standard 3

The IDT evaluated ecological processes in BLM-administered portions of the DCW using IRH data collected in the 2012 field season, as well as historic range health and vegetation data and remotely-sensed imagery. Collection of data for IRH and comparison to reference conditions for Standard 3 is the same as described under Standard 1 (Section 3.1). Specific indicators used to characterize Standard 3 conditions and findings in this assessment included:

- IRH 4: Bare ground
- IRH 7: Litter movement
- IRH 10: Plant community composition and distribution relative to infiltration and runoff
- IRH 11: Compaction layer
- IRH 12: Functional/structural groups
- IRH 13: Plant mortality and decadence
- IRH 14: Litter amount
- IRH 15: Annual production
- IRH 16: Invasive plants
- IRH 17: Reproductive capability of perennial plants

Mapping of these IRH to Standard 3 potential indicators, including the importance of individual IRHs, is included in Appendix B, Table B-6. Plant lists created during pasture-scale reviews were also relevant for gauging site departure from reference F/S groups.

VCC was included in Standard 3 analysis to assess the influence of fire on ecological processes in the DCW. VCC is a modeled measure of vegetation departure from historic conditions (Hann and Bunnell 2001). VCCs have been defined and mapped by Schmidt et al. (2002). The classification is based on a relative measure describing the degree of departure from the natural (historical) fire regime. This departure results from changes to one or more of the following ecological components: vegetation characteristics (e.g. composition, structural stages), fuel composition, fire frequency, severity, and pattern. Departure in VCC can occur associated with changes in fire regime, invasive species, or other human disturbances. VCCs are remotely-sensed data collected at a 30 meter pixel scale, designed to support large-scale planning efforts (LANDFIRE 2013b; Jones and Tirmenstein 2012; Barrett et al. 2010). VCC classifications used in this analysis were last updated in 2008.

There are three VCCs based on low (VCC1), moderate (VCC2), and high (VCC3) departure from the central tendency of the simulated historical vegetation reference conditions. VCC 1 represents areas with low (less than 33%) departure from the estimated historical range of

variability, as determined by modeling for the pre-Euro-American era. VCC 2 indicates ecosystems with moderate (33 to 66%) departure. VCC 3 indicates ecosystems with high (greater than 66%) departure. A low departure indicates current conditions are characteristic of those occurring in the natural fire regime and associated vegetation. A high departure indicates uncharacteristic conditions that did not occur within the historic natural fire regime. Based on observations of its applicability, and consistent with direction (LANDFIRE 2013b), VCC was summarized for the Douglas Creek Watershed for all ownerships, to consider the role of fire in natural ecosystems (USDI BLM 1997, p. 10). Note that "departure", as defined by VCC, does not necessarily imply departure in Standard 3 Ecological Processes, since VCC is focused solely on departure from historic fire regime (USDI and USDA 2009).

Allotments were found to be achieving Standard 3 (ecological processes) by the IDT during evaluation if none of the above range health indicators were rated as moderate or greater departures from reference conditions, as described in ESDs. Fire regime condition class departure was included to consider the role of fire regime and fire regime departure in influencing Standard 3 indicators (USDI BLM 1997).

3.3.3 Findings and Analysis: Standard 3

Based on IRH plot data and field observations, the assessment area was evaluated for Standard 3 indicators of ecological processes, including indicators of effective photosynthesis and nutrient cycling. All allotments and unleased areas within the assessment area were classified as "achieving" Standard 3 by the IDT, at the allotment scale. During this analysis, nutrient cycling appeared no more than slightly to moderately departed from the potential of the area. Photosynthesis appeared to be effectively occurring with no more than slight to moderate departure from reference conditions, as evidenced by plant community composition and structure.

Table 7 summarizes findings for indicators of ecological processes for allotments in the DCW. More information about each allotment's upland health and the health of pastures within these allotments is listed below.

Table 7. Ecological Processes within the Assessment Area

Allotment/ Area	**Plant Composition/ Community Structure[1]**	**Nutrient Cycling Indicators[2]**	**General Notes**
Douglas Creek Canyon	SM	SM	Ecological processes of photosynthesis and nutrient cycling largely intact. Areas near roads have changed F/S groups and departed soil attributes.
Douglas Creek	SM	SM	Ecological processes of photosynthesis and nutrient cycling largely intact. Invasive exotics affecting conditions in three pastures.
Duffy Creek	SM	NS-SM	Ecological processes of photosynthesis and nutrient cycling largely intact.
New	SM	SM	Native areas have photosynthesis and nutrient cycling

Acquisition			processes operating close to reference conditions. Seeded areas (24%) have modified F/S groups and a plow pan exists, but apparently vigorous production.
Rimrock	NS	NS	Close to reference state. Small areas (<1%) with OHV road impacts, associated with Douglas Creek Road.
Slack Canyon	SM	NS	Invasive annual grasses are widely distributed but are not leading to changes in F/S group dominance or diversity.
Titchenal	NS	NS	Photosynthesis and nutrient cycling are close to reference condition.
Unleased: West	SM	SM	Variability between ecological sites: a) lithosols have F/S groups close to reference conditions and minor erosional features (rills, flow paths) influencing soil productivity; b) loamy areas include significant areas of non-native seeding with changes F/S groups and minor changes in soil characteristics.

[1]Classification of the effectiveness of photosynthesis, as indicated by plant composition and community structure, based on IRH 12, 10, 16.
[2]Classification of the effectiveness of nutrient cycling, based on IRH 4, 7, 11, 15, 17, 14, 10, 12, 16

Douglas Creek Canyon
Douglas Creek Canyon as a whole was found to be achieving Standard 3 by the IDT: indicators of photosynthetic effectiveness were assessed as consistent with the potential capability of the site and slightly to moderately departed from reference conditions. Many areas near roads have changed F/S groups and departed soil attributes, possibly due to disturbance or introduction of invasive species; disturbed areas comprise less than 100 acres.

Douglas Creek Allotment
Douglas Creek allotment was found to be achieving Standard 3 by the IDT: indicators of photosynthetic effectiveness were assessed as consistent with the potential capability of the site and slightly to moderately departed from reference conditions, based on IRH numbers 12, 10, and 16 (in order of importance). Plant composition and community structure is largely intact. Non-native invasive annual grass species minimally affect F/S groups, although some pastures (described below) within the allotment are dominated by seeded non-native grasses. Many assessed areas are in a grass-dominated phase, lacking shrub cover.

Nutrient cycling in the Douglas Creek allotment includes accumulation of organic matter into the soil, root occupancy in the soil profile and plant growth, herbivory and animal activity consistent with reference conditions (based on IRH numbers 4, 7, 11, 15, 17, 14, 10, 12 and 16, in order of importance). Invasive annual species and grass-dominated phases may limit full root occupancy in some portions of the allotment.

Specific areas of the Douglas Creek allotment with departed ecological processes are described below, by pasture:

- **Douglas One:** This pasture includes a departed south-facing hill slope (approximately 150 acres). F/S groups on this slope have departed from reference condition and are dominated by cheatgrass and Jim Hill mustard (*Sisymbrium altissimum*). Soil resistance in this small area is low, leading to rill formation and increased water flow paths. The replacement of perennial shrubs and bunchgrasses with annual grasses has probably changed photosynthetic and nutrient cycling processes in this portion of the pasture.

- **Douglas Two:** Invasive annuals are affecting ecological processes slightly at the pasture scale.

- **Douglas Five:** Portions of loamy ecological sites in Pasture 5 (less than 200 acres) include large water flow paths and extensive bare ground. Nutrient cycling would be expected to be changed in these localized areas. These departures are not typical for the entire pasture. Invasive annuals were noted as prevalent in some loamy soils.

Duffy Creek Allotment

Duffy Creek was found to be achieving Standard 3 by the IDT at the allotment scale. In most parts of the Duffy Creek allotment, plant composition and community structure is intact. Portions of the allotment include non-native invasive annual grass species; however, these occur mostly in disturbed patches within otherwise-functioning F/S groups. Some pastures (described below) within the allotment are dominated by seeded non-native grasses. Changes in F/S groups in seeded areas, in addition to modest changes in water flow patterns associated with drill row and plow pans, may be influencing nutrient cycling and have influenced plant community structure in portions of the allotment.

Nutrient cycling and belowground processes (e.g., incorporation of organic matter into the soil, root occupancy), as evidenced by plant productivity and soil conditions, appeared largely intact in nearly all pastures in this allotment. Plant production was at or above ranges predicted for ecological sites in most areas, based on limited sampling. Site-scale (patches less than 10 acres) conditions affecting soil profiles including soil loss and compaction were noted but seemed to have limited effects on root occupancy, plant growth, or plant vigor.

Specific areas of the Duffy Creek allotment with departed ecological processes are described below, by pasture.

- **Duffy CRP:** Loamy sites in this pasture have been seeded. Drill rows, a plow pan, and changed F/S groups (due to seeding) may be affecting infiltration. Additionally, invasive annual grasses have replaced F/S groups in some portions of the pasture.

- **Duffy Hay**: Some areas of seeding in loamy soils, some lithosols with low F/S group diversity (*Poa secunda*-dominated) and invasive annuals may represent departure from the potential capability of the site. Some minor decadence in Wyoming big sagebrush was observed. Production in this pasture was not noted as low by the IDT during field assessment. Reproductive capacity of plants on site appeared similar to reference conditions.

- **Duffy Well:** Loamy sites in this pasture have been seeded and include modified F/S groups, limited shrub cover, invasive annuals, and bare ground patches.

New Acquisition
The New Acquisition area as a whole was found to be achieving Standard 3 by the IDT. The New Acquisition area includes approximately 250 acres (24% of the area) of CRP areas seeded with non-native grasses. Seeded areas have modified F/S groups and a plow pan, but vigorous grass production, and are developing biological soil crust. Indicators of photosynthetic efficiency are near reference conditions in this area, but phenology and below-ground processes have changed from native conditions. Seeding rows, tilling, increased detritus, and changed F/S groups have probably changed nutrient cycling from native conditions.

Native areas (76% of the area) have indicators of photosynthetic effectiveness and nutrient cycling processes that are close to reference conditions, including minimal changes from native F/S groups and soil/root zone conditions.

Rimrock Allotment and Adjacent Unleased Areas
The majority of the Rimrock allotment has well-developed native F/S groups, including shrub/ bunchgrass communities. Much of this allotment is steep and rocky. Invasive annuals are not pervasive and do not affect indicators of photosynthetic effectiveness (plant community structure) and nutrient cycling in this parcel.

Slack Canyon Allotment
The Slack Canyon allotment is a small, 40 acre parcel bordered by agriculture on three sides. Significant weed populations are present at the edge of this parcel. The Slack Canyon allotment has well-developed native F/S groups, including shrub and bunchgrass communities. Invasive annuals are well distributed, but probably minimally affect photosynthesis and nutrient cycling in this parcel.

Titchenal Canyon Allotment
In most parts of the Titchenal Canyon allotment, plant composition and community structure is intact. F/S groups are intact and supporting photosynthesis and nutrient cycling. Non-native invasive annual grass species are not widely distributed. Many assessed areas are in a grass-dominated phase with slight departure from the reference state.

Nutrient cycling and belowground processes, as evidenced by plant productivity and soil conditions, appear largely intact in this allotment.

Unleased Areas: West
Unleased areas in the western portion of the assessment area include native shrub-steppe (primarily lithosols) and loamy seeded areas. Lithosols support F/S groups at near-reference conditions, with few invasive annuals. These areas have some minor erosional features which may influence plant community productivity.

Seedings in this area include areas of the CRP pasture excluded from grazing and unleased areas west of the Duffy allotment. Over 300 acres of areas first seeded to non-native, and recently to

native grasses, have limited shrubs, dense native species planted in rows, increased litter loads, and modest plow pans with limited effects on infiltration or root expression.

Fire Regime Condition Class Summary (Watershed Scale)
The majority of the DCW (including all ownerships) has been modified from pre-European settlement conditions, based on VCC departure classification (Table 8 below). Departure is primarily due to current and historic agricultural conversion (Section 2.6). BLM-administered portions of the DCW that were historically converted to agriculture are in various states of recovery, but in general would be considered early or mid-seral. Based on field observation by the IDT however, VCC classification appeared to over-predict departure based on early seral conditions, particularly in lithosol sites, classified and mapped as the Columbia Plateau Steppe and Grassland BpS.

The fire return interval appears to be within the 35-200 year range expected in the Inter-Mountain Basins Big Sagebrush Steppe BpS, but may be somewhat extended due to fire suppression efforts in areas mapped as the Columbia Plateau Steppe and Grassland BpS, where the historic return interval may have been as short as 20 years (LANDFIRE 2013a). The effects of fire may have been somewhat replicated by historic agricultural areas and recent restoration efforts that moved portions of the landscape to earlier seral states.

Mapped departure from historic fire regime appeared to be due to dominance by early seral stages, and not presence of invasive species. This is not considered a significant departure from the reference state (USDA NRCS 2013), and would be expected to have a small impact on Standard 3 key indicators for the effectiveness of photosynthesis and nutrient cycling. For this reason, VCC results are used as a consideration but not a primary indicator for Standard 3 Findings.

Table 8. VCC Classes and Coverage in the DCW

VCC Class	% of DCW
I (reference condition)	0.1
II (Moderately departed)	19.8
III (Highly departed)	12
Water, Urban, Barren, Sparsely Vegetated	3.4
Agriculture (current or historic)	64.8

3.4 Standard 4: Water Quality

3.4.1 Definition

Surface water and groundwater quality, influenced by agency actions, complies with State water quality standards.
Water quality meets applicable water quality standards (USDI BLM 1997) as evidenced by the following potential indicators:

- Water temperature
- Dissolved oxygen

- Fecal coliform
- Turbidity
- pH
- Populations of aquatic organisms
- Effects on beneficial uses

3.4.2 Methods to Determine Conformance with Standard 4

Most of the potential indicators suggested in the Standards for Rangeland Health (1997) have been measured for Douglas Creek. Sources used to inform Standard 4 conditions and findings in this assessment and evaluation included:

- Classification as polluted or not polluted under Sections 303(d) of the Clean Water Act, as administered by Washington State Department of Ecology (DOE) water quality listings under; i.e. 303(d) listing.

- Water quality data collected for Douglas Creek by Foster Creek Conservation District (FCCD) and summarized in Behne (2005). A single water quality station was established on Douglas Creek (BLM Reach 110, N47.467822°xW119.876051°, 1310 ft. elevation) in 2001. No data exists for Duffy Creek or other tributaries to Douglas Creek. However, Douglas Creek integrates the upstream water quality effects of these tributaries. Specific water quality indicators measured included indicators described above.

- Collected data on aquatic macroinvertebrates (summarized in Behne 2005).

- IDT observations on water quality made during field reviews and riparian PFC (Standard 2) evaluations.

The IDT evaluated Standard 4 by comparing measured water quality conditions to standards established by the U.S. Environmental Protection Agency (EPA) and Washington State Department of Ecology DOE (DOE). Water quality departure of more than one standard deviation from DOE standards were considered to be "not achieving" Standard 4. Findings were informed by qualitative observations where water quality data was not available.

3.4.3 Findings and Analysis: Standard 4

Douglas Creek

Water quality for several stream reaches in the DCW has been monitored since 1988 by Foster Creek Conservation District (Behne 2005). Douglas Creek collects water from tributaries in the DCW, and thus integrates water quality from the entire DCW. Douglas Creek is not 303(d) water quality listed (DOE 2013). Douglas Creek generally meets applicable water quality standards for measured water quality indices:

- **Water Temperature**: Daily mean temperatures in Douglas Creek ranged between 10°C and 18°C with daily peaks to 20.5°C in the period monitored by Behne (2005). Washington Department of Ecology (DOE 2013) standards for support of non-

anadromous interior redband trout[2] (DOE standard, hereafter) is 18°C (64.4°F) for highest seven day maximum (7-DADMax). The 7-DADMax for Douglas Creek was 18.7°C in August 2004. Douglas Creek is fed by warm springs (Behne 2005) and warmer temperatures are part of the natural condition. Temperatures are moderate even in winter when temperatures average 12°C.

- **Dissolved Oxygen**: Hydrolab readings for dissolved oxygen (DO) levels had a mean of 10.1 mg/l and a standard deviation of 1.1 mg/l. DOE minimum standard for DO is 8 mg/l; a single reading in July 2002 of 7.2 mg/l was below this standard.

- **Fecal Coliform**: Douglas Creek fecal coliform levels averaged 12.7 colonies/100 ml during the sampling period, and ranged from 0.0-89 colonies/100 ml. This is below DOE standards for waters defined as "Primary Contact Recreation".

- **Stream pH**: Douglas Creek had a mean pH of 8.1 with a standard deviation of 0.2 during the sampling period (range: 7.8-8.5). DOE standard is 6.5-8.5.

- **Turbidity:** Mean turbidity for Douglas Creek (ignoring one contaminated reading) was 2.3 nephelometric turbidity units (NTU) with a standard deviation of 3.3 NTU during the measurement period. The range in turbidity was 0.0 NTU to 11.7 NTU during the sampling period. DOE standard is 5 NTU over background when the background is 50 NTU or less; Douglas Creek should rarely exceed this level.

- **Toxics:** Lead, cadmium, chloride, and arsenic have been sampled in Douglas Creek. Samples were below DOE standards for all but the chloride, which averaged 10.7 mg/l (Behne 2005).

Douglas Creek Macroinvertebrates

Macroinvertebrates were sampled in the lower reaches of Douglas Creek in 2001 (Behne 2005). The measured Douglas Creek macroinvertebrate community was indicative of good overall water quality, productivity, and flow. Douglas Creek had high EPT richness[3], B-IBI score[4], and macroinvertebrate density compared to nearby drainages (Behne 2005). The number of pollution-intolerant taxa was relatively high and mayflies dominated the fauna. Douglas Creek had the highest relative abundance of long-lived taxa of all six streams.

Douglas Creek Water Quality Conclusions

Douglas Creek was found to be achieving" Standard 4 by the IDT. Water quality in Douglas Creek had little departure from DOE standards for all potential indicators (listed above) other than water temperature. Although Douglas Creek water temperature peaks were slightly above DOE standards for support of non-anadromous interior redband trout, this creek is fed by warm

[2] Native redband trout have been extirpated from the DCW or never occurred there. This temperature standard is used for reference only.

[3] EPT refers to the combined number of mayfly (E), stonefly (P) and caddisfly (T) species (EPA 2013, Available at: http://water.epa.gov/type/rsl/monitoring/108.cfm)

[4] Benthic index of biological integrity (EPA 2013). Available at: http://water.epa.gov/scitech/monitoring/rsl/bioassessment/index.cfm

springs; water temperature is probably only minimally affected by surrounding land use. Macroinvertebrate production and diversity suggest moderately high water quality.

3.5 Standard 5: Native, T&E, and Locally Important Species

3.5.1 Definition

Habitats support healthy, productive and diverse populations and communities of native plants and animals (including special status species and species of local importance) appropriate to soil, climate and landform (USDI BLM 1997)

Essential habitat elements for species, populations, and communities are present and available, consistent with the potential capability of the landscape (USDI BLM 1997), as evidenced by:

- Plant community and composition, age class distribution, productivity
- Animal community composition, productivity
- Habitat elements
- Spatial distribution of habitat
- Habitat connectivity
- Population stability/resilience

Federal agencies are mandated to protect threatened and endangered species and will take appropriate action to avoid the listing of any species. This standard focuses on retaining and restoring native plant and animal (including fish) species, populations and communities (including threatened, endangered, and other special status species and species of local importance). In meeting the standard, native plant communities and animal habitats would be spatially distributed across the landscape with a density and frequency of species suitable to ensure reproductive capability and sustainability. Plant populations and communities would exhibit a range of age classes necessary to sustain recruitment and mortality fluctuations.

3.5.2 Methods to Determine Conformance with Standard 5

For sensitive species, and where specific information was available, plant and animal community and composition was mapped or modeled. Modeled habitat was informed by IDT-collected plot data where applicable. Where species-specific data was lacking and for non-sensitive species in the assessment area, the IDT used IRH and other data (including historic range health, vegetation data, and remotely-sensed imagery), to characterize plant community and composition, age class distribution, productivity and habitat elements for target habitat types (Section 3.1). IRH which were most helpful in characterizing Standard 5 habitat elements included IRH numbers 8, 9, 11, 12, 13, 14, 15, 16, and 17, indicators of the biotic integrity attribute. Mapping of these IRH to Standard 5 potential indicators is included in Appendix B, Table B-7. In the absence of other information, portions of the landscape supporting little departure from reference conditions for

these IRH were assumed to support healthy productive and diverse plant and animal populations and communities.

Table 9 below describes habitat types present in the assessment area as well as key individual species and floral and faunal groups using these habitats. The IDT identified three distinct habitat types relevant to Standard 5 analysis to be considered in addition to individual species: upland shrub-steppe, sparsely vegetated habitats (including talus, caves, cliffs), and riparian habitats (including wetlands). Each of these habitat types are described generally in the Affected Environment (Section 2 above), and specifically in terms of habitat and species support in Findings (see Section 3.5.3 below).

Habitat Type	**DCW Species or Community Supported**		
Plants[1]			
Shrub-steppe	Longsepal globemallow (*Illiamna longesepala*)		
	Shrub-steppe associated plants including Pauper milk-vetch (*Astragalus misellus* var. *pauper*), Piper's fleabane (*Erigeron piperianus*)		
Sparsely vegetated	Sandy, sparsely vegetated, or cliff and talus associated plants including sagebrush stickseed (*Hackelia hispida* var *disjuncta*) and coyote tobacco (*Nicotiana attenuata*)		
Animals[2]			

Shrub-steppe	Sagebrush obligate animals including greater sage-grouse	Habitat Assessment Framework (Appendix C), BLM shrub classification, other data	
	Shrub-steppe associated animals		

[1]Plant species associated with shrub-steppe and sparsely vegetated habitats including native, locally important species, and sensitive species are described in Appendix B, Table B-8.
[2]Animals including sagebrush obligate fauna, and shrub-steppe associated fauna including native, locally important species, and sensitive species potentially present in DCW during all or part of the year are described in Appendix B, Table B-9.
[3] Although native redband trout have been extirpated from the DCW or never occurred there, habitat conditions on BLM-administered lands in DCW are not precluding their existence or reinvasion
[4]Species associated with riparian habitat other than fishes including native, locally important species, and sensitive species potentially present in DCW during all or part of the year are described in Appendix B, Table B-9. Neotropical migrants are also included in this group.

