

Vegetation and Habitat of Grouse Mtn. Property
An OPRD Assessment of Natural Resource Values

Noel Bacheller
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Introduction

George and Priscilla Meredith, owners of the subject property have approached OPRD with a concept of the OPRD acquisition of all or a portion of their property. In assessing this potential, Natural Resources and Planning staff made a site visit to the property in August of 2012. This report describes the habitat and environment of the property in broad terms, with attention to vegetation composition and general ecological setting.

Location and geographic description of the property

The subject property is located in rural Grant County, Oregon, straddling US highway 395 beginning approximately 1 mile NE of the town of Mount Vernon. The legal description of the property is T13S, R30E, Sections 1,2,11,12,13,14,15; T12S, R30E, Sections 25,35,36; T12S, R31E, Section 31; T13S, R31E, Sections 6,7,8,18. The property encompasses approximately 6524 acres of land.

In terms of landscape setting, the property encompasses low mountain peaks, ridges, broad slopes, incised canyons, and areas of broad, formerly agricultural bottomland. It spans the transition between open rangeland, woodlands, and relatively dense forests. It includes a perennial pond, several emergent marshes, several perennial creeks, numerous seasonal streams, and many springs. Elevation ranges from 2958 to 4830 feet above sea level, and topographic diversity is high. The property adjoins US Forest Service and Bureau of Land Management lands over approximately 2 miles of its perimeter (6% of total perimeter). The remaining adjacent property is private.

Historic Vegetation and Sources of Change

Historic vegetation has been mapped and modeled by both the Oregon Biodiversity Information Center (ORBIC) and by the US Forest Service LANDFIRE project. The ORBIC data was mapped from surveyors' notes in the late 1800's at a relatively coarse scale. The LANDFIRE historic vegetation mapping was based on their Biophysical settings (BiOPS) modeling. Both datasets have their advantages and disadvantages. In the case of this particular property the LANDFIRE data is probably the better dataset. It is depicted in Figure 4, but it should be regarded as only coarsely accurate. A refined historic vegetation model could be created using the mapped current vegetation as a basis for suppositions of past vegetation. This approach would likely be more accurate, but this analysis is not within the scope of this assessment.

The types of vegetation that were present on the landscape prior to agricultural modification and fire suppression were ponderosa pine forest, juniper forest, riparian forest, big sagebrush steppe, rigid sagebrush steppe, bunchgrass prairie, aspen woodland and forest, emergent marshland, and serpentine barrens. All of these types are present on

the landscape today as well. The modeled extents of these cover types given by the LANDFIRE BiOPS model is probably erroneous in areas, particularly with regard to the extent of aspen forest. Big sagebrush steppe may also have been less prominent than is shown in the model.

Change in vegetation across the landscape is due to primarily past intensive grazing by domestic livestock, seeding of pastures to palatable livestock forage, hydrological modifications, weed introduction, and fire suppression.

- Livestock grazing has left abundant signs on the landscape particularly in areas of lower, flatter ground where livestock were present for more of the year. These areas have transitioned away from the former native bunchgrass communities to introduced and invasive grass species. Even forested areas show signs of grazing history in the species composition of the grasses present – which have transitioned to having areas of non-native bluegrasses common in “improved” pastures. Some areas of open meadowland are almost entirely composed of non-native grasses that have either been directly seeded, or have occurred because of overgrazing of native bunchgrasses and passive introduction of invasive non-native grasses.
- Hydrological modifications are evident in the Gordon Lakes area, where earthmoving was used to either increase the impoundment capacity of an existing wetland or pond; or, a new impoundment altogether may have been created from a former creek, seep, or spring. Bottomland riparian areas, particularly surrounding Beech creek, have likely been narrowed through either active channelization and conversion of bottomlands to pasture, by stream downcutting due to the influence of vegetation loss due to overgrazing, or by a combination of the two forces.
- Weeds usually occur in close association with livestock grazing and agriculture, and this property is no exception. Weeds present include North Africa grass, spotted knapweed, tumbledustards, cheatgrass, medusahead, teasel, scotch thistle, Canada thistle, and forage grasses. The grass weeds are the most widespread. North Africa grass’ abundance is quite high.

