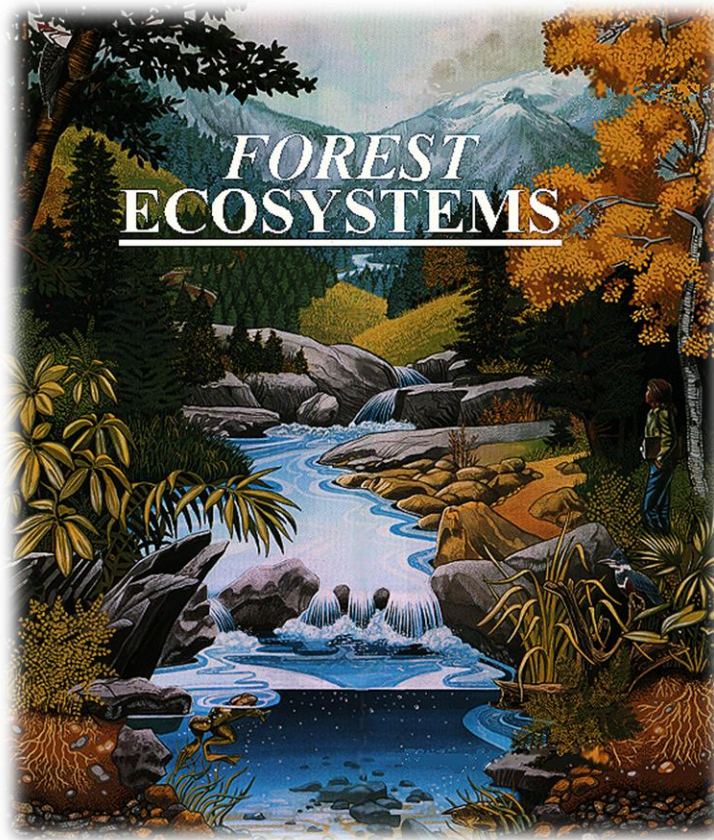WHITE PAPER

Restoration Opportunities for Upland Forest Environments of Umatilla National Forest [1]

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FOREST ECOSYSTEMS

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[1] White papers are internal reports; they receive only limited review. Viewpoints expressed in this paper are those of the author – they may not represent positions of USDA Forest Service.

CONTENTS

INTRODUCTION

This white paper describes methods, results, and active restoration opportunities related to a rating process for upland forests of Umatilla National Forest (USDA Forest Service 2002). Analysis results pertain to Umatilla National Forest lands located in 36 watersheds (5th field Hydrologic Unit Codes or HUC5s) of northeastern Oregon and southeastern Washington.

Although portions of four other watersheds occur within the Umatilla National Forest boundary, they contain limited amounts of National Forest System (NFS) lands (generally 1 acre or less) and were excluded from analysis due to a lack of information about their condition.

This analysis only includes NFS lands (e.g., lands administered by USDA Forest Service) because Forest Service database systems do not characterize vegetation conditions for private and non-NFS lands (although such information could be readily obtained from other database systems).

METHODS

A watershed prioritization process used seven issue-based factors. Analysis criteria were selected to address forest health, changes in species composition and forest structure, and other upland-forest issues.

Upland-forest issues surfaced during three broad-scale, science-based assessments completed over a decade, as described below:

- Caraher Report, titled "Restoring Ecosystems in the Blue Mountains: A Report to the Regional Forester and the Forest Supervisors of the Blue Mountains," was released in July 1992 (Caraher et al. 1992). It was prepared by a panel of resource scientists who assessed nine criteria (early seral, late seral park-like, late seral tolerant multistory, high density low vigor ponderosa pine, high density low vigor lodgepole pine, available fuels, juniper-grasslands, riparian shrub cover, and streambank stability) for all river basins occurring in the Blue Mountains.

- Everett Report, titled the "Eastside Forest Ecosystem Health Assessment," was released in April 1993. It was prepared in response to a request from U.S. House Speaker Tom Foley (representing a US House district encompassing southeastern Washington state) and U.S. Senator Mark Hatfield (representing Oregon) for a scientific evaluation of effects of Forest Service management practices on sustainability of forest ecosystems in eastern Oregon and eastern Washington.
Pacific Northwest Research Station published assessment findings as a series of general technical reports in 1994 and 1995 (Lehmkuhl et al. 1994, and others).

- President Bill Clinton issued this direction on July 1, 1993: "management of eastside forests will need to focus on restoring the health of forest ecosystems impacted by poor management practices of the past… The President is directing the Forest Service to develop a scientifically sound and ecosystem-based strategy for management of eastside forests. This strategy should be based on the forest health study recently completed by agency scientists [e.g., Everett Report] as well as other studies."

  This direction quickly resulted in an Interior Columbia Basin Ecosystem Management Project (ICBEMP), initiated in January of 1994. ICBEMP produced broad-scale and mid-scale ecosystem assessments covering 145 million acres of federal land in seven western states. Many science reports were published by ICBEMP (Hessburg et al. 1999, Quigley et al. 1996, and others).

Note: Further information about three broad-scale assessments described in this section is provided in a white paper: "Blue Mountains Vegetation Chronology" (Powell 2016). The vegetation chronology white paper (Silv-11) provides literature citations (and associated weblinks for digital versions of publications) for general technical reports and other science products (including journal articles) issued in conjunction with the Everett Report and ICBEMP.

BIAS FOR ACTION ASSUMPTION

This upland-forest restoration analysis adopted a "bias for action" concept – it was assumed that a proactive response (active restoration) would be more effective as a restoration strategy than avoidance (passive restoration). This assumption is derived from broad-scale assessments described above because they concluded that changes in forest composition and structure were often related to a passive approach (i.e., suppression or exclusion) to native disturbance agents such as wildfire and defoliating insects.

A primary focus of forest restoration is to use active management treatments to emulate the intensity, scale, and pattern of historical (native) disturbance processes. A primary objective of restoration treatments is to address wildfire hazard and insect and disease susceptibility; production of timber, water, forage, and other commodities (if any) is only a by-product of addressing these forest-health objectives.

RESTORATION ANALYSIS CRITERIA

Individual factor ratings are derived from queries of a Forest-wide 'Composite' vegetation database compiled between January and July of 2001. Information in the characterization database can be assumed to reflect vegetation conditions as they existed in mid-2001.

Composite vegetation database is described in White Paper Silv-2: "Description of Composite vegetation database" (Powell 2013).

A Composite vegetation-analysis database contains characterization information for 29,634 individual polygons; information came from a variety of sources such as interpretation of aerial photography, walk-through surveys, stand examinations, and so forth.

Most analyses utilized a technique called "historical range of variability" (HRV). In an HRV-based analysis, current conditions are compared to a range of historical conditions believed to represent presettlement vegetation, as it existed prior to significant modification or influence by Euro-Americans (defined as mid-1800s for Blue Mountains region).

HRV is described in White Paper Silv-3: "Range of variation recommendations for dry, moist, and cold forests" (Powell 2019).

In a restoration context, instances where current conditions deviate from an historical range (whether above or below) are particularly concerning because they indicate situations that may be unsustainable, at least to whatever extent historical conditions represent sustainability.

For two factors, ranges used in HRV analysis vary by climatic regime, so the 36 watersheds are assigned to either a marine or mixed regime by using information from Caraher et al. (1992) ('mixed' refers to watersheds influenced by both marine and continental climatic regimes).

The following seven criteria, many of which are derived from broad-scale assessments such as Caraher Report (Caraher et al. 1992), are used to analyze upland-forest restoration opportunities for 36 watersheds occurring entirely or partly within the Umatilla National Forest:

1. **Percentage of overstocked area**. This criterion is rated by using recently developed stocking recommendations that vary by ecological site potential (plant association).

   Stocking refers to how much growing space is currently occupied by trees when compared with a site's ecological 'carrying capacity' for forest (tree) density.

   Carrying capacity levels are based on recommendations from recent stocking guides (Cochran et al. 1994, Powell 1999, Powell 2001).

2. **Crown fire potential**. This criterion is rated by using crown bulk density (CBD) thresholds that relate forest (tree) density levels to canopy fuel loading expressed as foliage volume or biomass.

   CBD thresholds vary by forest cover type (Agee 1996, Powell 2010).

3. **Percentage of "high density, low vigor ponderosa pine."** This criterion examines whether an existing percentage of "high density, low vigor ponderosa pine" represents a departure from an historical range of variability for this vegetation condition (Caraher et al. 1992).

4. **Percentage of "high density, low vigor lodgepole pine."** This criterion examines whether an existing percentage of "high density, low vigor lodgepole pine" represents a departure from an historical range of variability for this vegetation condition (Caraher et al. 1992).

5. **Opportunity to restore "old forest single stratum"** structural stage on dry forest sites. This criterion examines whether an existing percentage of "old forest single stratum" structural stage represents a departure from HRV for upland forest structural stages (Blackwood 1998).

   'OFSS' structural stage is now so rare as to be considered a 'threatened' ecosystem of the western United States (Noss et al. 1995).

6. **Percentage of western juniper invasion** on dry forest sites. This criterion examines whether an existing percentage of "western juniper forest cover type" represents a departure from HRV for this cover type (Morgan and Parsons 2001).

7. **Percentage of ponderosa pine cover type** on dry forest sites. This criterion examines whether an existing percentage of "ponderosa pine forest cover type" represents a departure from HRV for this cover type (Morgan and Parsons 2001).

A composite rating is calculated by converting descriptive ratings (high, medium, low) to a numeric score (1=low; 2=medium; 3=high), and then summing seven factor scores to produce a total for each watershed. The 36 total (watershed) scores were then arrayed from lowest to highest, examined by the analyst (author), and subjectively delineated into three groups: watersheds with high, medium, or low opportunity to apply active management treatments to achieve upland-forest restoration objectives.

Watersheds with a high rating have high potential (and need) for active restoration techniques to reduce crown fire risk, improve forest health, restore a rare structural class (old, single-layer forest on dry upland sites), and otherwise contribute to restoration of ecological integrity and resilience for upland forest sites.

RESULTS OF AN UPLAND-FOREST RESTORATION ANALYSIS

Results for seven upland-forest rating factors are provided in tables 2-8, and in appendix 1 (in vegetation section of table 9 in app. 1).

Of 36 watersheds for which NFS data was available, 7 of them (19%) had a composite rating of low when evaluated by using seven upland-forest criteria. These 'low' watersheds are concentrated in the east-central portion of Umatilla National Forest, ranging from Meadow Creek on the south to Grand Ronde River/Grossman Creek on the north.

Of 36 watersheds for which NFS data was available, 18 of them (50%) had a composite rating of medium when evaluated by using seven upland-forest criteria. These 'medium' watersheds are spread across the Umatilla National Forest, with pretty much an equal representation on both the south and north ends.

Of 36 watersheds for which NFS data was available, 11 of them (31%) had a composite rating of high when evaluated by using seven upland-forest criteria. These 'high' watersheds are concentrated on the south end of the Forest (North Fork John Day and Heppner Ranger Districts), although three of them are located on the north end – Upper Tucannon River, Pataha Creek, and Asotin Creek.

Table 1 provides a list of 36 watersheds included in an upland-forest restoration evaluation. Figure 1 shows the geographical extent and location of these watersheds.

Table 1: Watersheds included in upland-forest analyses.

Watershed Number	Watershed Name
1706010302	Asotin Creek/George Creek
1706010303	Asotin Creek
1706010402	Meadow Creek
1706010404	Grande Ronde River/State Ditch
1706010409	Willow Creek
1706010410	Lookingglass Creek
1706010411	Grande Ronde River/Cabin Creek
1706010601	Grande Ronde River/Grossman Creek
1706010603	Wenaha River
1706010607	Lower Grande Ronde River
1706010705	Upper Tucannon River
1706010706	Tucannon River/Pataha Creek
1707010201	Upper Walla Walla River
1707010202	Mill Creek
1707010203	Upper Touchet River
1707010301	Upper Umatilla River
1707010302	Meacham Creek
1707010303	Umatilla River/Mission Creek
1707010306	Birch Creek
1707010309	Upper Butter Creek
1707010401	Upper Willow Creek
1707010403	Rhea Creek
1707020201	Upper North Fork John Day River
1707020202	Granite Creek
1707020203	North Fork John Day River/Big Creek
1707020204	Desolation Creek
1707020205	Upper Camas Creek
1707020206	Lower Camas Creek
1707020207	North Fork John Day River/Potamus Creek
1707020208	Wall Creek
1707020210	Lower North Fork John Day River
1707020302	Galena
1707020305	Middle Fork Granite to Big Creek
1707020306	Lower Middle Fork
1707020401	Lower John Day River/Kahler Creek
1707020411	Upper Rock Creek
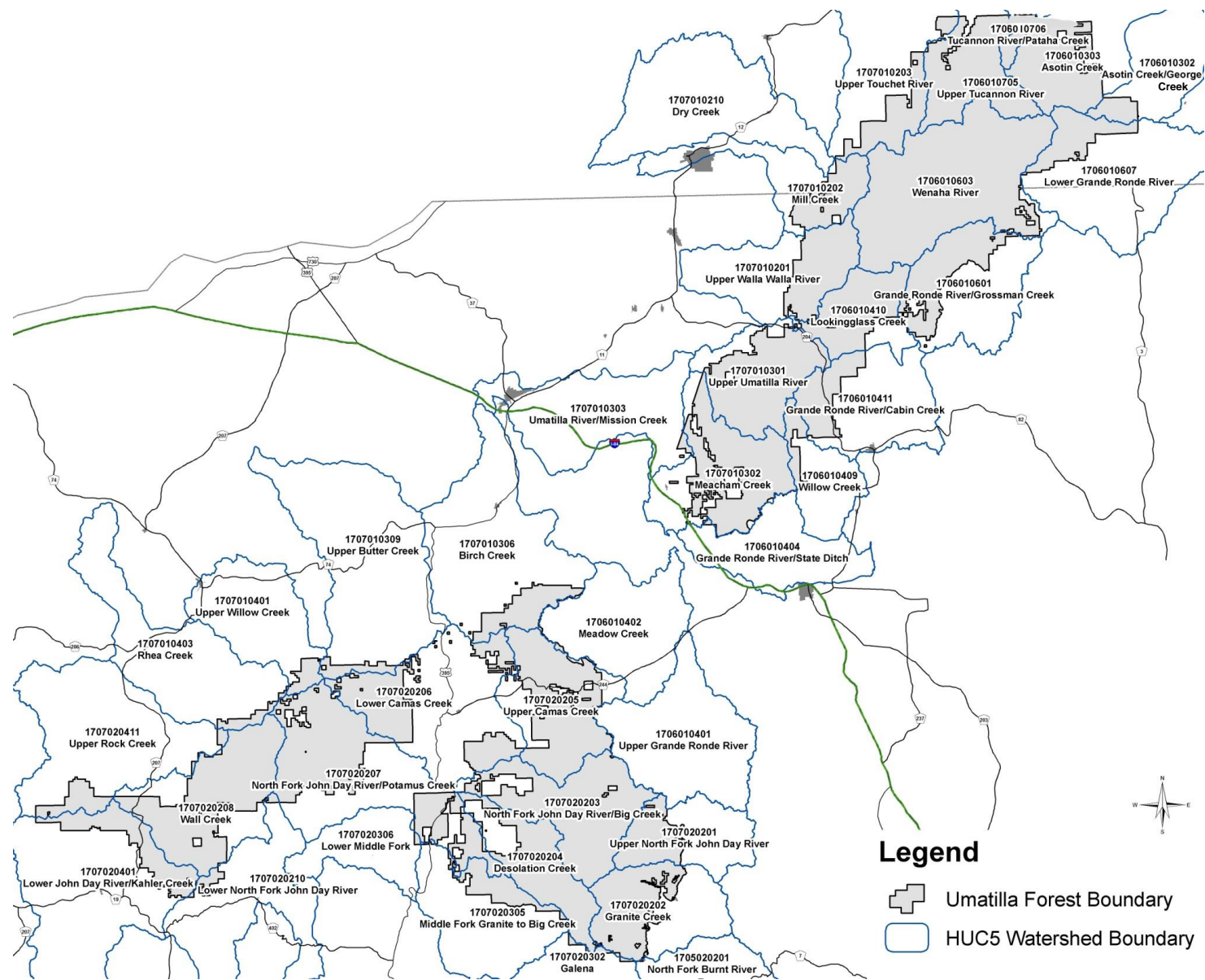
Figure 1 – Location and names of watersheds (HUC5 units) used for upland-forest restoration analyses.