Findings for Standard 5 were summarized at the spatial scale of the BLM allotment or similar sized unit within the assessment area, although support of healthy, productive and diverse populations of native plants and animals is affected by factors operating at multiple spatial scales. The IDT considered that evaluated habitats within allotments were "achieving" standards for Native, T&E, and Locally Important Species (Standard 5) if they supported healthy, productive and diverse populations of native plants and animals, based on the state of relevant Standard 5 indicators, as evidenced by available data sources. Moderate or greater departure of Standard 5 indicators from expected or reference conditions was considered "not achieving" Standard 5. The IDT considered units to be not achieving but "making significant progress" towards achieving Standard 5 in cases where habitat conditions were assumed to be improving based on apparent succession or change from historic management practices. The IDT's rationale for habitat and species-specific departure classifications is presented below.

3.5.3 Findings and Analysis: Standard 5

Table 10 below summarizes functional rating for habitats supporting native, T&E, and locally important species utilizing the assessment area. For this analysis, one individual plant species, two plant community types, and three animal community types were evaluated. Habitat for species other than longsepal globemallow and sagebrush obligate animals was characterized as "achieving" Standard 5 by the IDT. Overall the assessment area exhibited no more than a slight

to moderate departure from site appropriate hydrologic function, soil/site stability, and biotic integrity. Riparian and wetland areas were found to be in properly functioning physical condition in nearly all reaches. Based on these conditions, the assessment area would generally be expected to support healthy, productive and diverse plant and animal populations and communities including shrub-steppe, sparsely vegetated and riparian associated species. However, site-specific conditions and species-specific habitat needs still influence Standard 5 indicators, including the spatial distribution of habitat and population stability/ resilience for species including SSS.

Table 10. Analysis for Native, T&E, and Locally Important Species in the Assessment Area.

Allotment	DCW Species or Community Supported						Notes on departure
	Plants			Animals			
	Longsepal globemallow	Shrub-steppe	Sparsely vegetated	Sagebrush obligate[1]	Shrub-steppe	Riparian	
Douglas Creek Canyon	Not Achieving	Achieving	Achieving	Making significant progress	Achieving	Achieving	Globemallow: limited distribution of habitat. Population stability threatened by lack of fire, population size, weed competition. Sagebrush obligates: Less than 25 acres of potential GSG habitat is currently unsuitable.
Douglas Creek	Achieving	Achieving	Achieving	Making significant progress	Achieving	Achieving	Globemallow: Historic site no longer occupied. No obvious disturbance at this site. Sagebrush obligates: marginal GSG breeding habitat. Active and passive restoration ongoing.
Duffy Creek	NA[2]	Achieving	Achieving	Making significant progress	Achieving	Achieving	Sagebrush obligates: Over 50% of potential GSG habitat unsuitable. Active and passive restoration occurring.
New Acquisition	NA	Achieving	Achieving	Not Achieving	Achieving	Achieving	Sagebrush obligates: marginal GSG breeding habitat.
Rimrock	NA	Achieving	Achieving	Achieving	Achieving	Achieving	
Slack Canyon	NA	Achieving	Achieving	Achieving	Achieving	Achieving	
Titchenal Canyon	NA	Achieving	Achieving	Making significant progress	Achieving	Achieving	Sagebrush obligates: limited suitable habitat, but shrub succession is apparent.
Unleased West	NA	Achieving	Achieving	Making significant progress	Achieving	Achieving	Sagebrush obligates: Over 50% of potential GSG habitat unsuitable. Active and passive restoration occurring.

[1]Sagebrush obligates include greater sage-grouse and pygmy rabbit.
[2] Populations of this species were only identified in Douglas Creek Canyon and the Douglas Creek allotment.

Native, Federally Listed, and Special Status Plants

Upland Shrub-Steppe Habitat

As described in Section 2, upland shrub-steppe habitat is characterized by deep soils, sagebrush, and bunchgrass features. Sagebrush and grassland habitat types are key vegetation communities in the watershed, making up over 40 percent of the assessment area (based on ESD). Allotments within the assessment area rated none-slight to slight-moderate departure from reference conditions, suggesting that biotic integrity is intact in upland shrub-steppe habitats at the allotment scale in the assessment area. Slight departures in the deep soils of shrub-steppe habitat were determined based upon some alterations of F/S groups, the presence of invasive annuals, or historic disturbance such as seeding of non-native grasses (Section 3.1).

Overall, the assessment area had the following attributes of rangeland health; site appropriate hydrologic function, soil/site stability, and biotic integrity. The IDT assumed that areas supporting these three attributes of rangeland health, particularly biotic integrity, would likely support healthy productive and diverse plant and animal populations and communities. Therefore, the IDT assumed that since all allotments were found to be achieving standards for upland conditions, shrub-steppe associated plants were supported in the assessment area, with the exception of longsepal globemallow (*Iliamna longisepala,* G3/S3[1]).

Longsepal globemallow is typically found on gravelly streamsides in open shrub-steppe and open forest on the eastern flank of the cascades; also on open hillsides in microsites not immediately adjacent to stream channels (Camp and Gamon 2011). This plant is a regional endemic of central Washington. Longsepal globemallow is considered sensitive by both the BLM and Washington Natural Heritage Program. In the assessment area, it is found primarily in the floodplain of Douglas Creek Canyon, with one historic record in Douglas Creek Pasture One. One population of this species, as defined by a single Natural Heritage Program element occurrence (DNR 2013), occurs across approximately four miles of the floodplain of Douglas Creek. An "element occurrence" is the basic unit of the WNHP inventory, defined by WNHP as a particular, on-the-ground observation of a rare species or ecosystem. For rare plant species, an element occurrence is generally defined as a "population", but units as small as single plants may be tracked as element occurrence. The Douglas Creek element occurrence of longsepal globemallow is therefore considered one population, despite being comprised of several sites scattered along four miles of the drainage. The number of plants at each of the six known sites comprising the population range from one to several.

A mention of a plant in Duffy Creek was found in an older field report but was not relocated during the assessment. Trend information for this population consists of original site records beginning in the 1980s or 1990s, followed by site re-visits between 2011 and 2014. Most individuals were relocated in historic sites with two exceptions: a single plant in Douglas Creek Allotment Pasture One and a single plant along the Douglas Creek trail were not

[1] The conservation status of a species or ecosystem is designated by a number from 1 to 5, preceded by a letter reflecting the appropriate geographic scale of the assessment (G = Global), N = National, and S = Subnational). The numbers have the following meaning: 1 is critically imperiled; 2 is imperiled; 3 is vulnerable;4 is apparently secure; and 5 is secure. For example, G1 would indicate that a species is critically imperiled across its entire range (i.e., globally). In this sense the species as a whole is regarded as being at very high risk of extinction. A rank of S3 would indicate the species is vulnerable and at moderate risk within a particular state or province, even though it may be more secure elsewhere. A T-rank applies to a subspecies scarcity when the main species is more common (as described in NatureServe 2013).

relocated in 2011, 2013, or in 2014. The Douglas Creek population represents the eastern-most extent of this species, one of the only known populations known east of the Columbia River, and the only element occurrence occurring on BLM lands east of the Columbia River. No other element occurrences have been recorded for this species in other allotments in the assessment area.

Although in general the shrub-steppe habitat in the assessment area is meeting rangeland health standards, habitats supporting the longsepal globemallow population (element occurrence) in the assessment area were found to be "not achieving" Standard 5 for the following reasons:

- While potential habitat exists in DCW, the six globemallow sites in this population are widely scattered and two of these are comprised of one mature plant. This indicates that little to no recruitment has occurred. The species appears to depend on out-crossing (Harrod, unpublished data as referenced in Harrod and Halpern 2005), which is limited by the distance between plant occurrences.

- Many of the Douglas Creek longsepal globemallow sites consist of sparsely scattered single plants. Exhaustive monitoring of this population has not occurred, but relocation of historically occupied sites suggests that site densities are either very small and stable or decreasing/lost.

- Fire may be needed to break seed dormancy in this species (Harrod and Halpern 2005), and removal of wildland fire may be detrimental to the survival of individuals (Camp and Gamon 2011). Loss of wildland fire thus may be thus limiting reproduction.

- Noxious weeds including knapweed and tumble mustard have expanded around many of the longsepal globemallow occurrences. This competition may be limiting reproduction by reducing the areas available for new plants.

The finding of "not achieving" Standard 5 applies to habitat in the Douglas Creek Canyon area (Table 10 above). The single historic site located in Douglas Creek Allotment Pasture One was not relocated, and site disturbance does not seem to be occurring at this location. Site visits in 2004 and 2001 indicate the plant was experiencing increased shading from shrubs at this site. No other populations of this species have been identified in the assessment area.

Two other BLM Sensitive Plants are found in shrub-steppe habitat types in DCW, and habitats for these species are considered to be achieving standards for Standard 5. Pauper milk-vetch (*Astragalus misellus* var. *pauper*, G4T3/S3) typically occurs on open ridge tops and gentle upper slopes, along the western margin of the Columbia Plateau (Camp and Gamon 2011). One element occurrence of pauper's milkvetch occurs on the southern end of Douglas Creek allotment and is comprised of approximately 100 individuals. Trend information is not available due to limitations in monitoring.

Piper's fleabane (*Erigeron piperianus*, G3/S3) is most often documented in dry open places on level ground to moderate slopes of all aspects in undisturbed areas of shrub-steppe. Soils are well drained and somewhat alkaline (Camp and Gamon 2011). This species is spatially distributed throughout the western Columbia Basin. There is a historic state record of some

plants in the southern end of the assessment area; however, condition and number of plants are not known. Trend information is not available due to limitations in monitoring.

Sparsely Vegetated, Including Cliffs and Talus

Sparsely vegetated habitats, including lithosols, rock rubble, cliffs and talus account for greater than 54 percent of BLM administered land in DCW (based on ESD). Sandy sites are rare in DCW, and generally occur in washes. The IDT found sparsely vegetated habitat in BLM-administered portions of the DCW to have slight-moderate or less departure from reference conditions at allotment scales. These departures were typically the result of the presence of annual invasive plants such as bromes. One interesting observation the team made was found in Duffy Creek allotment where lithosols of the *Artemisia rigida-Poa secunda* association were lacking *Artemisia rigida*. Daubenmire (1970) noted an *Eriogonum thymoides-Poa secunda* association on the summit and north slopes of the Badger Mountain area; the IDT confirmed the presence of this association in sparsely-vegetated portions of the assessment area at the highest elevations of the Duffy Creek allotment and Unleased West area.

Sparsely vegetated areas in the assessment area were functioning as well as or better than deep-soiled portions of the assessment area, and would be expected to support "healthy, productive and diverse populations and communities of native plants and animals (including special status species and species of local importance) appropriate to soil, climate and landform" (Standards, p.11). The plants occurring in sparsely-vegetated portions of the assessment area have not experienced much disturbance due to their growth in rocks or talus. This habitat type is less used for grazing and recreation and has less available soil for noxious weed invasion.

Habitat for all of the BLM Sensitive plants found in sparsely vegetated portions of the assessment area is considered to be achieving Standard 5. Sagebrush stickseed (*Hackelia hispida* var *disjuncta*, G4/T2T3/ S2S3) is found on fine to coarse basalt talus, cliffs, or outcrops; sparsely vegetated, dry sites (Camp and Gamon 2011). This plant is an endemic of Grand Coulee and Moses Coulee, and two populations with several occurrences are found within and just south of the Douglas Creek allotment. The population in the Slack Canyon portion of Douglas Creek allotment appears stable; but trend information is not available for the occurrence south of the allotment due to limitations in monitoring.

Coyote tobacco (*Nicotiana attenuata*, G4/S2) is documented from dry sandy bottomlands, rocky washes, and other dry open places (Camp and Gamon 2011). This species is spatially distributed along the Western edge of the Columbia Plateau. Two historical populations are located along the old railroad grade in Douglas Creek allotment. These populations were not found during searches in 2013. This may be explained by the unstable nature of the habitat and the fact that the plant is an annual, making the population variability high. The habitat in the area of these populations does not appear to have been drastically altered, however.

Dwarf evening primrose (*Camisonia pygmaea*, G3/S3) is found in sagebrush steppe on unstable soil or gravel in steep talus, dry washes, banks, and roadcuts (Camp and Gamon 2011). This species is spatially distributed in the western Columbia Basin. One population of approximately 30 individuals growing with cheatgrass is located south of the Douglas Creek exclosure in the analysis area. Trend information is not available for this occurrence due to limitations in monitoring.

Native and T&E Wildlife

Shrub-Steppe Wildlife Species: Sagebrush Obligates and Shrub-Steppe Associated Species

Upland shrub-steppe habitats support a wide variety of wildlife species, including habitat specialists such as sagebrush obligates, as well as habitat generalists that have varying levels of dependence on shrub-steppe habitat and adaptability to use of other habitats. 91 species of birds, 88 species of mammals and 45 species of reptiles have been associated with use of shrub-steppe habitat. Of these, 33 species of bird, 19 species of mammals, and an unknown number of reptile species are considered "near-obligates" (McAdoo n.d.).

Sagebrush obligate species are dependent on sagebrush for some part of their life history (e.g. foraging, nesting). These habitat specialists are less adaptable than generalist species, and are the most affected by loss of sagebrush habitat because they are unable to shift to use of other habitats. Clearly defined sagebrush obligate species with potential to occur in the DCW include federally and state protected or sensitive species including the greater sage-grouse (*Centrocercus urophasianus*), pygmy rabbit (*Brachylagus idahoensis*), sage sparrow (*Amphispiza belli*) and sage thrasher (*Oreoscoptes montanus*), as well as species not currently recognized as sensitive (Brewer's sparrow (*Spizella breweri*), and sagebrush vole (*Lemmiscus curtatus*)). Species with weaker ties to sagebrush include state listing candidate sagebrush lizard (*Sceloporus graciosus*) and unlisted least chipmunk (*Tamias minimus*). Appendix B provides additional information for federal and state protected and sensitive species. Specific habitat requirements and levels of dependence on sagebrush vary by species and in general the group is often represented by an "umbrella" or "focal" species whose well-studied habitat needs are thought to also represent the needs of other sagebrush obligate species. As shown in Figure 1 below, the diversity of habitats used by greater sage-grouse makes it an appropriate focal species for managing sagebrush ecosystems (Stiver et al. 2010; McAdoo n.d.).

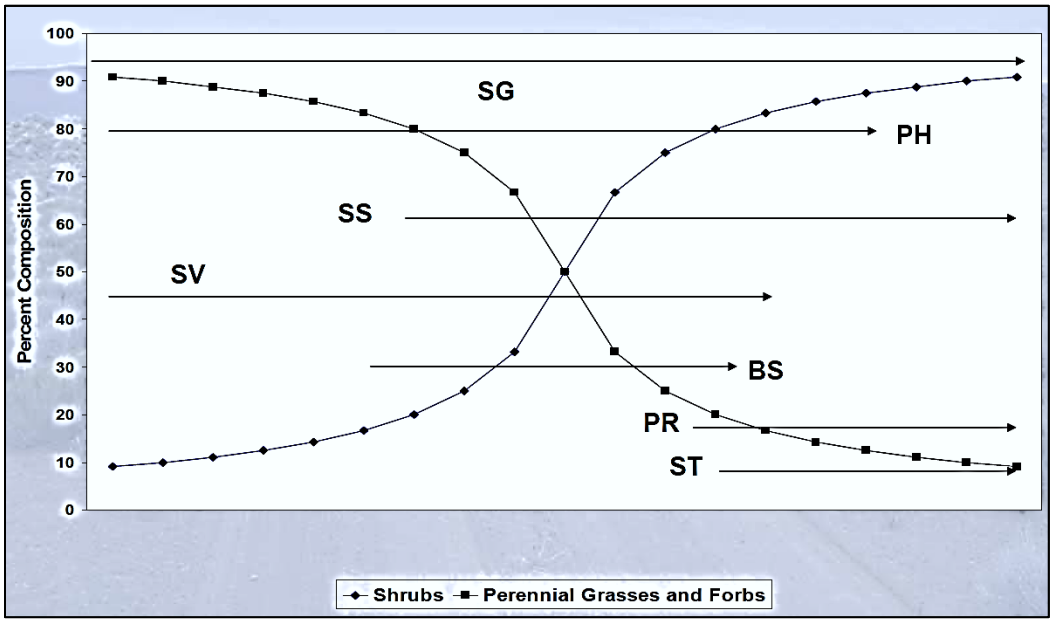

Figure 1. Relative Habitat Compositions Used by Sagebrush Obligates Demonstrating Greater Sage-Grouse as a Focal Species (Modified from McAdoo n.d.). SG-greater sage-grouse; PH-pronghorn (not present in DCW); SS-sage sparrow; SV-sagebrush vole; BS=-Brewer's sparrow; PR-pygmy rabbit; ST-sage thrasher.

Non-obligate shrub-steppe associated species may use shrub-steppe areas for part or all of their life-histories, but are not dependent on sagebrush as a species for survival. Shrub-steppe associated bird species include Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*), loggerhead shrike (*Lanius ludovicianus*), western meadowlark (*Sturnella neglecta*), Vesper sparrow (*Pooecetes gramineus*), burrowing owl (*Athene cunicularia*), ferruginous hawk (*Buteo regalis*) and many others, including some Neotropical migrants. Shrub-steppe associated mammals include common species such as mule deer (*Odocoileus hemionus),* coyote (*Canis latrans*), and a wide variety of rodents, as well as less common species such as Washington ground squirrel (*Urocitellus washingtoni*), American badger (*Taxidea taxus*) and white-tailed jackrabbit (*Lepus townsendii*).

Seeded areas including CRP fields support substantial numbers of birds, reptiles, amphibians, and mammals, but native shrub-steppe appears to have the highest diversity of wildlife (Vander Haegen et al. 2004). Areas seeded under the CRP program support their greatest diversity a decade or more following seeding, when they contain shrubs. Greater sage-grouse establishes more nests in shrub-steppe than in seeded CRP, but maturing CRP with tall perennial grasses and invasion by big sagebrush appears capable of supporting greater sage-grouse nesting, and may be responsible for maintaining greater sage-grouse population and fitness in Douglas County (Schroeder and Vander Haegen 2006).

Greater Sage-Grouse and Other Sagebrush Obligate Species

Evaluation of whether sagebrush obligate species habitat was "spatially distributed across the landscape with a density and frequency of species suitable to ensure reproductive capability and sustainability" was based on application of the greater sage-grouse Habitat Assessment Framework (HAF) (Stiver et al. 2010). The HAF is intended to provide policy makers, resource managers, and specialists with a comprehensive framework for landscape conservation in the sagebrush ecosystem (Stiver et al. 2010). The HAF was used to assess greater sage-grouse habitat specifically, but was also used indirectly to assess habitat for other sagebrush obligate species.

Results of application of this method are presented in Appendix C and summarized below for three spatial scales. Standard 5 findings for habitat in allotments supporting sagebrush obligate species were based primarily on the site-scale (fourth-order) analyses described in the HAF (Appendix C). Site-scale analysis in the HAF was conducted specifically for the assessment area, BLM-administered lands in DCW. However, larger-scale conditions influence spatial distribution of habitat and sustainability of sagebrush obligate populations; therefore the effects of conditions at these larger scales on habitats and populations in the assessment area were considered in findings.

<u>Second-Order/Mid-Scale (Range of Greater Sage-Grouse in WA, Management Zones)</u>

HAF suitability at this scale was ranked marginal. Approximately 50 percent of the steppe habitats that existed in eastern Washington prior to European settlement have been converted to agriculture or otherwise developed, and 42 percent of this existing shrub-steppe has less than 10 percent shrub cover. Shrub-steppe at this spatial scale is not well-connected. Occasional movements between sage-grouse populations have been documented, but overall connectivity is low and fragmentation is high. Anthropogenic disturbances that disrupt dispersal or cause mortality are present throughout most of the landscape.

Third-Order/Fine Scale (Moses Coulee Population, Seasonal Home Ranges Utilizing Portions of the DCW)

HAF suitability at this scale was also ranked marginal. Approximately 13 percent of the area identified as potential breeding habitat within breeding home range areas currently supports adequate shrub cover to be considered occupied seasonal breeding habitat. Approximately 13.5 percent of the area identified as potential winter habitat in the Moses Coulee Priority Area for Conservation (PAC) currently supports adequate shrub cover to be considered occupied winter habitat. Agricultural conversion in the PAC has removed the majority of historic breeding, late brood rearing, and winter sage-grouse habitat. Roughly half of the PAC has low biotic integrity (WWHCWG 2013). A single major corridor connects northern and southern seasonal habitats, and it is bisected by a highway. Anthropogenic features that can disrupt seasonal movements or cause mortality within the home range include agriculture, high road density, fence lines and utilities.

Fourth-Order/Site-Scale (Breeding, Late Brood Rearing, Winter Areas in the Assessment Area)

HAF suitability at the site scale (BLM-administered lands) was also ranked marginal. BLM-administered lands in DCW comprise less than 2% of the entire Moses Coulee PAC. Approximately half of those portions of the assessment area classified as having potential to meet Connelly et al. (2000) guidelines for habitat (based on soil conditions) actually met that definition, and areas classified as breeding habitat are mostly marginal-quality habitat. The primary reason that sites were rated as marginal or unsuitable was that sagebrush cover did meet canopy cover criteria identified in the HAF (Appendix C). It is important to note, however, that based on BpS descriptions and ESD state and transition models, lower levels of sagebrush cover are expected at higher elevation areas mapped as within the Columbia Plateau Steppe and Grassland setting, and the assessment area is in reference phases within the natural range of variability for sagebrush production and has not crossed a threshold to a degraded state. The mosaic of soil types and existing sagebrush cover and the scale on which they occur provide opportunity for the re-establishment of sagebrush for much of the assessment area, and young re-establishing shrubs were noted in many areas. This should be considered when assessing potential restoration or other habitat improvements for these species.