Figure 1. Vicinity Map

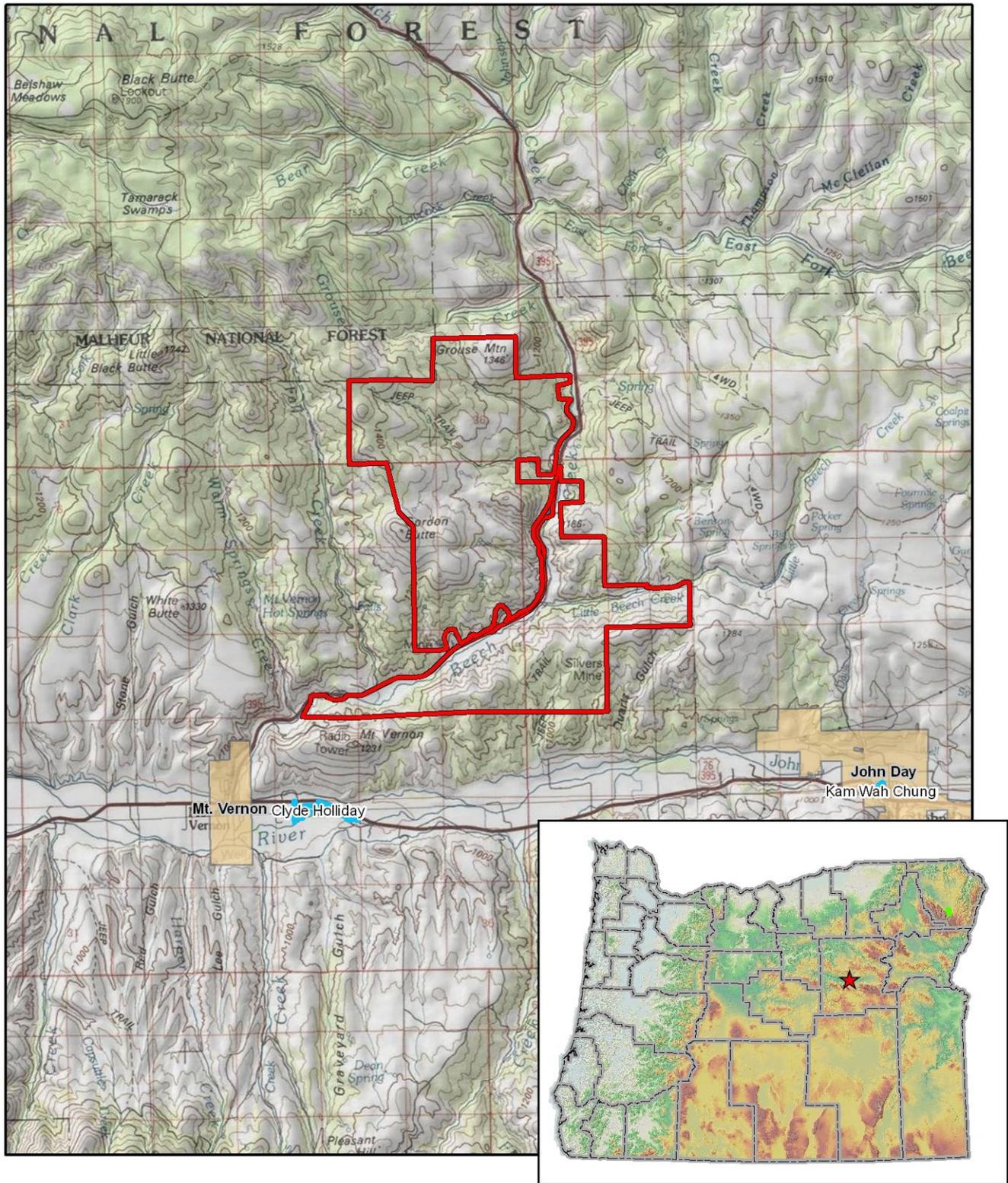


Figure 2. Topographic Setting

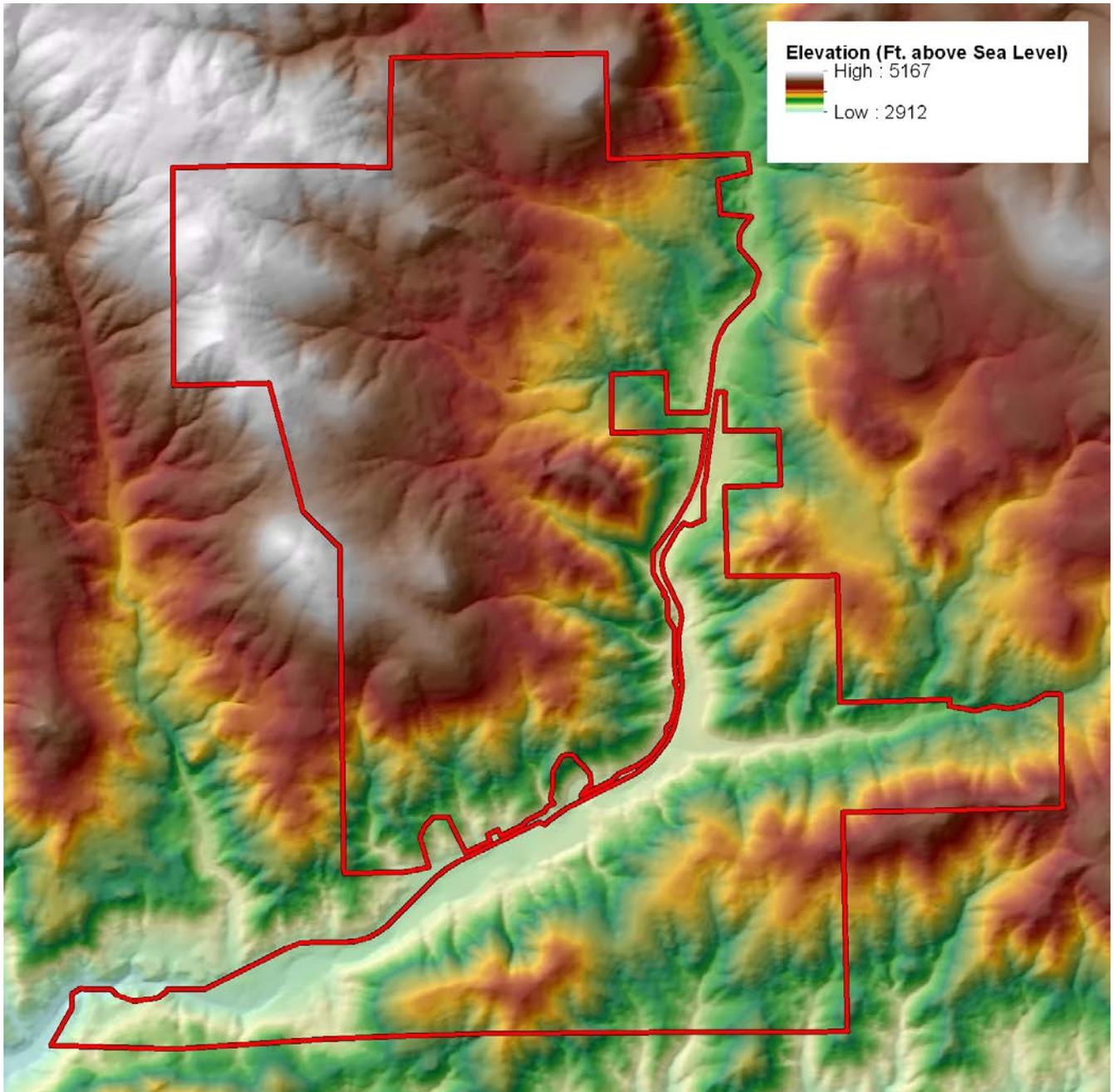
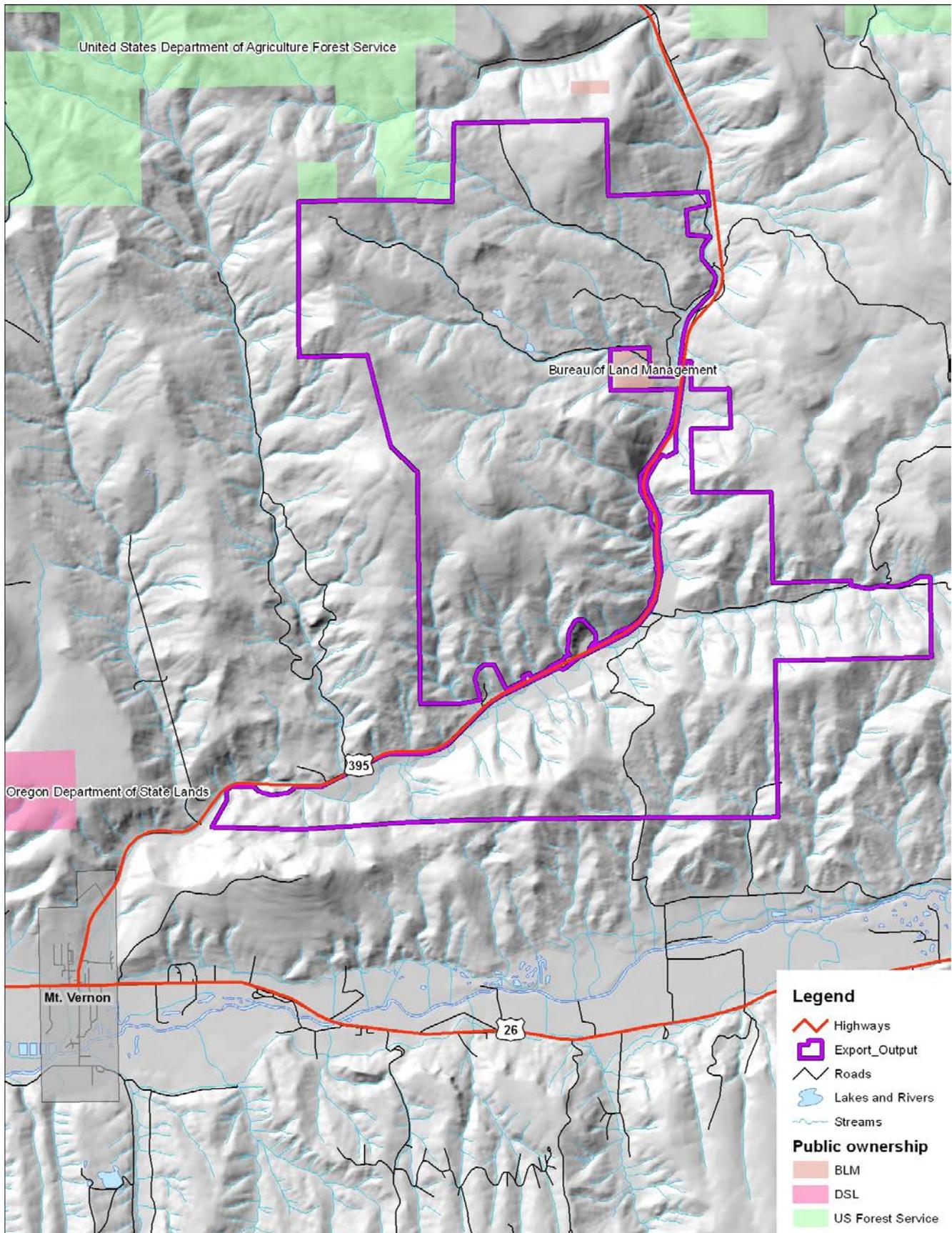


Figure 3. Landscape Settings



Current Vegetation and Landcover

Previously available current vegetation models for the site are mostly inadequate. The most accurate dataset available is the 2008 ORBIC GAP landcover data, but this dataset has some very significant inaccuracies. To improve upon available datasets, a number of plots were sampled in the field in the course of OPRD's August site-visit. A remote sensing process was undertaken to produce a more accurate model of current vegetation cover. The result is depicted in Figure 5. More work could be done to refine the detail and accuracy of the mapped vegetation types, but further work is beyond the scope of this preliminary assessment of the property.

The vegetation habitat types present on the property can be broken down into 7 main types for purposes of the general description of the site's ecology: upland forest, woodland, savanna, grassland, shrub-steppe, riparian vegetation, and agricultural/fallow. Each of these groupings and their subtypes are described in the paragraphs below.

Forests

The distribution of forests on the property is primarily dictated by moisture and topography. Trees generally grow most densely in draws, canyons, and on north slopes. Some juniper-dominated areas have reached forest-level tree densities in drier situations than those that are typically forested. This is due to juniper's ability to thrive in and colonize drier sites in the absence of fire. Forest subtypes include ponderosa pine forest, mixed coniferous forest, aspen forest, and juniper forest. The majority of the forest on the property is ponderosa pine forest. Lesser amounts of white/grand fir and douglas-fir are present in some pockets. Most forested plant associations are characterized by snowberry, woods rose, and rhizomatous bluegrasses. Some forested areas have sparse enough shrub layers such that elk sedge and pinegrass become dominant species. Where juniper is dense enough to be considered forest rather than woodland or savanna, it is generally underlain by weedy grasses, bitterbrush, and native bunchgrasses.

Woodlands

Woodlands are abundant on the property and are characterized by open stands of trees with less than 60% canopy cover. Woodlands on the property can be either predominantly western juniper or ponderosa pine. Bitterbrush, bunchgrasses, and weedy grasses are common inhabitants of the understory. The majority of the woodlands on the property are western juniper-dominated.

Savanna

Savanna habitat is that in which tree cover becomes sparse enough such that the habitat is essentially open grassland or shrub steppe with sparse individual trees or sporadic small clumps of trees. It is common in the drier portions of the property and in less fertile soils. Shrub and herbaceous vegetation is usually sagebrushes, rabbitbrush, bunchgrasses, a variety of forbs, and weedy grasses.