Table 2: Forest density analysis for watersheds of Umatilla National Forest.

HUC5	Dense	Open	Unrated	Total	Forested	Percent Overstocked	Rating
1707020302	172	1204	687	2064	1376	12.5%	Low
1706010409	1571	7325	638	9534	8896	17.7%	Low
1706010411	4373	19730	2688	26791	24103	18.1%	Low
1706010601	8427	31733	6876	47035	40159	21.0%	Low
1706010402	10	31		41	41	24.5%	Low
1706010404	119	288	10	417	407	29.2%	Low
1707020306	200	459		659	659	30.3%	Low
1706010410	14060	31689	2462	48211	45749	30.7%	Low
1707020201	9034	17292	524	26849	26325	34.3%	Medium
1707010301	18068	33603	20589	72261	51671	35.0%	Medium
1707010302	17974	29578	37733	85285	47552	37.8%	Medium
1706010607	7320	12036	6446	25802	19356	37.8%	Medium
1707010403	2137	3294	11	5442	5431	39.3%	Medium
1707010203	11411	17327	2936	31674	28738	39.7%	Medium
1706010603	65671	98912	19176	183759	164583	39.9%	Medium
1707020305	7453	9916	828	18197	17369	42.9%	Medium
1707010202	9545	12395	6468	28408	21940	43.5%	Medium
1707020204	24551	31516	15284	71352	56068	43.8%	Medium
1706010302	3501	4489	697	8687	7990	43.8%	Medium
1707020203	41231	52618	9248	103097	93849	43.9%	Medium
1707010201	16489	20095	5699	42283	36584	45.1%	Medium
1707020210	1074	1106	1831	4011	2180	49.3%	High
1706010303	20544	20330	15062	55935	40874	50.3%	High
1707020205	38235	37722	4356	80313	75957	50.3%	High
1706010705	31273	30198	8000	69471	61471	50.9%	High
1707010303	319	291	93	704	610	52.3%	High
1707010306	11285	9928	564	21777	21213	53.2%	High
1707020206	29646	25269	3239	58154	54915	54.0%	High
1707020401	15198	12264	5700	33162	27462	55.3%	High
1707020207	49740	38624	14382	102746	88364	56.3%	High
1707010401	3940	2686	86	6712	6625	59.5%	High
1706010706	5098	3208	486	8792	8306	61.4%	High
1707020208	50201	29634	16762	96597	79835	62.9%	High
1707010309	4505	2629	164	7298	7134	63.1%	High
1707020202	30693	17161	1194	49048	47854	64.1%	High
1707020411	8899	3470	1529	13898	12369	71.9%	High
Grand Total	563,966	670,051	212,447	1,446,464	1,234,017	45.7%	

Sources/Notes: 'Unrated' includes water, administrative sites, non-vegetated, private lands, non-forested, etc. 'Dense' includes acreage considered to be overstocked when evaluated by using criteria contained in "Methodology for Forest (Tree) Density Analysis" (Powell 2001). 'Open' includes acreage not considered to be overstocked when evaluated by using criteria from Powell (2001).
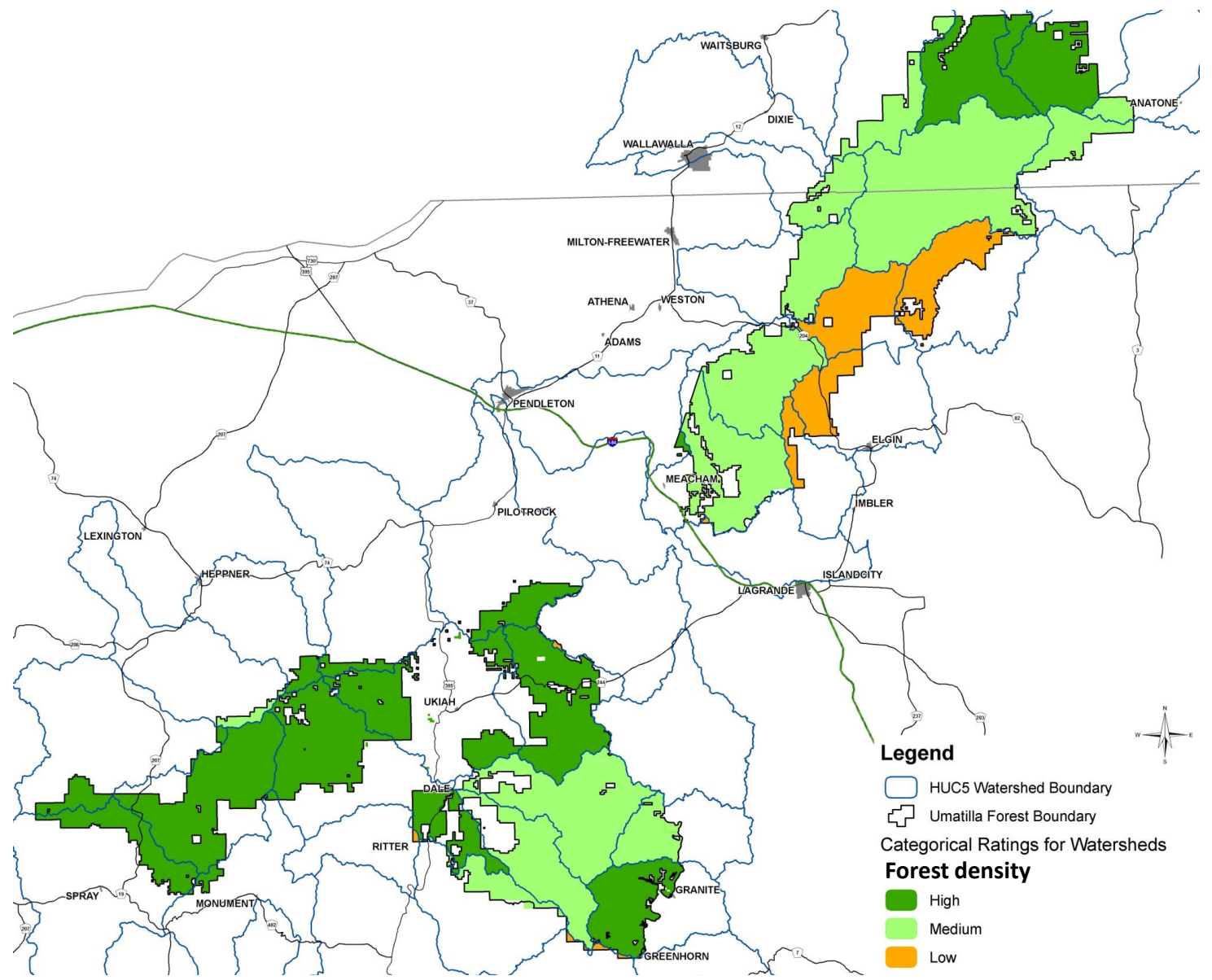
Figure 2 – Results of a forest density analysis (see table 2).

Table 3: Crown fire potential for watersheds of Umatilla National Forest.

HUC5	Crown Fire Potential? No	Yes	Unrated	Total	Rated	Crown Fire Percentage	Rating
1707020306	605		53	659	605	0.0%	Low
1707020210	1818	37	2156	4011	1855	2.0%	Low
1706010607	18689	668	6446	25803	19357	3.5%	Low
1707010202	20390	1493	6525	28408	21883	6.8%	Low
1707020302	1231	145	687	2064	1376	10.5%	Low
1706010601	35089	5057	6888	47035	40147	12.6%	Low
1707020208	66285	9803	20510	96598	76088	12.9%	Low
1706010411	20933	3170	2688	26791	24103	13.2%	Low
1707010403	4708	723	11	5442	5431	13.3%	Low
1707010301	44115	7551	20595	72261	51665	14.6%	Low
1707020401	21574	4125	7464	33162	25699	16.0%	Low
1706010409	7448	1447	638	9534	8896	16.3%	Low
1707020305	13004	2618	2576	18197	15621	16.8%	Low
1707020207	70291	14241	18214	102746	84532	16.8%	Low
1706010603	134843	29661	19254	183758	164504	18.0%	Low
1707010306	16790	3893	1093	21777	20683	18.8%	Low
1706010404	330	77	10	416	406	18.8%	Low
1707010302	38251	9275	37759	85285	47526	19.5%	Low
1707020206	43640	10788	3726	58154	54428	19.8%	Medium
1707010201	29024	7560	5699	42283	36584	20.7%	Medium
1706010410	35459	10271	2481	48211	45730	22.5%	Medium
1707020203	71739	21650	9708	103097	93389	23.2%	Medium
1707010203	21856	6656	3162	31674	28512	23.3%	Medium
1707020205	56915	18319	5079	80313	75234	24.3%	Medium
1706010303	30602	10122	15211	55935	40724	24.9%	Medium
1707020411	9018	3167	1713	13898	12185	26.0%	Medium
1706010706	6004	2284	505	8793	8288	27.6%	Medium
1707010401	4764	1862	86	6712	6625	28.1%	Medium
1707020201	18442	7883	524	26849	26325	29.9%	High
1707010303	425	186	93	704	610	30.4%	High
1706010705	41641	19633	8197	69471	61274	32.0%	High
1707020204	38035	18033	15284	71352	56068	32.2%	High
1707010309	4781	2353	164	7298	7134	33.0%	High
1707020202	30867	16978	1203	49048	47845	35.5%	High
1706010302	4891	2783	1013	8687	7674	36.3%	High
1706010402		41		41	41	100.0%	Low
Grand Total	964,495	254,553	227,417	1,446,465	1,219,048	20.9%	

Sources/Notes: 'Unrated' includes water, administrative sites, non-vegetated, private lands, non-forested, etc. Acreage included in 'Yes' column exceeds a high crown-fire threshold, as described in "Stand Density Thresholds as Related to Crown Fire Risk" (see Powell 2010). Acreage in 'No' column does not exceed a high crown-fire threshold value contained in Powell (2010).
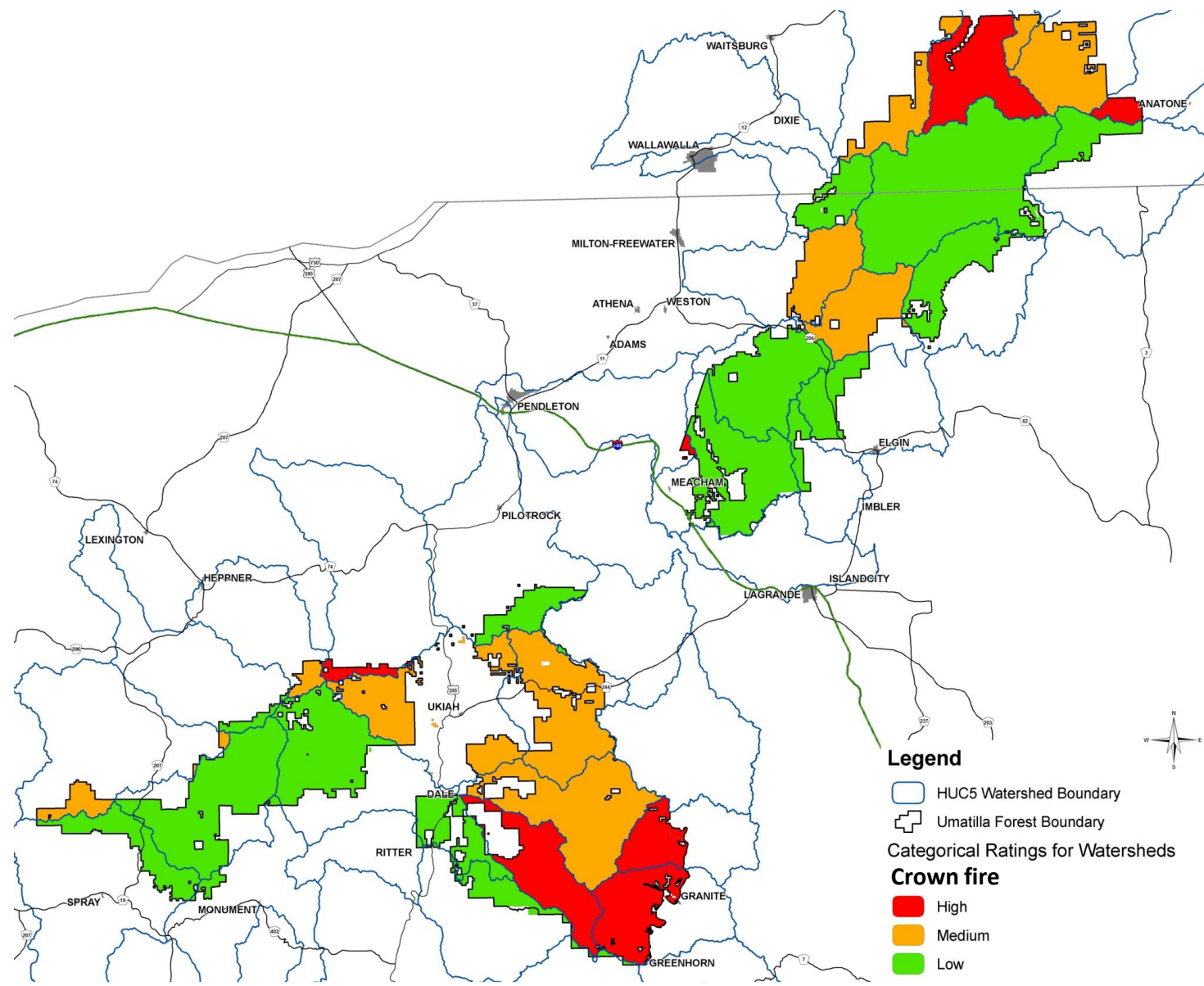
Figure 3 – Results of a crown fire analysis (see table 3).

Table 4: Analysis for high density, low vigor ponderosa pine and lodgepole pine cover types.

HUC5	High Density, Low Vigor	Total Ponderosa pine	High Density, Low Vigor	Total Lodgepole pine
1706010302	223	772	0	53
HIST%	0-10		20-30	
CURR%	29%		0%	
1706010303	3932	8510	303	609
HIST%	0-10		20-30	
CURR%	46%		50%	
1706010402	5	36	0	0
HIST%	0-10		20-30	
CURR%	14%		#DIV/0!	
1706010404	1	88	0	0
HIST%	0-10		20-30	
CURR%	1%		#DIV/0!	
1706010409	186	1356	0	0
HIST%	0-10		20-30	
CURR%	14%		#DIV/0!	
1706010410	299	3022	117	2866
HIST%	0-10		20-30	
CURR%	10%		4%	
1706010411	507	3910	0	165
HIST%	0-10		20-30	
CURR%	13%		0%	
1706010601	909	7981	198	2002
HIST%	0-10		20-30	
CURR%	11%		10%	
1706010603	6170	17908	546	880
HIST%	0-10		20-30	
CURR%	34%		62%	
1706010607	477	1350	0	0
HIST%	0-10		20-30	
CURR%	35%		#DIV/0!	
1706010705	4832	14819	348	956
HIST%	0-10		20-30	
CURR%	33%		36%	
1706010706	887	2117	1051	1075
HIST%	0-10		20-30	
CURR%	42%		98%	
1707010201	990	2659	81	338
HIST%	0-10		20-30	
CURR%	37%		24%	

HUC5	High Density, Low Vigor	Total Ponderosa pine	High Density, Low Vigor	Total Lodgepole pine
1707010202	442	1691	0	0
HIST%	0-10		20-30	
CURR%	26%		#DIV/0!	
1707010203	2177	6048	0	196
HIST%	0-10		20-30	
CURR%	36%		0%	
1707010301	2625	6147	27	497
HIST%	0-10		20-30	
CURR%	43%		5%	
1707010302	4418	11168	73	216
HIST%	0-10		20-30	
CURR%	40%		34%	
1707010303	188	200	0	0
HIST%	0-10		20-30	
CURR%	94%		#DIV/0!	
1707010306	3336	5633	278	795
HIST%	0-10		20-30	
CURR%	59%		35%	
1707010309	1038	2012	339	668
HIST%	0-10		20-30	
CURR%	52%		51%	
1707010401	151	183	252	689
HIST%	0-10		20-30	
CURR%	83%		37%	
1707010403	251	296	72	172
HIST%	0-10		20-30	
CURR%	85%		42%	
1707020201	140	3824	2483	4087
HIST%	10-20		20-40	
CURR%	4%		61%	
1707020202	5056	6713	1629	2505
HIST%	10-20		20-40	
CURR%	75%		65%	
1707020203	6580	14979	2726	8618
HIST%	10-20		20-40	
CURR%	44%		32%	
1707020204	1797	2672	2149	7383
HIST%	10-20		20-40	
CURR%	67%		29%	
1707020205	7674	16532	1151	10767
HIST%	10-20		20-40	
CURR%	46%		11%	

HUC5	High Density, Low Vigor	Total Ponderosa pine	High Density, Low Vigor	Total Lodgepole pine
1707020206	8699	17679	790	4183
HIST%	10-20		20-40	
CURR%	49%		19%	
1707020207	11279	20737	723	1997
HIST%	10-20		20-40	
CURR%	54%		36%	
1707020208	14555	27911	132	199
HIST%	10-20		20-40	
CURR%	52%		66%	
1707020210	332	944	0	0
HIST%	10-20		20-40	
CURR%	35%		#DIV/0!	
1707020305	2085	4080	0	227
HIST%	10-20		20-40	
CURR%	51%		0%	
1707020306	8	8	0	0
HIST%	10-20		20-40	
CURR%	100%		#DIV/0!	
1707020401	6878	14608	0	0
HIST%	10-20		20-40	
CURR%	47%		#DIV/0!	
1707020411	1926	3332	0	55
HIST%	10-20		20-40	
CURR%	58%		0%	
Grand Total	101,053	231,925	15,468	52,198
HIST%	0-20		20-40	
CURR%	44%		30%	

Sources/Notes: Acreage of 'high density, low vigor' includes dense ponderosa pine or lodge-pole pine cover type, respectively, that has a size class of 5" DBH or greater. This analysis was designed to replicate Caraher Report's "ponderosa pine – high density, low vigor" and "lodgepole pine – high density, low vigor" rating factors (Caraher et al. 1992).