At the site scale, previously disturbed or seeded areas have limited amounts of forbs and/or patches of invasive annual grasses or support invasive annual grasses as a component (described for Standard 1). In addition to displacing habitat components, areas with invasive species pose a long-term threat to sagebrush obligate habitat because of the potential for expansion following disturbance such as wildfire.

Sagebrush Obligate Species Summary

Based on conditions in the assessment area and influences at larger spatial scales, Slack Canyon allotment and the Rimrock allotment and adjacent unleased portions of the assessment area were classified as “achieving” Standard 5 for the sagebrush obligate animal community, including greater sage-grouse. The New Acquisition was classified as “not achieving” Standard 5 for this community. Based on limited historic vegetation transect data (BLM data, on record) throughout the assessment area, as well as documented restoration of native plants on more than 175 acres, portions of the assessment area including Douglas Creek Canyon, Douglas Creek, Duffy Creek, Titchenal Canyon and Unleased West units appear to be on an upward trend for sagebrush obligate habitat supporting this species group. Thus Douglas, Duffy, and Unleased West

allotments/units in the assessment area were classified as not achieving but "making significant progress" towards achieving Standard 5. Marginal population conditions at larger spatial scales (e.g., Second- and Third-order scales), mostly attributable to conversion to agriculture in areas outside of BLM administration, also influence Standard 5 indicators for sagebrush obligates (including sage-grouse) including habitat connectivity, spatial distribution of habitat, and population stability/ resilience, and factored in Findings for this community.

Shrub-Steppe Associated Species

Based on ratings for Standards 1, 2 and 3, as well as other data sources, BLM-administered lands appear to provide suitable shrub-steppe habitats of various types and seral stages for non-sagebrush obligate shrub-steppe associated species. Within the DCW and at larger scales, much of the shrub-steppe habitat has been converted to agriculture and the shrub-steppe values have been greatly impacted for some of these species. For example, at the site scale BLM-administered lands are providing some functioning habitat for Columbian sharp-tailed grouse, but the species is not present in the assessment area or DCW due to large scale habitat loss and fragmentation that has resulted in isolated populations that are not productive enough to expand back into previously occupied areas. Non-sagebrush obligates are less dependent on sagebrush dominated habitat for species survival, and BLM-administered lands are generally providing functioning shrub-steppe habitat; therefore this species group was classified as achieving Standard 5 for this habitat type.

Riparian-Wetland Habitats and Species

No Threatened, Endangered, or Bureau sensitive fish or aquatic species occur or have been collected in Douglas Creek or its tributaries. The following native fish species may occur in Douglas Creek (above confluence with the middle Columbia River) (Mongillo and Hallock 1995): redside shiner (*Richardsonius balteatus*), threespine stickleback (*Gasterosteus aculeatus*), bridgelip sucker (*Catostomus columbianus*). None of these species were present in recent electro-fishing in middle Douglas Creek (BLM internal data, 2012), which is the most downstream extent of where BLM-administered lands begin.

Rainbow trout (*Oncorhynchus mykiss*) occur throughout wetted portions of Douglas Creek (Vadas and Beecher 2011). Currently WDFW passively manages Douglas Creek rainbow trout populations. Rainbow trout in Douglas Creek show a closer genetic affinity to coastal-origin hatchery Rainbow trout than to redband trout (*Oncorhynchus mykiss gairdnerii*) (Small and Dean 2007). Since these fish spawn naturally and are persisting in this inland tributary, it is likely that they represent a naturalized population derived from coastal hatchery introduction. Although native redband trout have been extirpated from the DCW or never occurred there, habitat conditions on BLM-administered lands in DCW are not precluding their existence or reinvasion.

Riparian and wetland species other than fishes utilizing DCW riparian areas include North American beaver (*Castor canadensis*), Pacific chorus frog (*Pseudacris regilla*), American signal crayfish (*Pacifastacus leniusculus*) and a wide variety of neotropical migrant birds. Characterization by Vadas and Beecher (2011) and IDT observation suggest that riparian aquatic native species present in DCW occur with a density and frequency of species suitable to ensure reproductive capability and sustainability. This assumption is based on riparian habitat conditions in Douglas Creek and Duffy Creek. Both systems were identified as being in PFC, although some areas of concern were noted. Riparian habitats are discussed under Standards 2 and 4.

Based on findings for Standards 2 and 4, as well as other data sources, riparian-wetland habitats and the species supported by these habitats in BLM-administered lands in the DCW were determined to be achieving Standard 5 at the allotment scale by the IDT.

Interdisciplinary Team Composition
Chris Sheridan, Restoration Program Coordinator (IDT Lead)
Angela Link, Rangeland Management Specialist
Nathan Wehmeyer, Rangeland Management Specialist
Molly Boyter, Botanist
Erik Ellis, Wildlife Biologist
Anjolene Price, Environmental Planning Intern (Technical Editor)

Spokane District Specialists Consulted
Paula Brooks, Botanist
Kerrin Doloughan, District Range Lead
Mike Fallon, GIS Specialist
Jason Lowe, District Wildlife Lead
Sean MacDougall, Weeds Specialist
J.A. Vacca, Wildlife Biologist

Glossary

Biological crust: Microorganisms (e.g., lichens, algae, cyanobacteria, microfungi) and non-vascular plants (e.g., mosses, lichens) that grow on or just below the soil surface. *Synonym:* microbiotic crust and cryptogamic crust.

Canopy cover: The percentage of the ground covered by a vertical projection of the outermost perimeter of the natural spread of foliage of plants. Small openings within the canopy are included. *Synonym:* crown cover (USDA BLM 1997).

Capability-The highest level of condition or degree of function a site can attain given certain political, social or economic constraints. For example, these constraints might include riparian areas permanently occupied by a highway or railroad bed that prevent the stream's full access to its original flood plain. If such constraints are removed, the site may be able to move toward its potential.

In designing and implementing management strategies to meet the standards of rangeland health, the potential of the site must be identified, and any constraints recognized, in order that plan goals and objectives are realistic and physically and economically achievable.

Climax plant community (climax): The final or stable biotic community in a successional series; it is self-perpetuating and in equilibrium with the physical habitat (SRM 1999).

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 (USDA 1997).

Increasers: native plants that increase in number to take the place of decreasers that have weakened or died because of heavy grazing or other range abuse. The increaser plants are normally shorter, lower producing and less palatable to livestock.

Normal variability or normal range of variability: The deviation of characteristics of biotic communities and their environment that can be expected given natural variability in climate and disturbance regimes.

Pedestal (erosional): Plants or rocks that appear elevated as a result of soil loss by wind or water erosion (does not include plant or rock elevation as a result of non-erosional processes such as frost heaving).

Potential-The highest level of condition or degree of function a site can attain given no political, social or economic constraints.

Potential natural community (PNC): The biotic community that would become established on an ecological site if all successional sequences were completed without interferences by man under the present environmental conditions. Natural disturbances are inherent in its development.

Proper Functioning Condition (PFC): Riparian wetland areas: adequate vegetation, landform, or large (coarse) woody debris is present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid in flood plain development; improve flood-water retention and ground water recharge; develop root masses that stabilize streambanks against cutting action; develop diverse channel and ponding characteristics to provide the habitat and water depth, duration and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. The result of interaction among geology, soil, water, and vegetation (USDI BLM 1997).

Uplands: soil and plant conditions support the physical processes of infiltration and moisture storage and promote soil stability (as appropriate to site potential); includes the production of plant cover and the accumulation of plant residue that protect the soil surface from raindrop impact, moderate soil temperature in minimizing frozen soil conditions (frequency, depth, and duration), and the loss of soil moisture to evaporation; root growth and development in the support of permeability and soil aeration. The result of interaction among geology, climate, landform, soil, and organisms (USDI BLM 1997).

Potential natural vegetation: A historical term originally defined by A.W. Kuchler as the stable vegetation community which could occupy a site under current climatic conditions without further influence by people. Often used interchangeably with "potential natural community".

Reference state: The reference state is the state where the functional capacities represented by soil/site stability, hydrologic function, and biotic integrity are performing at an optimum level under the natural disturbance regime. This state usually includes, but is not limited to, what is often referred to as the PNC.

Relative dominance (composition): The percent of cover or production represented by a species or lifeform expressed relative to the total cover or production. It can also be based on biomass.

Unit: As used in BLM Manual 4180-1, reasonably representative, homogenous spatial subdivisions of the assessment area (USDI 2001, ***p. 27***). In this evaluation, the term unit is used to refer to discrete unleased areas of roughly the same size as leased allotments in the assessment area.

Valley Width Index: Ratio of the width of the active stream channel to the width of the valley floor. The Valley Width Index (VWI) is estimated for the reach by dividing the average active channel width into the average valley floor width. In practice, the number of active channels that could fit across the valley floor

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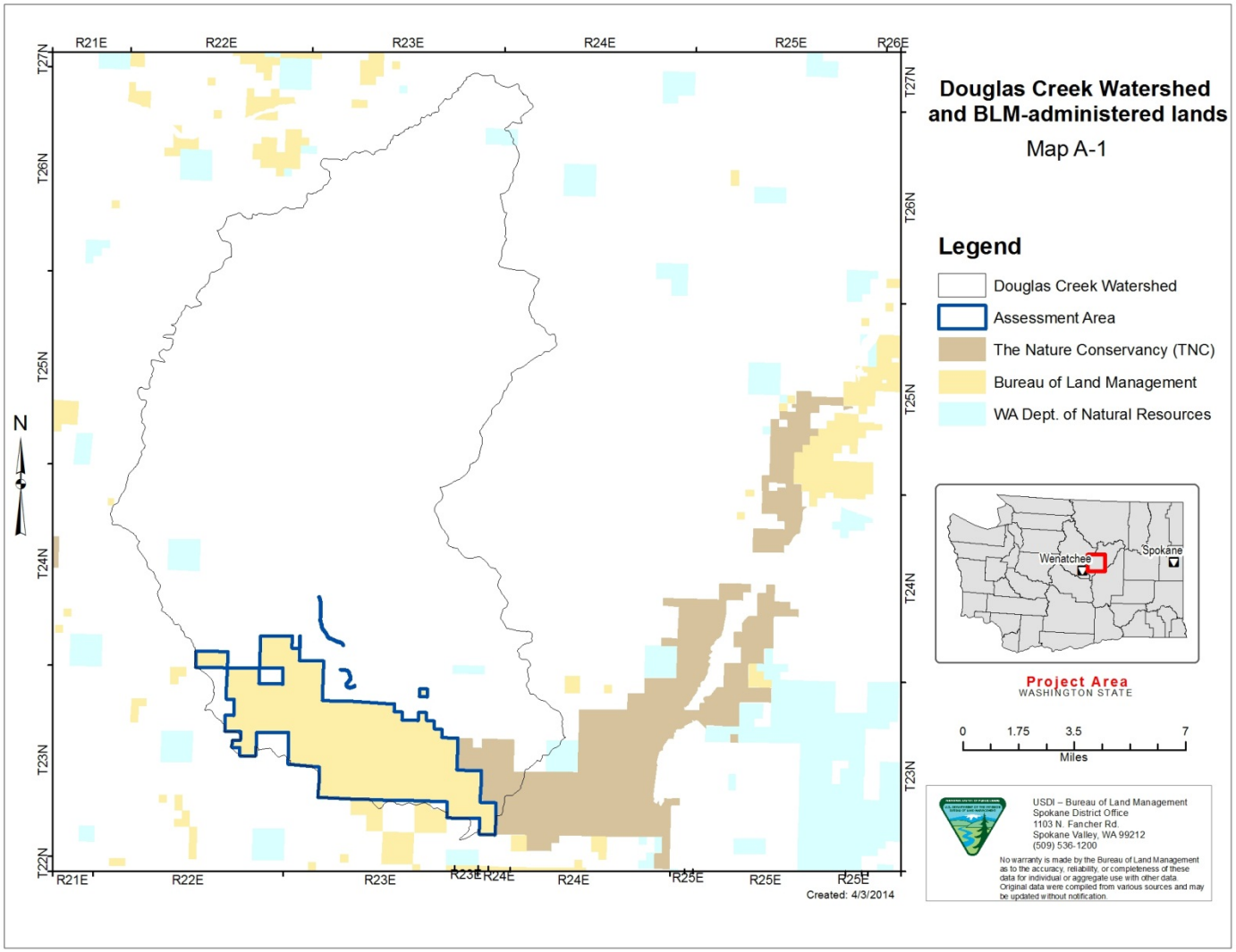
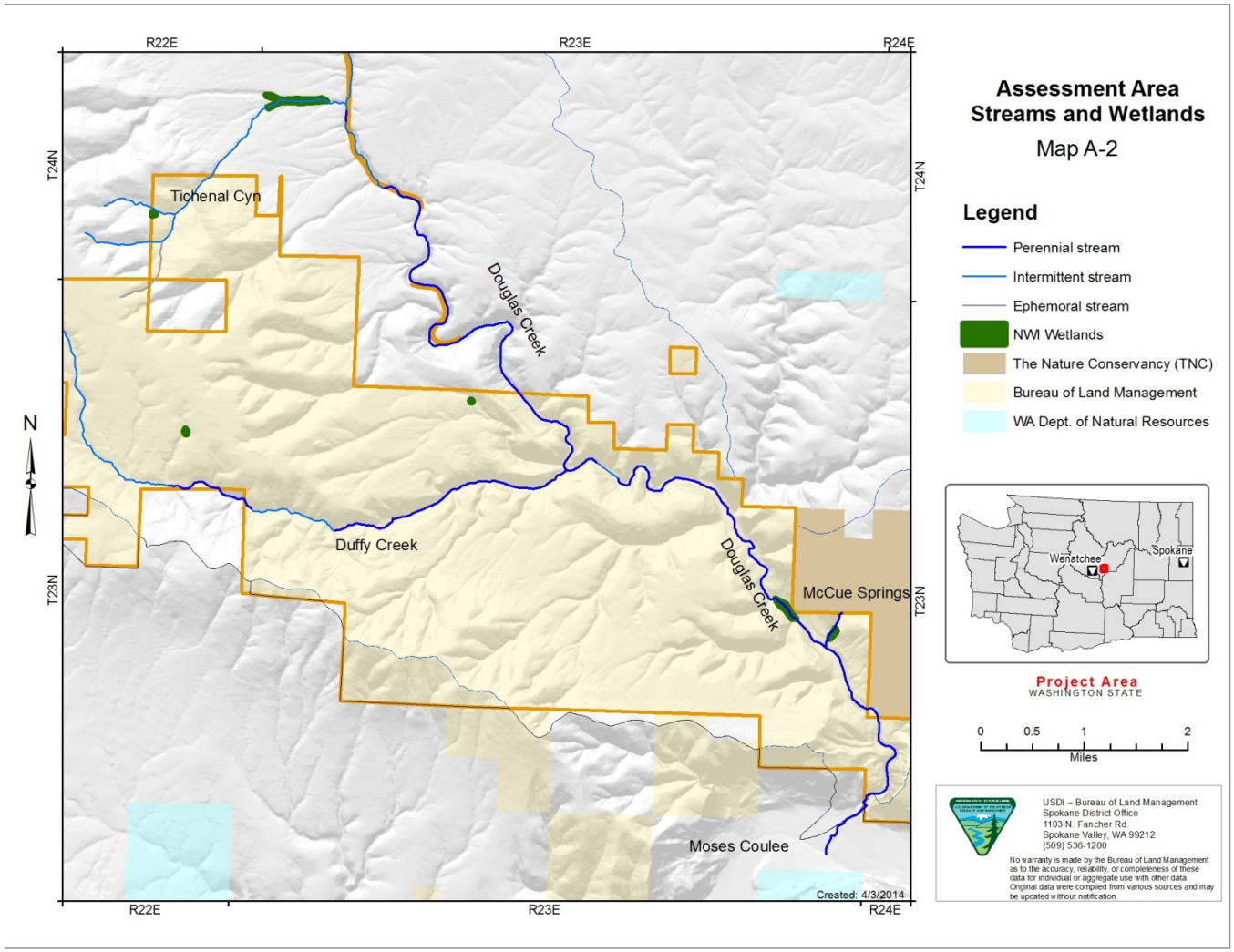
APPENDIX A: MAPS

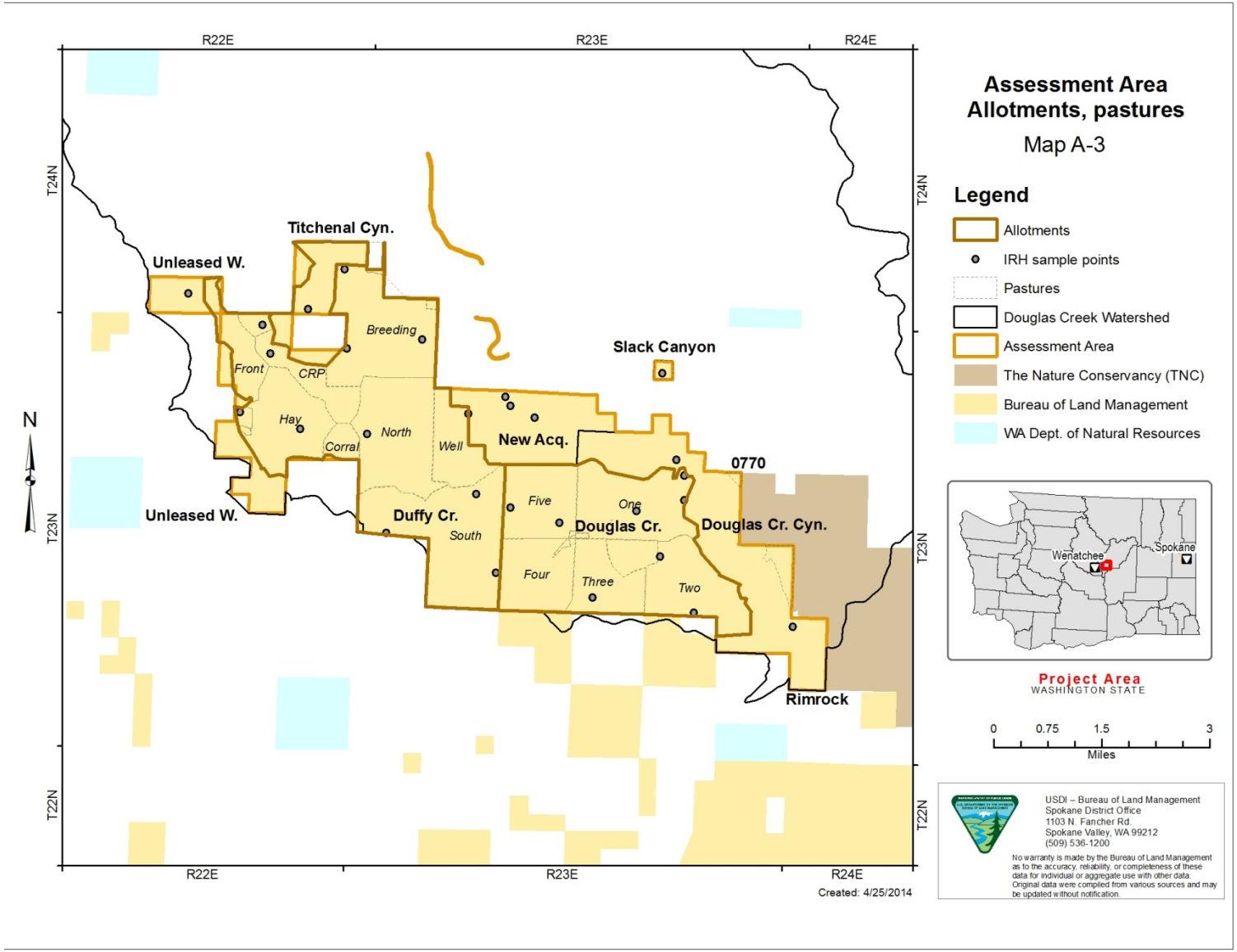
Map A-1. Douglas Creek Watershed and Assessment Area



Map A-2. DCW Riparian-Wetland Areas



Map A-3. DCW Allotments, Pastures, Unleased BLM-Administered Areas, and IRH Sample Points



APPENDIX B: TABLES

Table B-1. Functional Status of Stream Reaches within the Assessment Area. Mapping of specific reach locations on file at BLM Wenatchee Field Office, Wenatchee, WA.