Figure 4. Historic Vegetation from the LANDFIRE Biophysical Settings Model

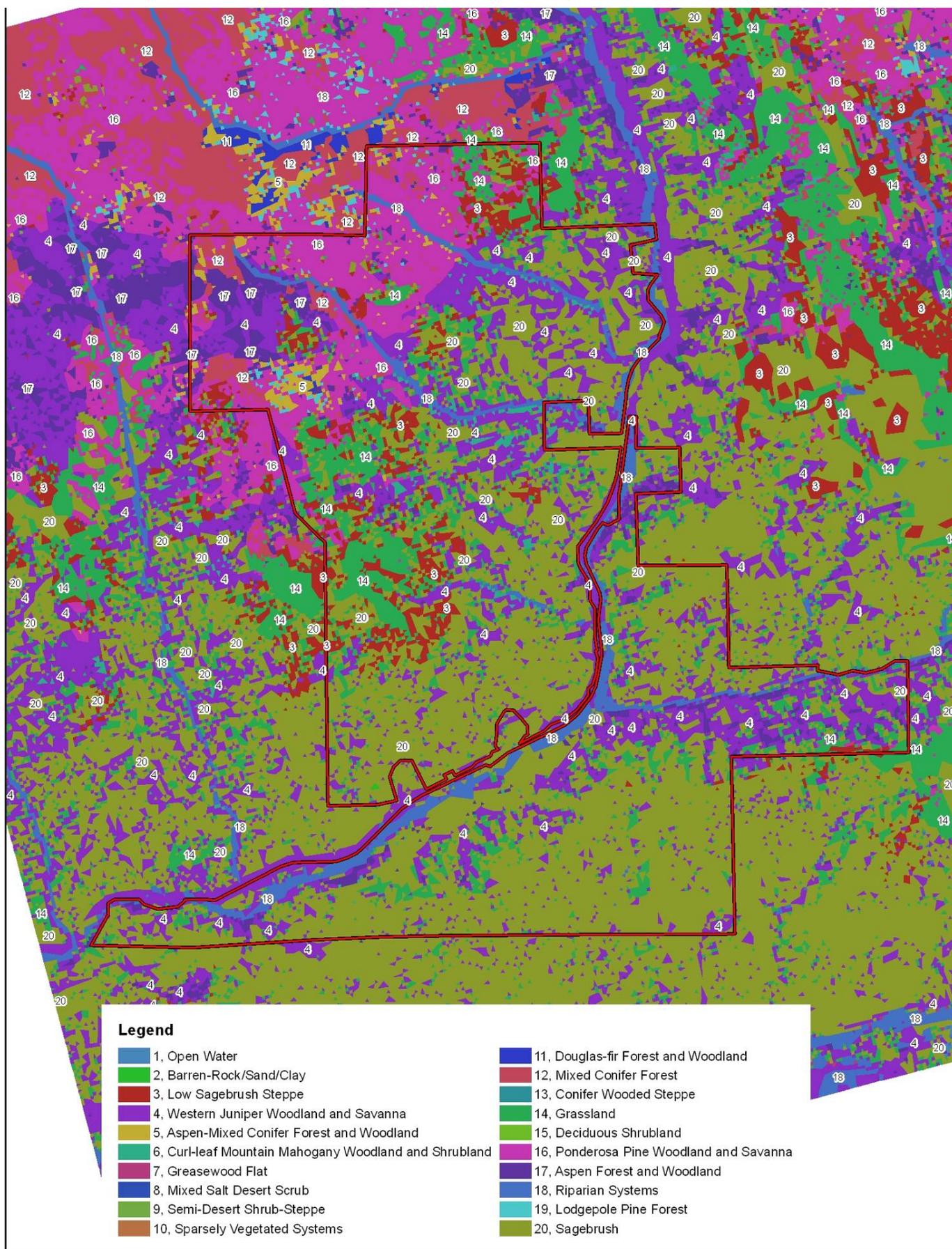


Figure 5. Current Vegetation based on August 2012 Site Visit

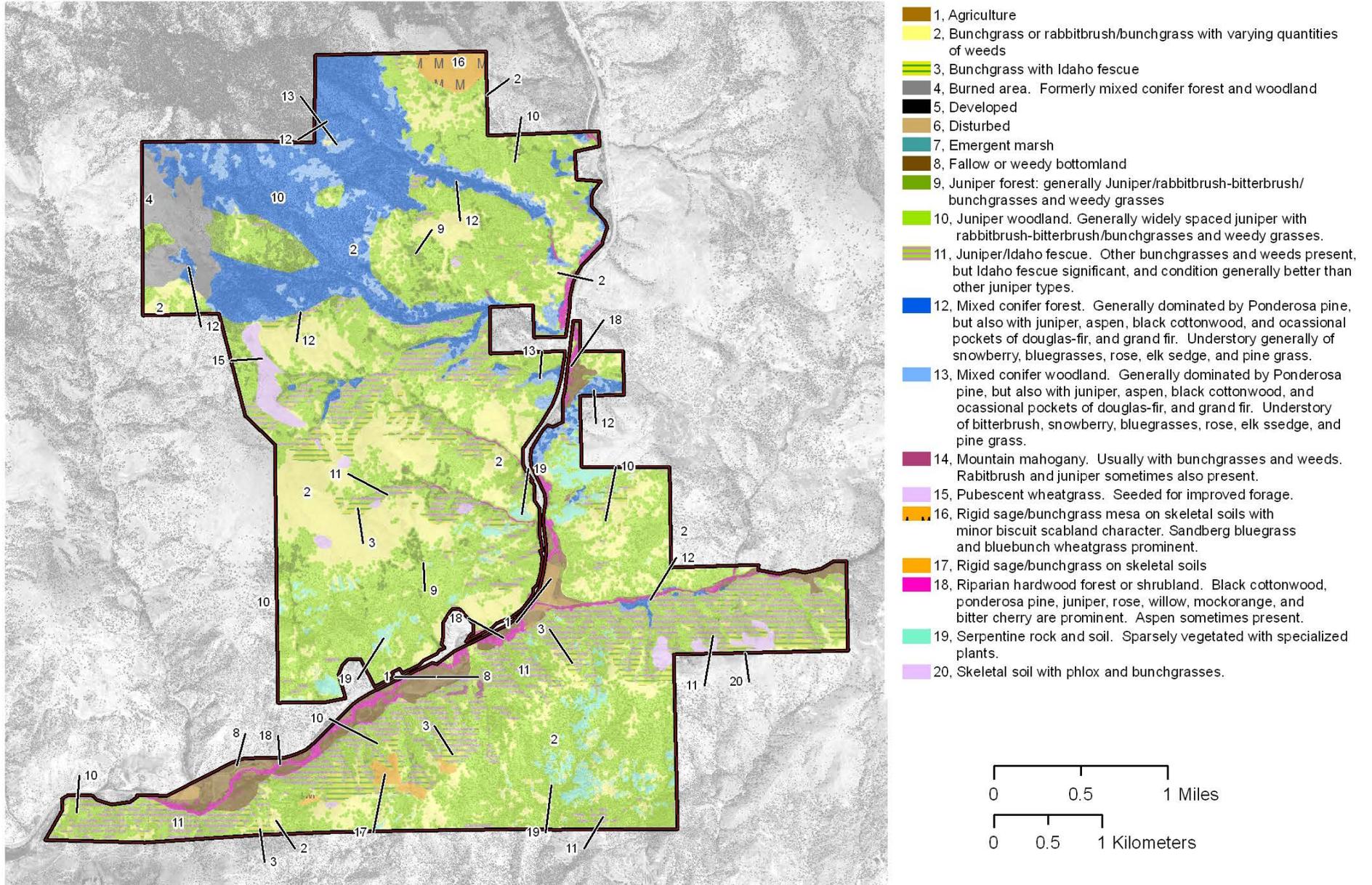
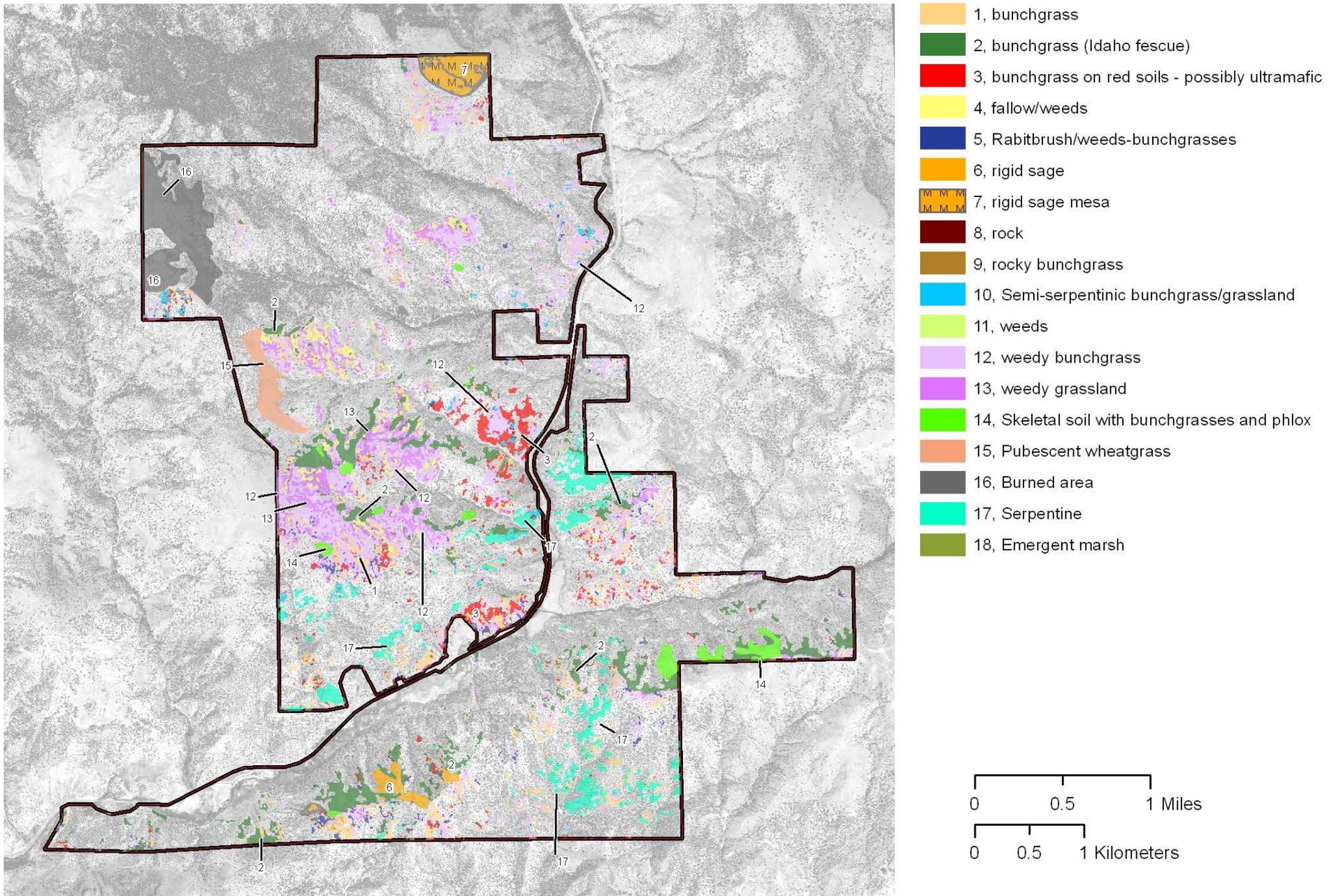


Figure 5B. Current Upland Grassland and Low-Growing Vegetation based on August 2012 Site Visit



Grasslands

This type of habitat is widespread on the property and falls into several categories: Idaho fescue dominated bunchgrass, bluebunch wheatgrass-pine bluegrass dominated bunchgrass, weedy grassland, and improved pasture/haylot. Most grasslands in the higher elevations where livestock were mostly seasonally present are at least partially native bunchgrass. Some areas of longer livestock holding are almost entirely weedy. Areas that have been tilled and managed for hay or improved pasture are usually dominated by non-native forage grasses and weeds. Generally speaking, the Idaho fescue grasslands are present and in better condition on steeper, higher, and/or more remote north slopes with either no trees or sparse juniper. Bluebunch wheatgrass-pine bluegrass communities are likewise found on steeper, higher, and/or more remote slopes where livestock have not lingered as long – but in contrast to Idaho fescue communities, these occur on aspects other than north. The lower in elevation toward the bottomland one travels, the fewer native bunchgrasses are present.

Shrub-steppe

Shrub-steppe communities are characterized by low to medium sized shrubs scattered across the landscape with less than 60% cover. The shrub component is made up of either rubber rabbitbrush, big sagebrush, bitterbrush, or rigid sagebrush. The herb and forb composition beneath the shrub overstory is generally composed of native bunchgrasses, a variety of native and weedy forbs, and weedy grasses. These communities are less abundant than grasslands, woodlands, and forest on the subject property but they are still significant enough to note.

Riparian vegetation

Riparian vegetation on the property is generally made up of a complicated mixture of black cottonwood, aspen, ponderosa pine, and juniper as overstory trees; a midstory of shrubs that include willows, woods rose, chokecherry, snowberry, and golden current; and a forb layer that includes white sweetclover, blue wildrye, Kentucky bluegrass, basin wildrye, and thickspike wheatgrass. White sweetclover and Kentucky bluegrass are non-native forage species that are sometimes very invasive in these areas.

Agricultural/fallow

These areas are almost entirely in the bottomlands along Beech Creek and Little Beech Creek. There is one area in the higher ground that was seeded to pubescent wheatgrass that fits this description as well, although pubescent wheatgrass is a native species. Most of these areas are densely infested with non-native vegetation that includes weedy grasses, knapweed, scotch thistle, Canada thistle, tumble mustard, etc. Much of the arable land in the bottomland to the south of Beech Creek has been managed to transition it away from this weedy condition, and has been seeded in some areas with an ODFW-recommended wildlife forage mix that includes both native and non-native species, but much of this ground

continues to be plagued with weeds. The Merediths cut and sell hay from some of the bottomland arable land.