Figure 4 – Results of a high-density, low-vigor analysis for ponderosa pine (see table 4).

Figure 5 – Results of a high-density, low-vigor analysis for lodgepole pine (see table 4).

Table 5: Structural stage HRV analysis for watersheds of Umatilla National Forest.

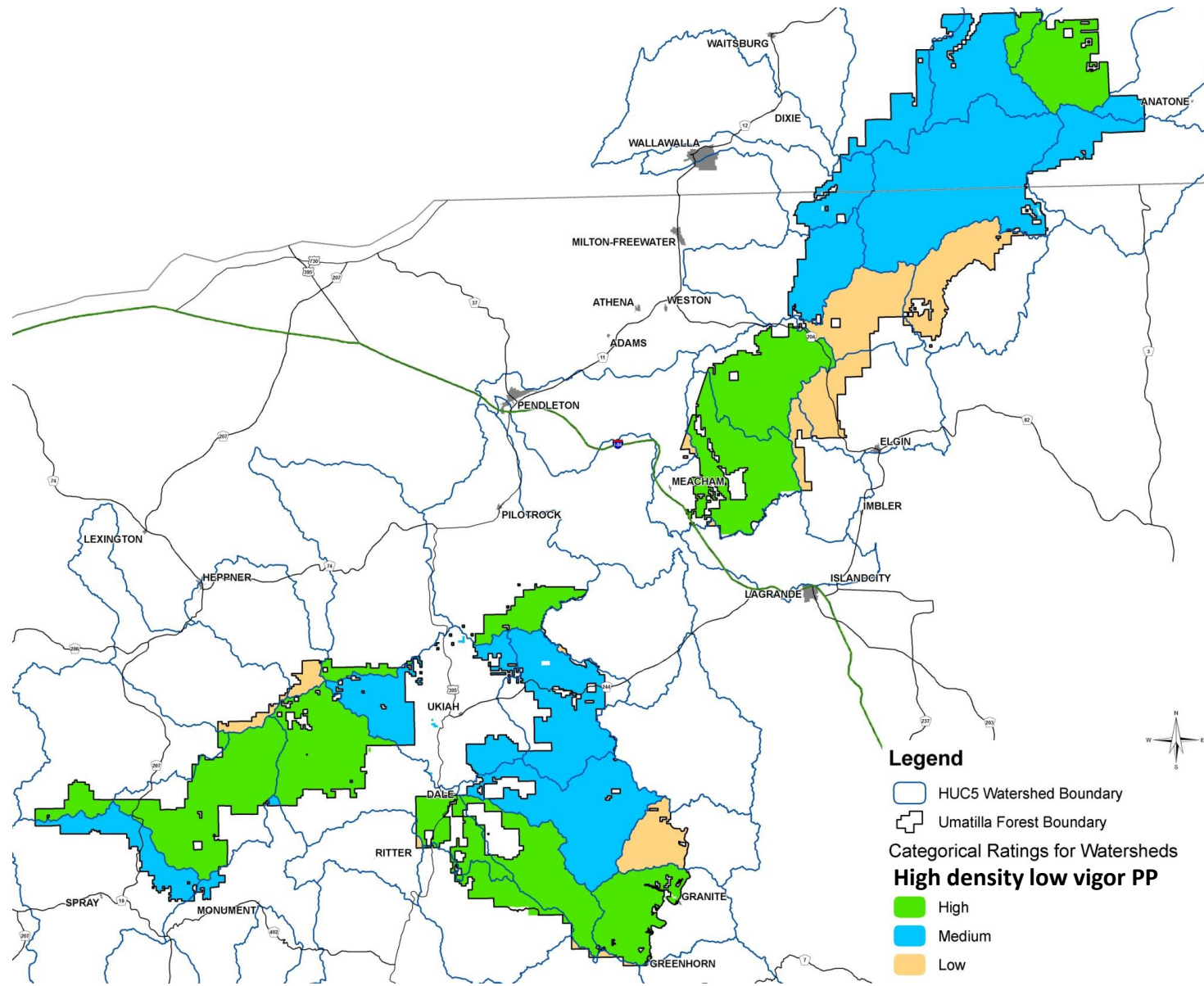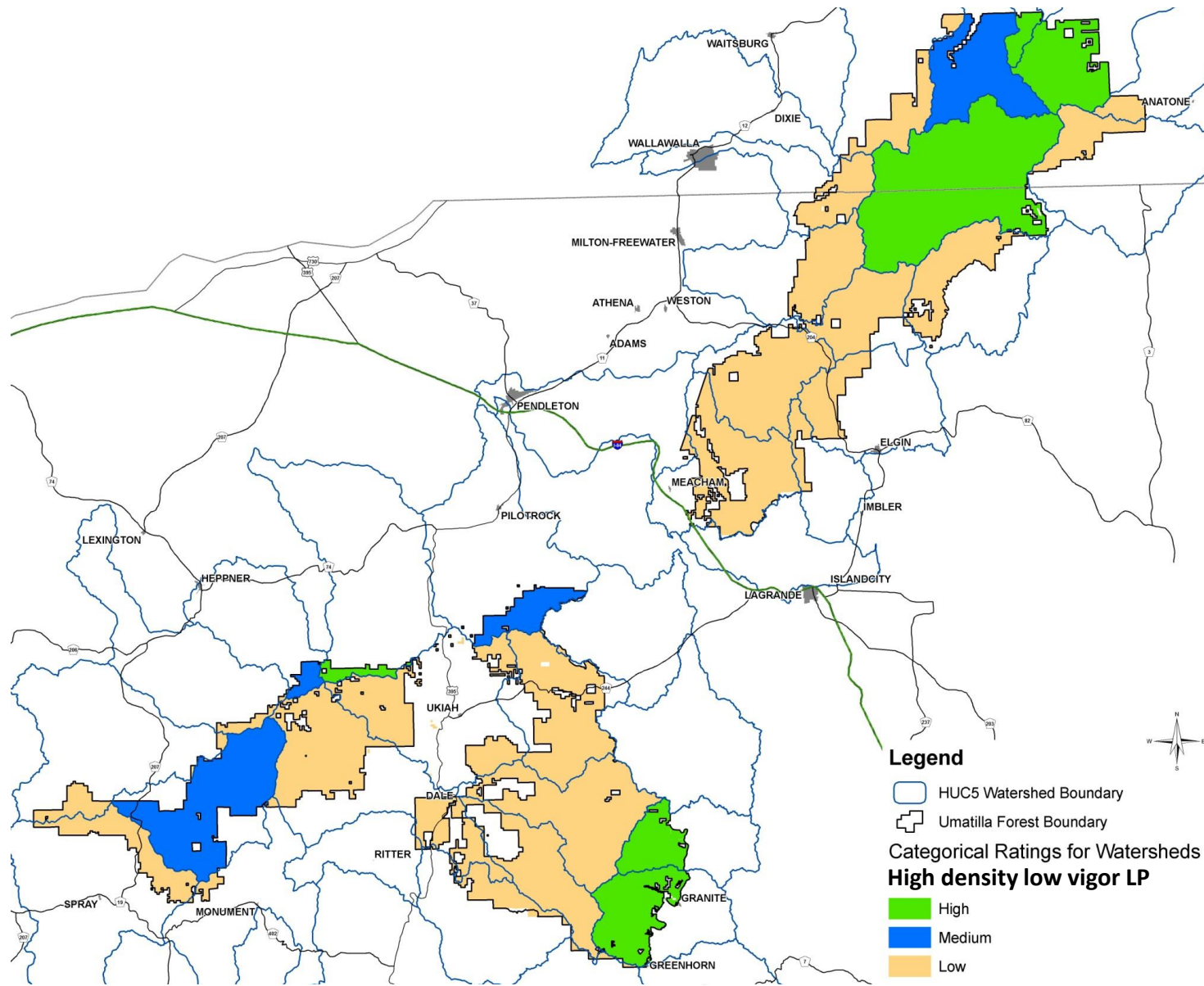|	COLD UPLAND FOREST POTENTIAL VEGETATION GROUP								DRY UPLAND FOREST POTENTIAL VEGETATION GROUP								MOIST UPLAND FOREST POTENTIAL VEGETATION GROUP								Grand Total
HUC5	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS	Total	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS	Total	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS	Total	
1706010302				29				29	56	73	82	310	1047		355	1924	1370	1171	292	1317	1009	13	865	6038	7991
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	0%	0%	0%	100%	0%	0%	0%		3%	4%	4%	16%	54%	0%	18%		23%	19%	5%	22%	17%	0%	14%		
1706010303		138	302	962	328		490	2220	5497	1588	4117	1915	3712	2762	2247	21838	2253	1225	1093	3576	4240	1056	3373	16815	40874
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	0%	6%	14%	43%	15%	0%	22%		25%	7%	19%	9%	17%	13%	10%		13%	7%	6%	21%	25%	6%	20%		
1706010402							5	5	5							5					31			31	41
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	0%	0%	0%	0%	0%	0%	100%		100%	0%	0%	0%	0%	0%	0%		0%	0%	0%	0%	100%	0%	0%		
1706010404				4				4	41			48	41	63	33	226					56	43		77	176	406
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	0%	0%	0%	100%	0%	0%	0%		18%	0%	0%	21%	18%	28%	15%		0%	0%	0%	32%	24%	0%	44%		
1706010409	34	12		73				119	387	91	270	1262	348		27	2384	603	1008	197	3673	399		511	6392	8895
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	29%	10%	0%	61%	0%	0%	0%		16%	4%	11%	53%	15%	0%	1%		9%	16%	3%	57%	6%	0%	8%		
1706010410	750	464	70	924	56		1096	3360	484	95	614	1368	461	4	170	3197	2811	5621	2522	15642	7332	528	4736	39192	45748
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	22%	14%	2%	28%	2%	0%	33%		15%	3%	19%	43%	14%	0%	5%		7%	14%	6%	40%	19%	1%	12%		
1706010411		433	10	288	89		46	865	570	51	1540	3152	1566	59	688	7626	94	3124	816	8659	1799	20	1100	15612	24104
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	0%	50%	1%	33%	10%	0%	5%		7%	1%	20%	41%	21%	1%	9%		1%	20%	5%	55%	12%	0%	7%		
1706010601	139	21	76	96	15		349	695	1671	1232	2257	1414	3524	296	447	10841	626	4860	990	15162	3554	121	3310	28622	40158
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	20%	3%	11%	14%	2%	0%	50%		15%	11%	21%	13%	33%	3%	4%		2%	17%	3%	53%	12%	0%	12%		
1706010603	2081	1581	158	2691	162	736	8706	16115	19160	2722	4713	28451	9529	2815	5078	72468	13137	10187	3597	19733	2451	519	26376	76000	164583
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	13%	10%	1%	17%	1%	5%	54%		26%	4%	7%	39%	13%	4%	7%		17%	13%	5%	26%	3%	1%	35%		
1706010607		393					431	824	6978	1159	1125	2400	1874	139	1473	15148	132	1999		220	266	55	713	3384	19356
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	0%	48%	0%	0%	0%	0%	52%		46%	8%	7%	16%	12%	1%	10%		4%	59%	0%	7%	8%	2%	21%		
1706010705	120		85	1022	598	21	740	2586	5973	2671	2635	6817	4874	1075	2019	26064	4767	7724	2273	6382	2290	385	9002	32823	61473
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	5%	0%	3%	40%	23%	1%	29%		23%	10%	10%	26%	19%	4%	8%		15%	24%	7%	19%	7%	1%	27%		

| | COLD UPLAND FOREST POTENTIAL VEGETATION GROUP | | | | | | | | DRY UPLAND FOREST POTENTIAL VEGETATION GROUP | | | | | | | | MOIST UPLAND FOREST POTENTIAL VEGETATION GROUP | | | | | | | | Grand |
HUC5	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS	Total	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS	Total	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS	Total	Total
1706010706					25			25	571	14	752	1225	734	161	792	4249	136	302	1065	480	1049	21	978	4032	8306
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	0%	0%	0%	0%	100%	0%	0%		13%	0%	18%	29%	17%	4%	19%		3%	7%	26%	12%	26%	1%	24%		
1707010201	52	2118	15	431	39	42	426	3122	8407	797	771	2802	2621	39	676	16114	1454	2336	260	5676	966	1013	5643	17348	36584
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	2%	68%	0%	14%	1%	1%	14%		52%	5%	5%	17%	16%	0%	4%		8%	13%	1%	33%	6%	6%	33%		
1707010202		94	94	258	28		389	863	2134	631	575	1770	1572	60	377	7119	1190	5899	282	3869	342	141	2235	13958	21940
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	0%	11%	11%	30%	3%	0%	45%		30%	9%	8%	25%	22%	1%	5%		9%	42%	2%	28%	2%	1%	16%		
1707010203	52	61	5	8	31	6	114	277	1512	805	1236	3275	823	215	886	8752	2152	5358	1575	4865	1772	86	3901	19709	28738
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	19%	22%	2%	3%	11%	2%	41%		17%	9%	14%	37%	9%	2%	10%		11%	27%	8%	25%	9%	0%	20%		
1707010301	190	149		176	61		223	799	4206	293	3070	3139	1800	1788	1060	15356	4219	4669	1881	15885	2330	196	6336	35517	51673
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	24%	19%	0%	22%	8%	0%	28%		27%	2%	20%	20%	12%	12%	7%		12%	13%	5%	45%	7%	1%	18%		
1707010302		33		892			91	1015	4728	741	7237	6678	2226	1482	2040	25132	287	3474	1007	10954	926	433	4323	21404	47552
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	0%	3%	0%	88%	0%	0%	9%		19%	3%	29%	27%	9%	6%	8%		1%	16%	5%	51%	4%	2%	20%		
1707010303									319			10	2			331		125		154				279	610
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%									96%	0%	0%	3%	1%	0%	0%		0%	45%	0%	55%	0%	0%	0%		
1707010306	586	106			267		173	1133	8097	829	325	1175	1147	32	280	11885	1390	1650	66	352	2294		2442	8194	21213
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	52%	9%	0%	0%	24%	0%	15%		68%	7%	3%	10%	10%	0%	2%		17%	20%	1%	4%	28%	0%	30%		
1707010309	41	150		218	481	113	1272	2275	1511		111	675	744		110	3151	23	410	49	360	26		840	1709	7135
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	2%	7%	0%	10%	21%	5%	56%		48%	0%	4%	21%	24%	0%	3%		1%	24%	3%	21%	2%	0%	49%		
1707010401	109	143	59	61	16		210	598	1300	77	135	47	31	81	215	1885	1054	884	324	640	133		1107	4142	6625
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	18%	24%	10%	10%	3%	0%	35%		69%	4%	7%	3%	2%	4%	11%		25%	21%	8%	15%	3%	0%	27%		
1707010403	158	268	15	149	8		192	791	494	64	257	184	9	34	25	1068	676	266	207	797	9	24	1592	3571	5431
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	20%	34%	2%	19%	1%	0%	24%		46%	6%	24%	17%	1%	3%	2%		19%	7%	6%	22%	0%	1%	45%		
1707020201	299		129	4083	751	197	5572	11031	1830	34	251	5445	1855	147	108	9670	375		113	3882	634		621	5624	26326
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	3%	0%	1%	37%	7%	2%	51%		19%	0%	3%	56%	19%	2%	1%		7%	0%	2%	69%	11%	0%	11%		