Creek/ Allotment	Pasture	Reach	Rosgen Type	Veg Comm.[1]	Flow	Funct. Rating	Mi.	Notes
Douglas Creek								
None	Unleased	51	E3	Woods rose	Per	PFC	0.6	Short BLM-administered section of creek near the town of Alstown
None	Unleased	52	E3	Woods rose	Per	PFC	3.6	
Private	Private	53	Unk	Unk	Int	Unk	1.2	Not BLM-administered lands
None	Unleased	101	E3	Upland: big sagebrush	Int	PFC	1.1	Grazing excluded. Negligible riparian veg, droughty substrate. Weeds (white top, Russian knapweed)
None	Unleased	102	E3	Woods rose	Per/ Pond	PFC	0.3	PFC for both lentic and lotic
None	Unleased	103	F3	Sandbar willow	Int	PFC	0.6	Braided intermittent. Russian olive (terrace)
None	Unleased	104	E3	Water birch/ redosier dogwood	Per	PFC	0.4	PFC for both lentic and lotic
None	Unleased	105	E3	Water birch/ redosier dogwood	Per	PFC	1	Ponded glide
None	Unleased	106	E3	Sandbar willow	Per	PFC	1.4	Nettles common
Douglas Creek	Rimrock	107	E3/E4	Sandbar willow	Per	PFC	1.4	Nettles common
Douglas Creek	Rimrock	108	G1/A1	Sandbar willow	Per	PFC	0.4	Glide with cascades. Bedrock substrate. VWI<1.5

Douglas Creek	Rimrock	109	E4 (G4)	Water birch/ redosier dogwood	Per	PFC	0.2	
Douglas Creek	Rimrock	110	E4 (G4)	Water birch/ redosier dogwood	Per	PFC	0.3	
Douglas Creek	Rimrock/Priv	111	E4	Upland: big sagebrush	Int	PFC	0.9	Junction with Moses Coulee. Deep cobble, hyperrheic
Duffy Creek								
Duffy	Front	1	E3	Upland: big sagebrush	Int	PFC	1.8	Almost ephemeral-little scour.
Duffy	Front	2	E3	Black hawthorn/ common snowberry	Per	PFC	1.1	
Duffy	Hay	3	E3	Black hawthorn/ snowberry	Int	PFC	1.6	Spatially intermittent. Occasional hoof shear
Duffy	7	4	E3	Thinleaf alder/woods rose	Per	PFC	0.2	Hydrologically isolated
Duffy	7	5	E3	Black hawthorn/ snowberry	Int	PFC	1.45	Adjacent spring impacted by cattle
Duffy	Well	6	E3	Thinleaf alder/ woods rose	Per	PFC	0.8	Very minor, occasional bank slumping.
Duffy	Well	7	E3	Black hawthorn/ snowberry	Int	PFC	0.8	Spatially intermittent.
Duffy	Unleased	8	E3	Water birch/ snowberry	Per	PFC	0.4	Includes wetland at Douglas Cr. junction
McCue Springs								
McCue Springs /Douglas	Rip exclosure	1	E1	Woods rose	Per	PFC	0.4	Spring-fed wetlands within riparian

Creek								
Unnamed Titchenal								
Unnamed creek/ Titchenal Canyon	Titchenal Canyon	1	E6	Yellow willow-Sandbar willow	Int	PFC	0.8	Rare cattle access; localized bank impacts.
Titchenal Canyon	Titchenal Canyon	2	E6	Yellow willow-Sandbar willow	Int	PFC	0.3	
Titchenal Canyon	Titchenal Canyon	3	E6	Yellow willow-Sandbar willow	Per	PFC	0.2	
Titchenal Canyon	Titchenal Canyon	4	F6	Pasture grasses, Wyoming big sage	Per	FAR	0.2	Riparian veg removal, bank impacts, garbage
Titchenal Canyon	Titchenal Canyon	5	E3/B3	Yellow willow-Sandbar willow	Per	PFC	0.3	Cobble subsrate. Well-developed riparian veg. VWI< 2
Titchenal Canyon	Titchenal Canyon	Trib 1	E6	Black cottonwood/ snowberry	Int	PFC	0.3	Trib has significant flow, well-developed channel

[1]Riparian vegetation community types from Crawford (2003).

Table B-2. Douglas Creek Revegetation Sites (All Treatments Performed in 1997 and 1998)

Location	Treatment[1]	Size
T 23N R23E sect 14, NE1/4 of SE1/4	Weed treatment	0.6 ac.
T 23N R23E sect 14, NE1/4 of NE1/4	Seeded 0.25 acres to LECI; Seeded 0.15 acres to SODAR.	0.4 ac.
T 23N R23E sect 14, NW1/4 of NE1/4	Seeded to LECI.	0.6 ac.
T 23N R23E sect 11, SW1/4 of SW1/4	Sprayed whitetop. Seeded to LECI; fertilized.	0.8 ac.
T 23N R23E sect 11, SW1/4 of SW1/4	Sprayed whitetop. Seeded to LECI and SECAR.	0.1 ac.

Table B-3. Invasive Species Treatments in the Assessment Area (392 Acres Total)

Duffy	**Invasive Species Present**									
Township Range Section	Russian Knap weed	White top	Diffuse Knap weed	Spotted Knap weed	Canada Thistle	Kochia	Perennial Pepper weed	Dalmatian Toadflax	Scotch Thistle	Russian Thistle
23N22E01	*	*	*		*		*	*		
23N22E02	*	*	*		*		*	*		
23N2211	*	*	*		*	*	*	*		*
23N22E12	*	*	*		*		*	*		
23N22E14	*	*	*		*	*	*	*		*
23N23E06	*	*	*		*		*	*		
23N23E07	*	*	*		*		*	*		
23N23E08	*	*	*		*		*	*		
Douglas										
23N23E10	*	*	*	*	*	*	*	*	*	
23N23E11	*	*	*	*	*	*	*	*	*	
23N23E13	*	*	*	*	*	*	*	*	*	
23N23E14	*	*	*	*	*	*	*	*	*	
23N23E15	*	*	*		*	*	*	*	*	
23N23E17	*	*	*		*		*	*		
23N23E18	*	*	*		*		*	*		
23N23E20	*	*	*		*		*	*		
23N23E21	*	*	*		*	*		*		
23N23E22	*	*	*		*	*	*	*	*	
23N23E23	*	*	*		*	*		*		
23N23E24	*	*	*		*	*	*	*	*	

Table B-4. Mapping of Indicators for Standard 1. Comparison of Standards for Rangeland Health (USDI BLM 1997) Indicators with IRH classified following Technical Reference 1734-6 (Pellant et al. 2005).

Standard 1 Indicator (USDI BLM 1997)	IRH Indicator (Tech. Ref 1734-6)	Attribute
Amount and distribution of plant cover (including forest canopy cover)	10, 12, 16	Biotic
Amount and distribution of plant litter	7, 14	Soil, Hydrologic
Accumulation/incorporation of organic matter	8, 9	Soil
Amount and distribution of bare ground	4, 8	Soil
Amount and distribution of rock, stone, and gravel	9	Soil
Plant composition and community structure	10, 12	Hydrologic, Biotic
Thickness and continuity of A horizon	6, 9	Soil
Character of micro relief	1, 6	Soil
Presents and integrity of the soil profile	9, 11	Soil
Biological activity (plant, animal, and insect)	13, 15, 17	Biotic
Absence of accelerated erosion and overland flow	1, 2, 3, 5, 6	Soil

Table B-5. Standard 1 Pasture Findings. New Acquisition, Rimrock, Titchenal Canyon, Slack Canyon, and Unleased West allotments/areas do not have individual pastures. Standard 1 conditions in these allotments are addressed in Table 2 (see section 2.6).

Pasture	Ecological Sites[1]	Soil Site stability	Hydrologic Function	Biotic Integrity	Description of Departure and Notes
Douglas Creek Cyn	R008XY202WA R008XY103WA	NS	NS	SM	No widespread rills or gullies. Localized dominance of weeds near roads.
Douglas Creek Allotment					
One	R008XY102WA	SM	SM	SM	Few rills/flow paths. Some invasive annuals, little reduction in F/S diversity. Stony sites rare changes in F/S groups.
Two	R008XY102WA	SM	SM	SM	Scattered invasive annuals.
Three	R008XY102WA	NS	NS	SM	No lacks of stability or hydrological issues noted. Scattered invasive annuals.
Four	R008XY301WA	SM	SM	SM	Occ. loss of soil, pedestaling (lithosols). Lacking shrubs, invasive annuals present.
Five	R008XY102WA	SM	SM	SM	Occ. large water flow paths, bare ground. Reduced diversity in F/S groups: invasive annuals, Increasers.
Duffy Creek Allotment					
Breeding	R008XY301WA R008XY102WA	NS	NS	SM	Occasional waterflow and pedestals in exposed, steep areas. Invasive annuals in patches on south slopes.
Corral	R008XY202WA R008XY301WA	NS	NS	SM	Few invasive annuals in disturbed areas.
CRP	R008XY102WA R008XY301WA	NS	NS	SM	F/S groups have been modified

					by seeding (loamy).
Front	R008XY301WA R008XY202WA	NS	NS	NS	
Hay	R008XY301WA R008XY201WA	SM	SM	SM	Rills in lithosols. Lithosols have low F/S diversity and invasive annuals. Seeding in loamy area (N).
North	R008XY301WA R008XY201WA	NS	NS	SM	Invasive annuals on south-facing slopes and northern portion of pasture.
South	R008XY301WA R008XY102WA	SM	SM	SM	Lithosols stable. Occ. loamy sites with departure. F/S groups reduced diversity due to invasive annual bromes.
Well	R008XY301WA R008XY102WA	NS	NS	SM	Seeded species have changed F/S groups (loamy soils).

[1] Ecological sites contributing to 50 percent of the pasture or similar landscape unit, in order of cover amount.

Table B-6. Mapping of Indicators for Standard 3. Comparison of Standards for Rangeland Health (USDI BLM 1997) Indicators for Standard 3 with IRH classified following Technical Reference 1734-6 (Pellant et al. 2005).

Standard 3 Indicator (USDI BLM 1997)	**IRH Indicator (Pellant et al. 2005)**
Photosynthesis is effectively occurring throughout the potential growing season, consistent with the potential/capability of the site, as evidenced by plant composition and community structure.	12, 10, 16
Nutrient cycling is occurring effectively, consistent with potential/capability of the site, as evidenced by:	
• Plant composition and community structure	10, 12, 16
• Accumulation, distribution, incorporation of plant litter and organic matter into the soil	14, 7, 4, 11
• Animal community structure and composition	Not assessed
• Root occupancy in the soil profile	10, 17, 15
• Biological activity including plant growth, herbivory, and rodent, insect, and microbial activity	17, 15,12,13

Table B-7. Mapping of Indicators for Standard 5. Comparison of Standards for Rangeland Health (USDI BLM 1997) Indicators for Standard 5 with IRH classified following Technical Reference 1734-6 (Pellant et al. 2005).

Standard 5 Indicator (USDI BLM 1997)	**IRH Indicator (Tech. Ref 1734-6)**	**Notes**
Plant community and composition, age class distribution, productivity	12, 13, 15, 16, 17	
Animal community composition, productivity	NA/ 8, 9, 11, 12, 13, 14, 15, 16, 17	Assumption that sites with rangeland health support productive animal communities.
Habitat elements	NA/ 8, 9, 11, 12, 13, 14, 15, 16, 17	Assumption that sites with rangeland health support productive animal communities.
Spatial distribution of habitat	NA	ESD data collected at site scales, not effective at characterizing habitat connectivity.
Habitat connectivity	NA	ESD data collected at site scales, not effective at characterizing habitat connectivity.
Population stability/resilience	NA/ 8, 9, 11, 12, 13, 14, 15, 16, 17	Assumption that sites with rangeland health support productive animal communities.

Table B-8. Special Status Plant Species Found In or Near the DCW

Plant Species	Current Management Status	Preferred Habitat	Occurrence	Analysis Summary
Pauper milk-vetch *Astragalus misellus var. pauper*	Sensitive	Sagebrush steppe: vegetated	Yes	Upland Shrub-steppe group
Dwarf suncup *Camissonia pygmaea*	Sensitive	Sagebrush steppe: dry rocky, sandy, sparsely vegetated, or cliffs and talus	Yes	Sparsely Vegetated group
Narrow stem cryptantha *Cryptantha gracilis*	Sensitive	Sagebrush steppe: dry rocky, sandy, sparsely vegetated, or cliffs and talus	No	Does not occur / not analyzed
Gray cryptantha *Cryptantha leucophaea*	Sensitive	Sagebrush steppe: dry rocky, sandy, sparsely vegetated, or cliffs and talus	No	Does not occur / not analyzed
Piper's fleabane *Erigeron piperianus*	Sensitive	Sagebrush steppe: vegetated	Yes	Upland Shrub-steppe group
Sagebrush stickseed *Hackelia hispida var disjuncta*	Sensitive	Sagebrush steppe: dry rocky, sandy, sparsely vegetated, or cliffs and talus	Yes	Sparsely Vegetated group
Longsepal globemallow *Illiamna longisepala*	Sensitive	Sagebrush steppe: vegetated	Yes	Analyzed Individually
Coyote tobacco *Nicotiana attenuata*	Sensitive	Sagebrush steppe: dry rocky, sandy, sparsely vegetated, or cliffs and talus	Yes	Sparsely Vegetated group
Snowball cactus *Pediocactus nigrispinus*	Sensitive	Sagebrush steppe: vegetated	No	Does not occur / not analyzed
Sticky phacelia *Phacelia lenta*	Sensitive	Sagebrush steppe: dry rocky, sandy, sparsely vegetated, or cliffs and talus	No	Does not occur / not analyzed

Table B-9. BLM Sensitive and WDFW Priority Species in the DCW. FE is federal endangered, FC is federal candidate, SOC is species of concern, SS is Special Status, SM is State Monitor, SC is State Candidate, ST is State Threatened, SE is State Endangered, AA is Assessment Area. DCW Analysis types include "Not included", SS assoc" (Shrubsteppe associate), "Sagebrush obligate", and "Riparian".

Common name	***Scientific name***	**Federal Status**	**WNHP WDFW Status**	**Distribution/Habitat Association**	**DCW Standard 5 Indicator relevance**	**DCW Analysis**
American peregrine falcon	*Falco peregrinus anatum*	None	SS	Nest on cliffs, typically 150 ft or more in height. Young reared in small caves or on ledges. Nest sites near water.	No documented observations in DCW or adjacent areas. Potential breeding habitat present in DCW.	SS assoc
Ash-throated flycatcher	*Myiarchus cinerascens*	None	M	Open, arid habitats. In WA, restricted to Garry oak and streamside woodlands in SE Cascade foothills.	No identified seasonal use in Douglas Co.	Not included
Black-crowned night-heron	*Nycticorax nycticorax*	None	M	In WA, breed primarily in freshwater areas. Winter habitat is varied. Use forested swamps.	Core habitat for this species NE of DCW. Limited forested swamps, little open water other than Douglas Creek.	Not included
Black-tailed jackrabbit	*Lepus californicus*	None	SC	Inhabits open plains, fields and deserts; open country with scattered thickets or patches of shrubs.	Core habitat for this species is identified in DCW, but no documented occurrences.	Sagebrush obligate
Black-throated sparrow	*Amphispiza bilineata*	None	None	Variety of habitats including sagebrush and creosote bush deserts. In WA, degraded or otherwise gravelly soils.	No documented occurrences in DCW. Limited potential habitat.	Not included
Bobolink	*Dolichonyx oryzivorus*	None	M	Breeds in open grasslands and hay fields. In migration and in winter uses freshwater marshes, grasslands, ag fields.	No core or marginal habitat identified in Douglas County.	Not included
Burrowing owl	*Athene cunicularia*	None	SC	Shrub-steppe habitat of eastern part of the state during the breeding season.	Documented occurrence in AA.	Sagebrush obligate
Cavity-nesting ducks	*Aix sponsa, Bucephala islandica, B clangula, B albeola, Lophodytes cucullatus*	None	None	Wood duck, barrow's goldeneye, common goldeneye, bufflehead, hooded merganser. Wooded wetlands, slow-moving rivers, small lakes and ponds. Forested habitat with mature trees for nesting cavities.	DCW probably never provided significant high quality habitat for cavity-nesting ducks. No clear lakes, few trees.	Not included

Common name	*Scientific name*	Federal Status	WNHP WDFW Status	Distribution/Habitat Association	DCW Standard 5 Indicator relevance	DCW Analysis
Chukar	*Alectoris chukar*	None	None	Steep, dry, rocky shrub-steppe slopes. Cheatgrass and wheat seeds are significant part of diet.	Year round habitat for this species occurs in the AA.	SS assoc
Columbia spotted frog	*Rana luteiventris*	None	SC	Eastern WA, in permanent water bodies with seasonal flooding.	No documented occurrences or suitable or marginal habitat in AA. Unlikely to occur; few non-riparian ponded areas occur.	Not included
Eastern tailed blue	*Cupido comyntas*	None	None	Many open, sunny places including weedy areas and disturbed habitats	No documented occurrences in DCW.	Not included
Elk	*Cervus elaphus*	None	None	Widespread in WA. Habitats include shrub steppe, bunchgrass, shrub plant communities.	No core or marginal habitat for this species mapped for DCW. Potential transient.	SS assoc
Ferruginous hawk	*Buteo regalis*	None	ST	In WA, bird uses Columbia Basin channeled scablands and juniper-savannah.	Breeding habitat in Douglas Co is east of DCW. Species probably uses DCW for foraging.	Sagebrush obligate
Golden eagle	*Aquila chrysaetos*	None	SC	Open shrubsteppe and grassland habitats.	Documented occurrence and nesting in AA.	SS assoc
Gray flycatcher	*Empidonax wrightii*	None	M	Sagebrush, pinyon pine and juniper, or open ponderosa pine forests.	Douglas Creek identified as breeding habitat, but no documented occurrences.	Riparian
Gray wolf	*Canis lupus (northern rocky mtn.)*	None	SE	East of Hwy 97. Diverse habitat with sufficient prey base. Known breeding packs in NE WA.	Not documented near AA. Nearest breeding pack >50 miles away. DCW lacks habitat diversity and prey base. Individuals unlikely to occur in AA except as transients.	Not included
Great blue heron	*Ardea herodias*	None	None	Slow-moving or calm salt, fresh, or brackish water. Nesting colonies are typically found in mature forests, on islands, or near mudflats.	DCW provides limited slow moving freshwater habitat, and is not considered good habitat for this species.	Not included
Greater sage-grouse	*Centrocercus urophasianus (columbia basin dps)*	FC	ST	Shrub-steppe within Recovery Area	Documented occurrences in AA.	Sagebrush obligate

Common name	*Scientific name*	Federal Status	WNHP WDFW Status	Distribution/Habitat Association	DCW Standard 5 Indicator relevance	DCW Analysis
Gyrfalcon	*Falco rusticolus*	None	M	DCW supports non-breeding range for this species	No documented occurrences in AA.	Not included
Kincaid meadow vole	*Microtus pennsylvanicus kincaidi*	None	M	Grassy meadows, moist areas.	No documented occurrences in AA.	Not included
Lewis' woodpecker	*Melanerpes lewis*	None	SC	Breeds east of Cascades in WA forest with open overstory and often heavy brush layer.	No documented occurrences. Limited habitat in DCW.	Not included
Loggerhead shrike	*Lanius ludovicianus*	None	SC	Breed in open country: grasslands and shrub-steppe areas with scattered trees, tall shrubs, fence posts or other lookouts.	Documented occurrence in AA.	Sagebrush obligate
Meadow fritillary	*Boloria bellona*	None	M	Wet area: marshes, mesic aspen groves. Caterpillar host is violets.	No documented occurrence in AA. Host plant rare to absent in DCW.	Not included
Merriam's shrew	*Sorex merriami*	None	SC	Primarily associated with arid shrub-steppe and steppe communities.	Documented occurrence in AA.	Sagebrush obligate
Moose	*Alces americanus*	None	None	Requires water bodies for foraging and hardwood-conifer forests for winter cover.	DCW is outside of WDFW's priority management areas for this species. Possible transient.	Not included
Northwest white-tailed deer	*Odocoileus virginianus v. idahoensis*	None	None	Generalists able to adapt to a wide variety of habitats.	Limited habitat for this species is mapped for DCW, no documented occurrences.	Not included
Pallid bat	*Antrozous pallidus*	None	M	Arid regions with rocky outcroppings, to open, sparsely vegetated grasslands. Water must be available close by.	Documented occurrence in AA.	Riparian
Prairie falcon	*Falco mexicanus*	None	None	All habitats in steppe zones except for development and agriculture. This species is limited by the presence of cliffs and large rocky outcroppings on which it nests.	Documented occurrence in AA.	SS assoc
Preble's shrew	*Sorex preblei*	SOC	SC	Arid or semiarid shrub-grass associations, and in wet areas such as stream banks, marshes, and wet meadows.	No core or marginal habitat or documented occurrences in AA.	Not included

Common name	***Scientific name***	**Federal Status**	**WNHP WDFW Status**	**Distribution/Habitat Association**	**DCW Standard 5 Indicator relevance**	**DCW Analysis**
Pygmy rabbit	*Brachylagus idahoensis (columbia basin dps)*	FE	SE	Deep soil shrub steppe. Currently limited to experimental population introduced to sagebrush flats (east of DCW).	Currently extirpated from DCW. Formerly occupied sagebrush habitat in five WA counties including Douglas.	Sagebrush obligate
Ring-necked pheasant	*Phasianus colchicus*	None	None	Edges of open fields, brushy hedgerows, and forest edges. Prime habitat in WA appears to be cattail and willow patches near irrigated farmlands.	Fairly common resident.	SS assoc
Rocky mountain mule deer	*Odocoileus hemionus hemionus*	None	None	Open forests and sagebrush meadows east of the Cascades in WA	Year round habitat for this species occurs in the AA.	SS assoc
Sage sparrow	*Amphispiza belli*	None	SC	Restricted to open shrub and grasslands. Hot, dry areas of eastern WA with patchy cover by mature big sagebrush	Breeding habitat includes DCW; no documented occurrences in AA.	Sagebrush obligate
Sage thrasher	*Oreoscoptes montanus*	None	SC	Open shrub-steppe dominated by sagebrush or bitterbrush, with native grasses intermixed, generally avoiding cheatgrass-dominated landscapes.	Documented occurrences in AA. Breeding habitat for this species includes DCW.	Sagebrush obligate
Sagebrush lizard	*Sceloporus graciosus*	SOC	SC	Primarily habitat is sagebrush. Also found in pinyon-juniper woodlands, open pine forests, and Douglas fir forests.	Core habitat for this species is identified in DCW, but no documented occurrences.	Sagebrush obligate
Sharp-tailed grouse	*Tympanuchus phasianellus*	None	ST	8 small, isolated populations in north-central WA. Grass-dominated habitats with patches of deciduous trees and shrubs. Leks located on knolls and ridges with sparse veg.	Not documented in AA, but in DCW. Nearest Lek is >10 miles north. Few trees in AA.	Not included
Tawny-edged skipper	*Polites themistocles*	None	M	Moist grassy areas including prairie swales, pastures, lawns, roadsides, vacant lots.	Documented in Douglas County. Few prairie swales in DCW.	Not included
Townsend's big-eared bat	*Corynorhinus townsendii*	None	SC	Uses caves, mines, hollow trees, and built structures for roosting. Forages in riparian.	Documented occurrences in AA.	Riparian
Washington ground squirrel	*Spermophilus washingtoni*	FC	SC	Shrub-steppe east of Columbia River.	Documented occurrences in AA.	Sagebrush obligate

Common name	***Scientific name***	**Federal Status**	**WNHP WDFW Status**	**Distribution/Habitat Association**	**DCW Standard 5 Indicator relevance**	**DCW Analysis**
White-headed woodpecker	*Picoides albolarvatus*	None	SC	Open canopy, mature and old-growth ponderosa pine forest, eastslope Cascades, Okanogan Highlands, Selkirk and Blue Mtns.	Negligible open canopied forest is present in DCW.	Not included
White-tailed jackrabbit	*Lepus townsendii*	None	SC	Open grasslands and sagebrush plains. At higher elevations found in open areas adjacent to pine forests and in alpine tundra.	Documented occurrences in AA.	Sagebrush obligate
Yellow-billed cuckoo	*Coccyzus americanus*	FC	SC	Extirpated in WA, but appear extremely rarely during summer. Forested stream-sides, cottonwoods and willows with dense, low vegetation.	Absent from the state. Forested streamside areas are naturally rare in Douglas Creek.	Not included

Table B-10. Data Summary for plots collected during DCW land health evaluation. Sample sizes are small: data was used to confirm field reviews by IDT, not to establish thresholds during site classification.