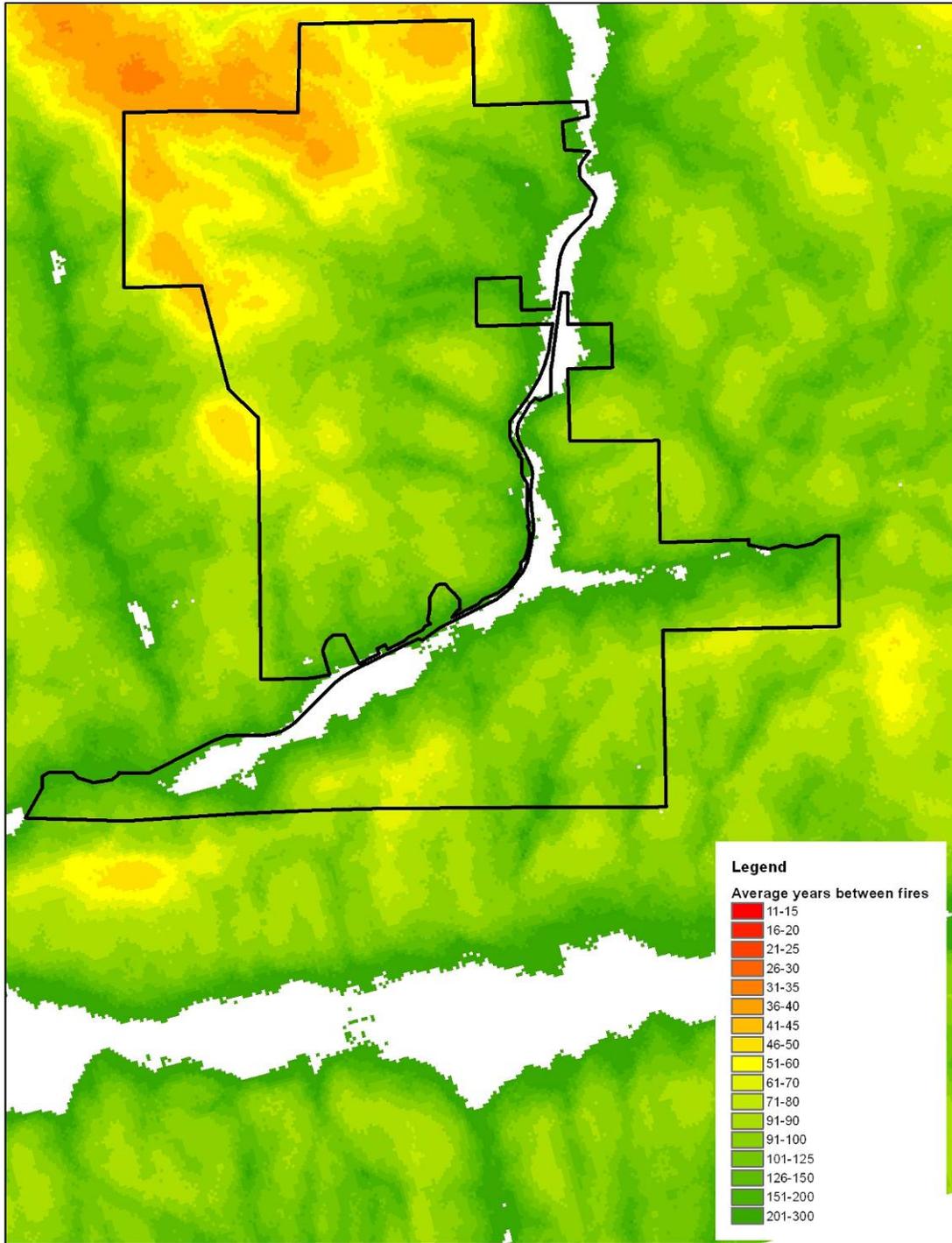
Fuels Management

The Merediths have treated 60%+ of the forested areas of the property for previously overstocked forest conditions and excessive fuel loading relative to pre-European-American settlement conditions. Fuels treatment is still needed on a maximum of 400 acres of forest.

The work done thus far has been a monumental effort that has been quite expensive. Revenues from wood products harvested have only offset costs by about 50%.

This landscape was previously subject to fairly frequent ground fires. Modeled fire return intervals are depicted in Figure 6. This fire return frequency suggests that forest thinning will need to be periodic to clear undergrowth and maintain open forest and woodland conditions. This frequency will be highest in younger stands, and should decrease as larger fire-resistant trees develop. Even in late seral woodland and forest, though, shade tolerant tree and shrub ingrowth is to be expected in the absence of ground fire and this ingrowth will need to be periodically cleared to maintain both habitat and acceptable fuel loadings.

Figure 6. Mean Fire Return interval from LANDFIRE Model



Significant Natural Features

The most unusual and significant feature of the property is arguably the serpentine/ultramafic slopes and outcrops of greenish rock. Serpentine soils contain high levels of certain minerals (such as the heavy metals nickel and chromium) and low levels of certain nutrients – which can make them toxic or infertile to many plants. The soils occurring in these outcrops favor plant species with special adaptations that allow them to tolerate the toxicity and/or infertility of the soil, and this fact accounts for their distinctive flora. These sites are generally fairly sparsely vegetated and visually striking. It is likely that some of the red colored soils on the Grouse Mountain property are also non-metamorphosed ultramafic rock – such as olivinite, periodotite, and dunite.

From a wildlife perspective, Beech Creek and Little Beech Creek are highly significant for their fish habitat. Both streams support strong runs of listed and other fish species. Mature cottonwood riparian forest and relatively dense shrub associates provide nearly ideal shading conditions and wood recruitment.

Strongly red soils also appear to support stronger native bunchgrass communities and may be chemically exclusive to some extent of dense colonization by weeds.

Similarly, the Grouse Mountain mesa is rocky and shallowly soiled, and supports a relatively healthy example of a rigid sagebrush low shrub-steppe community on top. This mesa feature has distinctive flora, and the soils are somewhat mounded in places – suggesting biscuit and swale topography (biscuit scablands).

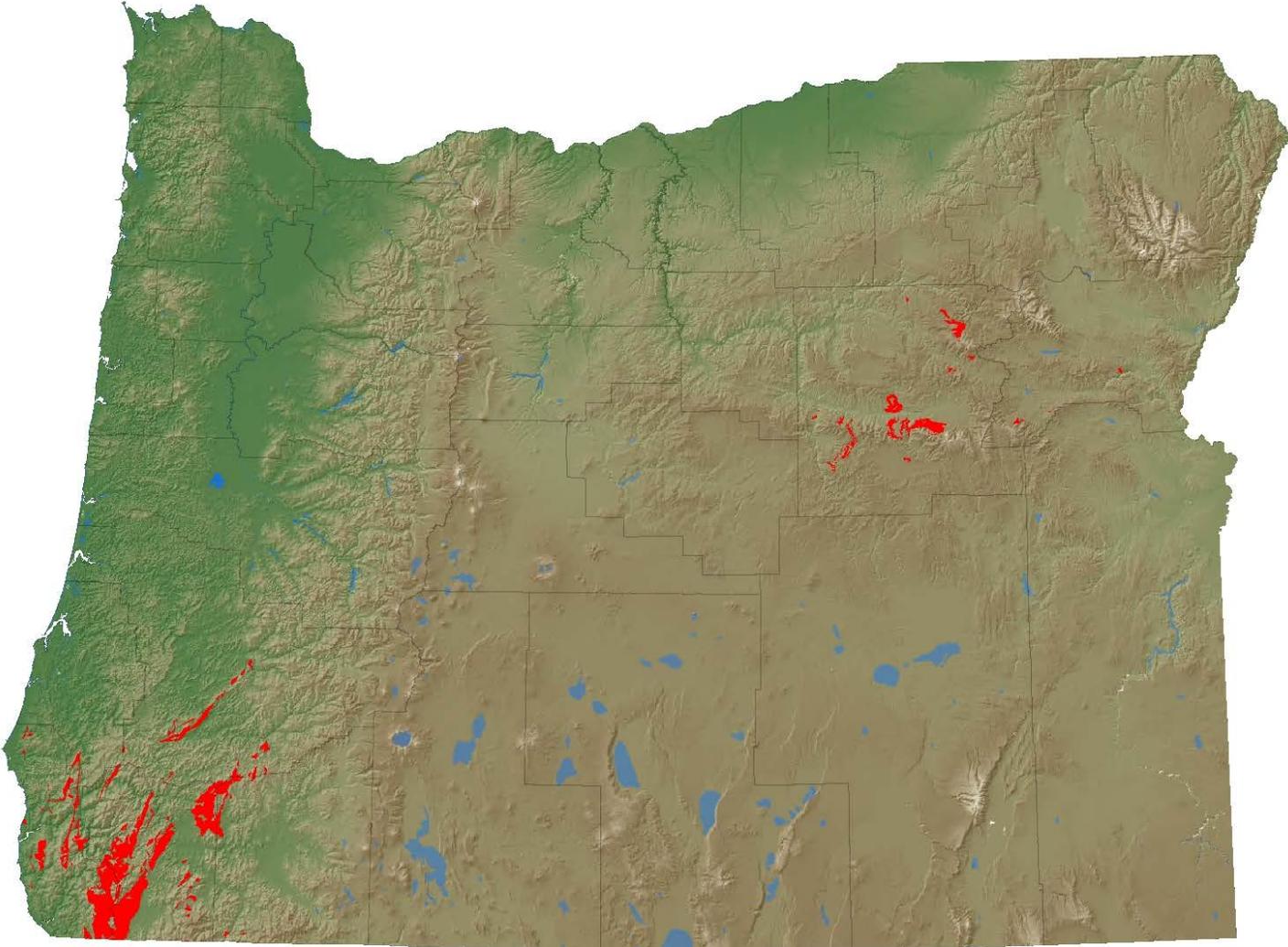
The property has abundant springs on the open slopes as well as in the forests that are valuable plant and animal habitat.

The State Natural Areas Plan indicates habitats that are present and significant in each ecoregion of Oregon. Table 1 presents habitats listed in the Blue Mountains ecoregion that may have significant representation on the Grouse Mountain property. Whether any or all of these potentially significant ecosystem types are present and/or significant enough for registration in the State Natural Areas Plan will require more in-depth assessment of presence, extent, and condition of these communities on the property.

Table 1. Habitats in the State Natural Areas Plan's Blue Mountains Ecoregion Section that May Have Significant Representation on the Grouse Mountain property