	COLD UPLAND FOREST POTENTIAL VEGETATION GROUP								DRY UPLAND FOREST POTENTIAL VEGETATION GROUP								MOIST UPLAND FOREST POTENTIAL VEGETATION GROUP								Grand Total
HUC5	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS	Total	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS	Total	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS	Total	
1707020202	4574	651	400	3683	1681	16	5802	16806	6761	4	2494	995	556	1156	589	12555	6794	296	1040	3822	914	137	5492	18494	47856
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	27%	4%	2%	22%	10%	0%	35%		54%	0%	20%	8%	4%	9%	5%		37%	2%	6%	21%	5%	1%	30%		
1707020203	1710	771	1172	5771	7268	170	6227	23090	14267	1444	8164	9987	6485	1423	1062	42832	2884	1010	263	9783	5356	112	8519	27927	93849
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	7%	3%	5%	25%	31%	1%	27%		33%	3%	19%	23%	15%	3%	2%		10%	4%	1%	35%	19%	0%	31%		
1707020204	1278	717	501	9154	7592	57	4887	24186	4532	84	3002	2408	657	350	541	11573	553	194	1179	6397	3454	288	8242	20308	56067
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	5%	3%	2%	38%	31%	0%	20%		39%	1%	26%	21%	6%	3%	5%		3%	1%	6%	32%	17%	1%	41%		
1707020205	1539	476	57	1178	5523		1910	10682	17788	884	2129	5577	5357	621	4743	37099	5511	1322	117	3220	10786		7220	28177	75958
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	14%	4%	1%	11%	52%	0%	18%		48%	2%	6%	15%	14%	2%	13%		20%	5%	0%	11%	38%	0%	26%		
1707020206	460	123	820	401	1640	256	2161	5861	14349	275	2856	12458	4942	1877	3503	40259	1949	276	181	2815	970	13	2590	8794	54914
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	8%	2%	14%	7%	28%	4%	37%		36%	1%	7%	31%	12%	5%	9%		22%	3%	2%	32%	11%	0%	29%		
1707020207	1631	2983	246	1135	1157	9	2712	9873	26272	3701	7829	16955	7256	1926	5567	69505	712	792	355	2819	1651		2657	8986	88364
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	17%	30%	2%	11%	12%	0%	27%		38%	5%	11%	24%	10%	3%	8%		8%	9%	4%	31%	18%	0%	30%		
1707020208	565	677	37	184	351		1721	3534	22858	4674	17466	11666	3345	2599	4786	67394	1047	1854	146	2635	360	48	2819	8908	79836
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	16%	19%	1%	5%	10%	0%	49%		34%	7%	26%	17%	5%	4%	7%		12%	21%	2%	30%	4%	1%	32%		
1707020210									600	621	501	185	100	46	30	2082		12		86				98	2180
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%									29%	30%	24%	9%	5%	2%	1%		0%	12%	0%	88%	0%	0%	0%		
1707020302			14	282	222	29	768	1316									10	5		21			25	61	1376
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	0%	0%	1%	21%	17%	2%	58%										16%	8%	0%	34%	0%	0%	41%		
1707020305	24	94	38	506	154		752	1568	3379	124	1142	6177	843	735	851	13251	335	89	166	1106	331		523	2549	17369
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	2%	6%	2%	32%	10%	0%	48%		26%	1%	9%	47%	6%	6%	6%		13%	3%	6%	43%	13%	0%	21%		
1707020306									200			441	18			659									659
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%									30%	0%	0%	67%	3%	0%	0%										
1707020401									4742	1776	7903	4061	5713	1144	800	26138	73	306	121	503	115		206	1324	27462
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%									18%	7%	30%	16%	22%	4%	3%		6%	23%	9%	38%	9%	0%	16%		

HUC5	COLD UPLAND FOREST POTENTIAL VEGETATION GROUP								DRY UPLAND FOREST POTENTIAL VEGETATION GROUP								MOIST UPLAND FOREST POTENTIAL VEGETATION GROUP								Grand Total
	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS	Total	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS	Total	OFMS	OFSS	SECC	SEOC	SI	UR	YFMS	Total	
1707020411									3356	702	3007	1270	1308	1020	132	10795	331	235	316	331	110	6	245	1574	12369
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%									31%	7%	28%	12%	12%	9%	1%		21%	15%	20%	21%	7%	0%	16%		
Grand Total	16392	12657	4304	34658	28542	1650	47467	145670	195035	28255	88565	145742	77120	24150	41709	600576	58949	68683	22495	155872	57941	5214	118620	487775	1234020
HIST%	10-40	0-5	5-20	0-5	1-20	5-25	10-40		5-20	15-55	1-10	5-20	5-15	1-10	5-25		10-30	0-5	5-25	0-5	1-10	5-25	40-60		
CURR%	11%	9%	3%	24%	20%	1%	33%		32%	5%	15%	24%	13%	4%	7%		12%	14%	5%	32%	12%	1%	24%		

Sources/Notes: Historical ranges are derived from Hall (1993), Johnson (1993), and USDA Forest Service (1995), as summarized in Blackwood (1998). Cold upland forest used 'Cold Dry UF' ranges; dry upland forest used 'Warm Dry UF' ranges; moist upland forest used 'Cool Moist UF' ranges (see Blackwood 1998). This historical range of variability analysis does not include non-forest or woodland potential vegetation groups.

Note: OFSS and OFMS stages under Dry Upland Forest are used for a "Restore OFSS" factor described earlier in this white paper (see fifth factor in Methods section). When current % of OFMS is above HRV, the Restore OFSS rating is high; when OFMS is within the range but at its upper end, the Restore OFSS rating is moderate; when OFSS is within the range, or the amount of OFMS is insufficient to convert to OFSS, then the Restore OFSS rating is low.
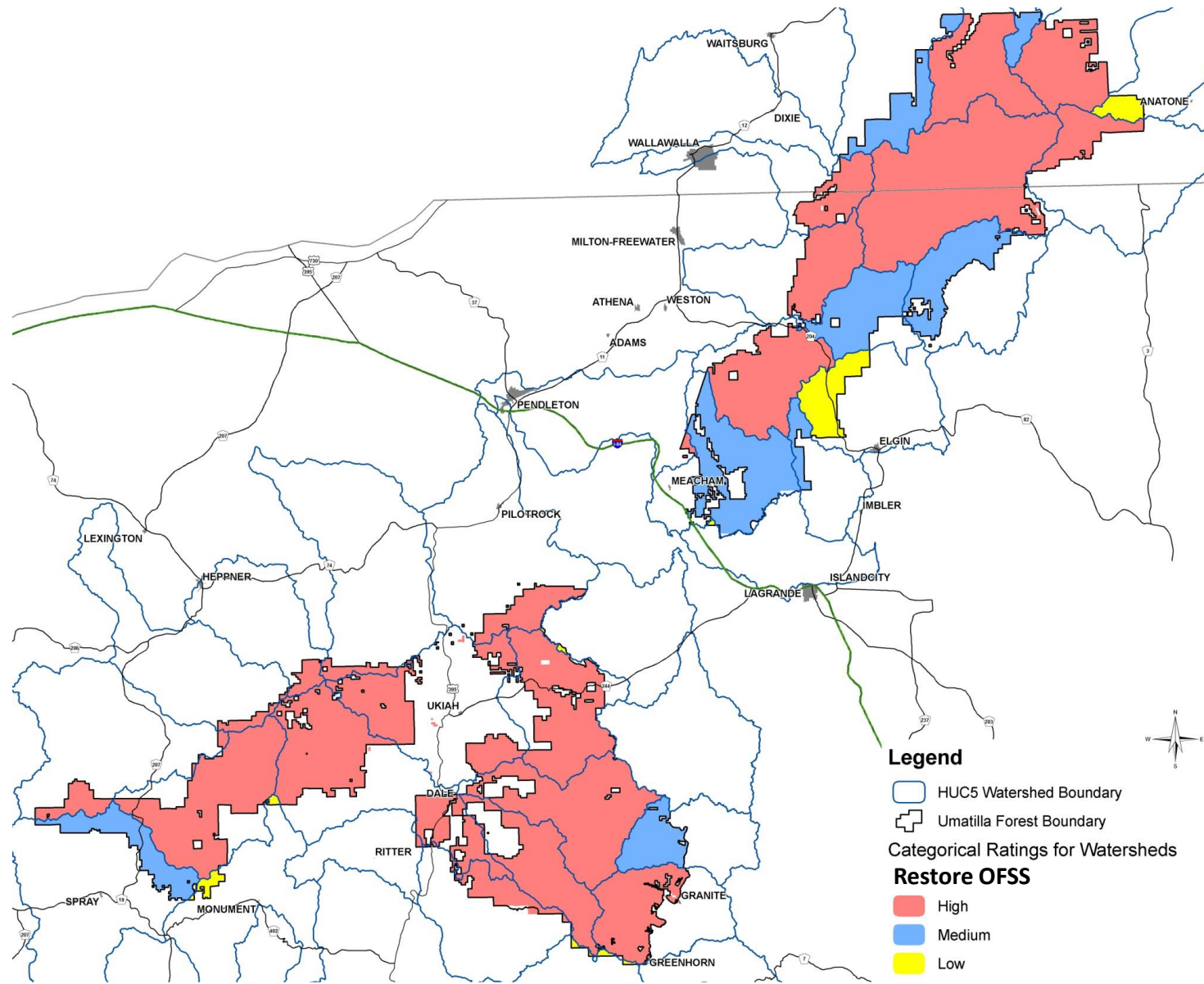
Figure 6 – Results of a 'restore old forest single stratum (OFSS) structural stage' analysis (see table 5).

Table 6: HRV analysis for species composition for Dry Upland Forest PVG.

HUC5	Nonforest	ABGR	JUOC	PIPO	PSME	Total
1706010302	316	415		496	697	1924
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	16%	22%	0%	26%	36%	
1706010303	50	3901	30	5964	11892	21838
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	18%	0%	27%	54%	
1706010402				5		5
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	0%	0%	100%	0%	
1706010404		117		43	66	227
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	52%	0%	19%	29%	
1706010409		649		949	786	2384
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	27%	0%	40%	33%	
1706010410		1001		958	1238	3198
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	31%	0%	30%	39%	
1706010411		2377		1868	3380	7625
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	31%	0%	24%	44%	
1706010601		1488		3725	5629	10842
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	14%	0%	34%	52%	
1706010603	79	30927		16350	25113	72468
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	43%	0%	23%	35%	
1706010607		4781		1268	9099	15148
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	32%	0%	8%	60%	
1706010705	40	2086	36	12163	11737	26063
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	8%	0%	47%	45%	
1706010706		1050		1438	1761	4249
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	25%	0%	34%	41%	
1707010201		6586		2659	6869	16114
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	41%	0%	17%	43%	

HUC5	Nonforest	ABGR	JUOC	PIPO	PSME	Total
1707010202	57	2292		1571	3199	7119
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	1%	32%	0%	22%	45%	
1707010203	77	1389		3320	3967	8753
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	1%	16%	0%	38%	45%	
1707010301	3	2797		4020	8536	15356
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	18%	0%	26%	56%	
1707010302	3	3646		9687	11796	25132
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	15%	0%	39%	47%	
1707010303				200	131	331
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	0%	0%	60%	40%	
1707010306		1601	530	5518	4237	11885
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	13%	4%	46%	36%	
1707010309		194		1841	1115	3150
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	6%	0%	58%	35%	
1707010401		615		150	1120	1885
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	33%	0%	8%	59%	
1707010403		57		257	754	1068
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	5%	0%	24%	71%	
1707020201		1763		3675	4233	9670
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	18%	0%	38%	44%	
1707020202		1237	9	6146	5162	12555
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	10%	0%	49%	41%	
1707020203		7803	460	13583	20986	42832
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	18%	1%	32%	49%	
1707020204		2621		2672	6281	11573
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	23%	0%	23%	54%	
1707020205		5698	723	14065	16612	37098

HUC5	Nonforest	ABGR	JUOC	PIPO	PSME	Total
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	15%	2%	38%	45%	
1707020206		7877	487	17221	14675	40260
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	20%	1%	43%	36%	
1707020207		11961	3832	20289	33423	69506
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	17%	6%	29%	48%	
1707020208		7058	3747	26972	29615	67393
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	10%	6%	40%	44%	
1707020210			326	929	827	2082
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	0%	16%	45%	40%	
1707020305		1306	1748	3869	6328	13251
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	10%	13%	29%	48%	
1707020306		53	53	8	545	659
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	8%	8%	1%	83%	
1707020401	715	1532	1042	14296	8553	26138
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	3%	6%	4%	55%	33%	
1707020411		2837	185	3208	4565	10795
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	26%	2%	30%	42%	
Grand Total	1,340	119,716	13,208	201,384	264,927	600,576
HIST%	0-5	1-5	1-5	70-90	5-15	
CURR%	0%	20%	2%	34%	44%	

Sources/Notes: Historic ranges (HIST%) are adapted from "Historical range of variability for the Idaho southern batholith ecosystem" (Morgan and Parsons 2001). 'PIPO' column is used to derive "Restore PIPO on Dry UF" ratings (current % close to HRV range has low rating; current % far away from HRV range has high rating). 'JUOC' column is used to derive "JUOC on Dry UF" ratings (current % of 0 or within the HRV range has low rating; current % above the HRV range has medium or high rating).
ABGR = grand fir.
JUOC = western juniper.
PIPO = ponderosa pine.
PSME = Douglas-fir.