Allotment/Unit	Sample Size	Bare Ground (%)	Plant Litter (%)	Invasive[1] Cover (%)	Bunchgrass[2] Cover (%)	Shrub Cover (%)	Soil Stability[3] Covered	Soil Stability Uncovered
Stony soils	1	2	34	8	68	26	6	5
Loamy soils	6	10	51	5	50	9	5.7	5.3
Stony soils	2	2	76	58[4]	39	6	4.5	2.9
Loamy soils	8	3	61	21	45	5	5.4	4.8
Very thin soils	5	12	31	2	20	0[5]	5.2	3.1
Loamy soils	2	7	61	19	25	3	5.2	3.5
Stony soils	1	7	30	2	38	10	4.8	4.5
Loamy soils	1	0	90	2	96	4	4.8	6
Very thin soils	1	18	34	0	46	4	4.4	1
Loamy soils	1	4	78	28	60	18	5.4	5.5
Very thin soils	1	28	22	2	28	0[4]	5.5	4

[1]Invasives and bunchgrasses do not include seeded non-native grasses
[2]Bunchgrasses include increasers (POSE, ACTH)
[3]Soil stability ranges from 1 (unstable, dissolving quickly in water) to 6 (stable, does not dissolve in water). Data taken for sites covered by vegetation and open.
[4]One plot was weed infested
[5]*Eriognum thymoides* community

APPENDIX C: Greater Sage-Grouse Habitat Assessment Framework Analysis

Douglas Creek Watershed/Moses Coulee Priority Area for Conservation

Introduction

The purpose of this appendix is to document the Habitat Assessment Framework (HAF) process used in the Douglas Creek Watershed (DCW) Land Health Evaluation. The HAF has been developed over time by the BLM, and the latest version (Stiver et al. 2010) was adopted by BLM for use in the National Sage-Grouse Strategy (USDI 2004). The HAF is designed to provide policy makers, resource managers, and specialists with a comprehensive framework for landscape conservation in the sagebrush ecosystem (Stiver et al. 2010). The HAF was used to assess greater sage-grouse habitat specifically, but was also used indirectly to assess habitat for other sagebrush obligate species. The diversity of habitats used by greater sage-grouse makes it an appropriate focal species for managing sagebrush ecosystems (Stiver et al. 2010).

This appendix documents specific protocols, any deviations from or modifications of HAF protocol where necessary due to data or other limitations, and habitat descriptions for four spatial scales. The spatial scales are first defined, and then each spatial scale is described and assessed following the steps outlined in the HAF, including descriptions of the methods applied in this assessment.

HAF spatial scales

The HAF uses the four orders of habitat selection described by Johnson (1980). Table C-1 defines these orders and describes the spatial boundaries and data sources used to assess each scale. Note that the site-scale (HAF 4) is the only scale that specifically assesses only BLM-administered lands in the DCW, while the other scales assess all ownerships across broader areas. Therefore, in this appendix, the "assessment area" is defined at each spatial scale and is not synonymous with "assessment area" as defined in the DCW Land Health Evaluation.

Table C-1. **Four orders of habitat selection as they apply to DCW and supporting data sources.**

Habitat Selection Processes	**Broad-Scale (HAF1)**	**Mid-Scale (HAF2)**	**Fine-Scale (HAF3)**	**Site-Scale (HAF4)**
Orders of Habitat Selection (HAF, p. I-6)	First-order: Range-wide distribution of sage-grouse populations throughout West.	Second-order: Physical and geographic range of populations and subpopulations.	Third-order: Physical and geographic area within home ranges.	Fourth-order: Physical and geographic area within seasonal ranges to meet life requisite needs.
DCW-specific boundaries	Range-wide distribution of sage-grouse populations throughout the West, including Columbia Basin Management Area (CBMA)	Greater sage-grouse management zones in Washington: CBMA	Breeding, late brood rearing home range: all areas within 18 km of 4 identified leks associated with the DCW. Winter home range: Entire Moses	Habitat within specific Moses Coulee Subpopulation seasonal use areas for BLM-administered lands in the DCW: breeding, late brood rearing, winter.

			Coulee PAC.	
DCW Data sources	Primary literature (Connelly et al. 2000, Aldridge et al. 2008, etc.)	1) "Priority Area for Conservation" (PAC) polygons for CBMA (USFWS 2013) 2) Primary lit detailing use of these areas (USFWS 2013, Stinson et al 2004.	WDFW 1999 shrub habitat layer, WWHCWG landscape integrity data, roads/km (BLM gtrn layer)	BLM-classed polygon data based on 2006, 2010 and 2012 vegetation transects and ocular estimates.

Key Acronyms used in this document

CBMA: the Columbia Basin Management Area for greater sage-grouse
DPS: Distinct population segment
EBR: Early brood-rearing habitat
GSG: Greater sage-grouse
HAF: Habitat Assessment Framework
PAC: Priority Area for Conservation
LBR: Late Brood-rearing habitat
ESD: Ecological Site Description
WWHCWG: Washington Wildlife Habitat Connectivity Working Group

First and Second Order Habitat Description Steps

Sage-grouse first and second-order habitat description is based on summarization of primary literature (USFWS 2013, Connelly et al. 2000, Aldridge et al. 2008, and Stinson et al. 2004). No new analysis was done for HAF levels 1 or 2 for the DCW sage-grouse habitat analysis.

HAF 1: Broad-scale (Range-wide distribution of sage-grouse)

Description of conditions at the broad-scale (HAF 1) depends on previous studies as summarized in the greater sage-grouse Conservation Objectives Team (COT) Report (USFWS 2013) and the Greater Sage-Grouse Recovery Plan (Stinson et al. 2004).

Sage-grouse historically occurred in 13 states and three Canadian provinces on 0.46 million mi^2. Currently sage-grouse occur in 11 states and two provinces on 56% of the historic area. Habitat loss and fragmentation is a primary cause of the decline of sage-grouse populations (USFWS 2013). Primary habitat alteration factors include conversion or degradation of habitat for agriculture, loss of habitat due to increasing cycles of fire and exotic species invasion at lower elevations and expansion of native conifers (pinyon-juniper) due to fire suppression at higher elevations, and more recently energy development such as oil and gas wells and associated roads and infrastructure. Secondary factors of population loss that are exacerbated by the primary factors above include parasites and diseases, predation and weather events (USFWS 2013). Due to

this loss and fragmentation of historic habitat and subsequent population decline, the species became a Candidate for ESA listing in 2012 and the USFWS is studying a petition to list the species as Threatened under the Endangered Species Act (ESA) (*75 FR 13910*).

As the range and population of sage-grouse contracted, birds in the Columbia Basin Management Zone became genetically isolated from the historic population and are currently considered to be a Distinct Population Segment (DPS). This DPS is described in further detail below under HAF 2.

HAF 2: Mid-scale (range of populations and subpopulations)

Description of conditions at the mid-scale (HAF 2) depends on previous studies, and includes: 1) habitat characteristics within populations; and 2) dispersal between populations (Stiver et al. 2010, p. I-6). Habitat and populations are described below. Discussion of HAF 2 conditions rely on primary literature (described above).

The HAF describes three significant indicators of Second Order habitat Suitability (HAF, p. II-4):

1) Availability of sagebrush shrubland habitat
    a) Size and number of habitat patches
2) Connectivity of habitat patches
    a) Vegetation structure characteristics of linkage areas between patches.
3) Landscape matrix in which patches are imbedded and resulting patch edge effects.

Each of these indicators is described below following a description of the Columbia Basin DPS status.

Columbia Basin DPS status. The status of greater sage-grouse populations in the Columbia Basin DPS have been described specifically, including population size and stability, movement between population segments, and habitat conditions.

The Columbia Basin Management Zone includes all populations of sage-grouse in Washington State. The Columbia Basin DPS includes two extant populations (Moses Coulee and Yakima Training Center) and two re-introduced populations (Crab Creek and Yakama Nation) (USFWS 2013). The Washington Fish and Wildlife Commission listed the Columbia Basin DPS as a State Candidate in 1991 and as State Threatened in 1998 (Stinson et al. 2004). ESA listing of the Columbia Basin DPS was determined to be "Warranted, but precluded by higher priority listings" in 2001, and the DPS became a Candidate for listing along with the entire population in 2012 (75 FR 13910).

Based on counts of males at lek sites and estimated historic populations, sage-grouse populations in Washington have declined over 92% in the 20th century, and declined approximately 60% between 1970 and 2006 (Stinson et al. 2004, Schroeder et al. 2007). Sage-grouse have survived in Washington largely because portions of the land in Moses Coulee PAC that are poorly suited to agriculture haven't been developed or have been enrolled in CRP and other conservation programs, and in part because U.S. Army ownership of the YTC prevented agricultural conversion and development. Population estimates in 2012 totaled less than 1,100 birds, consisting of approximately 853 in the Moses Coulee Population, 148 in the YTC population, 83 in the Crab Creek population, and an unknown number from the Yakama Nation Population (none observed since 2010) (WDFW 2012).

The Moses Coulee Population has declined from approximately 1,500 birds in 1970 reaching a low of approximately 300 birds in 1985. Population estimates increased in following years but continue to fluctuate, dropping below 500 at times and reaching its highest estimate (1,100 birds) since 1980 in 2010 (WDFW 2012). This relative stability is attributed to heavy dependence on farm programs such as CRP and State Acres For Enhancement (SAFE). This population is considered at risk due to the abundant private property and associated uncertainty, high amounts of habitat fragmentation and anthropogenic disturbance, and heavy dependence on farm programs and associated long-term uncertainty. The probability of the population dropping below 200 males by 2037 is estimated to be 88% (USFWS 2013).

The YTC Population has displayed long-term declines, with 2012's estimate of 148 birds being the lowest estimate to date (WDFW 2012). This population is considered at high risk due to low population size, direct and indirect disturbance caused by military activities including wildfire, and isolation due to habitat fragmentation caused by anthropogenic disturbances including agricultural conversion, two interstate highways (I-82 and I-90), high voltage transmission lines, and wind energy developments, in addition to the Columbia River corridor. The probability of the population dropping below 20 males by 2037 is estimated to be 26%.

The Crab Creek area supported sage-grouse populations until the mid-1980s. Following acquisitions of approximately 50,000 acres by WDFW and BLM, re-introduction efforts began in 2008. As of 2012, 181 birds have been released and at least one lek has been established with a high count of 16 birds in 2012. This population is considered at high risk due to low population size, habitat fragmentation and dependence on farm programs (WDFW 2012, USFWS 2013).

The Yakama Nation area historically supported greater sage-grouse, but extinction of the endemic population was not precisely documented. Reintroduction efforts occurred in 2006-2008 and 61 birds were released. The highest number observed since has been 10 birds, and one lek was documented in 2010; 8 birds were observed in 2012 but no active leks were documented. An additional 40 birds were translocated to the area in 2012 and translocations will continue in 2013-2015. This population is considered at high risk due to small population size, poor habitat quality, wild horse populations, and isolation due to low connectivity with other populations (WDFW 2012, USFWS 2013).

These four remaining populations of sage-grouse in Washington described above are too small for long-term viability, so the persistence of the species in Washington depends on recovery efforts (USFWS 2013). Small populations are affected disproportionately by loss of genetic variability, inbreeding, and predation pressure, and are at risk from random events such as extreme weather or fires. WDFW's Recovery Plan requires a breeding season population average of at least 3,200 birds for 10 years before the species would be removed from the State Threatened list (Stinson et al. 2004). Federal recovery objectives have not yet been determined by USFWS.

WDFW's Recovery Plan (Stinson et al. 2004) identifies 11 primary conservation strategies and tasks that include continued population monitoring and augmentation, protection of existing populations from human disturbance and mortality, protection of habitat on both public and private lands, facilitation of conservation programs such as CRP, facilitation of compatible use of agricultural and range lands, restoration of degraded and burned areas, cooperation with government agencies and landowners, continued research and public education.

HAF Level 2 Indicators:

Availability of sagebrush shrubland habitat (size and number of habitat patches): An estimated 7.4 million acres of steppe vegetation types remain in Washington (Jacobson and Snyder 2000), about 50% of the estimated 15 million acres of steppe habitats that existed in eastern Washington prior to European settlement. Within the historic range of sage-grouse, approximately 56% of shrub-steppe habitats have been lost, resulting in a loss of approximately 92% of the historic range (Stinson et al 2004). Most of the shrub-steppe lost has been converted to cropland, but smaller amounts have been lost to roads, residential and commercial development, or inundation by reservoirs (Table C-2). The result is that overall both patch size and number are relatively small, especially when compared to other parts of the sage-grouse range where patch sizes are often tens of thousands of acres.

Table C-2. Approximate cover* by different habitat types (%) and total cover (mi^2) for extant populations of sage-grouse in CBMA (based on Schroeder et al. 2000).

	Proportion of area dominated by cover type (%)				Total Area
	Steppe habitat#	Cropland	CRP	Other	($mi^{2)}$
Current sage-grouse range	**57**	**26.6**	**13**	**3.4**	**1,806**
Moses Coulee Population	44.3	35.1	16.7	3.9	1,361
YTC Population	95.6	0.5	1.9	1.9	445

*Based on 1993 Thematic Mapper Landsat data (Jacobson and Snyder 2000); current CRP would be higher and cropland lower for Moses Coulee Population.
Includes shrub-steppe, meadow-steppe and steppe habitats described by Daubenmire (1970).

Quality of steppe habitats described in the table above is highly variable. More than 42% of the land classified as shrub-steppe has less than 10% shrub cover, either due to fires or because it is a grass-steppe vegetation type unable to support dense shrub cover (Jacobson and Snyder 2000), and is generally not suitable for sage-grouse.

Connectivity of habitat patches: Connectivity of suitable sage-grouse habitat patches for the Columbia Basin DPS has been modeled spatially (WWHCWG, Figure F-1), and depicts clear areas of linkage and discontinuity in the Columbia Plateau. Significant portions of the Columbia Plateau, particularly the eastern portion, have high fragmentation and do not support connectivity between populations of sage-grouse. Anthropogenic factors including land conversion, highways, transmission lines and wind farms, as well and geographic barriers such as steep terrain, lakes and rivers contribute to overall low connectivity. Overall connectivity of Washington's grouse populations is considered low and fragmentation is high (USFWS 2013). The highest connectivity occurs between Moses Coulee population and YTC population. These populations are separated by about 50-60 km. (Stinson et al. 2004).

Landscape matrix in which patches are embedded and resulting patch edge effects. Edge effects have not been quantified for shrub steppe in the Columbia Basin DPS. However, qualitative assessments of patch configuration suggest that most patches are relatively small and are interspersed with unsuitable habitats. The result is higher resistance to movements between habitat patches with greater mortality and overall reductions in productivity. This in turn leads to reduced genetic exchange and further loss of species vigor. Leks in the Columbia Basin

Management Zone are considered the least connected across the range of the species (USFWS 2013). The loss and fragmentation of sagebrush habitats is a primary cause of the decline of sage-grouse populations (USFWS 2013).

HAF 2 Summary. The following classifications of second order sage-grouse habitat have been developed (HAF, p. II-15):

> **Suitable:** Subpopulation landscape has connected mosaic sagebrush shrub-lands that allow for bird dispersal movements. Anthropogenic disturbances that can disrupt dispersal or cause mortality are generally not wide-spread or are absent.
>
> **Marginal:** Subpopulation landscape has patchy, fragmented sagebrush shrub-lands that are not well connected for dispersal in portions of the area. Anthropogenic disturbances that disrupt dispersal or cause mortality are present throughout all or portions of the landscape. Some lek groups may be isolated or nearly isolated.
>
> **Unsuitable:** Subpopulation landscape was former shrubland habitat now converted to predominantly grassland or woodland land cover or other unsuitable land cover or use (e.g., high density of anthropogenic features). Remaining sagebrush patches are predominantly unoccupied or have few remaining birds. Portions of the area may become occupied in the foreseeable future through succession or restoration.

Sage-grouse habitat at second order (Columbia Basin Management Area) was classified as **Marginal** for the following reasons and with the following caveats:

- The sage-grouse population landscape in Washington supports patchy, fragmented sagebrush shrub-lands. Approximately 50% of the steppe habitats that existed in eastern Washington prior to European settlement have been converted or lost, and 42% of this existing shrub-steppe has less than 10% shrub cover.
- Shrub-steppe at this spatial scale (Columbia Basin DPS) is not well-connected. Occasional movements between populations have been documented, but overall connectivity is low and fragmentation is high (USFWS 2013). A single connectivity corridor exists in the Columbia Plateau, and it is highly disturbed (WWHCWG 2013).
- Anthropogenic disturbances that disrupt dispersal or cause mortality are present throughout most of the landscape.
- Lek groups are isolated. Telemetry data clearly shows little or no movement between Moses coulee and YTC populations, and presumably little genetic mixing is occurring.

HAF 3: Steps to Describe Sage-Grouse Habitat at the Third Order

Steps to determine suitability at HAF level 3 are described in HAF, p. II-18. Methods followed for each step in DCW analysis of GSG habitat are detailed below.

Step 1. Determine the extent and grain appropriate for a habitat description of the home range area. Develop vegetation map using appropriate third order land cover types.

The extent of analysis for HAF 3 was based on three seasonal home range types within the Moses Coulee population PAC:

- **Breeding, including nesting and early brood-rearing (EBR) home range:** Breeding home range was defined as areas within 18 kilometer (radii) of all identified GSG leks that intersected the DCW analysis area (Figure F-2). This radius was chosen based on telemetry data from Washington sage-grouse populations indicating that nesting occurred up to 19 kilometers from the lek (Stinson et al 2004) and on HAF (Table II-3) descriptions of lek site suitability relative to detrimental land uses within 18 kilometers of leks in migratory populations. Note that 105,466 acres of these radii are outside of the currently-defined Moses Coulee PAC as designated by USFWS (2013), although portions of these radii were included in previous WDFW habitat mapping efforts to identify Habitat Concentration Areas (Citation). Note also that breeding habitat for GSG using the Moses Coulee PAC but not associated with the DCW is not quantified here.
- **Late brood-rearing (LBR) home range:** LBR was defined as the same area as Breeding home range; it is assumed that there is significant overlap in Breeding and LBR home ranges, and the breeding home range used the maximum expected distance from lek to nest so it covers a large area that includes late brood-rearing areas.
- **Winter home range:** Winter home range in the DCW was defined as the Entire Moses Coulee population PAC because birds have been documented to migrate from northern to southern areas of the PAC during winter, and specific information on winter home range for birds breeding in the DCW is not available (Figure F-2).

Mapping of these habitat types at HAF 3 scale used the 1999 WDFW Shrub Map (WDFW, 1999), with other remotely-sensed data used as a check. The 1999 WDFW Shrub Map data source has a 30 m grain size, and provided the most relevant information for GSG habitat conditions at this spatial scale.

GSG habitat estimates based on the 1999 WDFW Shrub Map should be considered approximations used for analysis. Changes in habitat in DCW that have occurred since 1999 and may affect the actual acreage of GSG habitat in DCW include the following:

- Due to succession, some areas mapped in 1999 as CRP or as shrub-steppe supporting less than 10% shrub may have developed shrub cover levels meeting Connelly et al. (2000) guidelines for GSG habitat. Currently, 182,072 acres are enrolled into the CRP in Douglas County (NRCS 2013).
- Over 60,000 acres that have been enrolled in the SAFE program in Douglas County have recently undergone shrub removal to facilitate understory (grass) development, resulting in a short-term reduction in shrub cover (NRCS 2013).
- Fire has reset succession in some portions of DCW since 1999. There has been at least one small (less than 1,500 acres) fire documented within the last 20 years affecting BLM-administered lands in DCW and several large fire complexes burned more than 100,000 acres in the northern portions of the Moses Coulee PAC in 2012. These 2012 fires only affected winter home-range habitat mapped in this analysis; breeding habitat was not assessed in the northern part of the Moses Coulee PAC where the fires occurred.
- Within the Moses Coulee PAC some agricultural conversion of shrub-steppe may also have occurred since 1999.

Step 2. Map occupied seasonal habitats and identify potential habitat by seasonal use period.

For HAF 3 analysis, potential and existing GSG seasonal habitats were defined as follows:

- **Breeding and LBR habitat**
  - Potential Breeding/LBR habitat: defined as all areas within the breeding home range (18 km radii of all identified GSG leks that intersected the DCW analysis area) with slopes less than 30% and deep soils (based on ESD).
  - Existing Breeding/LBR habitat: defined as all potential Breeding/LBR habitat (defined above) supporting at least 10% or greater shrub cover according to the 1999 WDFW Shrub Map.
- **Winter habitat**
  - Potential Winter habitat: defined as all areas within the Moses Coulee PAC supporting slopes less than 30% and deep soils.
  - Existing GSG Winter habitat: defined as all potential winter habitat (defined above) supporting at least 10% or greater shrub cover according to the 1999 WDFW Shrub Map.