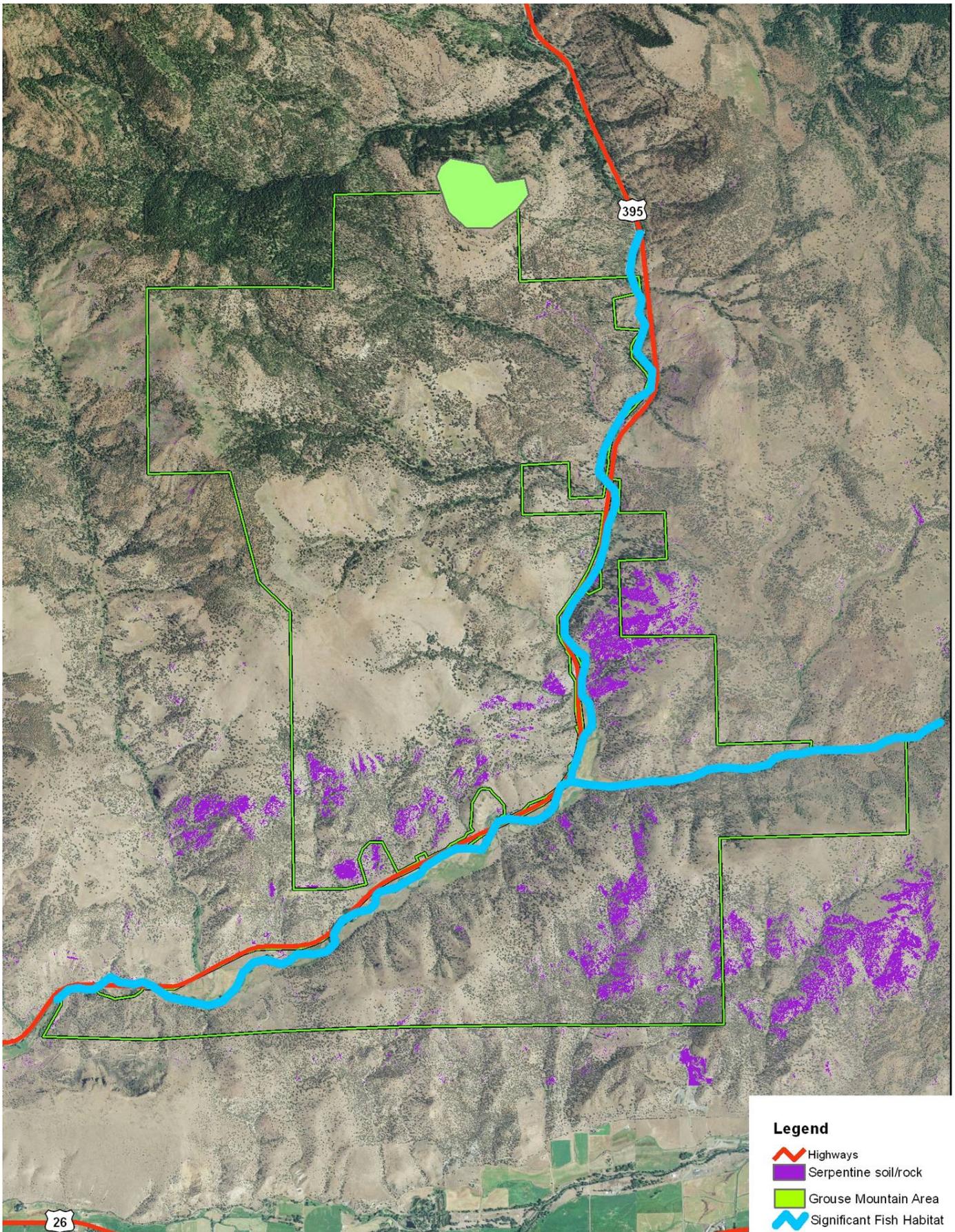
<u>System</u>	<u>Community</u>	<u>Priority</u>
Western Juniper	Western juniper/stiff sagebrush.	Low (already represented elsewhere)
	Western juniper/mountain mahogany.	(already represented elsewhere)
	Western juniper/big sagebrush/bluebunch wheatgrass.	(already represented elsewhere)
	Western juniper/big sagebrush/Idaho fescue.	(already represented elsewhere)
	Western juniper/big sagebrush-bitterbrush/bluebunch wheatgrass & Idaho fescue vegetation.	(already represented elsewhere)
	Western juniper/bluebunch wheatgrass. Western juniper/Idaho fescue.	High
Ponderosa Pine	Ponderosa pine-western juniper/big sagebrush-bitterbrush vegetation mosaic.	Moderate (already represented elsewhere)
	Ponderosa pine/pinegrass with elk sedge if possible.	Moderate
	Ponderosa pine/mountain snowberry.	High
	Ponderosa pine/common snowberry floodplain.	(already represented elsewhere)
Grassland Communities	Biscuit scabland grasslands.	(already represented elsewhere)
	Rigid sagebrush/Sandberg bluegrass scabland.	(already represented elsewhere) (already represented elsewhere)
Shrubland Communities	Mountain mahogany/bunchgrass.	(already represented elsewhere)
	Freshwater lake with aquatic beds and marshy shore.	Unknown
Lacustrine	Bulrush-cattail marsh with aquatic beds.	Low
Palustrine	Low elevation riparian dominated by coyote willow, Pacific willow, or arroyo willow.	High
Riparian	Black cottonwood/common snowberry.	Moderate
	Black cottonwood/snowberry.	Moderate

Figure 7. The Distribution of Ultramafic/Serpentine Rock Outcroppings in Oregon



 Ultramafic Rock of Oregon

Figure 8. Highly Significant Habitats and Natural Features



Restoration Progress and Potential

As has been described briefly in several preceding sections of this report, the Merediths have implemented several management actions that have aimed for ecological restoration of the property. Principal among these are the discontinuation of grazing, the exclusion of livestock from the creeks, conversion of some of the bottomlands to wildlife forage, fuels reduction thinning, and reclaiming Beech Creek floodplain. Each of these is described in more detail below.

Discontinuation of grazing and exclusion of livestock from the creeks

Discontinuation of grazing has had very obvious positive impacts to the riparian areas in particular. Stream banks and floodplains are generally very densely vegetated with wood and herbaceous plants that are essential to stream health in that they provide shade and woody debris recruitment. In upland areas where native bunchgrasses are still significantly present, summer grazing exclusion is presumably resulting in increased abundance of native bunchgrasses over weedy annual grasses in at least some areas. George Meredith has noticed this progression. In areas with no remaining native bunchgrasses the trajectory is less certain.

Conversion of some of the bottomlands to wildlife forage

Although not yet entirely successful, the Merediths – in cooperation with ODFW - have converted some agricultural fields to a wildlife forage “crop” that includes palatable native and non-native grasses and forbs. Weeds continue to be an issue in these fields that have forced restarting the process.

Fuels reduction thinning

60% or more of the forest on the property has been thinned for forest health and fuels reduction. Some of the wood products removed have created revenue to offset the cost of the work. There are still large debris piles that are being worked by a commercial firewood cutter. The amount of wood removed thus far has been enormous, and the associated costs correspondingly large.

Reclaiming Beech Creek floodplain

The Merediths, ODFW, and the Bureau of Reclamation are currently restoring the banks and bed of the reach of Beech Creek within the property. Work has entailed recontouring (decreasing the slope of) much of the bank and placement of woody debris structures. The goal of the work is to encourage the creek to top its banks during high water events, re-establish meanders, capture debris, restore pool/riffle structure, and reclaim flood plain dynamics. During the OPRD August 2012 visit the grading and dam construction were in progress.

Other potential restoration actions to investigate

1. Control of weedy annual grasses in the uplands
 - a. Spring grazing to decrease annual grass abundances while they are actively growing and palatable (and dormant bunchgrasses are not).
 - b. Herbicide applications?

- i. Possible imazapic application, which selectively kills many annual grasses (along with some forbs).
 - ii. Canter R&P application?
 - iii. Low-rate pre-emergent herbicide?
 - iv. All potential herbicide treatments would need to be tested on the native grasses and forbs present to find a balance between target weed treatment and non-target damage to native species.
2. Restoration of fire to the landscape
3. Systematic survey and control of knapweeds, scotch thistle, and other high priority weeds.
4. Completion of fuels reduction in remaining un-treated areas.
5. Use of native bottomland seed mix in agriculturally arable land composed of basin wildrye, thickspike wheatgrass, creeping wildrye, pine bluegrass, indian ricegrass, and needle and thread grass. This grass-only mix would allow for overspraying with broadleaf specific herbicides to kill the problematic scotch thistle, knapweed, etc. that have not been controlled by pure competition from the forage seed mix used thus far. Since the forage seed mix has included broadleaf species, overspraying has not been possible. In a grass-only phased restoration, forbs can be seeded or planted when weeds are substantially controlled and the rhizomatous native grasses have occupied bare ground. It might be necessary to open patches for forb seeding with treatments such as patchy fire, tillage, or spraying to make space for incoming broadleaf species.

Potential Ecological Liabilities Associated with Acquisition

In the interest in identifying natural resource aspects of the property that could/would result in additional cost commitments and management obligations, the following items are offered as inexhaustive examples:

1. Additional fuels treatment needed. This could cost up to \$125,000 (\$250,000 without wood products revenue offset).
2. Weed treatment. This property, while in better condition than most similar land in the area, could require significant weed control costs, *depending on goals*. If non-native annual grasses are tolerated for the most part, the cost would be considerably lower than if the goal were to restore the property to near-pristine conditions.
3. Agricultural/fallow field management. Long-term restoration cost estimates for grass-only native prairie would be in the vicinity of approximately \$1000/ac total over the initial multi-year establishment period. Bottomland native prairie establishment areas would cover no more than 100 acres. Annual maintenance costs after the initial establishment period (which would include periodic mowing or prescribed burning, broadcast spraying, and spot spraying) would be approximately \$200/ac.
4. Woody debris structures. Restoration of the floodplain of Beech Creek has included construction of woody debris structures. These may need either upkeep or removal in the future.
5. Hunting pressure. Management will need to consider potential hunting issues, including pressure to allow hunting, and potentially the need for special hunts as elk and deer populations rise. Other parks near agricultural lands are sometimes pressured to allow hunting because of herds' damage to neighboring farms and retreat to "refuge conditions" on the park.

The Significance of Grouse Mountain Natural Resource and Habitat Values Relative to Those of Other OPRD Properties

Aspects of the Grouse Mountain property described in the preceding sections of this report detail features present on the property without special analysis of how these features fit into the OPRD portfolio of properties as a whole. The discussion below is meant to put the Grouse Mountain property into that context, with special attention to Grouse Mountain characteristics that either add to the offerings of the OPRD portfolio or that are redundant. The following discussion does not analyze the property in relationship to Oregon ecological diversity as a whole, public landholdings as a whole, or other private property that has or could be considered for acquisition. This section is meant only to address Grouse Mountain values relative to current OPRD properties.

Diversity of environment and experience

While many of the habitats and features of the Grouse Mountain property are represented on other park properties, no other park in the system provides as complete of a package of diverse habitats within an accessible context that is well suited to back-country recreational enjoyment. Habitats such as juniper woodland, riparian shrubland, bunchgrass prairie, rock outcroppings, and streams are common in OPRD Blue Mountains landholdings – however, most properties that contain these habitats do not contain them all, and many of them only contain the habitat in a setting less conducive to trail-based and cross-country recreation. All of OPRD’s Blue Mountains properties that contain a range of these habitats are relatively narrow in terms of explorable land and are centered on a feature such as a highway or reservoir. Narrow strip properties do not provide the same quality of experience as properties in which it is possible to get away from roads and experience the landscape without a man-made feature so prominently obvious in the foreground. Other parks that contain a similar range of habitat types, often have accessibility issues such as cliffs, water bodies, or extremely steep slopes.

Other properties on the east side of the state that contain similar diversity and room to roam are Cottonwood Canyon State Park, Smith Rock State Park, Prineville Reservoir State Park, The Cove Palisades State Park, Bates State Park, LaPine State Park, Collier Memorial State Park, Booth State Scenic Corridor, Lake Owyhee State Park, and Succor Creek State Natural Area. Although these properties provide an expanse of diverse habitat, they do not contain the same types of habitat, views, and experience. Some of these properties have very little in common with the landscape of the Grouse Mountain property.

In order to produce an objective basis for comparing the scenic quality, topographic interest, back-country experience, and habitat diversity, a GIS analysis was performed to

assess the character of all OPRD properties east of the Cascade crest. Table 2, below, ranks current OPRD eastside properties along with Grouse Mountain according to their topographic diversity, landcover diversity, and room-to-roam (described below). Results were sorted in that table in order of decreasing habitat/landcover diversity. This GIS analysis is basic version of landscape character assessment that is used in high level planning strategies and overviews.