Figure 7 – Results of a western juniper invasion analysis (see table 6).
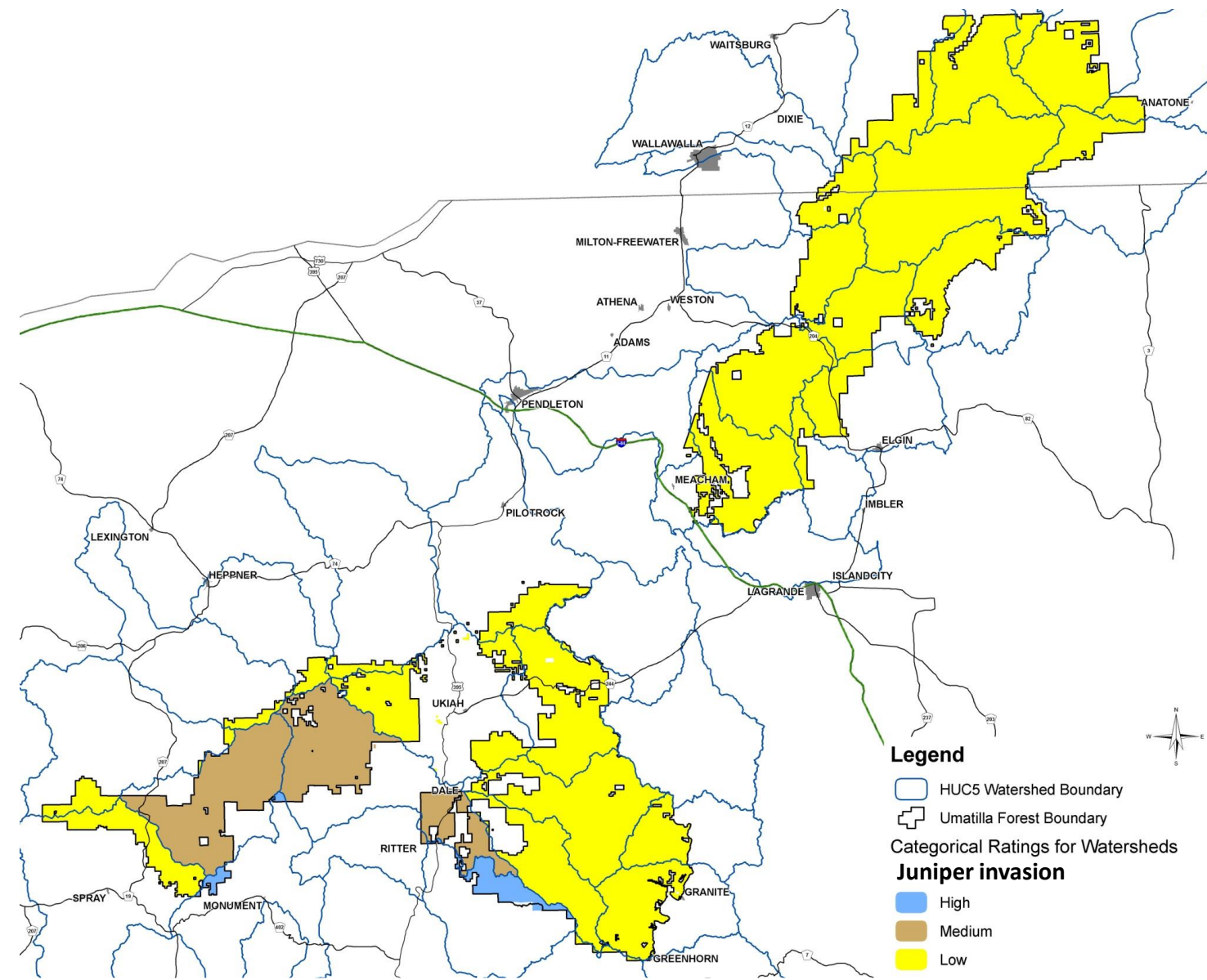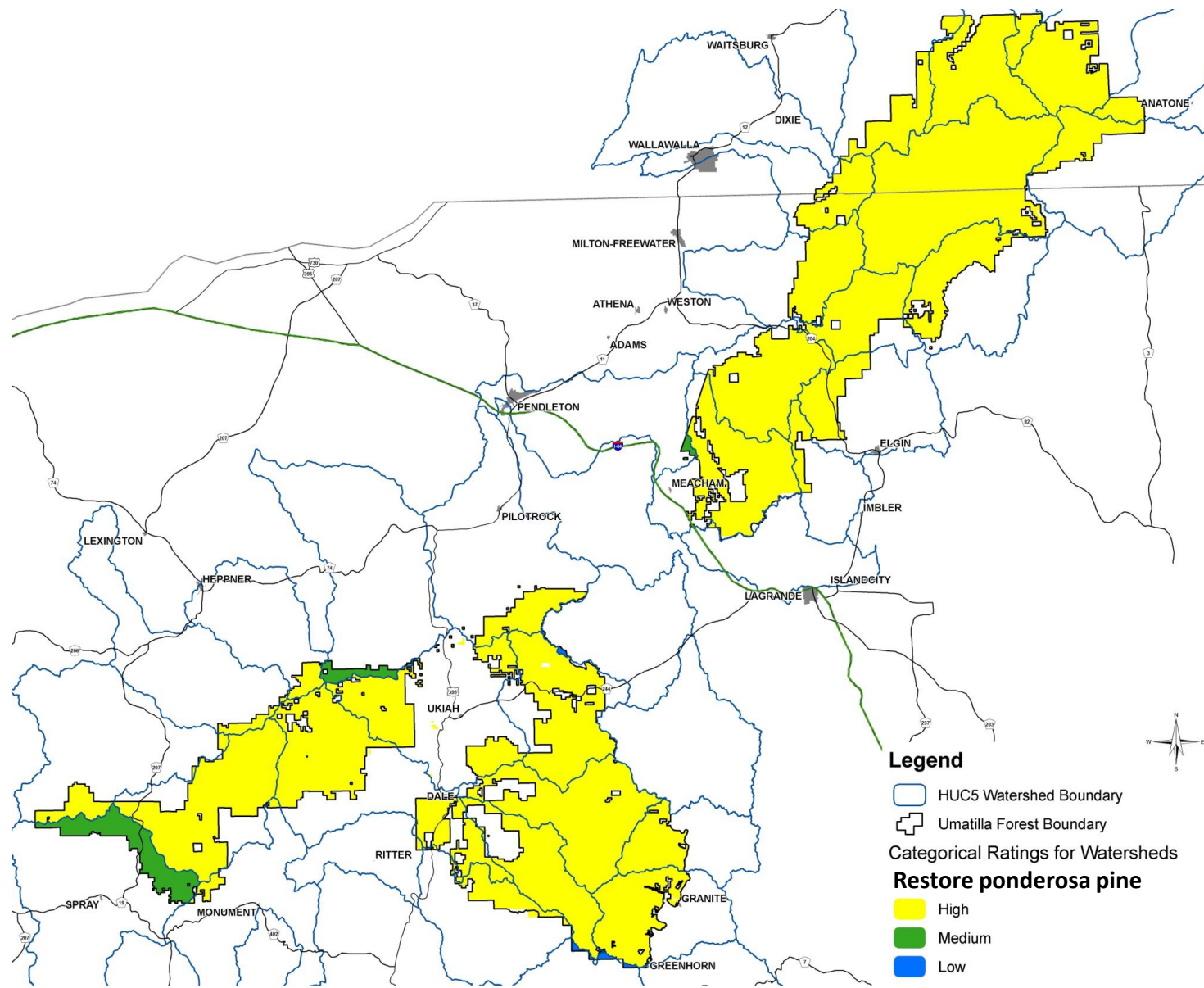
Figure 8 – Results of a ponderosa pine cover type analysis (see table 6).

Table 7: Numerical ratings for upland-forest restoration factors for watersheds of Umatilla NF.

HUC5	Forest Density	Crown Fire	High Density, Low Vigor PIPO	PICO	Restore OFSS	JUOC on Dry UF	Restore PIPO on Dry UF	Composite Score
1706010402	1	1	1	1	1	1	1	7
1707020302	1	1	1	1	1	1	1	7
1706010404	1	1	1	1	1	1	3	9
1706010411	1	1	1	1	1	1	3	9
1706010409	1	1	1	1	2	1	3	10
1706010601	1	1	1	1	2	1	3	10
1706010410	1	2	1	1	2	1	3	11
1707010403	2	1	1	1	3	1	3	12
1707020306	1	1	1	1	3	2	3	12
1707020401	3	1	2	1	2	1	2	12
1706010302	2	3	2	1	1	1	3	13
1706010607	2	1	2	1	3	1	3	13
1707010202	2	1	2	1	3	1	3	13
1707010203	2	2	2	1	2	1	3	13
1707010302	2	1	3	1	2	1	3	13
1707010201	2	2	2	1	3	1	3	14
1707010301	2	1	3	1	3	1	3	14
1707010303	3	3	1	1	3	1	2	14
1707020203	2	2	2	1	3	1	3	14
1707020210	3	1	2	1	1	3	3	14
1706010603	2	1	2	3	3	1	3	15
1707010401	3	2	1	2	3	1	3	15
1707020201	2	3	1	3	2	1	3	15
1707020205	3	2	2	1	3	1	3	15
1707020206	3	2	2	1	3	1	3	15
1707010306	3	1	3	2	3	1	3	16
1707020204	2	3	3	1	3	1	3	16
1707020207	3	1	3	1	3	2	3	16
1707020305	2	1	3	1	3	3	3	16
1707020411	3	2	3	1	3	1	3	16
1706010705	3	3	2	2	3	1	3	17
1706010706	3	2	3	3	2	1	3	17
1707020208	3	1	3	2	3	2	3	17
1706010303	3	2	3	3	3	1	3	18
1707010309	3	3	3	3	3	1	2	18
1707020202	3	3	3	3	3	1	3	19

Sources/Notes: Tables 1-5 describe each factor and how it was determined and scored.

Table 8: Categorical ratings for upland-forest restoration factors for watersheds of Umatilla NF.

HUC5	Forest Density	Crown Fire	High Density, Low Vigor PIPO	PICO	Restore OFSS	JUOC on Dry UF	Restore PIPO on Dry UF	Composite Rating
1706010302	Medium	High	Medium	Low	Low	Low	High	Medium
1706010303	High	Medium	High	High	High	Low	High	High
1706010402	Low	Low	Low	Low	Low	Low	Low	Low
1706010404	Low	Low	Low	Low	Low	Low	High	Low
1706010409	Low	Low	Low	Low	Medium	Low	High	Low
1706010410	Low	Medium	Low	Low	Medium	Low	High	Low
1706010411	Low	Low	Low	Low	Low	Low	High	Low
1706010601	Low	Low	Low	Low	Medium	Low	High	Low
1706010603	Medium	Low	Medium	High	High	Low	High	Medium
1706010607	Medium	Low	Medium	Low	High	Low	High	Medium
1706010705	High	High	Medium	Medium	High	Low	High	High
1706010706	High	Medium	High	High	Medium	Low	High	High
1707010201	Medium	Medium	Medium	Low	High	Low	High	Medium
1707010202	Medium	Low	Medium	Low	High	Low	High	Medium
1707010203	Medium	Medium	Medium	Low	Medium	Low	High	Medium
1707010301	Medium	Low	High	Low	High	Low	High	Medium
1707010302	Medium	Low	High	Low	Medium	Low	High	Medium
1707010303	High	High	Low	Low	High	Low	Medium	Medium
1707010306	High	Low	High	Medium	High	Low	High	High
1707010309	High	High	High	High	High	Low	Medium	High
1707010401	High	Medium	Low	Medium	High	Low	High	Medium
1707010403	Medium	Low	Low	Low	High	Low	High	Medium
1707020201	Medium	High	Low	High	Medium	Low	High	Medium
1707020202	High	High	High	High	High	Low	High	High
1707020203	Medium	Medium	Medium	Low	High	Low	High	Medium
1707020204	Medium	High	High	Low	High	Low	High	High
1707020205	High	Medium	Medium	Low	High	Low	High	Medium
1707020206	High	Medium	Medium	Low	High	Low	High	Medium
1707020207	High	Low	High	Low	High	Medium	High	High
1707020208	High	Low	High	Medium	High	Medium	High	High
1707020210	High	Low	Medium	Low	Low	High	High	Medium
1707020302	Low	Low	Low	Low	Low	Low	Low	Low
1707020305	Medium	Low	High	Low	High	High	High	High
1707020306	Low	Low	Low	Low	High	Medium	High	Medium
1707020401	High	Low	Medium	Low	Medium	Low	Medium	Medium
1707020411	High	Medium	High	Low	High	Low	High	High

Sources/Notes: Tables 1-5 describe each factor and how it was determined and scored.
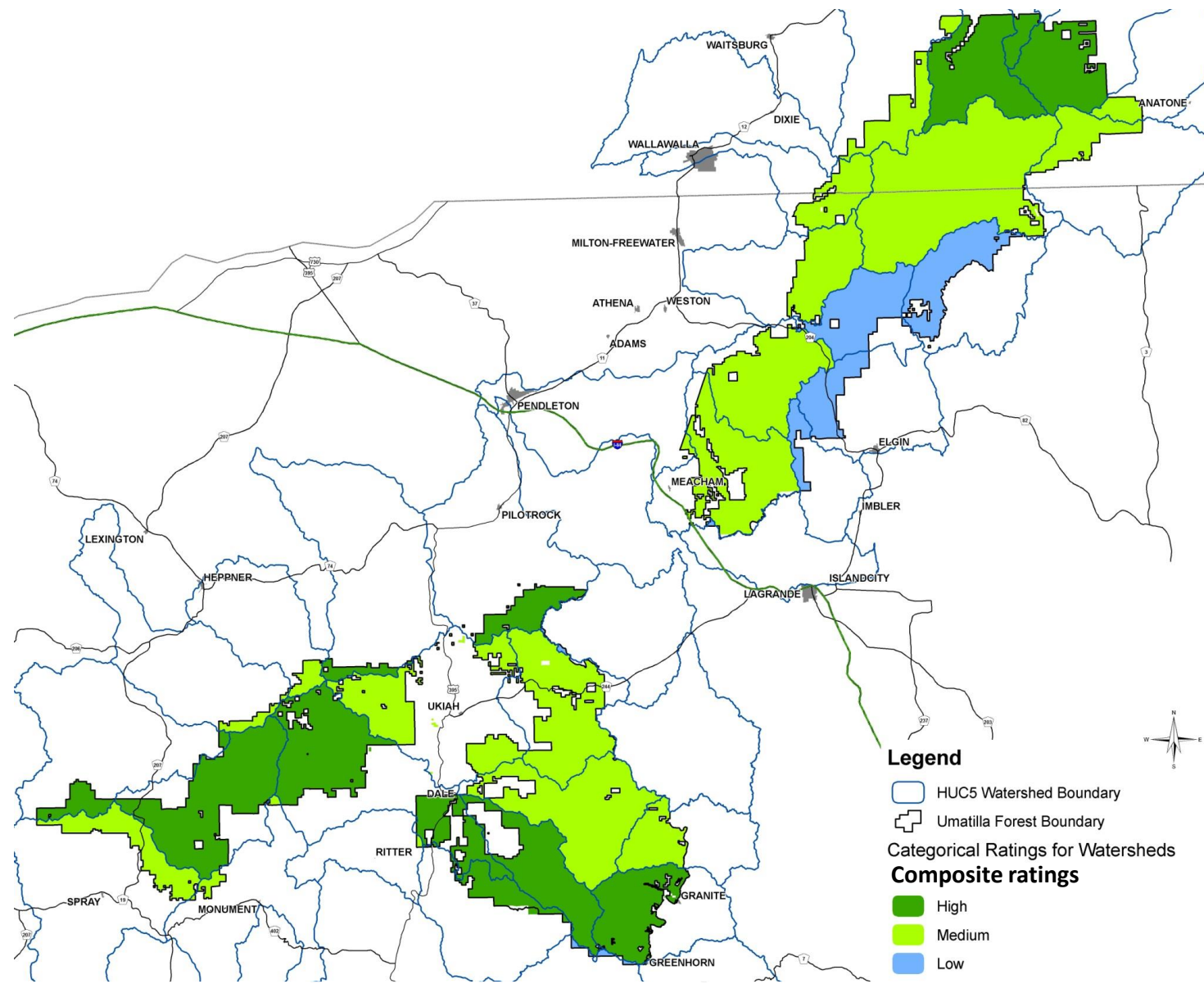
Figure 9 – Composite ratings for upland-forest restoration factors (see tables 7-8).

ACTIVE RESTORATION TREATMENTS

A wide variety of active restoration treatments can be deployed in response to analysis results reported in this white paper. Issues related to analysis results, and upland forest restoration treatments responsive to the issues, are provided in this section.

With possible exception of stewardship timber harvest, none of the restoration treatments require road access (see appendix 1) for their implementation. However, access limitations have a definite impact on economic viability because road and trail closures can necessitate long "walk ins" by project crews carrying heavy equipment (chain saws, planting augers, etc.).

Generally, access restrictions result in higher bid rates on silvicultural contracts, which in turn increases unit costs (dollar cost per unit of work), or restrictions can decrease the amount of treatment acreage to be accomplished for any particular funding amount.

1. *Many watersheds have tree density levels that threaten future sustainability of upland forests*. This issue is reflected by results for four analysis factors: percent of overstocked area; crown fire potential; percent of high density, low vigor ponderosa pine; and percent of high density, low vigor lodgepole pine.

   Upland forest restoration treatments that are responsive to this issue include:
   - **Thinning** to reduce stocking levels and thereby restore sustainable forest density;
   - **Pruning** (in conjunction with thinning) on sites with high crown fire potential (pruning could address potential for crown-fire initiation, particularly as related to ladder fuels);
   - **Stewardship harvest** on sites where tree removals have potential product value (commercial thinnings, for example).