Step 3. Describe seasonal habitat availability

- **Breeding habitat (Nesting/EBR) (See Table C-3)**
  - Potential Breeding habitat: A total of 56% (251,670 acres) of the breeding home range surrounding leks potentially using the DCW were mapped as having loamy soils and less than 30% slope.
  - Existing Breeding habitat: Approximately 13% (31,755 acres) of the area identified as potential breeding habitat within this home range currently supports adequate shrub cover to be considered existing breeding habitat, based on available data. This may underestimate actual existing breeding habitat in the home range for the following reasons:
    - An additional 11% (28,112 acres) occurs in areas classified as CRP in loamy soils with slopes less than 30%; some of these areas have documented use by GSG.
    - Approximately 13% (32,798 acres) of these radii were mapped as less than 10% shrub cover in 1999 on loamy soiled slopes less than 30%; some may be now meet requirements for seasonal habitat usage based on potential for increased shrub cover since 1999.
    - Some areas mapped as shrub steppe with less than 10 % sagebrush cover may meet the definition of Marginal habitat at the site scale.
- **LBR habitat**
  - For the purposes of HAF 3 analyses, LBR habitat is assumed to have the same extent/perimeter and conditions as breeding habitat, based on soil potential to support habitat that meets Connelly guidelines for LBR habitat. However, sage-grouse have been documented to use shallow soil areas that do not meet Connelly guidelines for LBR that are interspersed with deep soil areas that support shrub cover for escape habitat. These areas were not quantified.
  - Differences between LBR habitat and breeding habitat are explored at HAF 4 scale, below.
- **Winter habitat (See Table 3)**
  - Potential winter habitat: Based on available data, a total of 51% (563,264 acres) of the Moses Coulee PAC has deep soils and less than 30 % slope. An additional 3% (31,810

acres) of the PAC had slopes less than 30% but did not have classified ESDs and were not considered in this analysis.

- Existing winter habitat: Approximately 13.5% (75,768 acres) of the area identified as potential winter habitat in the PAC currently supports adequate shrub cover to be considered existing winter habitat, based on available data. This may underestimate actual existing habitat in the PAC for the following reasons:
  - An additional 9% (99,931 acres) of the PAC occurs in areas classified as CRP in loamy soils with slopes less than 30%; some of these areas have documented use by GSG.
  - Approximately 9% (94,003 acres) of the PAC was mapped as less than 10% shrub cover in 1999 on loamy soiled slopes less than 30% and some of this may be now meeting requirements for winter seasonal habitat.

Table C-3. Summary of GSG Habitat for HAF 3, the Moses Coulee Subpopulation (PAC), including potential, existing, and unsuitable potential habitat for both breeding and winter habitat.

Potential	Existing	Unsuitable potential	Agriculture in potential	CRP and other in potential
Breeding habitat/ LBR habitat[1]				
251,670 ac.	31,755 ac.	32,798 ac.	157, 675 ac.	29,442 ac.
Winter habitat[2]				
563,264 ac.	75,768 ac.	94,002	292,069 ac.	101,425 ac.

[1] This data includes areas in 18 km radii surrounding GSG leks that utilize DCW during breeding season, it does not analyze breeding habitat for the remaining leks in the Moses Coulee PAC: 450,483 analysis acres.
[2] Winter habitat was classified for all portions of the Moses Coulee PAC, 1,096,606 analysis acres.

Step 4. Describe and map anthropogenic features within and between seasonal habitats.

The following key information gathering steps are suggested in HAF (pg. II-20) to map anthropogenic features.

1. Location/density of highways, roads, railroads, OHV trails, canals, pipelines, fences or other linear features.
   - The road density in the PAC is 2,205 mi of road for the PAC (1,713 mi^2). This equates to 0.87 miles/mi^2, based on BLM GIS information. Most roads are gravel/dirt, with low use. Hwy 2 runs east to west, and may represent a partial barrier between northern and southern parts of the PAC, based on WWHCWG biotic integrity modeling.
   - There are 83 miles of power line in the PAC (1,713 mi^2), equating to a density of 0.03 miles/sq. mile. Power lines do not bisect large portions of the PAC.
   - Fencelines surround most BLM pastures and much private ownership in the PAC. There are 4,454 mi of fencelines in the PAC, covering 2.6 mi/mi^2 of BLM-administered lands. Fencelines outside of BLM-administered lands have not been mapped, but contribute to

disturbance for this species. Some fences within the PAC have been marked for visibility to reduce sage-grouse collision mortality.

2. The location/density of communication sites, energy pads, mineral sites, landfills, watering troughs, or other point landscape features.
    - Meteorological towers have been placed on Moses Stool. No other point landscape features were identified. However, water troughs in BLM and private lands occur which may increase mortality due to predation.
3. The estimated decade or year when the anthropogenic feature occurred within the home range.
    - Homesteading in the Douglas Creek area began in 1893 and expanded well into the 1930s.
    - Other anthropogenic features occurred incrementally over time, specific dates are not provided.
4. Overlay the spatial information and describe cumulative suitability of the home range based on anthropogenic features.
    - Spatial representation of anthropogenic disturbance occurs in Figure F-3. The key anthropogenic feature affecting greater sage-grouse in this PAC is the conversion of historic habitats to agriculture.
    - Anthropogenic features including roads and fencelines have further impacted movement of this species, impacting connectivity between habitat in the north and south of the PAC.

Step 5. Describe vegetation connectivity characteristics between seasonal use areas.

Based on WWHCWG data (2013), 52.7% of the Moses Coulee PAC is classed as having low biotic integrity, 5.4% moderate and 41.9% as having high integrity. High integrity areas occur in large patches in the north and south parts of PAC, connected by the Moses Coulee corridor (Figure F-3). High integrity patches are not homogenous, are bisected by disturbance corridors, and include large patches of disturbed agriculture. Modeling of landscape resistance to movement by sage-grouse identifies the high integrity areas as low resistance connectivity corridors.

Seasonal habitats overlap and many areas provide year-round habitat for sage-grouse. Use of habitat and site selection, however, does change seasonally, and long-distance movements may occur between lek areas or winter areas with exposed vegetation. Connectivity descriptions from the PAC above can also be applied to many GSG seasonal use areas.

- Lek connectivity to Breeding/EBR habitat: for the Moses Coulee population, leks associated with DCW occur in agricultural areas and grouse use nearby sagebrush areas for cover. Grouse moving between lek and cover areas are exposed going to and from the leks. Most areas north of leks are in agriculture; shrub-steppe habitat occurs mostly to the east, south and west of leks.
- Breeding habitat connectivity to LBR: LBR habitat partially overlaps with EBR habitat, but LBR habitat includes areas with higher elevation and mesic areas such as those in the Duffy Creek area. Vegetation connectivity in these LBR areas is often disrupted by steep drainages, lithosols and current or former agricultural areas.
- LBR connectivity to Winter habitat: In winter, GSG using Breeding/LBR habitat in DCW move to areas with exposed sagebrush including south-facing slopes and wind-swept ridges within the PAC. Winter migration tends to be generally from north to south. Birds breeding in other portions of the PAC also move to optimal wintering areas within the PAC, so birds that

breed in different home ranges may or may not winter in the same area. Vegetation connectivity between these areas, which may include significant movement within the PAC, is described by conditions within the PAC as a whole (above).

- Winter habitat connectivity to Leks: In late winter grouse begin to move back to breeding areas, typically returning to the same area. Vegetation connectivity between winter and lek areas, which may include significant movement within the PAC, is described by conditions within the PAC as a whole (above).

Step 6. Summarize the information from Steps 3-5 to describe the existing third order habitat suitability of the home range area of interest.

- Key components of this step include: organizing and summarizing habitat information (done above in step 3), spatially depicting habitat suitability (Figures F-1, F-2, F-3), and describing suitability according to the following classes (HAF, pg. II-21):
    - **Suitable:** Seasonal use areas are well connected. Anthropogenic features that can disrupt seasonal movements or cause mortality are generally absent or at least not widespread.
    - **Marginal:** Seasonal use areas are poorly connected or disjunct. Anthropogenic features that can disrupt seasonal movements or cause mortality are within the home range.
    - **Unsuitable:** Seasonal use areas that were formerly shrubland dominated sites are predominantly grassland, woodland or incompatible land uses (certain agricultural areas, urban sites, other anthropogenic features) not conducive to sage-grouse seasonal movements or habitat use. Most leks have been abandoned or have few remaining birds.
- Based on the amount and arrangement of Breeding, LBR, and Winter habitat, the Moses Coulee Population including grouse that utilize DCW would be classed as **Marginal** at the HAF 3 scale. Specific factors supporting this classification include:
    - Limited amount of breeding, LBR, and winter habitat in the PAC (Step 3). Approximately 13% of the area identified as potential breeding habitat within Breeding home range areas (18 km radii) currently supports adequate shrub cover to be considered occupied seasonal breeding habitat. Approximately 13.5% of the area identified as potential winter habitat in the PAC currently supports adequate shrub cover to be considered occupied winter habitat. Agricultural conversion in the PAC has removed the majority of historic breeding, LBR, and winter sage-grouse habitat.
    - Arrangement of breeding, LBR, and winter habitat in the PAC; connectivity of seasonal use areas (Step 4, Step 5). Roughly half of the PAC has low biotic integrity. A single major corridor connects northern and southern seasonal habitats, and it is bisected by U. S. Highway 2. Anthropogenic features that can disrupt seasonal movements or cause mortality within the home range include agriculture, high road density, fencelines and utilities.
    - Although several historic leks have been abandoned and the range and genetic exchange of sage-grouse has decreased, the small ($\leq$ 20 leks) Moses Coulee population is reproducing and currently appears to be somewhat stable. Based on population, third-order suitability is thus clearly not “Unsuitable”.

HAF 4: Describing Sage-Grouse Habitat at the Fourth Order

Step 1. Identify seasonal use areas and associated third order cover types of interest for third order descriptions. Determine the extent of these land cover types within the seasonal use area.

The seasonal use areas are identified above, under HAF 3 modeling. Breeding and LBR habitat was defined as all areas within 18 km radii of all identified GSG leks that intersected the DCW analysis area with slopes less than 30% and deep soils. Winter habitat was defined as all areas within the Moses Coulee PAC supporting slopes less than 30% and deep soils.

Data characterizing sage-grouse habitat at the fourth order was only analyzed for the BLM-administered lands within these identified seasonal use areas in the DCW. These BLM-administered lands were entirely within the southern portion of the DCW.

Step 2. Overlay soil or ecological site maps on land cover type maps to determine ecological site potential.

Completed above, as part of identification of HAF 3 "potential habitat". This analysis assumed that loamy soils in the assessment area were capable of supporting shrub and understory conditions associated with sage-grouse habitat requirements. Therefore, only loamy dominated ESDs were used to define potential habitat areas.

Other ESDs have loamy inclusions that can support habitat capable of meeting sage-grouse habitat requirements, but these loamy inclusions are not mapped and occur in an unpredictable manner, so non-loamy dominated ESDs cannot be expected to consistently provide sage-grouse habitat. NRCS defined ecological site potential production values were not used to define habitat capability.

Step 3. If available, obtain Ecological Reference sheets for the ecological sites contained within the seasonal habitat area of interest.

The IDT obtained draft ecological site evaluation matrices from NRCS and evaluated them in the field as part of the overall DCW Rangeland Health Assessment.

Step 4. Design sampling approach.

IDT developed a stratified sampling approach based on ESD and used collected data to inform HAF analysis. Additionally, previously-collected habitat polygons and vegetation transects were used as a data source and "truthed" using IDT-collected field data and field visits.

All of this data was used to inform classification of habitat within BLM-administered lands for the HAF 4 scale analysis.

Step 5. Collect field data.

Measuring vegetation at the fourth order generally involves field data collection on composition and structure of habitat within a seasonal use area (HAF p. II-28, also Table II-19). These measures, including canopy cover of shrubs and perennial grass height, were taken at randomly-established plots within ESDs within pastures in BLM-administered lands in DCW.

HAF suggests that once field data are collected, data should be summarized for the seasonal habitats of interest (HAF p. II-28). IDT used data to characterize habitat polygons classifying BLM-administered areas for seasonal habitats (see below).

Step 6. Transfer field data for land cover types of interest into suitability matrix categories associated with the seasonal habitat. Determine fourth order suitability.

The HAF relies on habitat requirements for greater sage-grouse as described by Connelly et al. (2000). These habitat requirements describe the core seasonal habitats that must be present for sage-grouse populations to survive on a landscape over the long-term. The habitats described by these requirements, however, do not represent the only habitats used by sage-grouse; for example, sage-grouse have been observed using areas with little or no sagebrush cover, sometimes far from any sagebrush. The exact reasons sage-grouse use these areas varies, and sometimes is unknown, but in general these other habitats are not considered to be key factors in sage-grouse survival. Therefore, the HAF focuses on the core seasonal habitat requirements identified by Connelly et al. (2000). These requirements, as applied in this analysis, are shown in Tables F-4- F-6.

Table C-4. Nesting and early brood-rearing habitat requirements.

Habitat Indicator	Suitable	Marginal	Unsuitable
Sagebrush Cover	15-25%	5-15%	<5%
Sagebrush Height	40-80 cm	20-40 or >80 cm	<20 cm
Sagebrush Shape	Spreading	Mix	Columnar
Perennial Grass Cover	≥15%	5-15%	<5%
Perennial Forb Cover	≥10%	5-10%	<5%
Perennial Grass Height	≥18 cm	10-18 cm	<10 cm
Preferred Forb Availability	Common, Several Spp.	Common, Few Spp.	Rare

Table C-5. Late brood-rearing habitat requirements.

Habitat Indicator	Suitable	Marginal	Unsuitable
Sagebrush Cover	10-25%	5-10 or >25%	<5%
Sagebrush Height	40-80 cm	20-40 or >80 cm	<20 cm
Herbaceous Cover	≥15%	5-15%	<5%
Preferred Forb Availability	Common, Several Spp.	Common, Few Spp.	Rare
Riparian/Wet Meadow Stability	Majority PFC	Majority FAR	Majority NF
Proximity to Sagebrush Cover	<90 m	90-275 m	>275 m

Table C-6. Winter habitat requirements.

Habitat Indicator	Suitable	Marginal	Unsuitable
Sagebrush Cover	≥10%	5-10%	<5%
Sagebrush Height	>25 cm	10-25 cm	<10 cm

Current and historic field-collected data was used to classify all BLM-administered lands in DCW into suitability classes for breeding, LBR, and winter habitat types. Where current field data was absent, historic field data or GIS mapping was used to complete classification of areas.

Based on vegetation information provided by field measurements and ESD reference sheets, the IDT considered only deep soils to have the potential to meet the seasonal habitat requirements listed above. In addition to the indicators described above, areas of greater than 30 percent slope were excluded from analysis. Steep slopes are generally avoided by grouse, although exceptions occur, such as use of south facing slopes in winter.

Step 7. Describe fourth order habitat suitability for the seasonal habitats of interest.

Summarize the seasonal suitability descriptions for the home range area (Form H-7).

To be consistent with Range Health Standards, suitability calls at HAF 4 level were made for seasonal habitats within DCW allotments or similar BLM-administered lands.

HAF 4 GSG Habitat Results:

HAF 4 results are provided specifically for BLM-administered lands in the DCW. All BLM-administered lands in the DCW are within 18 km radii of mapped GSG lek sites. Although 1,232 acres of BLM-administered lands in the DCW are outside of the PAC, for the purposes of analyses all BLM-administered lands in the DCW meeting Connelly et al. (2000) guidelines for GSG habitat are quantified in this analysis.

General Habitat (All Seasonal Habitats)

Approximately 3,900 acres (27% of the over 14,500 acre analysis area) were considered to have the potential to meet Connelly et al. (2000) guidelines for GSG breeding, LBR, or winter habitats. These areas were ESDs with loamy soils and slopes less than 30 percent. Over 4,600 acres were eliminated from consideration due to having slopes over 30 percent; approximately 1,600 acres of these steep areas had loamy soils.

Within classified potential habitat, potential breeding habitat was mostly marginal or unsuitable; LBR and winter habitats included a mix of suitable, marginal, and unsuitable types (Table C-7). Seasonal habitats are discussed in detail below.

Table C-7. Summary of habitat potential and current suitability on BLM-administered land in DCW. All acreages are modeled from GIS data and should be considered estimates; trends described should be accurate, but acreages are not exact.

Seasonal Habitat	Potential Acres	Existing Suitable Acres	Existing Marginal Acres	Unsuitable Acres
Breeding	3,909	198 (5%)	2,263 (58%)	1,449 (37%)
LBR	3,909	1,337 (34%)	963 (25%)	1,610 (41%)
Winter	3,909	1,337 (34%)	962 (25%)	1,611 (41%)

Breeding Habitat

Lekking

Lekking habitat was not quantified in this assessment. Historic lek sites that are not currently used occur near BLM-administered lands in DCW, and the area has some large expanses of shallow soil areas that provide long-distance visibility, especially in the Duffy Creek/Unleased West areas. Currently used leks in the area occur in agricultural fields, and based on similar use across the PAC, there appears to be a preference for agricultural fields for lek sites. Qualitative assessments

indicate that suitable lek areas occur in native habitat, and WDFW and BLM continue to search for undocumented leks in this area.

Nesting and Early Brood-Rearing

Approximately 3,900 acres were identified as potential nesting/early brood-rearing habitat (approximately 27% of analysis area), based on deep soil ESDs with slopes less than 30% (Table C-8). The acres identified as potential nesting habitat occur in smaller patches interspersed with other soil types not expected to meet Connelly et al. (2000) habitat requirements.

Of the potential nesting habitat, less than 200 acres were considered suitable (5% of analysis area), over 2,250 acres marginal (58% of analysis area), and approximately 1,450 acres unsuitable (37% of analysis area). Sagebrush canopy cover was the main indicator resulting in marginal and unsuitable habitat. Portions of the New Acquisition were considered marginal despite having less than 5% sagebrush cover based on presence of shrubs and density and height of perennial grasses. Although understory conditions were not identified as a limiting factor, the presence of invasive annual grasses in certain areas presents a long-term threat to habitat associated with potential for increased annual grass following disturbance such as wildfire.

The areas with the greatest amount of currently unsuitable potential nesting habitat are Titchenal Canyon allotment, Unleased West, and Duffy Creek allotment. Many of these unsuitable areas have been disturbed by former agricultural production and have been seeded with non-native species. Non-native perennial grasses provide cover for nesting, but some of these areas lack forb diversity important for early brood-rearing. It is important to note, however, that these areas are generally within the Columbia Plateau Steppe and Grassland Bio-Physical Setting (BPS), where historic fire return interval is presumed to be less than 20 years, maintaining more open grassland and sparse shrub areas (LANDFIRE 2013).

The remaining areas that have lower amounts of currently unsuitable potential habitat are generally within the Inter-Mountain Basins Big Sagebrush Steppe BPS, where fire return intervals may been as long as 200 years, resulting in greater cover of sagebrush on the landscape (LANDFIRE 2013). However, the Douglas Creek allotment and New Acquisition contain approximately 500 acres of currently unsuitable potential habitat and 1,600 acres of marginal habitat. This represents over 2,100 acres that could be improved for sage-grouse in an area where sagebrush cover would be expected to be higher. Some of these areas have been previously disturbed by former agricultural production, and some areas, especially marginal areas, have some level of shrub cover, so need and feasibility of restoration compared to natural recovery should be considered.

Table C-8. Nesting/early brood-rearing habitat potential and current suitability. All acreages are modeled from GIS data and should be considered estimates; trends described should be accurate, but acreages are not exact.

Allotment/ Unleased Area	GIS Acres	Breeding Potential Acres	Breeding Potential % Area	Suitable Acres	% Area Potential	Marginal Acres	% Area Potential	Unsuitable Acres	% Area Potential
Douglas Creek Cyn	1,609	147	9%	1	<1%	123	84%	24	16%
Douglas Creek	3,801	1,845	49%	25	1%	1,350	73%	470	25%

Duffy Creek	5,954	1,057	18%	67	6%	397	38%	593	56%
Titchenal Cyn	558	153	27%	0	0%	15	10%	138	90%
New Acquisition	1,113	337	30%	44	13%	262	78%	31	9%
Slack Canyon	41	26	63%	24	92%	0	0%	2	8%
Rimrock	583	14	2%	10	71%	4	29%	0	0%
Unleased West	861	330	38%	27	8%	112	34%	191	58%
Total	**14,520**	**3,909**	**27%**	**198**	**5%**	**2,258**	**58%**	**1,454**	**37%**

LBR Habitat

Allotments and unleased BLM-administered lands in DCW support habitat meeting Connelly guidelines for GSG LBR habitat on approximately 1,300 acres. This represents 34% of the areas classified as having "potential" to meet those guidelines (Table C-9). LBR habitat was divided approximately evenly between habitat classified as marginal and classified as suitable.

Table C-9. Late brood-rearing habitat potential and current suitability. All acreages are modeled from GIS data and should be considered estimates; trends described should be accurate, but acreages are not exact.

Allotment/Unleased Area	GIS Acres	LBR Potential Acres	LBR Potential % Area	Suitable Acres	% Area Potential	Marginal Acres	% Area Potential	Unsuitable Acres	% Area Potential
Douglas Creek Cyn	1,609	147	9%	56	38%	67	46%	24	16%
Douglas Creek	3,801	1,845	49%	935	51%	441	24%	470	25%
Duffy Creek	5,954	1,057	18%	144	14%	320	30%	593	56%
Titchenal Cyn	558	153	27%	9	6%	79	52%	65	42%
New Acquisition	1,113	337	30%	45	13%	24	7%	268	80%
Slack Canyon	41	26	63%	25	96%	1	4%	0	0%
Rimrock	583	14	2%	13	93%	1	7%	0	0%
Unleased West	861	330	38%	110	33%	30	9%	190	58%
Total	**14,520**	**3,909**	**27%**	**1,332**	**34%**	**890**	**23%**	**1,688**	**43%**

Winter Habitat

Of classified potential winter habitat, approximately 1,300 acres were considered suitable, 950 acres marginal, and approximately 1,600 acres unsuitable; 34 percent, 25 percent, and 41 percent of potentially suitable winter habitat in the analysis area, respectively. Sagebrush cover is the

main indicator of winter habitat suitability, so areas not meeting suitability requirements mainly lack adequate sagebrush cover.

The areas with the greatest amount of currently unsuitable potential winter habitat are the New Acquisition, Titchenal Canyon allotment, Unleased West, and Duffy Creek allotment. Many of these areas have been disturbed by former agricultural production and have not recovered a significant shrub component. As discussed above, BPS may play a role in this, but the New Acquisition is primarily modeled as Big Sagebrush Steppe BPS, and therefore should be considered first for potential to increase shrub cover.

Table C-10. Winter habitat potential and current suitability. All acreages are modeled from GIS data and should be considered estimates; trends described should be accurate, but acreages are not exact.