A basic description of landscape character metrics and methodology:

Topographic interest and landcover diversity measures were calculated from focal Digital Elevation Model (DEM)-derived elevation variation, slope variation, and LANDFIRE existing vegetation and landcover mapping. For topographic interest characterization, topographic diversity across all properties was derived from a statewide Digital Elevation Model (DEM). The DEM was used to produce maps of the amount of slope and elevation variation within a focal radius. The elevation and slope variation were averaged across all property boundaries to produce a measure of the property's topographic diversity. These values were scaled to a range of 1 to 10 for ease of interpretation and combination with other landscape characters to be described more fully below. For landcover diversity, the number of different mapped landcover classes (i.e., types of cover such as forest types, shrubland types, grassland types, rock outcroppings, agriculture, etc) occurring within each property boundary was counted and reported in the table. Like topographic diversity, the landcover diversity tally was scaled to a range of 1 to 10 for use in combination with other parameters. A total diversity score was calculated to combine the two characteristics by adding scaled values of topographic and landcover diversity together

In addition to landscape diversity measures described above, it is useful to consider the concept of "room-to-roam". Room-to-roam is meant to capture the landscape characteristic of unconfined space for cross-country, back-country exploration. Room-to-roam is essentially interior space at a distance from edges, or a feel of being in the middle of a wild, undeveloped space. Wide properties with a square or circular outline have more interior space in relation to edge than do narrow or fragmented properties. For example, a square 4 feet x 4 feet has an area of 16 sqft and a perimeter of 12 feet. A rectangle with dimensions of 1 foot by 16 feet has the same area of 16 sqft, but it's perimeter is much higher at 34 feet. A metric for room-to-roam can be derived by calculation of the ratio of property area versus property perimeter for each property. Long and narrow features have a lower area to perimeter ratio than more blocky features that allow for more dispersal from the developed features such as highways. The area to perimeter ratio gives a metric for characterizing shape - but absolute room-to-roam is dependent on shape in combination with overall size. A meaningful

relative figure for room-to-roam can be calculated by multiplying property size by property shape. This metric was scaled to a range of 1 to 10 for purposes of interpretability and combination with other parameters.

When landscape diversity is considered in conjunction with room to roam (a metric labeled as “total diversity experience” in the table and charts below), a single numerical value can be given for the landscape character of each property assessed that allows comparison of properties’ relative scenic and recreational interest. This value was calculated by adding together the component characters:

$$\text{Total diversity experience} = \text{topographic diversity} + \text{landcover diversity} + \text{room-to-roam}$$

The Grouse Mountain property ranks higher in terms of total diversity experience than all other OPRD properties east of the Cascades except Cove Palisades State Park. Although Cove Palisades ranks higher, it must be said that Cove Palisades is a completely different type of experience – being centered on a large lake, where much of the area of coverage is water and much is inaccessible. Of the “terrestrial” parks east of the Cascades and in the Blue Mountains, Grouse Mountain ranks highest in terms of both landcover type diversity and total diversity experience. In terms of total landscape diversity, Grouse Mountain ranked lower than only The Cove Palisades and OC&E Woods Line State Trail. Again, being centered on a reservoir, Cove Palisades is a completely different kind of experience. OC&E Woods Line is diverse because of its length, but because it is an extremely narrow corridor, it offers little room-to-roam away from the old railway alignment.

The charts below illustrate how the Grouse Mountain property compares to the OPRD property portfolio. Figures 9 and 10 show Grouse Mountain in relationship to both terrestrial and reservoir-based parks. Figures 11 and 12 show Grouse Mountain in relationship to terrestrial/non-reservoir-based properties.

Table 2. Tabulated Landscape Diversity Values for all East-side OPRD Properties and Grouse Mountain from GIS Analysis

NAME	ACRES	area:perimeter ratio	room-to-room(raw) (area*(area/perimeter))	room-to-room scaled 1:10	Number of Landcover Types	landcover types diversity scaled 1:10	MEAN topographic diversity	mean topo diversity normalized scaled 1:10	total diversity (scaled landforms+scaled topo)	total diversity experience (total diversity+scaled roomtoroom)
OC&E Woods Line	1188	46	2405261424	1	46	10	-1.92	2.1	12	13
The Cove Palisades	7440	2018	653900927823	10	37	8	-1.70	5.7	14	23
Grouse Mountain	6524	1855	527287886232	8	36	8	-1.66	6.4	14	22
Blue Mountain Forest	2504	441	42643628165	2	35	8	-1.81	3.9	12	13
Cottonwood Canyon	7732	753	253483267070	4	34	8	-1.56	7.9	15	20
Ukiah-Dale Forest	3114	753	102129528127	2	33	7	-1.44	10.0	17	20
Prineville Reservoir	8800	1800	689927465873	10	32	7	-1.76	4.8	12	22
LaPine	2368	1021	105300895080	2	29	7	-1.95	1.6	8	11
Hilgard Junction	1084	631	29774307351	1	28	6	-1.53	8.6	15	16
Deschutes River	808	944	33235505951	1	27	6	-1.62	7.0	13	15
Smith Rock	651	858	24346452668	1	27	6	-1.45	9.7	16	17
White River Falls	304	562	7442474920	1	27	6	-1.67	6.2	12	13
Succor Creek	2244	1015	99165202007	2	26	6	-1.55	8.2	14	16
Collier	579	918	23177214937	1	26	6	-1.95	1.6	8	9
Minam	610	638	16955126405	1	25	6	-1.48	9.4	15	16
Lake Owyhee	863	785	29526867893	1	24	6	-1.47	9.5	15	16
Sumpter Valley Dredge	97	393	1666487972	1	24	6	-1.92	2.2	8	9
Battle Mountain Forest	443	446	8609338449	1	22	5	-1.73	5.2	10	11
Wallowa Lake Highway Forest	315	292	4009969027	1	22	5	-1.46	9.7	15	16
Iwetemlaykin	59	345	887644435	1	22	5	-1.86	3.1	8	9
Booth	325	528	7474248159	1	20	5	-1.74	5.1	10	11
Wallowa Lake	208	372	3369318738	1	20	5	-1.67	6.2	11	12
Bates	138	458	2744173244	1	20	5	-1.77	4.6	9	10
Farewell Bend	83	150	544463316	1	20	5	-1.85	3.3	8	9
Hat Rock	662	700	20177002583	1	19	4	-1.87	2.9	7	9
Redmond-Bend Juniper	565	383	9412341486	1	19	4	-1.96	1.4	6	7
Unity Forest	86	112	418142483	1	19	4	-1.52	8.7	13	14
Unity Lake	43	206	384224918	1	19	4	-1.88	2.8	7	8

Tumalo	339	402	5933727474	1	18	4	-1.72	5.4	10	11
John Day, Chaparral Recreation Association	136	479	2840459123	1	18	4	-1.72	5.4	10	11
Pilot Butte	121	521	2751348263	1	18	4	-1.61	7.3	12	13
Ontario	94	191	777678673	1	17	4	-1.99	1.0	5	6
Peter Skene Ogden	84	304	1115634182	1	17	4	-1.67	6.3	10	11
Clyde Holliday	43	163	304559908	1	17	4	-1.97	1.3	5	6
Crooked Creek	564	1031	25349162628	1	16	4	-1.82	3.7	8	9
Chandler	95	249	1027883586	1	16	4	-1.67	6.2	10	11
Catherine Creek	158	654	4486152758	1	14	3	-1.54	8.4	12	13
Red Bridge	42	339	622516402	1	14	3	-1.66	6.4	10	11
Frenchglen Corral	28	244	299584081	1	14	3	-1.73	5.2	9	10
Fort Rock	349	674	10251952757	1	13	3	-1.80	4.2	7	9
Jackson F. Kimball	19	189	159008310	1	13	3	-1.80	4.1	7	8
Cline Falls	12	99	52643467	1	13	3	-1.82	3.7	7	8
Deschutes River SSW	226	224	2204938662	1	12	3	-1.58	7.7	11	12
Goose Lake	64	291	812774509	1	12	3	-1.96	1.4	4	5
Emigrant Springs	59	240	629189159	1	12	3	-1.90	2.5	5	7
Sisters	23	92	91343267	1	10	3	-1.98	1.1	4	5
J.S. Burres	14	97	57734902	1	9	2	-1.88	2.8	5	6
Ochoco	250	707	7697183363	1	8	2	-1.72	5.5	8	9
Ochoco Lake	11	138	66375528	1	8	2	-1.88	2.7	5	6
Warm Springs	4	55	10361392	1	8	2	-1.82	3.8	6	7
Arlington	214	371	3451882688	1	7	2	-1.82	3.8	6	7
Clarno	2	56	4846326	1	7	2	-1.86	3.1	5	6
John Day, Chaparral Access	72	342	1069863636	1	6	2	-1.46	9.6	11	12
Fort Rock Cave	20	233	202798118	1	6	2	-1.73	5.2	7	8
Union Shop	13	166	95517206	1	6	2	-1.89	2.6	4	5
Frenchglen Hotel	2	65	4989116	1	5	2	-1.77	4.6	6	7
Dyer	1	36	2160503	1	4	1	-1.49	9.1	11	12
John Day, Hilderbrand	17	189	136074521	1	3	1	-1.73	5.2	6	7
Kam Wah Chung	1	34	1844739	1	3	1	-1.95	1.7	3	4
Pete French Round Barn	2	70	6060015	1	2	1	-1.99	1.0	2	3
Robert Sawyer Shop	1	52	2344106	1	2	1	-1.95	1.6	3	4

Figure 9. Comparative Landscape Diversity and Room to Roam for Properties East of the Cascades and >400acres in size