2. *Many watersheds have dry forest sites with conditions that are inconsistent with ecosystem integrity and resilience* (e.g., sustainability). This issue is reflected by results for three analysis factors: opportunity to restore the 'old forest single stratum' structural stage; percent of western juniper invasion; and percent of ponderosa pine cover type.

   Upland forest restoration treatments that are responsive to this issue include:
   - **Understory thinning** to convert 'old forest multi strata' structural stage back to an 'old forest single stratum' stage that existed historically;

- **Improvement cutting** in late-seral stands where ponderosa pine still exists (these sites are successionally advanced and dominated by late-seral species such as grand fir and Douglas-fir);
- **Forest regeneration cutting** on dry-forest sites where ponderosa pine no longer exists (these sites are successionally advanced and no longer contain an ecologically viable representation of the historically dominant early-seral species – ponderosa pine);
- **Prescribed fire** on dry-forest sites where existing composition and structure is amenable to this activity, and as a maintenance treatment in stands where thinning, pruning, stewardship harvest, or improvement cutting have created appropriate (safe) conditions for its implementation.

Definitions for active restoration treatments included in these recommendations are provided below (definitions generally derived from Helms 1998).

1. **Forest Regeneration Cutting.** Regeneration cutting involves removal of existing trees to assist regeneration already present (cutting overstory or seed trees that compete with, or otherwise influence, an existing understory of seedlings and saplings), or to make future regeneration possible. If regeneration is not already present before existing trees are removed, then it becomes established from seed trees left on site or by planting tree seedlings grown in a nursery.

2. **Improvement Cutting.** Improvement cutting involves removal of less desirable trees in order to meet objectives related to species composition or vertical stand structure. Trees of undesirable species or condition are removed from an upper canopy, often in conjunction with an understory thinning. For upland forest restoration recommendations, improvement cutting would be applied in mixed-species stands that still have a viable component of ponderosa pine. In this context, some proportion of species or trees competing with overstory ponderosa pine would be removed.

   An objective of this active management scenario is to provide additional growing space for residual ponderosa pines, many of which are old and have low vigor, in order to improve their vitality, insect and disease resistance, seed production, and future longevity.

3. **Prescribed Fire.** Prescribed fire involves deliberate burning of wildland fuels in either a natural or modified state, and under specified environmental conditions, in order to confine a fire to a predetermined area and produce a fireline intensity, and rate of spread, that meets established resource management objectives.

4. **Pruning.** Pruning is deliberate removal of side branches (live or dead) or multiple leaders from a standing tree. Pruning is often done to improve

aesthetics or health of a forest, to reduce fuel ladders and associated wildfire risk, or to produce clear (knot free), economically valuable wood.

5. **Stewardship Harvest.** Stewardship harvest is any timber harvest treatment completed for reasons other than production of timber commodities. Timber harvest where a primary objective is to improve forest health or reduce wildfire risk by removing woody biomass is an example of stewardship harvest.

6. **Thinning.** Thinning is a treatment in immature forests designed to reduce tree density and thereby improve growth of the residual trees, enhance forest health, or recover potential mortality resulting from intertree competition.

    Two types of thinning are recognized – commercial thinning where trees being removed are large enough to have economic value and can be sold to a timber purchaser, and noncommercial thinning where trees are too small to be sold for conventional wood products, and they are typically left on site after being cut.

    White paper Silv-34, "Silvicultural Activities: Description and Terminology" (Powell 2018), provides further information about how these active restoration treatments are used with upland-forest sites.

ACTIVE RESTORATION ROTATION

A concept in the fire ecology realm involves an 'area frequency' term called *fire rotation*. Fire rotation is an area-frequency metric (measure) because it refers to the number of years required to burn an acreage <u>equivalent</u> to the entire area of a management unit, **even if every acre does not burn.**

So, with this concept, it is possible for some portions of a management unit to burn more than once, and some portions not at all, if an acreage equivalent to the whole management unit eventually burns. *A length of time, in years, for an 'area equivalent' acreage to burn is the fire rotation*. This concept will become clearer with a few examples of its application.

Fire rotation (area frequency), in years, is expressed mathematically as:

Area in management unit (acres) ÷ Desired Average Acres Burned Per Year = Desired Fire Rotation (years).

What is a 'management unit' in the context of fire rotation? Let's use a hypothetical project planning area on Heppner RD to answer that question. Dry forest (fire regime I) in the planning area has been identified as a management unit. NEPA objectives for this biophysical environment, along with Forest Plan standards and guidelines, have identified a goal of burning all fire

regime I acreage at least once every 15 years (e.g., desired fire frequency for dry-forest portion (fire regime I) of this planning area is 15 years).

Management unit (FR I) acreage in planning area = <u>2,665 acres</u>

Desired fire frequency (rotation) for FR I/dry-forest acreage = <u>15 years</u>

Management goal: 2665 acres ÷ 15 years = <u>178 acres per year</u>

So, this example has identified what is termed a 'desired fire rotation' – if funding, labor, burn windows, and all other factors cooperate consistently (Ha! When is that going to happen☺), then Heppner personnel would want to burn at least 178 acres of fire regime I (dry forest), in the management unit (dry forest/FR I in that particular planning area), every year.

But what if we decide to look in the District's digital fire atlas to see how much acreage has been burned in the management unit in the past (over the last few decades)? Doing so will allow us to calculate what is often termed an 'actual fire rotation.' For our hypothetical example, here are the results.

Management unit (FR I) acreage in planning area = <u>2,665 acres</u>

Actual fire frequency determined from fire atlas records = <u>61 acres/year</u>

Actual fire rotation: 2665 acres ÷ 61 acres/year = <u>44 years</u>

So, this 'actual fire rotation' calculation has identified that when looking at recent prescribed fire history for our management unit (fire regime I/dry forest acres in the planning area), our fire rotation is actually 44 years – at current rates of annual burning, it will take us 44 years to get the equivalent of 2,665 acres of Fire Regime I ground burned!

And, the flip side of this coin is that even though our desired fire rotation is 15 years (i.e., we would like to burn the equivalent of 2,665 acres of FR I ground in a 15-year period, or an average of 178 acres per year), what is actually happening is that it's taking us 3 times as long (44 years instead of 15 years) to get the burning completed.

Active Restoration Rotation. Now, what happens if we apply this fire rotation concept to active restoration treatment needs described in this white paper? The same concept should apply equally well to thinning, timber harvest, and other mechanical treatments as to prescribed fire/burning.

So, when consulting white paper #50, "Stand Density Conditions for Umatilla National Forest: A Range of Variation Analysis," we find that the Umatilla NF has a total of app. 538,515 acres of 'Active Forestry' area.

An Active Forestry category includes forested National Forest System lands within the Umatilla NF that are available for active restoration treatments such as timber harvest, thinning, stewardship harvest, and so forth.

Two other primary land-use categories – Reserves and Restricted – include land-use designations such as Wilderness areas, designated roadless areas, certain Forest Plan allocations, PACFISH riparian buffers, and other restrictions preventing, or precluding, application of active harvest or upland-restoration treatments involving conventional timber management practices.

Forested areas of the Umatilla NF need to be managed (entered) on a frequency of 10 to 40 years, depending on their site productivity. Highly productive areas produce biomass faster than acreage with low productivity. If forest stands are to be maintained in a sustainable and resilient condition, with properly functioning composition, structure, and density, then their biomass (stand density) needs to be modified on a periodicity of 10 to 40 years.

In my estimation, a reasonable average periodicity to maintain resilience and integrity of Umatilla NF forested ecosystems is 30 years (when balancing cold, moist, and dry sites, and south end versus north end). So, the active restoration rotation calculations for these assumptions are as follows:

First, let's calculate a 'desired restoration goal' for Active Forestry:

Active Forestry acreage in Umatilla NF = <u>538,515 acres</u>

Desired entry frequency for Active Forestry restoration = <u>30 years</u>

Management goal: 538515 acres ÷ 30 years = <u>17,951 acres per year</u>

Next, let's calculate an 'actual restoration rotation' for Active Forestry:

Active Forestry acreage in Umatilla NF = <u>538,515 acres</u>

Actual harvest + noncommercial thinning for 1990-2009 = <u>7,634 acres/yr</u>

Actual restoration rotation: 538,515 acres ÷ 7,634 acres/year = <u>71 years</u>

So, this 'actual restoration rotation' calculation identifies that when looking at recent timber harvest and active management treatments for our management unit (Active Forestry land-use category in Umatilla NF), our restoration rotation is actually 71 years – at current rates of annual management, it will take us 71 years to get the equivalent of 538,515 acres of Active Forestry ground treated!

And, the flip side of this coin is that even though our desired restoration rotation is 30 years (i.e., we would like to actively treat the equivalent of 538,515 acres of Active Forestry ground in a 30-year period), what is actually happening is that it's taking us more than twice as long (71 years) to get the restoration treatments completed.

<u>Note</u>: Concepts underlying this analysis, including determination of Active Forestry and other land-use categories, are described more fully in a general technical report entitled "Assessment of Timber Availability From Forest Restoration Within the Blue Mountains of Oregon" (Rainville et al. 2008).

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APPENDIX 1: ROADS ANALYSIS FOR FOREST RESTORATION

Over the last few decades, roads have been widely viewed in a negative context. Recent ecological literature seems to focus on negative effects of roads. Although roads can certainly have detrimental ecological or environmental effects, they also provide positive benefits from socioeconomic and other perspectives (Coffin 2007, Lugo and Gucinski 2000).

Results from analysis of upland-forest restoration opportunities, by watershed (results of a watershed-based restoration analysis are described earlier in this white paper), was applied to the roads system on Umatilla National Forest.

The context for this analysis of Umatilla National Forest's transportation system considered roads to be a value (benefit), rather than a risk (detriment), because they provide useful access to upland-forest sites where active-restoration treatments are needed.

After rating 36 watersheds for each of seven restoration criteria, a geographic information system was used to overlay road segments and watershed extents. Then, restoration ratings associated with a watershed were assigned to road segments in the watershed (e.g., road segments in a watershed with a 'high' composite rating also received a 'high' rating in the upland-forest value column in a roads analysis spreadsheet).

ROADS ANALYSIS RESULTS

Of 495 road segments having Forest Service jurisdiction, 75 of them (15%) occurred in watersheds with a composite upland-forest restoration rating of low. These road segments access areas where opportunity and need for active restoration treatments is low.

Of 495 road segments having Forest Service jurisdiction, 199 of them (40%) occurred in watersheds with a composite upland-forest restoration rating of medium. These road segments access areas where opportunity and need for active restoration treatments is moderate.

Of 495 road segments having Forest Service jurisdiction, 221 of them (45%) occurred in watersheds with a composite upland-forest restoration rating of high. These road segments access areas where opportunity and need for active restoration treatments is high.

Results of a roads analysis, by road segment (road number), are presented in table 9. Table 9 also shows the watershed in which a road segment occurs, along with the watershed's associated upland-forest ratings (e.g., for seven restoration criteria, and for a watershed's overall (composite) rating).

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
1	10	5	A	FS	1707020204	M	H	H	L	H	L	H	H
2	10	5	A	FS	1707020202	H	H	H	H	H	L	H	H
3	10	5	A	FS	1707020202	H	H	H	H	H	L	H	H
4	480	5	L	FS	1707020202	H	H	H	H	H	L	H	H
5	481	5	L	FS	1707020202	H	H	H	H	H	L	H	H
6	1003	5	C	FS	1707020204	M	H	H	L	H	L	H	H
7	1003	5	C	FS	1707020204	M	H	H	L	H	L	H	H
8	1003	5	C	FS	1707020204	M	H	H	L	H	L	H	H
9	1003	5	C	FS	1707020204	M	H	H	L	H	L	H	H
10	1003	5	C	FS	1707020204	M	H	H	L	H	L	H	H
11	1006	5	C	FS	1707020207	H	L	H	L	H	M	H	H
12	1007	5	C	FS	1707020204	M	H	H	L	H	L	H	H
13	1007	5	C	FS	1707020204	M	H	H	L	H	L	H	H
14	1007	5	C	FS	1707020204	M	H	H	L	H	L	H	H
15	1009	5	C	FS	1707020204	M	H	H	L	H	L	H	H
16	1009	5	C	FS	1707020204	M	H	H	L	H	L	H	H
17	1010	5	C	FS	1707020204	M	H	H	L	H	L	H	H
18	1010	5	C	FS	1707020204	M	H	H	L	H	L	H	H
19	1010	5	C	FS	1707020204	M	H	H	L	H	L	H	H
20	1010	5	C	FS	1707020204	M	H	H	L	H	L	H	H
21	1011	5	C	FS	1707020204	M	H	H	L	H	L	H	H
22	1011	5	C	FS	1707020204	M	H	H	L	H	L	H	H
23	1012	5	C	FS	1707020204	M	H	H	L	H	L	H	H
24	1012	5	C	FS	1707020204	M	H	H	L	H	L	H	H
25	1014	5	C	FS	1707020204	M	H	H	L	H	L	H	H
26	1030	5	C	FS	1707020202	H	H	H	H	H	L	H	H
27	1031	5	C	FS	1707020202	H	H	H	H	H	L	H	H
28	1035	5	C	FS	1707020202	H	H	H	H	H	L	H	H
29	1038	5	C	FS	1707020202	H	H	H	H	H	L	H	H
30	13	5	C	FS	1707020202	H	H	H	H	H	L	H	H
31	1310	5	C	FS	1707020202	H	H	H	H	H	L	H	H
32	1310	5	C	FS	1707020202	H	H	H	H	H	L	H	H
33	1310	5	C	FS	1707020202	H	H	H	H	H	L	H	H

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
34	400	2	L	FS	1707020401	H	L	M	L	M	L	M	M
35	2039	2	C	FS	1707020208	H	L	H	M	H	M	H	H
36	2039	2	C	FS	1707020208	H	L	H	M	H	M	H	H
37	2039	2	C	FS	1707020208	H	L	H	M	H	M	H	H
38	2039	2	C	FS	1707020208	H	L	H	M	H	M	H	H
39	2039	2	C	P									
40	2039	2	C	P									
41	30	2	L	FS	1707020208	H	L	H	M	H	M	H	H
42	50	2	L	FS	1707020208	H	L	H	M	H	M	H	H
43	21	2	A	C									
44	21	2	A	FS	1707020207	H	L	H	L	H	M	H	H
45	21	2	A	C									
46	21	2	A	C									
47	21	2	A	FS	1707020208	H	L	H	M	H	M	H	H
48	21	2	A	FS	1707020208	H	L	H	M	H	M	H	H
49	21	2	A	FS	1707020411	H	M	H	L	H	L	H	H
50	21	2	A	FS	1707020208	H	L	H	M	H	M	H	H
51	21	2	A	FS	1707020411	H	M	H	L	H	L	H	H
52	21	2	A	P									
53	160	2	L	FS	1707020208	H	L	H	M	H	M	H	H
54	300	2	L	P									
55	300	2	L	FS	1707020208	H	L	H	M	H	M	H	H
56	2103	2	C	C									
57	30	2	L	FS	1707020207	H	L	H	L	H	M	H	H
58	2104	2	C	C									
59	2104	2	C	C									
60	2104	2	C	FS	1707020207	H	L	H	L	H	M	H	H
61	2105	2	C	FS	1707020207	H	L	H	L	H	M	H	H
62	2105	2	C	FS	1707020207	H	L	H	L	H	M	H	H
63	2106	2	C	FS	1707020207	H	L	H	L	H	M	H	H
64	2107	2	C	FS	1707020208	H	L	H	M	H	M	H	H
65	2107	2	C	FS	1707020208	H	L	H	M	H	M	H	H
66	2110	2	C	FS	1707020208	H	L	H	M	H	M	H	H