Allotment/ Unleased Area	GIW Acres	Winter Potential Acres	Winter Potential % Area	Suitable Acres	% Area Potential	Marginal Acres	% Area Potential	Unsuitable Acres	% Area Potential
Douglas Creek Cyn	1,609	147	9%	*56*	38%	*67*	46%	24	16%
Douglas Creek	3,801	1,845	49%	*936*	51%	*440*	24%	470	25%
Duffy Creek	5,954	1,057	18%	*144*	14%	*321*	30%	592	56%
Titchenal Cyn	558	153	27%	9	6%	79	52%	65	42%
New Acquisition	1,113	337	30%	*45*	13%	*24*	7%	268	80%
Slack Canyon	41	26	63%	*24*	92%	*0*	0%	2	8%
Rimrock	583	14	2%	*13*	93%	*1*	7%	0	0%
Unleased West	861	330	38%	*110*	33%	*30*	9%	190	58%
Total	**14,520**	**3,909**	**27%**	**1,332**	**34%**	**889**	**23%**	**1,689**	**43%**

HAF 4 Summary

Approximately half of the areas classified as having potential to meet Connelly et al. (2000) guidelines for habitat (based on soil and slope conditions) actually met that definition, and classified breeding habitat is dominated by marginal-quality habitat. Sage-grouse habitat conditions were therefore classified as **Marginal** at HAF level 4, areas within seasonal ranges that meet the life requisite needs for this species.

Step 8. Review the seasonal habitat suitability matrices and determine whether regional adjustments to Connelly et al (2000) Management Guidelines are warranted.

For this analysis, deficiencies in the habitat suitability matrices were noted where shallow soil areas with high forb abundance and low shrub cover are interspersed with deep soil areas with tall

shrubs. These areas are thought to provide high quality foraging habitat, but do not meet the requirements for sagebrush cover and height to be considered suitable habitat. Coordination with WDFW regarding regional adjustments should be considered in future assessments.

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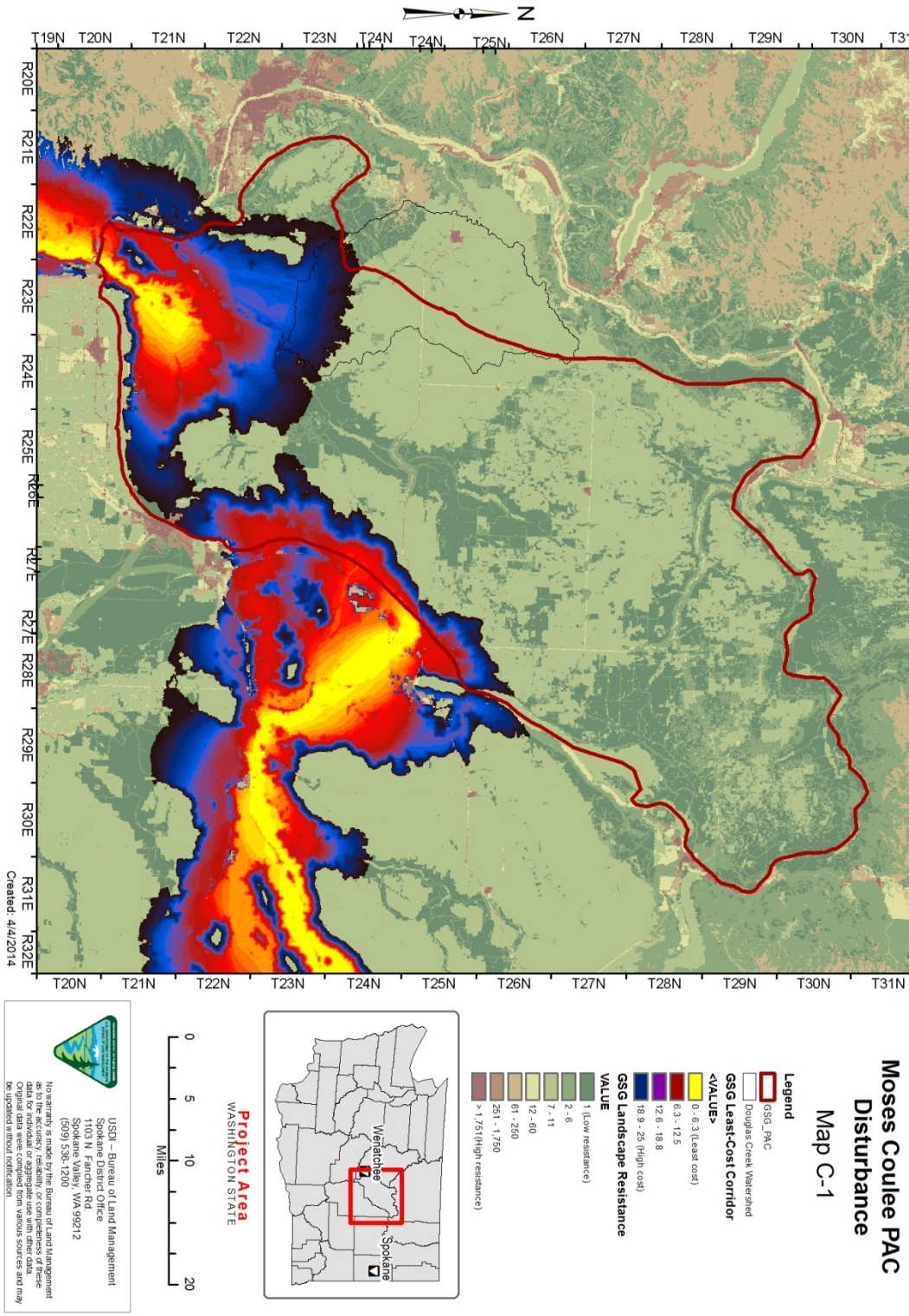
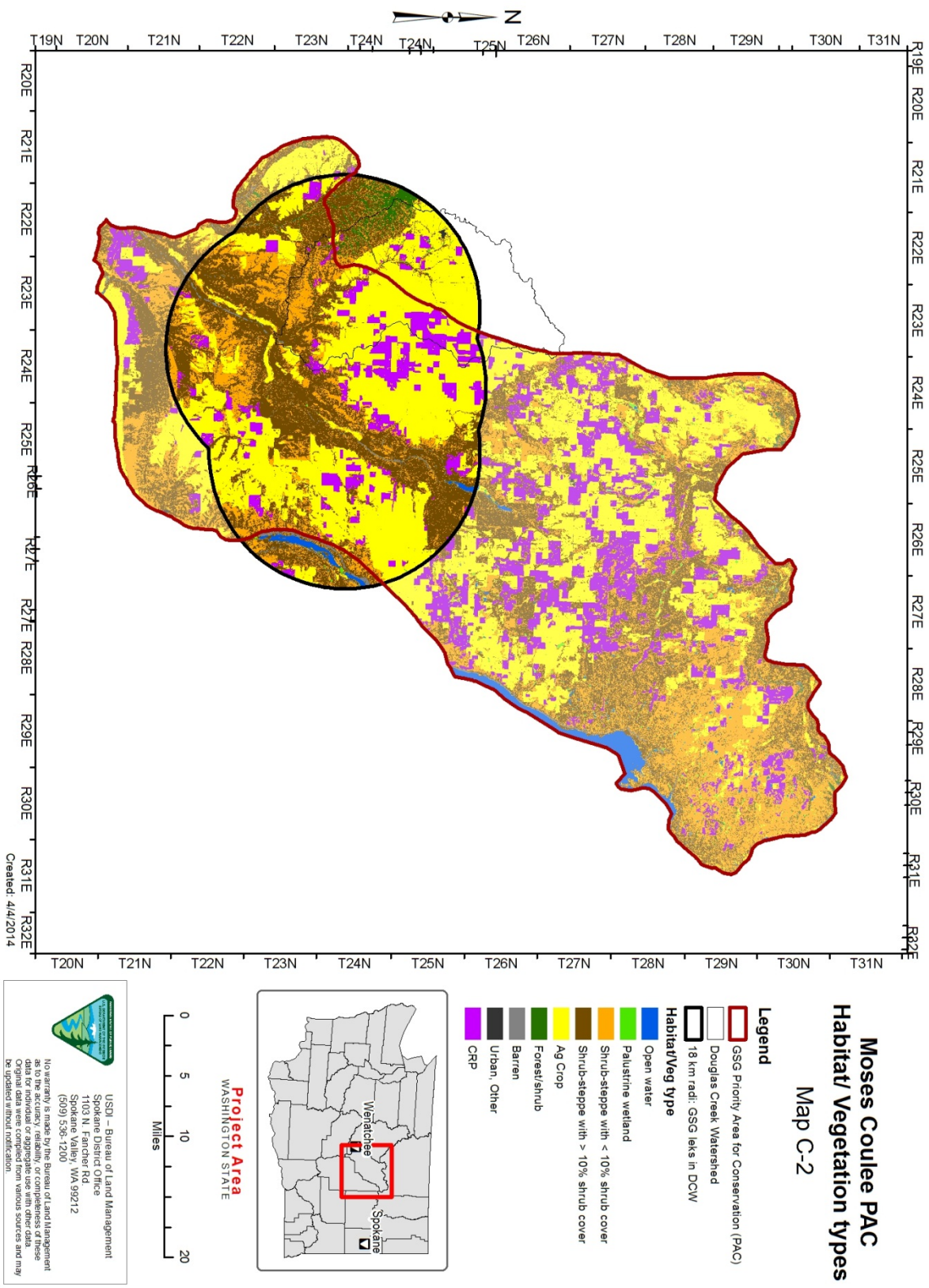
Appendix C: Figures




Moses Coulee PAC
Habitat/ Vegetation types
Map C-2
Legend
GSG Priority Area for Conservation (PAC)
Douglas Creek Watershed
18 km radi: GSG leks in DCW
Habitat/Veg type
Open water
Palustrine wetland
Shrub-steppe with < 10% shrub cover
Shrub-steppe with > 10% shrub cover
Ag Crop
Forest/shrub
Barren
Urban, Other
CRP
Project Area
WASHINGTON STATE
Wenatchee
Spokane
Miles
0 5 10 20
N
T19N T20N T21N T22N T23N T24N T25N T26N T27N T28N T29N T30N T31N
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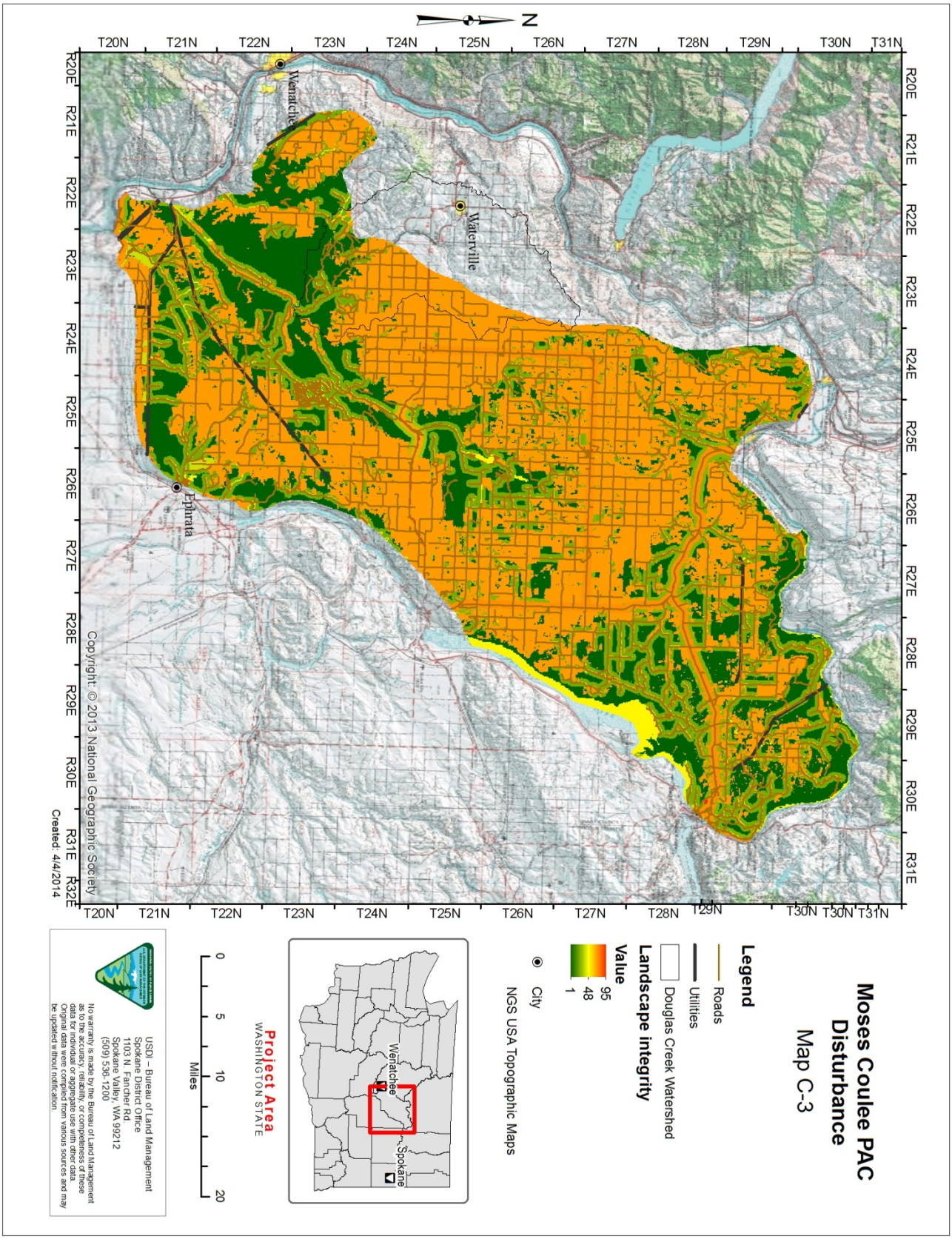
Moses Coulee PAC
Disturbance
Map C-3
Legend
Roads
Utilities
Douglas Creek Watershed
Landscape integrity
Value
95
48
1
City
NGS USA Topographic Maps
Project Area
WASHINGTON STATE
Wenatchee
Spokane
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Wenatchee
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APPENDIX D: OR/WA Standards for Rangeland Health

STANDARDS FOR RANGELAND HEALTH

AND

GUIDELINES FOR LIVESTOCK GRAZING MANAGEMENT

FOR

PUBLIC LANDS ADMINISTERED BY THE BUREAU OF LAND MANAGEMENT IN THE STATES OF OREGON AND

WASHINGTON

AUGUST 12, 1997

Table of Contents

Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington

Introduction

These Standards for Rangeland Health and Guidelines for Livestock Grazing Management for Public Lands in Oregon and Washington were developed in consultation with Resource Advisory Councils and Provincial Advisory Committees, tribes and others. These standards and guidelines meet the requirements and intent of 43 Code of Federal Regulations, Subpart 4180 (Rangeland Health) and are to be used as presented, in their entirety. These standards and guidelines are intended to provide a clear statement of agency policy and direction for those who use public lands for livestock grazing, and for those who are responsible for their management and accountable for their condition. Nothing in this document should be interpreted as an abrogation of Federal trust responsibilities in protection of treaty rights of Indian tribes or any other statutory responsibilities including, but not limited to, the Taylor Grazing Act, the Clean Water Act, and the Endangered Species Act.

Fundamentals of Rangeland Health

The objectives of the rangeland health regulations referred to above are: "to promote healthy sustainable rangeland ecosystems; to accelerate restoration and improvement of public rangelands to properly functioning conditions; . . . and to provide for the sustainability of the western livestock industry and communities that are dependent upon productive, healthy public rangelands."

To help meet these objectives, the regulations on rangeland health identify fundamental principles providing direction to the States, districts, and on-the-ground public land managers and users in the management and use of rangeland ecosystems.

A hierarchy, or order, of ecological function and process exists within each ecosystem. The rangeland ecosystem consists of four primary, interactive components: a physical component, a biological component, a social component, and an economic component. This perspective implies that the physical function of an ecosystem supports the biological health, diversity and productivity of that system. In turn, the interaction of the physical and biological components of the ecosystem provides the basic needs of society and supports economic use and potential.

The Fundamentals of Rangeland Health stated in 43 CFR 4180 are:

1.Watersheds are in, or are making significant progress toward, properly functioning physical condition, including their upland, riparian-wetland, and aquatic components; soil and plant conditions support infiltration, soil moisture storage and the release of water that are in balance with climate and landform and maintain or improve water quality, water quantity and the timing and duration of flow.

2.Ecological processes, including the hydrologic cycle, nutrient cycle and energy flow, are maintained, or there is significant progress toward their attainment, in order to support healthy biotic populations and communities.

3.Water quality complies with State water quality standards and achieves, or is making significant progress toward achieving, established Bureau of Land Management objectives such as meeting wildlife needs.

4.Habitats are, or are making significant progress toward being, restored or maintained for Federal threatened and endangered species, Federal Proposed, Category 1 and 2 Federal candidate and other special status species.

The fundamentals of rangeland health combine the basic precepts of physical function and biological health with elements of law relating to water quality, and plant and animal populations and communities. They provide direction in the development and implementation of the standards for rangeland health.

Standards for Rangeland Health

The standards for rangeland health (standards), based on the above fundamentals, are expressions of the physical and biological condition or degree of function necessary to sustain healthy rangeland ecosystems. Although the focus of these standards is on domestic livestock grazing on Bureau of Land Management lands, on-the-ground decisions must consider the effects and impacts of all uses.

Standards that address the physical components of rangeland ecosystems focus on the roles and interactions of geology and landform, soil, climate and water as they govern watershed function

and soil stability. The biological components addressed in the standards focus on the roles and interactions of plants, animals and microbes (producers, consumers and decomposers), and their habitats in the ecosystem. The biological component of rangeland ecosystems is supported by physical function of the system, and it is recognized that biological activity also influences and supports many of the ecosystem's physical functions.

Guidance contained in 43 CFR 4180 of the regulations directs management toward the maintenance or restoration of the physical function and biological health of rangeland ecosystems. Focusing on the basic ecological health and function of rangelands is expected to provide for the maintenance, enhancement, or creation of future social and economic options.

The standards are based upon the ecological potential and capability of each site. In assessing a site's condition or degree of function, it must be understood that the evaluation compares each site to its own potential or capability. Potential and capability are defined as follows:

Potential-The highest level of condition or degree of function a site can attain given no political, social or economic constraints.

Capability-The highest level of condition or degree of function a site can attain given certain political, social or economic constraints. For example, these constraints might include riparian areas permanently occupied by a highway or railroad bed that prevent the stream's full access to its original flood plain. If such constraints are removed, the site may be able to move toward its potential.

In designing and implementing management strategies to meet the standards of rangeland health, the potential of the site must be identified, and any constraints recognized, in order that plan goals and objectives are realistic and physically and economically achievable.

Standards and Guidelines in Relation to the Planning Process

The standards apply to the goals of land use plans, activity plans, and project plans (Allotment Management Plans, Annual Operating Plans, Habitat Management Plans, etc.). They establish the physical and biological conditions or degree of function toward which management of publicly-owned rangeland is to be directed. In the development of a plan, direction provided by the standards and the social and economic needs expressed by local communities and individuals are brought together in formulating the goal(s) of that plan.

When the standards and the social and economic goals of the planning participants are woven together in the plan goal(s), the quantifiable, time specific objective(s) of the plan are then developed. Objectives describe and quantify the desired future conditions to be achieved within a specified timeframe. Each plan objective should address the physical, biological, social and economic elements identified in the plan goal.

Standards apply to all ecological sites and land forms on public rangelands throughout Oregon and Washington. The standards require site-specific information for full on-ground usability. For each standard, a set of indicators is identified for use in tailoring the standards to site-specific situations. These indicators are used for rangeland ecosystem assessments and monitoring and for developing terms and conditions for permits and leases that achieve the plan goal.

Guidelines for livestock grazing management offer guidance in achieving the plan goal and objectives. The guidelines outline practices, methods, techniques and considerations used to ensure that progress is achieved in a way, and at a rate, that meets the plan goal and objectives.

Indicators of Rangeland Health

The condition or degree of function of a site in relation to the standards and its trend toward or away from any standard is determined through the use of reliable and scientifically sound indicators. The consistent application of such indicators can provide an objective view of the condition and trend of a site when used by trained observers.

For example, the amount and distribution of ground cover can be used to indicate that infiltration at the soil surface can take place as described in the standard relating to upland watershed function. In applying this indicator, the specific levels of plant cover necessary to support infiltration in a particular soil should be identified using currently available information from reference areas, if they exist; from technical sources like soil survey reports, Ecological Site Inventories, and Ecological Site Descriptions, or from other existing reference materials. Reference areas are lands that best represent the potential of a specific ecological site in both physical function and biological health. In many instances potential reference areas are identified in Ecological Site Descriptions and are referred to as "type locations." In the absence of suitable reference areas, the selection of indicators to be used in measuring or judging condition or function should be made by an interdisciplinary team of experienced professionals and other trained individuals.

Not all indicators identified for each standard are expected to be employed in every situation. Criteria for selecting appropriate indicators and methods of measurement and observation include, but are not limited to: 1. the relationship between the attribute(s) being measured or observed and the desired outcome; 2. the relationship between the activity (e.g., livestock grazing) and the attribute(s) being measured or observed; and 3. funds and workforce available to conduct the measurements or observations.

Assessments and Monitoring

The standards are the basis for assessing and monitoring rangeland condition and trend. Carrying out well-designed assessment and monitoring is critical to restoring or maintaining healthy rangelands and determining trends and conditions.

Assessments are a cursory form of evaluation based on the standards that can be used at different landscape scales. Assessments, conducted by qualified interdisciplinary teams (which may

include but are not limited to physical, biological and social specialists, and interagency personnel) with participation from permittees and other interested parties, are appropriate at the watershed and sub-watershed levels, at the allotment and pasture levels and on individual ecological sites or groups of sites. Assessments identify the condition or degree of function within the rangeland ecosystem and indicate resource problems and issues that should be monitored or studied in more detail. The results of assessments are a valuable tool for managers in assigning priorities within an administrative area and the subsequent allocation of personnel, money and time in resource monitoring and treatment. The results of assessments may also be used in making management decisions where an obvious problem exists.