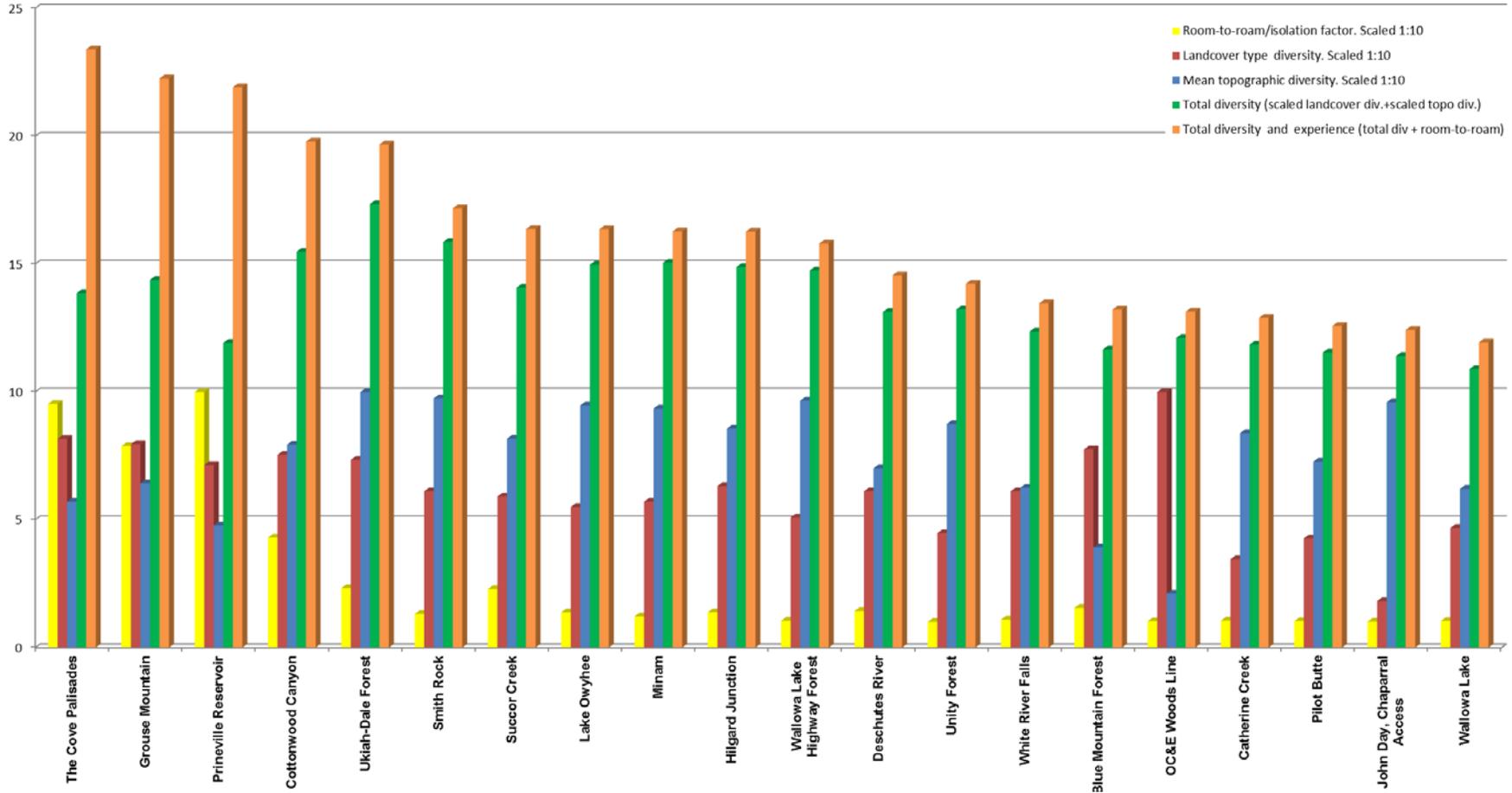


Figure 10. Comparative Landscape Diversity and Room to Roam– Blue Mountains Ecoregion Only, Properties >400 acres in size

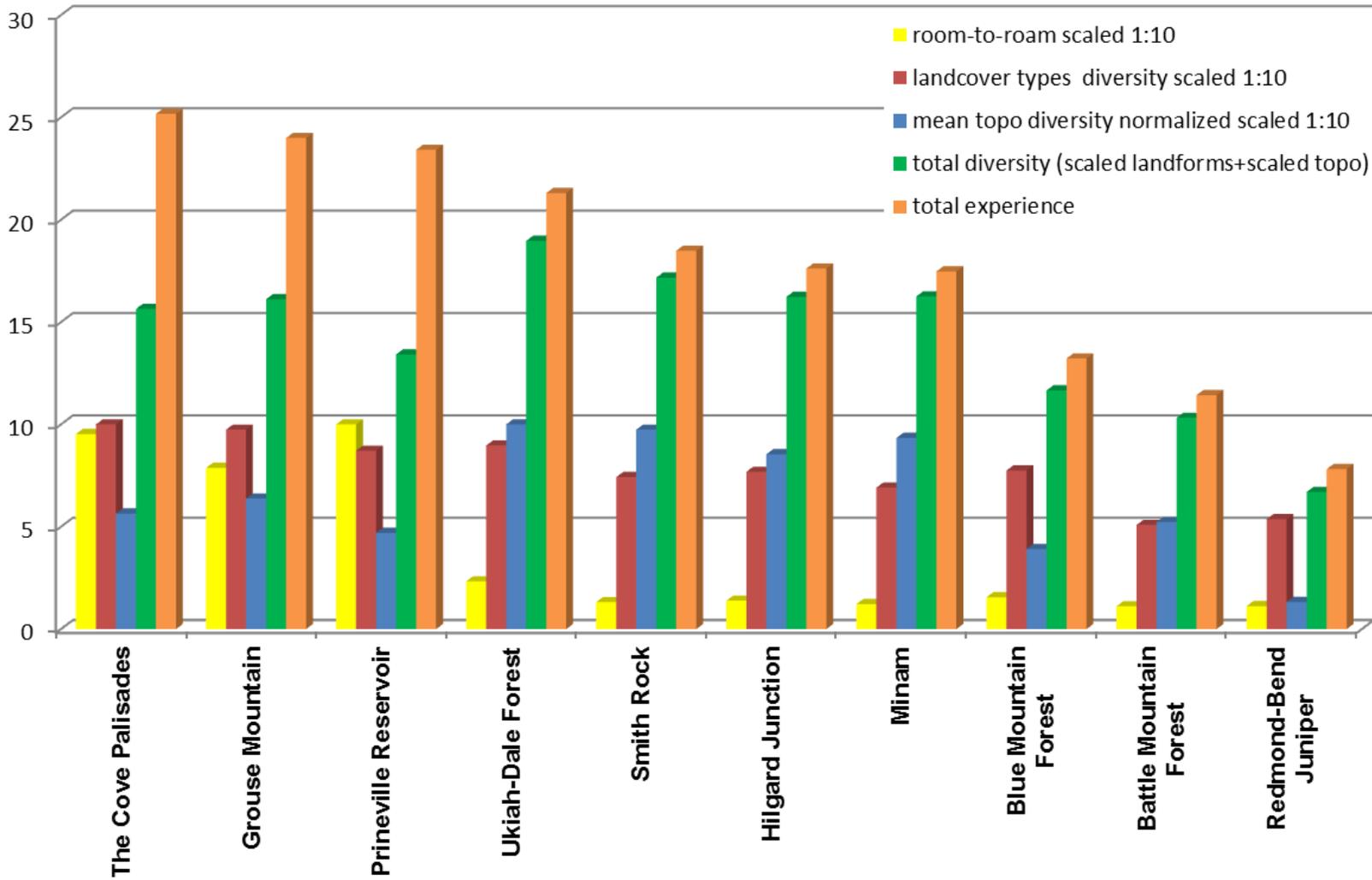


Figure 11. Comparative Landscape Diversity and Room to Roam for Properties Offering Purely Terrestrial Recreation. All properties east of the Cascades crest >400acres in size. except those centering on reservoirs

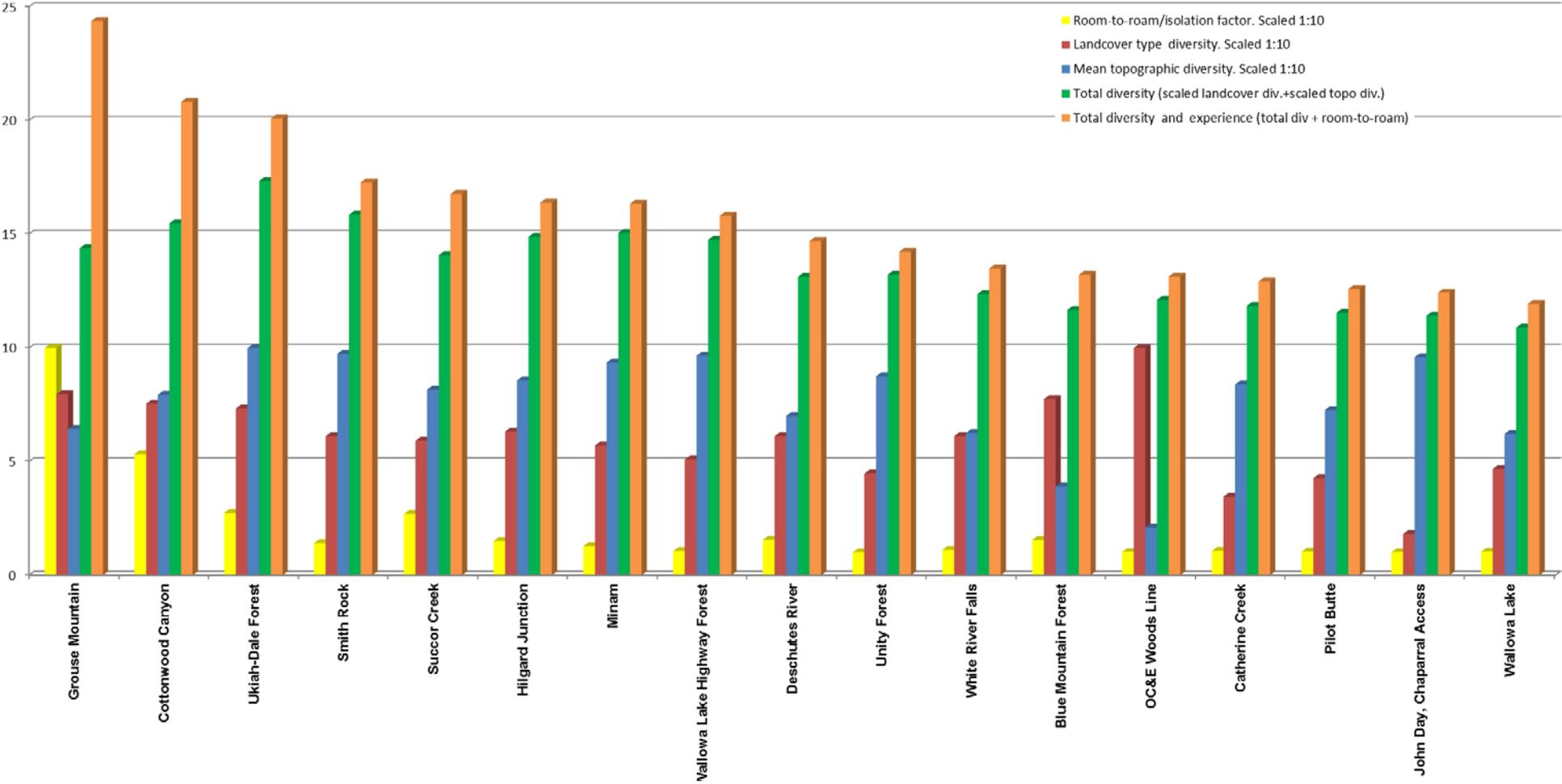
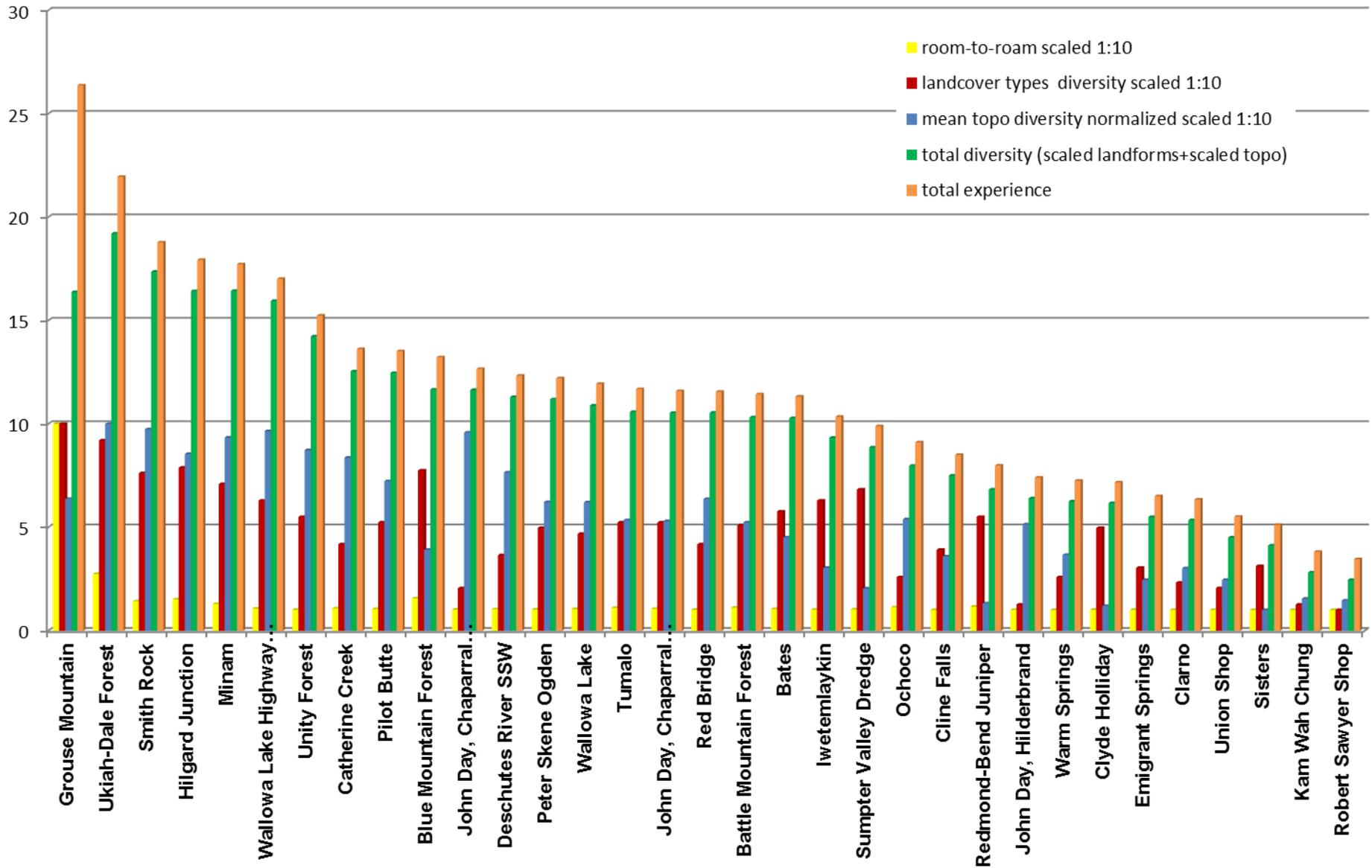