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
67	2110	2	C	FS	1707020207	H	L	H	L	H	M	H	H
68	2110	2	L	FS	1707020207	H	L	H	L	H	M	H	H
69	2115	2	C	FS	1707020208	H	L	H	M	H	M	H	H
70	2115	2	C	FS	1707020208	H	L	H	M	H	M	H	H
71	2115	2	L	FS	1707020208	H	L	H	M	H	M	H	H
72	2115	2	L	FS	1707020208	H	L	H	M	H	M	H	H
73	2115	2	L	FS	1707020208	H	L	H	M	H	M	H	H
74	2119	2	C	C									
75	2120	2	C	C									
76	2120	2	C	FS	1707020208	H	L	H	M	H	M	H	H
77	2120	2	C	FS	1707020208	H	L	H	M	H	M	H	H
78	2120	2	C	FS	1707020208	H	L	H	M	H	M	H	H
79	2122	2	C	FS	1707020208	H	L	H	M	H	M	H	H
80	2128	2	C	FS	1707020208	H	L	H	M	H	M	H	H
81	2128	2	C	FS	1707020208	H	L	H	M	H	M	H	H
82	2128	2	C	FS	1707020208	H	L	H	M	H	M	H	H
83	2140	2	C	FS	1707020411	H	M	H	L	H	L	H	H
84	2140	2	C	P									
85	2141	2	C	FS	1707020401	H	L	M	L	M	L	M	M
86	2141	2	C	FS	1707020401	H	L	M	L	M	L	M	M
87	2141	2	C	FS	1707020401	H	L	M	L	M	L	M	M
88	2141	2	C	FS	1707020401	H	L	M	L	M	L	M	M
89	2141	2	C	FS	1707020411	H	M	H	L	H	L	H	H
90	2142	2	C	FS	1707020411	H	M	H	L	H	L	H	H
91	2142	2	C	FS	1707020411	H	M	H	L	H	L	H	H
92	2142	2	C	FS	1707020411	H	M	H	L	H	L	H	H
93	2145	2	C	FS	1707020411	H	M	H	L	H	L	H	H
94	2145	2	C	P									
95	2145	2	C	P									
96	2145	2	C	FS	1707020411	H	M	H	L	H	L	H	H
97	2145	2	C	FS	1707020411	H	M	H	L	H	L	H	H
98	2145	2	C	P									
99	22	2	A	C									

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
100	22	2	A	C									
101	2201	2	C	P									
102	2201	2	C	P									
103	2201	2	C	P									
104	2202	2	C	FS	1707020208	H	L	H	M	H	M	H	H
105	2202	2	C	FS	1707020208	H	L	H	M	H	M	H	H
106	2202	2	C	FS	1707020208	H	L	H	M	H	M	H	H
107	2202	2	C	FS	1707020208	H	L	H	M	H	M	H	H
108	2202	2	C	FS	1707020208	H	L	H	M	H	M	H	H
109	2202	2	C	FS	1707020208	H	L	H	M	H	M	H	H
110	2202	2	C	FS	1707020208	H	L	H	M	H	M	H	H
111	2202	2	C	FS	1707020208	H	L	H	M	H	M	H	H
112	2202	2	C	C									
113	2202	2	C	C									
114	2202	2	C	C									
115	2202	2	C	C									
116	2202	2	C	C									
117	23	2	A	FS	1707020208	H	L	H	M	H	M	H	H
118	23	2	A	FS	1707020208	H	L	H	M	H	M	H	H
119	23	2	A	FS	1707020208	H	L	H	M	H	M	H	H
120	23	2	A	FS	1707020208	H	L	H	M	H	M	H	H
121	2307	2	C	FS	1707020208	H	L	H	M	H	M	H	H
122	2307	2	C	FS	1707020208	H	L	H	M	H	M	H	H
123	2307	2	C	FS	1707020208	H	L	H	M	H	M	H	H
124	2309	2	C	FS	1707020208	H	L	H	M	H	M	H	H
125	2309	2	C	FS	1707020208	H	L	H	M	H	M	H	H
126	24	2	A	FS	1707020208	H	L	H	M	H	M	H	H
127	24	2	A	FS	1707020208	H	L	H	M	H	M	H	H
128	24	2	A	FS	1707020208	H	L	H	M	H	M	H	H
129	2402	2	C	FS	1707020208	H	L	H	M	H	M	H	H
130	2402	2	C	FS	1707020208	H	L	H	M	H	M	H	H
131	2406	2	C	FS	1707020401	H	L	M	L	M	L	M	M
132	2406	2	C	FS	1707020401	H	L	M	L	M	L	M	M

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
133	2407	2	C	FS	1707020401	H	L	M	L	M	L	M	M
134	2408	2	C	FS	1707020401	H	L	M	L	M	L	M	M
135	2408	2	L	FS	1707020401	H	L	M	L	M	L	M	M
136	25	2	A	FS	1707020208	H	L	H	M	H	M	H	H
137	25	2	A	FS	1707020411	H	M	H	L	H	L	H	H
138	2513	2	C	FS	1707020401	H	L	M	L	M	L	M	M
139	2513	2	C	C									
140	2516	2	C	FS	1707020401	H	L	M	L	M	L	M	M
141	2519	2	C	FS	1707020208	H	L	H	M	H	M	H	H
142	2519	2	C	FS	1707020208	H	L	H	M	H	M	H	H
143	3030	6	C	FS	1707010302	M	L	H	L	M	L	H	M
144	3030	6	C	FS	1707010302	M	L	H	L	M	L	H	M
145	3032	6	C	P									
146	3032	6	C	P									
147	3032	6	C	FS	1707010302	M	L	H	L	M	L	H	M
148	3033	6	C	P									
149	3033	6	C	FS	1707010302	M	L	H	L	M	L	H	M
150	31	6	A	FS	1706010404	L	L	L	L	L	L	H	L
151	31	6	A	FS	1706010404	L	L	L	L	L	L	H	L
152	31	6	A	FS	1707010302	M	L	H	L	M	L	H	M
153	31	6	A	FS	1707010302	M	L	H	L	M	L	H	L
154	31	6	A	FS	1707010302	M	L	H	L	M	L	H	M
155	31	6	A	FS	1706010409	L	L	L	L	M	L	H	L
156	31	6	A	FS	1707010301	M	L	H	L	H	L	H	M
157	31	6	A	FS	1707010301	M	L	H	L	H	L	H	M
158	31	6	A	FS	1706010409	L	L	L	L	M	L	H	L
159	31	6	A	FS	1707010301	M	L	H	L	H	L	H	M
160	31	6	A	FS	1707010301	M	L	H	L	H	L	H	M
161	31	6	A	FS	1706010411	L	L	L	L	L	L	H	L
162	270	6	L	FS	1707010301	M	L	H	L	H	L	H	M
163	330	6	L	FS	1707010301	M	L	H	L	H	L	H	M
164	330	6	L	FS	1707010301	M	L	H	L	H	L	H	M
165	3102	6	C	FS	1706010404	L	L	L	L	L	L	H	L

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
166	3102	6	C	FS	1707010302	M	L	H	L	M	L	H	M
167	3102	6	C	FS	1707010302	M	L	H	L	M	L	H	M
168	3109	6	C	FS	1707010302	M	L	H	L	M	L	H	M
169	3113	6	C	FS	1707010302	M	L	H	L	M	L	H	M
170	15	6	L	FS	1707010302	M	L	H	L	M	L	H	M
171	3116	6	C	FS	1707010302	M	L	H	L	M	L	H	M
172	3116	6	C	FS	1707010302	M	L	H	L	M	L	H	M
173	3128	6	C	FS	1707010301	M	L	H	L	H	L	H	M
174	3128	6	C	FS	1707010301	M	L	H	L	H	L	H	M
175	3130	6	C	FS	1707010301	M	L	H	L	H	L	H	M
176	3133	6	C	FS	1707010301	M	L	H	L	H	L	H	M
177	3133	6	C	FS	1707010301	M	L	H	L	H	L	H	M
178	3135	6	C	FS	1707010301	M	L	H	L	H	L	H	M
179	3145	6	C	FS	1707010301	M	L	H	L	H	L	H	M
180	3148	6	C	FS	1706010409	L	L	L	L	M	L	H	L
181	3148	6	C	FS	1706010409	L	L	L	L	M	L	H	L
182	3148	6	C	FS	1706010411	L	L	L	L	L	L	H	L
183	3150	6	C	FS	1707010301	M	L	H	L	H	L	H	M
184	3150	6	C	FS	1707010301	M	L	H	L	H	L	H	M
185	3150	6	C	FS	1707010301	M	L	H	L	H	L	H	M
186	3180	6	C	FS	1707010301	M	L	H	L	H	L	H	M
187	3180	6	C	FS	1706010411	L	L	L	L	L	L	H	L
188	32	6	A	FS	1707010301	M	L	H	L	H	L	H	M
189	32	6	A	FS	1707010301	M	L	H	L	H	L	H	M
190	30	6	L	FS	1707010301	M	L	H	L	H	L	H	M
191	35	6	L	FS	1707010301	M	L	H	L	H	L	H	M
192	45	6	L	FS	1707010301	M	L	H	L	H	L	H	M
193	3217	6	C	FS	1706010411	L	L	L	L	L	L	H	L
194	3217	6	C	FS	1706010411	L	L	L	L	L	L	H	L
195	3217	6	C	FS	1706010411	L	L	L	L	L	L	H	L
196	3217	6	C	FS	1706010411	L	L	L	L	L	L	H	L
197	20	6	L	FS	1706010410	L	M	L	L	M	L	H	L
198	21	6	L	FS	1706010410	L	M	L	L	M	L	H	L

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
199	22	6	L	FS	1706010410	L	M	L	L	M	L	H	L
200	30	6	L	FS	1706010410	L	M	L	L	M	L	H	L
201	50	6	L	FS	1707010301	M	L	H	L	H	L	H	M
202	51	6	L	FS	1707010301	M	L	H	L	H	L	H	M
203	52	6	L	FS	1707010301	M	L	H	L	H	L	H	M
204	80	6	L	FS	1707010301	M	L	H	L	H	L	H	M
205	100	6	L	FS	1707010301	M	L	H	L	H	L	H	M
206	3701	6	C	FS	1706010410	L	M	L	L	M	L	H	L
207	3701	6	C	FS	1706010410	L	M	L	L	M	L	H	L
208	3715	6	C	FS	1707010201	M	M	M	L	H	L	H	M
209	3718	6	C	FS	1707010301	M	L	H	L	H	L	H	M
210	3718	6	C	FS	1707010301	M	L	H	L	H	L	H	M
211	3719	6	C	FS	1707010301	M	L	H	L	H	L	H	M
212	40	6	L	FS	1707010301	M	L	H	L	H	L	H	M
213	40	6	L	FS	1707010301	M	L	H	L	H	L	H	M
214	3725	6	C	FS	1706010410	L	M	L	L	M	L	H	L
215	3725	6	C	FS	1706010411	L	L	L	L	L	L	H	L
216	3725	6	C	P									
217	3727	6	C	FS	1707010301	M	L	H	L	H	L	H	M
218	3727	6	C	FS	1706010411	L	L	L	L	L	L	H	L
219	3728	6	C	FS	1707010301	M	L	H	L	H	L	H	M
220	3734	6	C	FS	1706010411	L	L	L	L	L	L	H	L
221	3734	6	C	FS	1706010411	L	L	L	L	L	L	H	L
222	3734	6	C	FS	1706010411	L	L	L	L	L	L	H	L
223	3738	6	C	FS	1706010411	L	L	L	L	L	L	H	L
224	3740	6	C	FS	1706010411	L	L	L	L	L	L	H	L
225	100	5	L	FS	1707020207	H	L	H	L	H	M	H	H
226	100	5	L	FS	1707020203	M	M	M	L	H	L	H	M
227	101	5	L	FS	1707020207	H	L	H	L	H	M	H	H
228	102	5	L	FS	1707020207	H	L	H	L	H	M	H	H
229	105	5	L	FS	1707020207	H	L	H	L	H	M	H	H
230	110	5	L	FS	1707020204	M	H	H	L	H	L	H	H
231	120	5	L	FS	1707020207	H	L	H	L	H	M	H	H

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
232	3961	5	C	P									
233	3963	5	C	FS	1707020207	H	L	H	L	H	M	H	H
234	3963	5	C	FS	1707020207	H	L	H	L	H	M	H	H
235	3963	5	C	C									
236	3969	5	C	FS	1707020207	H	L	H	L	H	M	H	H
237	3969	5	C	FS	1707020207	H	L	H	L	H	M	H	H
238	3969	5	C	FS	1707020207	H	L	H	L	H	M	H	H
239	3969	5	C	FS	1707020207	H	L	H	L	H	M	H	H
240	3969	5	C	FS	1707020207	H	L	H	L	H	M	H	H
241	3971	5	C	FS	1707020207	H	L	H	L	H	M	H	H
242	3972	5	C	FS	1707020207	H	L	H	L	H	M	H	H
243	3972	5	C	FS	1707020207	H	L	H	L	H	M	H	H
244	3974	5	C	FS	1707020207	H	L	H	L	H	M	H	H
245	3980	5	C	C									
246	3980	5	C	FS	1707020204	M	H	H	L	H	L	H	H
247	3980	5	C	FS	1707020204	M	H	H	L	H	L	H	H
248	3986	5	C	FS	1707020305	M	L	H	L	H	H	H	H
249	3986	5	C	FS	1707020305	M	L	H	L	H	H	H	H
250	3986	5	C	FS	1707020305	M	L	H	L	H	H	H	H
251	3986	5	C	FS	1707020305	M	L	H	L	H	H	H	H
252	3986	5	C	FS	1707020305	M	L	H	L	H	H	H	H
253	3986	5	C	FS	1707020305	M	L	H	L	H	H	H	H
254	3988	5	C	FS	1707020204	M	H	H	L	H	L	H	H
255	3990	5	C	FS	1707020305	M	L	H	L	H	H	H	H
256	40	4	A	FS	1706010705	H	H	M	M	H	L	H	H
257	40	4	A	FS	1706010706	H	M	H	H	M	L	H	H
258	40	4	A	FS	1706010706	H	M	H	H	M	L	H	H
259	40	4	A	FS	1706010603	M	L	M	H	H	L	H	M
260	40	4	A	FS	1706010603	M	L	M	H	H	L	H	M
261	40	4	A	FS	1706010607	M	L	M	L	H	L	H	M
262	12	4	L	FS	1706010706	H	M	H	H	M	L	H	H
263	40	4	L	FS	1706010706	H	M	H	H	M	L	H	H
264	140	4	L	FS	1706010706	H	M	H	H	M	L	H	H

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris- diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
265	185	4	L	FS	1706010705	H	H	M	M	H	L	H	H
266	185	4	L	FS	1706010303	H	M	H	H	H	L	H	H
267	200	4	L	FS	1706010303	H	M	H	H	H	L	H	H
268	215	4	L	FS	1706010705	H	H	M	M	H	L	H	H
269	4016	4	C	FS	1706010706	H	M	H	H	M	L	H	H
270	4016	4	C	FS	1706010706	H	M	H	H	M	L	H	H
271	4018	4	C	FS	1706010706	H	M	H	H	M	L	H	H
272	4018	4	C	FS	1706010705	H	H	M	M	H	L	H	H
273	4022	4	C	FS	1706010705	H	H	M	M	H	L	H	H
274	4027	4	C	FS	1706010303	H	M	H	H	H	L	H	H
275	4027	4	C	FS	1706010303	H	M	H	H	H	L	H	H
276	4030	4	C	FS	1706010705	H	H	M	M	H	L	H	H
277	4030	4	C	FS	1706010705	H	H	M	M	H	L	H	H
278	20	4	L	FS	1706010705	H	H	M	M	H	L	H	H
279	4038	4	C	FS	1706010607	M	L	M	L	H	L	H	M
280	4038	4	C	FS	1706010607	M	L	M	L	H	L	H	M
281	4038	4	C	FS	1706010607	M	L	M	L	H	L	H	M
282	4039	4	C	FS	1706010603	M	L	M	H	H	L	H	M
283	4039	4	C	FS	1706010607	M	L	M	L	H	L	H	M
284	4039	4	C	FS	1706010607	M	L	M	L	H	L	H	M
285	41	4	A	FS	1706010303	H	M	H	H	H	L	H	H
286	41	4	A	FS	1706010303	H	M	H	H	H	L	H	H
287	42	4	A	FS	1706010706	H	M	H	H	M	L	H	H
288	125	4	L	FS	1706010706	H	M	H	H	M	L	H	H
289	4206	4	C	FS	1706010303	H	M	H	H	H	L	H	H
290	4206	4	C	FS	1706010303	H	M	H	H	H	L	H	H
291	4206	4	C	FS	1706010303	H	M	H	H	H	L	H	H
292	43	4	A	FS	1706010303	H	M	H	H	H	L	H	H
293	43	4	A	FS	1706010302	M	H	M	L	L	L	H	M
294	43	4	A	FS	1706010303	H	M	H	H	H	L	H	H
295	62	4	L	FS	1706010303	H	M	H	H	H	L	H	H
296	4302	4	C	FS	1706010303	H	M	H	H	H	L	H	H
297	4302	4	C	FS	1706010303	H	M	H	H	H	L	H	H