Monitoring, which is the well documented and orderly collection, analysis and interpretation of resource data, serves as the basis for determining trends in the condition or degree of function of rangeland resources and for making management decisions. Monitoring should be designed and carried out to identify trends in resource conditions, to point out resource problems, to help indicate the cause of such problems, to point out solutions, and/or to contribute to adaptive management decisions. In cases where monitoring data do not exist, professional judgment, supported by interdisciplinary team recommendation, may be relied upon by the authorized officer in order to take necessary action. Review and evaluation of new information must be an ongoing activity.

To be effective, monitoring must be consistent over time, throughout administrative areas, and in the methods of measurement and observation of selected indicators. Those doing the monitoring must have the knowledge and skill required by the level or intensity of the monitoring being done, as well as the experience to properly interpret the results. Technical support for training must be made available.

Measurability

It is recognized that not every area will immediately meet the standards and that it will sometimes be a long-term process to restore some rangelands to properly functioning condition. It is intended that in cases where standards are not being met, measurable progress should be made toward achieving those standards, and significant progress should be made toward fulfilling the fundamentals of rangeland health. Measurability is defined on a case-specific basis based upon the stated planning objectives (i.e., quantifiable, time specific), taking into account economic and social goals along with the biological and ecological capability of the area. To the extent that a rate of recovery conforms with the planning objectives, the area is allowed the time to meet the standard under the selected management regime.

Implementation

The material contained in this document will be incorporated into existing Land Use Plans and used in the development of new Land Use Plans. According to 43 CFR 4130.3-1, permits and leases shall incorporate terms and conditions that ensure conformance with 43 CFR 4180. Terms and conditions of existing permits and leases will be modified to reflect standards and guidelines at the earliest possible date with priority for modification being at the discretion of the authorized

officer. Terms and conditions of new permits and leases will reflect standards and guidelines in their development.

Indicators identified in this document will serve as a focus of interpretation of existing monitoring data and will provide the basis of design for monitoring and assessment techniques, and in the development of monitoring and assessment plans.

The authorized officer shall take appropriate action as soon as practicable but not later than the start of the next grazing year upon determining, through assessment or monitoring by experienced professionals and interdisciplinary teams, that a standard is not being achieved and that livestock are a significant contributing factor to the failure to achieve the standards and conform with the guidelines.

Standards for Rangeland Health

Standard 1 Watershed Function – Uplands

Upland soils exhibit infiltration and permeability rates, moisture storage and stability that are appropriate to soil, climate and landform.

Rationale and Intent

This standard focuses on the basic physical functions of upland soils that support plant growth, the maintenance or development of plant populations and communities, and promote dependable flows of quality water from the watershed.

To achieve and sustain rangeland health, watersheds must function properly. Watersheds consist of three principle components: the uplands, riparian/wetland areas and the aquatic zone. This standard addresses the upland component of the watershed. When functioning properly, within its potential, a watershed captures, stores and safely releases the moisture associated with normal precipitation events (equal to or less than the 25 year, 5 hour event) that falls within its boundaries. Uplands make up the largest part of the watershed and are where most of the moisture received during precipitation events is captured and stored.

While all watersheds consist of similar components and processes, each is unique in its individual makeup. Each watershed displays its own pattern of landform and soil, its unique climate and weather patterns, and its own history of use and current condition. In directing management toward achieving this standard, it is essential to treat each unit of the landscape (soil, ecological site, and watershed) according to its own capability and how it fits with both smaller and larger units of the landscape.

A set of potential indicators has been identified for which site-specific criteria will be used to determine if this standard is being met. The appropriate indicators to be used in determining attainment of the standard should be drawn from the following list.

Potential Indicators

Protection of the soil surface from raindrop impact; detention of overland flow; maintenance of infiltration and permeability, and protection of the soil surface from erosion, consistent with the potential/capability of the site, as evidenced by the:

° amount and distribution of plant cover (including forest canopy cover);
° amount and distribution of plant litter;
° accumulation/incorporation of organic matter;
° amount and distribution of bare ground;
° amount and distribution of rock, stone, and gravel;
° plant composition and community structure;
° thickness and continuity of A horizon;
° character of micro-relief;
° presence and integrity of biotic crusts;
° root occupancy of the soil profile;
° biological activity (plant, animal, and insect); and
° absence of accelerated erosion and overland flow.

Soil and plant conditions promote moisture storage as evidenced by:

° amount and distribution of plant cover (including forest canopy cover);
° amount and distribution of plant litter;
° plant composition and community structure; and
° accumulation/incorporation of organic matter.

Standard 2 Watershed Function - Riparian/Wetland Areas

Riparian-wetland areas are in properly functioning physical condition appropriate to soil, climate, and landform.

Rationale and Intent

Riparian-wetland areas are grouped into two major categories: 1. lentic, or standing water systems such as lakes, ponds, seeps, bogs, and meadows; and 2. lotic, or moving water systems such as rivers, streams, and springs. Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. Riparian areas commonly occupy the transition zone between the uplands and surface water bodies (the aquatic zone) or permanently saturated wetlands.

Properly functioning condition of riparian and wetland areas describes the degree of physical function of these components of the watershed. Their functionality is important to water quality in the capture and retention of sediment and debris, the detention and detoxification of pollutants, and in moderating seasonal extremes of water temperature. Properly functioning riparian areas and wetlands enhance the timing and duration of streamflow through dissipation of flood energy, improved bank storage, and ground water recharge. Properly functioning condition should not be confused with the Desired Plant Community (DPC) or the Desired Future Condition (DFC) since, in most cases, it is the precursor to these levels of resource condition and is required for their attainment.

A set of indicators has been identified for which site-specific criteria will be used to determine if this standard is being met. The criteria are based upon the potential (or upon the capability where potential cannot be achieved) of individual sites or land forms.

Potential Indicators

Hydrologic, vegetative, and erosional/depositional processes interact in supporting physical function, consistent with the potential or capability of the site, as evidenced by:

° frequency of floodplain/wetland inundation;
° plant composition, age class distribution, and community structure;
° root mass;
° point bars revegetating;
° streambank/shoreline stability;
° riparian area width;
° sediment deposition;
° active/stable beaver dams;
° coarse/large woody debris;
° upland watershed conditions;
° frequency/duration of soil saturation; and
° water table fluctuation.

Stream channel characteristics are appropriate for landscape position as evidenced by:

° channel width/depth ratio;
° channel sinuosity;
° gradient;
° rocks and coarse and/or large woody debris;
° overhanging banks;
° pool/riffle ratio;
° pool size and frequency; and
° stream embeddedness.

Standard 3 Ecological Processes

Healthy, productive and diverse plant and animal populations and communities appropriate to soil, climate and landform are supported by ecological processes of nutrient cycling, energy flow and the hydrologic cycle.

Rationale and Intent

This standard addresses the ecological processes of energy flow and nutrient cycling as influenced by existing and desired plant and animal communities without establishing the kinds, amounts or proportions of plant and animal community compositions. While emphasis may be on native species, an ecological site may be capable of supporting a number of different native and introduced plant and animal populations and communities while meeting this standard. This standard also addresses the hydrologic cycle which is essential for plant growth and appropriate levels of energy flow and nutrient cycling. Standards 1 and 2 address the watershed aspects of the hydrologic cycle.

With few exceptions, all life on earth is supported by the energy supplied by the sun and captured by plants in the process of photosynthesis. This energy enters the food chain when plants are consumed by insects and herbivores and passes upward through the food chain to the carnivores. Eventually, the energy reaches the decomposers and is released as the thermal output of decomposition or through oxidation.

The ability of plants to capture sunlight energy, to grow and develop, to play a role in soil development and watershed function, to provide habitat for wildlife and to support economic uses depends on the availability of nutrients and moisture. Nutrients necessary for plant growth are made available to plants through the decomposition and metabolization of organic matter by insects, bacteria and fungi, the weathering of rocks and extraction from the atmosphere. Nutrients are transported through the soil by plant uptake, leaching and by rodent, insect and microbial activity. They follow cyclical patterns as they are used and reused by living organisms.

The ability of rangelands to supply resources and satisfy social and economic needs depends on the buildup and cycling of nutrients over time. Interrupting or slowing nutrient cycling can lead to site degradation, as these lands become increasingly deficient in the nutrients plants require.

Some plant communities, because of past use, frequent fire or other histories of extreme or continued disturbance, are incapable of meeting this standard. For example, shallow-rooted winter-annual grasses that completely dominate some sites do not fully occupy the potential rooting depth of some soils, thereby reducing nutrient cycling well below optimum levels. In addition, these plants have a relatively short growth period and thus capture less sunlight than more diverse plant communities. Plant communities like those cited in this example are considered to have crossed the threshold of recovery and often require great expense to be recovered. The cost of recovery must be weighed against the site's potential ecological/economic value in establishing treatment priorities.

The role of fire in natural ecosystems should be considered, whether it acts as a primary driver or only as one of many factors. It may play a significant role in both nutrient cycling and energy flows.

A set of indicators has been identified for which site-specific criteria will be used to determine if this standard is being met.

Potential Indicators

Photosynthesis is effectively occurring throughout the potential growing season, consistent with the potential/capability of the site, as evidenced by plant composition and community structure.

Nutrient cycling is occurring effectively, consistent with the potential/capability of the site, as evidenced by:

° plant composition and community structure;
° accumulation, distribution, incorporation of plant litter and organic matter into the soil;
° animal community structure and composition;
° root occupancy in the soil profile; and
° biological activity including plant growth, herbivory, and rodent, insect and microbial activity.

Standard 4 Water Quality

Surface water and groundwater quality, influenced by agency actions, complies with State water quality standards.

Rationale and Intent

The quality of the water yielded by a watershed is determined by the physical and chemical properties of the geology and soils unique to the watershed, the prevailing climate and weather patterns, current resource conditions, the uses to which the land is put and the quality of the management of those uses. Standards 1, 2 and 3 contribute to attaining this standard.

States are legally required to establish water quality standards and Federal land management agencies are to comply with those standards. In mixed ownership watersheds, agencies, like any other land owners, have limited influence on the quality of the water yielded by the watershed. The actions taken by the agency will contribute to meeting State water quality standards during the period that water crosses agency administered holdings.

Potential Indicators

Water quality meets applicable water quality standards as evidenced by:

° water temperature;
° dissolved oxygen;
° fecal coliform;
° turbidity;
° pH;

° populations of aquatic organisms; and
° effects on beneficial uses (i.e., effects of management activities on beneficial uses as defined under the Clean Water Act and State implementing regulations).

Standard 5 Native, T&E, and Locally Important Species

Habitats support healthy, productive and diverse populations and communities of native plants and animals (including special status species and species of local importance) appropriate to soil, climate and landform.

Rationale and Intent

Federal agencies are mandated to protect threatened and endangered species and will take appropriate action to avoid the listing of any species. This standard focuses on retaining and restoring native plant and animal (including fish) species, populations and communities (including threatened, endangered and other special status species and species of local importance). In meeting the standard, native plant communities and animal habitats would be spatially distributed across the landscape with a density and frequency of species suitable to ensure reproductive capability and sustainability. Plant populations and communities would exhibit a range of age classes necessary to sustain recruitment and mortality fluctuations.

Potential Indicators

Essential habitat elements for species, populations and communities are present and available, consistent with the potential/capability of the landscape, as evidenced by:

° plant community composition, age class distribution, productivity;
° animal community composition, productivity;
° habitat elements;
° spatial distribution of habitat;
° habitat connectivity; and
° population stability/resilience

Guidelines for Livestock Grazing Management

Guidelines for livestock grazing management offer guidance in achieving plan goals, meeting standards for rangeland health and fulfilling the fundamentals of rangeland health. Guidelines are applied in accordance with the capabilities of the resource in consultation, cooperation, and coordination with permittees/lessees and the interested public. Guidelines enable managers to

adjust grazing management on public lands to meet current and anticipated climatic and biological conditions.

General Guidelines

1. Involve diverse interests in rangeland assessment, planning and monitoring.

2. Assessment and monitoring are essential to the management of rangelands, especially in areas where resource problems exist or issues arise. Monitoring should proceed using a qualitative method of assessment to identify critical, site-specific problems or issues using interdisciplinary teams of specialists, managers, and knowledgeable land users.

Once identified, critical, site-specific problems or issues should be targeted for more intensive, quantitative monitoring or investigation. Priority for monitoring and treatment should be given to those areas that are ecologically at-risk where benefits can be maximized given existing budgets and other resources.

Livestock Grazing Management

1. The season, timing, frequency, duration and intensity of livestock grazing use should be based on the physical and biological characteristics of the site and the management unit in order to:

    a. provide adequate cover (live plants, plant litter and residue) to promote infiltration, conserve soil moisture and to maintain soil stability in upland areas;

    b. provide adequate cover and plant community structure to promote streambank stability, debris and sediment capture, and floodwater energy dissipation in riparian areas.

    c. promote soil surface conditions that support infiltration;

    d. avoid sub-surface soil compaction that retards the movement of water in the soil profile;

    e. help prevent the increase and spread of noxious weeds;

    f. maintain or restore diverse plant populations and communities that fully occupy the potential rooting volume of the soil;

    g. maintain or restore plant communities to promote photosynthesis throughout the potential growing season;

    h. promote soil and site conditions that provide the opportunity for the

establishment of desirable plants;

i. protect or restore water quality; and

j. provide for the life cycle requirements, and maintain or restore the habitat elements of native (including T&E, special status, and locally important species) and desired plants and animals.

2. Grazing management plans should be tailored to site-specific conditions and plan objectives. Livestock grazing should be coordinated with the timing of precipitation, plant growth and plant form. Soil moisture, plant growth stage and the timing of peak stream flows are key factors in determining when to graze. Response to different grazing strategies varies with differing ecological sites.

3. Grazing management systems should consider nutritional and herd health requirements of the livestock.

4. Integrate grazing management systems into the year-round management strategy and resources of the permittee(s) or lessee(s). Consider the use of collaborative approaches (e.g., Coordinated Resource Management, Working Groups) in this integration.

5. Consider competition for forage and browse among livestock, big game animals, and wild horses in designing and implementing a grazing plan.

6. Provide periodic rest from grazing for rangeland vegetation during critical growth periods to promote plant vigor, reproduction and productivity.

7. Range improvement practices should be prioritized to promote rehabilitation and resolve grazing concerns on transitory grazing land.

8. Consider the potential for conflict between grazing use on public land and adjoining land uses in the design and implementation of a grazing management plan.

Facilitating the Management of Livestock Grazing

1. The use of practices to facilitate the implementation of grazing systems should consider the kind and class of animals managed, indigenous wildlife, wild horses, the terrain and the availability of water. Practices such as fencing, herding, water development, and the placement of salt and supplements (where authorized) are used where appropriate to:

a. promote livestock distribution;

b. encourage a uniform level of proper grazing use throughout the grazing unit;

c. avoid unwanted or damaging concentrations of livestock on streambanks, in riparian areas and other sensitive areas such as highly erodible soils, unique wildlife habitats and plant communities; and

d. protect water quality.

2. Roads and trails used to facilitate livestock grazing are constructed and maintained in a manner that minimizes the effects on landscape hydrology; concentration of overland flow, erosion and sediment transport are prevented; and subsurface flows are retained.

Accelerating Rangeland Recovery

1. Upland treatments that alter the vegetative composition of a site, like prescribed burning, juniper management and seedings or plantings must be based on the potential of the site and should:

   a. retain or promote infiltration, permeability, and soil moisture storage;

   b. contribute to nutrient cycling and energy flow;

   c. protect water quality;

   d. help prevent the increase and spread of noxious weeds;

   e. contribute to the diversity of plant communities, and plant community composition and structure;

   f. support the conservation of T&E, other special status species and species of local importance; and

   g. be followed up with grazing management and other treatments that extend the life of the treatment and address the cause of the original treatment need.

2. Seedings and plantings of non-native vegetation should only be used in those cases where native species are not available in sufficient quantities; where native species are incapable of maintaining or achieving the standards; or where non-native species are essential to the functional integrity of the site.

3. Structural and vegetative treatments and animal introductions in riparian and wetland areas must be compatible with the capability of the site, including the system's hydrologic regime, and contribute to the maintenance or restoration of

properly functioning condition.

Glossary

Appropriate action-implementing actions pursuant to subparts 4110, 4120, 4130 and 4160 of the regulations that will result in significant progress toward fulfillment of the standards and significant progress toward conformance with the guidelines. (see **Significant progress**)

Assessment-a form of evaluation based on the standards of rangeland health, conducted by an interdisciplinary team at the appropriate landscape scale (pasture, allotment, sub-watershed, watershed, etc.) to determine conditions relative to standards.

Compaction layer-a layer within the soil profile in which the soil particles have been rearranged to decrease void space, thereby increasing soil bulk density and often reducing permeability.

Crust, Abiotic-(physical crust) a surface layer on soils, ranging in thickness from a few millimeters to a few centimeters, that is much more compact, hard and brittle, when dry, than the material immediately beneath it.

Crust, Biotic-(microbiotic or cryptogamic crust) a layer of living organisms (mosses, lichens, liverworts, algae, fungi, bacteria, and/or cyanobacteria) occurring on, or near the soil surface.

Degree of function-a level of physical function relative to properly functioning condition commonly expressed as: properly functioning, functioning-at-risk, or non-functional.

Diversity-the aggregate of species assemblages (communities), individual species, and the genetic variation within species and the processes by which these components interact within and among themselves. The elements of diversity are: 1. community diversity (habitat, ecosystem), 2. species diversity; and 3. genetic diversity within a species; all three of which change over time.

Energy flow-the processes in which solar energy is converted to chemical energy through photosynthesis and passed through the food chain until it is eventually dispersed through respiration and decomposition.

Groundwater-water in the ground that is in the zone of saturation; water in the ground that exists at, or below the water table.

Guideline-practices, methods, techniques and considerations used to ensure that progress is made in a way and at a rate that achieves the standard(s).

Gully-a channel resulting from erosion and caused by the concentrated but intermittent flow of water usually during and immediately following heavy rains.

Hydrologic cycle-the process in which water enters the atmosphere through evaporation, transpiration, or sublimation from the oceans, other surface water bodies, or from the land and vegetation, and through condensation and precipitation returns to the earth's surface. The precipitation then occurring as overland flow, stream flow, or percolating underground flow to the oceans or other surface water bodies or to other sites of evapo-transpiration and recirculation to the atmosphere.

Indicators-parameters of ecosystem function that are observed, assessed, measured, or monitored to directly or indirectly determine attainment of a standard(s).

Infiltration-the downward entry of water into the soil.

Infiltration rate-the rate at which water enters the soil.

Nutrient cycling-the movement of essential elements and inorganic compounds between the reservoir pool (soil, for example) and the cycling pool (organisms) in the rapid exchange (i.e., moving back and forth) between organisms and their immediate environment.

Organic matter-plant and animal residues accumulated or deposited at the soil surface; the organic fraction of the soil that includes plant and animal residues at various stages of decomposition; cells and tissues of soil organisms, and the substances synthesized by the soil population.

Permeability-the ease with which gases, liquids or plant roots penetrate or pass through a bulk mass of soil or a layer of soil.

Properly functioning condition-Riparian-wetland: adequate vegetation, landform, or large (coarse) woody debris is present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid in flood plain development; improve flood-water retention and ground water recharge; develop root masses that stabilize streambanks against cutting action; develop diverse channel and ponding characteristics to provide the habitat and water depth, duration and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. The result of interaction among geology, soil, water, and vegetation.

Uplands: soil and plant conditions support the physical processes of infiltration and moisture storage and promote soil stability (as appropriate to site potential); includes the production of plant cover and the accumulation of plant residue that protect the soil surface from raindrop impact, moderate soil temperature in minimizing frozen soil conditions (frequency, depth, and duration), and the loss of soil moisture to evaporation; root growth and development in the support of permeability and soil aeration. The result of interaction among geology, climate, landform, soil, and organisms.

Proper grazing use-grazing that, through the control of timing, frequency, intensity and duration of use, meets the physiological needs of the desirable vegetation, provides for the establishment of desirable plants and is in accord with the physical function and stability of soil and landform (properly functioning condition).

Reference area-sites that, because of their condition and degree of function, represent the ecological potential or capability of similar sites in an area or region (ecological province); serve as a benchmark in determining the ecological potential of sites with similar soil, climatic, and landscape characteristics.

Rill-a small, intermittent water course with steep sides; usually only a few inches deep.

Riparian area-a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and stream, glacial potholes, and shores of lakes and reservoirs with stable water levels area typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil. Includes, but is not limited to, jurisdictional wetlands.

Significant progress-when used in reference to achieving a standard: (actions), the necessary land treatments, practices and/or changes to management have been applied or are in effect; (rate), a rate of progress that is consistent with the anticipated recovery rate described in plan objectives, with due recognition of the effects of climatic extremes (drought, flooding, etc.), fire, and other unforeseen naturally occurring events or disturbances. Monitoring reference areas that are ungrazed and properly grazed may provide evidence of appropriate recovery rates. (See Proper Grazing Use)

Soil density-(bulk density)-the mass of dry soil per unit bulk volume.

Soil moisture-water contained in the soil; commonly used to describe water in the soil above the water table.

Special status species-species proposed for listing, officially listed (T/E), or candidates for listing as threatened or endangered by the Secretary of the Interior under the provisions of the Endangered Species Act; those listed or proposed for listing by the State in a category implying potential endangerment or extinction; those designated by each Bureau of Land Management State Director as sensitive.

Species of local importance-species of significant importance to Native American populations (e.g., medicinal and food plants).

Standard-an expression of the physical and biological condition or degree of function necessary to sustain healthy rangeland ecosystems.

Uplands-lands that exist above the riparian/wetland area, or active flood plains of rivers and streams; those lands not influenced by the water table or by free or unbound water; commonly represented by toe slopes, alluvial fans, and side slopes, shoulders and ridges of mountains and hills.

Watershed-an area of land that contributes to the surface flow of water past a given point. The watershed dimensions are determined by the point past, or through which, runoff flows.

Watershed function-the principal functions of a watershed include the capture of moisture contributed by precipitation; the storage of moisture within the soil profile, and the release of moisture through subsurface flow, deep percolation to groundwater, evaporation from the soil, and transpiration by live vegetation.

Wetland-areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.