Figure 12. Comparative Landscape Diversity and Room to Roam for Properties Offering Purely Terrestrial Recreation. All properties in the Blue Mountains Ecoregion regardless of size, except those centering on reservoirs.



East-side serpentine/ultramafic soils and rock

No other State Parks in eastern or central Oregon contain outcroppings of serpentine or ultramafic rock, or soils derived from ultramafic sources. OPRD does have several properties with serpentine habitats on the west side of the Cascades in Josephine and Curry counties, however these sites are completely dissimilar in appearance and in associated vegetation. Serpentine and ultramafic soils harbor unique species and plant communities that are specially adapted to their semi-toxic soils.

Mountain mahogany shrubland and steppe

Mountain mahogany habitat has limited distribution in Oregon. It occurs sporadically and in relatively small stands, and is considered an important habitat type. According to the Rex Crawford and Jimmy Kagan in *Wildlife-Habitat Relationships in Oregon and Washington* (Johnson, D. H. and T. A. O'Neil, Oregon State University Press, 2001) , “one third of Pacific Northwest juniper and mountain mahogany community types listed in the National Vegetation Classification are considered imperiled or critically imperiled”. A table of mountain mahogany plant associations and their rarity rankings are reproduced in Table 3, below. There is probably some mountain mahogany present within Ukiah-Dale Forest State Scenic Corridor or Battle Mountain Forest State Scenic Corridor, but presence and distribution are unknown. The only currently known mountain mahogany habitat on OPRD property is in mixed conifer woodland of Booth State Scenic Corridor west of Lakeview near the southern border of the state. The mountain mahogany stands present at Grouse Mountain are high quality and dispersed. Due to the scale of the property and distance from the highway, these sites are unparalleled in other OPRD landholdings.

Mountain Mahogany Community	RANK*
Cercocarpus ledifolius / Artemisia arbuscula / Poa secunda - Pseudoroegneria spicata	G4S4
Cercocarpus ledifolius / Artemisia tridentata ssp. vaseyana	G3S2
Cercocarpus ledifolius / Calamagrostis rubescens	G1S1
Cercocarpus ledifolius / Festuca idahoensis	G5S3
Cercocarpus ledifolius / Festuca idahoensis - Pseudoroegneria spicata	G2S2
Cercocarpus ledifolius / Prunus virginiana	G3S3
Cercocarpus ledifolius / Pseudoroegneria spicata	G5S3
Cercocarpus ledifolius / Symphoricarpos oreophilus	G2S2
Juniperus occidentalis / Cercocarpus ledifolius - Symphoricarpos oreophilus	G2S2
Juniperus occidentalis / Cercocarpus ledifolius / Carex geyeri	G2S2
Juniperus occidentalis / Cercocarpus ledifolius / Pseudoroegneria spicata	G4S4
Pinus ponderosa / Cercocarpus ledifolius	G3S2

Mountain Mahogany Community	RANK*
Pseudotsuga menziesii / Cercocarpus ledifolius	G2S2

*** Rank Definitions**

The ranking is a 1-5 scale, based primarily on the number of known occurrences, but also including threats, sensitivity, area occupied, and other biological factors. In this booklet, the ranks occupy two lines. The top line is the Global Rank and begins with a "G". If the taxon has a trinomial (a subspecies, variety or recognized race), this is followed by a "T" rank indicator. The second line is the State Rank and begins with the letter "S". The ranks are summarized below (see page 6 for migratory bird ranks):

- 1 = Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurrences.
- 2 = Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation), typically with 6-20 occurrences.
- 3 = Rare, uncommon or threatened, but not immediately imperiled, typically with 21-100 occurrences.
- 4 = Not rare and apparently secure, but with cause for long-term concern, usually with more than 100 occurrences.
- 5 = Demonstrably widespread, abundant, and secure.
- H = Historical Occurrence, formerly part of the native biota with the implied expectation that it may be rediscovered.
- X = Presumed extirpated or extinct.
- U = Unknown rank.
- NR = Not yet ranked.

Low elevation ponderosa pine woodland in Blue Mountains ecoregion

All other representatives of the type in OPRD ownership occur along narrow highway buffers or stream terraces that do not give the wild feel of the habitat in the same way that the stands on the Grouse Mountain property do. Bates State Park contains similar, but higher elevation and much smaller, versions of this habitat type. Due to property scale and disturbance history, the ponderosa pine wood land present at Bates State Park does not have the same natural and isolated feel of the stands at Grouse Mountain.

Wildflower meadows in a context of expansive views

Smaller, but similar wildflower views in a large landscape context (rather than a highway buffer as in the cases of Ukiah-Dale, Blue Mountain, and Battle Mountain) are present at Iwetemlaykin State Heritage Site, Prineville Reservoir State Park, Cove Palisades State Park, Hat Rock State Park, and Smith Rock State Park. The wildflower assemblage at each of these these sites is different. The scale and diversity of the Grouse Mountain

property provide much higher quality wildflower meadow scenic qualities, and the abundance of springs and different moisture regimes provide greater diversity.

Low elevation restorable bottomland

The bottomland fields present at Grouse Mountain have already had restoration begun. Accessibility, distance from development and disturbed sites, water availability, and growing environment make them more suitable than other sites for native bottomland grassland steppe and big sagebrush shrub steppe than all other sites in OPRD ownership. Iwetemlaykin State Heritage Site and Hat Rock State Park may offer secondary opportunities. Cottonwood Canyon State Park and Succor Creek State Natural Area have similar bottomland potential in a different and more arid ecoregions.

High quality riparian cottonwood gallery forest and shrubland

Since cattle exclusion, riparian conditions have significantly improved at Grouse Mountain. There are some areas of relic mature black cottonwood riparian gallery forest as well. At a smaller scale, similar riparian habitat is emerging at Bates and some is present at Clyde Holiday State Recreation Site. The riparian habitat at Grouse Mountain is more natural in that grade has not been as manipulated and filled as it has at the other sites. Cottonwood Canyon State Park has some of this habitat in emergent stages of establishment, but the environment of Cottonwood Canyon is much more arid and characteristic of canyonland than the more rolling Blue Mountains topography of the Grouse Mountain site.

Moisture diversity of springs in context of otherwise semi-arid bunchgrass and juniper woodland habitat

The grouse mountain property has an abundance of small springs that add diversity to the landscape and provide higher wildlife habitat value. No other OPRD properties in the Blue Mountains have as many remote springs.

The Grouse Mountain mesa with expansive views over wildflowers and biscuit/swale topography

No other examples of this feature and habitat type are present on OPRD properties in the Blue Mountains Ecoregion. Similar topography is found in more arid environments of the Columbia Plateau ecoregion as well as in the eastern Columbia River gorge, but no other representatives of the type occur on parks property in the Blue Mountains ecoregion.

Rigid sagebrush in Blue Mountains ecoregion

There are no other known examples of rigid sagebrush habitat on OPRD ownership in the Blue Mountains ecoregion. In the Columbia Plateau ecoregion, rigid sagebrush shrub-steppe is present at cottonwood canyon, in a much more arid environment. Rigid sagebrush is not rare statewide, but rigid sagebrush communities range in conservation rank from uncommon (“S3” rank, see above rank descriptions under Mountain Mahogany) to stable (“S4” rank), but with cause for long term concern according to the Classification of Native Vegetation of Oregon.

Forest and woodland fuels treatment already done

A major advantage of the Grouse Mountain property in terms of acquisition priority in the context of similar properties in the Blue Mountains ecoregion is that it has had the vast majority of forest fuel conditions treated for forest health and fire resiliency already. Restoration of forest and woodland habitat overstory structure is mostly complete.

Property contains a wide expanse of land spanning a natural watershed from ridge to ridge.

Other OPRD properties in the Blue Mountains tend to offer only a portion of the aspects within a watershed, or are very narrow. The scale of the Watershed expanse at Grouse Mountain is visually impressive. Cottonwood Canyon State Park, Smith Rock State Park, Ukiah-Dale Forest State Scenic Corridor, and Battle Mountain Forest State Scenic Corridor also contain cross sections of natural (non-reservoir) watersheds; however all of these properties have a subjective isolated canyon feel, rather than a larger rolling watershed feeling.

Property abuts other public lands

Abutting public lands allows for a wider range of recreational experience where trail connections can be made.

Large areas of relatively-intact native bunchgrass steppe and shrub-steppe.

While other State Park properties in the blue mountain ecoregion also offer large areas of relatively intact native bunchgrass steppe and shrub-steppe, all other examples are less easily accessible by foot. Most are present along narrow and very steep highway corridors.

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