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris- diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
298	4302	4	C	FS	1706010303	H	M	H	H	H	L	H	H
299	4304	4	C	FS	1706010302	M	H	M	L	L	L	H	M
300	4305	4	C	FS	1706010302	M	H	M	L	L	L	H	M
301	4305	4	C	FS	1706010302	M	H	M	L	L	L	H	M
302	4305	4	C	FS	1706010302	M	H	M	L	L	L	H	M
303	44	4	A	FS	1706010303	H	M	H	H	H	L	H	H
304	44	4	A	FS	1706010303	H	M	H	H	H	L	H	H
305	44	4	A	FS	1706010303	H	M	H	H	H	L	H	H
306	45	5	C	FS	1707020204	M	H	H	L	H	L	H	H
307	45	5	C	FS	1707020305	M	L	H	L	H	H	H	H
308	46	4	A	FS	1706010705	H	H	M	M	H	L	H	H
309	46	4	A	FS	1707010203	M	M	M	L	M	L	H	M
310	46	6	A	FS	1707010203	M	M	M	L	M	L	H	M
311	300	4	L	FS	1706010603	M	L	M	H	H	L	H	M
312	301	4	L	FS	1706010603	M	L	M	H	H	L	H	M
313	4608	4	C	FS	1706010705	H	H	M	M	H	L	H	H
314	4608	4	C	FS	1706010705	H	H	M	M	H	L	H	H
315	4610	4	C	FS	1706010705	H	H	M	M	H	L	H	H
316	4610	4	C	FS	1706010705	H	H	M	M	H	L	H	H
317	4610	4	C	FS	1706010705	H	H	M	M	H	L	H	H
318	4620	4	C	C									
319	4620	4	C	FS	1706010705	H	H	M	M	H	L	H	H
320	4620	4	C	FS	1706010705	H	H	M	M	H	L	H	H
321	4625	4	C	FS	1707010203	M	M	M	L	M	L	H	M
322	4625	4	C	FS	1707010203	M	M	M	L	M	L	H	M
323	47	4	A	FS	1706010705	H	H	M	M	H	L	H	H
324	47	4	A	FS	1706010705	H	H	M	M	H	L	H	H
325	160	4	L	FS	1706010705	H	H	M	M	H	L	H	H
326	160	4	L	FS	1706010705	H	H	M	M	H	L	H	H
327	165	4	L	FS	1706010705	H	H	M	M	H	L	H	H
328	165	4	L	FS	1706010705	H	H	M	M	H	L	H	H
329	4712	4	C	FS	1706010705	H	H	M	M	H	L	H	H
330	4712	4	C	FS	1706010705	H	H	M	M	H	L	H	H

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris- diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
331	40	4	L	FS	1706010705	H	H	M	M	H	L	H	H
332	4713	4	C	FS	1706010705	H	H	M	M	H	L	H	H
333	4713	4	C	FS	1706010705	H	H	M	M	H	L	H	H
334	4713	4	C	FS	1706010705	H	H	M	M	H	L	H	H
335	20	4	L	FS	1706010705	H	H	M	M	H	L	H	H
336	52	5	A	C									
337	52	5	A	FS	1707020201	M	H	L	H	M	L	H	M
338	52	5	A	FS	1707020201	M	H	L	H	M	L	H	M
339	440	5	L	FS	1707020203	M	M	M	L	H	L	H	M
340	995	5	L	FS	1707020201	M	H	L	H	M	L	H	M
341	5209	5	C	FS	1707020206	H	M	M	L	H	L	H	M
342	5209	5	C	FS	1707020206	H	M	M	L	H	L	H	M
343	5209	5	C	FS	1707020206	H	M	M	L	H	L	H	M
344	5212	5	C	FS	1707020203	M	M	M	L	H	L	H	M
345	5225	5	C	FS	1707020203	M	M	M	L	H	L	H	M
346	5225	5	C	FS	1707020201	M	H	L	H	M	L	H	M
347	5226	5	C	FS	1707020205	H	M	M	L	H	L	H	M
348	5226	5	C	FS	1707020205	H	M	M	L	H	L	H	M
349	5226	5	C	FS	1707020203	M	M	M	L	H	L	H	M
350	20	5	L	FS	1707020205	H	M	M	L	H	L	H	M
351	53	2	A	C									
352	53	2	A	FS	1707020207	H	L	H	L	H	M	H	H
353	53	5	A	FS	1707020206	H	M	M	L	H	L	H	M
354	53	5	A	FS	1707020206	H	M	M	L	H	L	H	M
355	140	5	L	FS	1707020206	H	M	M	L	H	L	H	M
356	140	5	L	FS	1707020206	H	M	M	L	H	L	H	M
357	155	2	L	FS	1707010401	H	M	L	M	H	L	H	M
358	5305	5	C	FS	1707020206	H	M	M	L	H	L	H	M
359	5308	5	C	FS	1707010309	H	H	H	H	H	L	M	H
360	5308	5	C	FS	1707010309	H	H	H	H	H	L	M	H
361	5308	5	C	C									
362	5308	5	C	C									
363	5308	5	C	C									

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
364	5309	5	C	FS	1707020206	H	M	M	L	H	L	H	M
365	5311	5	C	FS	1707020206	H	M	M	L	H	L	H	M
366	5311	5	C	FS	1707020206	H	M	M	L	H	L	H	M
367	5312	5	C	FS	1707020206	H	M	M	L	H	L	H	M
368	5314	5	C	FS	1707020206	H	M	M	L	H	L	H	M
369	5314	5	C	FS	1707020206	H	M	M	L	H	L	H	M
370	5314	5	C	FS	1707020206	H	M	M	L	H	L	H	M
371	5316	5	C	FS	1707020206	H	M	M	L	H	L	H	M
372	5316	5	C	FS	1707020207	H	L	H	L	H	M	H	H
373	5316	5	C	FS	1707020207	H	L	H	L	H	M	H	H
374	5318	5	C	FS	1707020206	H	M	M	L	H	L	H	M
375	5320	5	C	FS	1707020207	H	L	H	L	H	M	H	H
376	5320	5	C	FS	1707020207	H	L	H	L	H	M	H	H
377	60	5	L	FS	1707020207	H	L	H	L	H	M	H	H
378	5321	2	C	FS	1707020207	H	L	H	L	H	M	H	H
379	5322	2	C	FS	1707020207	H	L	H	L	H	M	H	H
380	5322	2	C	FS	1707020207	H	L	H	L	H	M	H	H
381	5326	5	L	C									
382	5326	5	C	C									
383	5326	5	C	FS	1707010309	H	H	H	H	H	L	M	H
384	5327	5	C	FS	1707020206	H	M	M	L	H	L	H	M
385	5327	5	C	FS	1707020207	H	L	H	L	H	M	H	H
386	5327	5	C	FS	1707020206	H	M	M	L	H	L	H	M
387	290	5	L	FS	1707020206	H	M	M	L	H	L	H	M
388	290	5	L	FS	1707020206	H	M	M	L	H	L	H	M
389	5350	2	C	FS	1707020207	H	L	H	L	H	M	H	H
390	5370	2	C	FS	1707020208	H	L	H	M	H	M	H	H
391	5380	2	C	FS	1707020208	H	L	H	M	H	M	H	H
392	54	5	A	FS	1707010306	H	L	H	M	H	L	H	H
393	54	5	A	FS	1707010306	H	L	H	M	H	L	H	H
394	54	5	A	FS	1707020205	H	M	M	L	H	L	H	M
395	54	5	A	FS	1707020205	H	M	M	L	H	L	H	M
396	500	5	L	FS	1707020205	H	M	M	L	H	L	H	M

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
397	5411	5	C	FS	1707010306	H	L	H	M	H	L	H	H
398	5411	5	C	FS	1707010306	H	L	H	M	H	L	H	H
399	5412	5	C	FS	1707010306	H	L	H	M	H	L	H	H
400	5412	5	C	C									
401	30	5	L	FS	1707020205	H	M	M	L	H	L	H	M
402	5415	5	C	C									
403	5415	5	C	C									
404	5415	5	C	FS	1707010306	H	L	H	M	H	L	H	H
405	5417	5	C	FS	1707020206	H	M	M	L	H	L	H	M
406	5417	5	C	FS	1707020206	H	M	M	L	H	L	H	M
407	5417	5	C	P									
408	5417	5	C	FS	1707020206	H	M	M	L	H	L	H	M
409	5417	5	C	P									
410	5417	5	C	FS	1707020206	H	M	M	L	H	L	H	M
411	5420	5	C	C									
412	5420	5	C	C									
413	5425	5	C	FS	1707020205	H	M	M	L	H	L	H	M
414	5425	5	C	FS	1707020205	H	M	M	L	H	L	H	M
415	5425	5	C	FS	1707020205	H	M	M	L	H	L	H	M
416	5425	5	C	FS	1707020205	H	M	M	L	H	L	H	M
417	5425	5	C	FS	1707020205	H	M	M	L	H	L	H	M
418	5425	5	C	P									
419	5425	5	C	FS	1707020206	H	M	M	L	H	L	H	M
420	5425	5	C	P									
421	5425	5	C	FS	1707020205	H	M	M	L	H	L	H	M
422	5425	5	C	P									
423	5427	5	C	FS	1707010306	H	L	H	M	H	L	H	H
424	5427	5	C	FS	1707010306	H	L	H	M	H	L	H	H
425	5427	5	C	FS	1707010306	H	L	H	M	H	L	H	H
426	5427	5	C	FS	1707010306	H	L	H	M	H	L	H	H
427	5427	5	C	FS	1707010306	H	L	H	M	H	L	H	H
428	5427	5	C	FS	1707010306	H	L	H	M	H	L	H	H
429	5428	5	C	FS	1707020205	H	M	M	L	H	L	H	M

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
430	5435	5	C	FS	1707020205	H	M	M	L	H	L	H	M
431	5435	5	C	FS	1707020205	H	M	M	L	H	L	H	M
432	5440	5	C	FS	1707020205	H	M	M	L	H	L	H	M
433	5445	5	C	FS	1707020205	H	M	M	L	H	L	H	M
434	5445	5	C	FS	1707020205	H	M	M	L	H	L	H	M
435	5445	5	C	FS	1707020205	H	M	M	L	H	L	H	M
436	5448	5	C	FS	1707020205	H	M	M	L	H	L	H	M
437	5448	5	C	FS	1707020205	H	M	M	L	H	L	H	M
438	5450	5	C	FS	1707020205	H	M	M	L	H	L	H	M
439	5450	5	C	FS	1707020205	H	M	M	L	H	L	H	M
440	55	5	A	FS	1707020203	M	M	M	L	H	L	H	M
441	55	5	A	FS	1707020203	M	M	M	L	H	L	H	M
442	5505	5	C	FS	1707020203	M	M	M	L	H	L	H	M
443	5505	5	C	FS	1707020203	M	M	M	L	H	L	H	M
444	5505	5	C	FS	1707020204	M	H	H	L	H	L	H	H
445	5506	5	C	FS	1707020203	M	M	M	L	H	L	H	M
446	5506	5	C	FS	1707020203	M	M	M	L	H	L	H	M
447	5506	5	C	FS	1707020203	M	M	M	L	H	L	H	M
448	5507	5	C	FS	1707020203	M	M	M	L	H	L	H	M
449	5507	5	C	FS	1707020203	M	M	M	L	H	L	H	M
450	5507	5	C	FS	1707020203	M	M	M	L	H	L	H	M
451	5507	5	C	FS	1707020203	M	M	M	L	H	L	H	M
452	5507	5	C	FS	1707020203	M	M	M	L	H	L	H	M
453	5507	5	C	FS	1707020203	M	M	M	L	H	L	H	M
454	5507	5	C	FS	1707020203	M	M	M	L	H	L	H	M
455	5507	5	C	FS	1707020205	H	M	M	L	H	L	H	M
456	5510	5	C	FS	1707020203	M	M	M	L	H	L	H	M
457	5510	5	C	FS	1707020203	M	M	M	L	H	L	H	M
458	5730	5	C	C									
459	5730	5	C	FS	1707010309	H	H	H	H	H	L	M	H
460	5730	5	C	FS	1707010309	H	H	H	H	H	L	M	H
461	11	5	L	FS	1707020206	H	M	M	L	H	L	H	M
462	70	5	L	FS	1707020205	H	M	M	L	H	L	H	M

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
463	240	5	L	FS	1707020205	H	M	M	L	H	L	H	M
464	5916	5	C	FS	1707020205	H	M	M	L	H	L	H	M
465	5916	5	C	FS	1707020205	H	M	M	L	H	L	H	M
466	62	6	A	FS	1706010410	L	M	L	L	M	L	H	L
467	62	6	A	FS	1706010601	L	L	L	L	M	L	H	L
468	290	6	L	FS	1706010603	M	L	M	H	H	L	H	M
469	6206	6	C	FS	1706010603	M	L	M	H	H	L	H	M
470	6206	6	C	FS	1706010603	M	L	M	H	H	L	H	M
471	6206	6	C	FS	1706010603	M	L	M	H	H	L	H	M
472	6208	6	C	FS	1706010603	M	L	M	H	H	L	H	M
473	6208	6	C	FS	1706010603	M	L	M	H	H	L	H	M
474	6209	6	C	FS	1706010603	M	L	M	H	H	L	H	M
475	6209	6	C	FS	1706010603	M	L	M	H	H	L	H	M
476	6209	6	C	FS	1706010603	M	L	M	H	H	L	H	M
477	6212	6	C	FS	1706010601	L	L	L	L	M	L	H	L
478	6212	6	C	FS	1706010601	L	L	L	L	M	L	H	L
479	6213	6	C	FS	1706010601	L	L	L	L	M	L	H	L
480	6213	6	C	FS	1706010601	L	L	L	L	M	L	H	L
481	6214	6	C	FS	1706010601	L	L	L	L	M	L	H	L
482	6214	6	C	FS	1706010603	M	L	M	H	H	L	H	M
483	6217	6	C	FS	1706010603	M	L	M	H	H	L	H	M
484	6217	6	C	FS	1706010603	M	L	M	H	H	L	H	M
485	6219	6	C	FS	1706010603	M	L	M	H	H	L	H	M
486	6219	6	C	FS	1706010601	L	L	L	L	M	L	H	L
487	6222	6	C	FS	1706010601	L	L	L	L	M	L	H	L
488	6230	6	C	FS	1706010601	L	L	L	L	M	L	H	L
489	6230	6	C	FS	1706010601	L	L	L	L	M	L	H	L
490	6230	6	C	FS	1706010601	L	L	L	L	M	L	H	L
491	6231	6	C	C									
492	6231	6	C	FS	1706010601	L	L	L	L	M	L	H	L
493	6231	6	C	C									
494	6231	6	C	FS	1706010410	L	M	L	L	M	L	H	L
495	6232	6	C	FS	1706010410	L	M	L	L	M	L	H	L

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris-diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
496	6234	6	C	FS	1706010601	L	L	L	L	M	L	H	L
497	6234	6	C	FS	1706010601	L	L	L	L	M	L	H	L
498	6234	6	C	FS	1706010601	L	L	L	L	M	L	H	L
499	6234	6	C	FS	1706010601	L	L	L	L	M	L	H	L
500	6235	6	C	FS	1706010410	L	M	L	L	M	L	H	L
501	6236	6	C	FS	1706010410	L	M	L	L	M	L	H	L
502	63	6	A	FS	1706010410	L	M	L	L	M	L	H	L
503	63	6	A	FS	1706010410	L	M	L	L	M	L	H	L
504	63	6	A	FS	1706010410	L	M	L	L	M	L	H	L
505	63	6	A	C									
506	63	6	A	C									
507	31	6	C	FS	1706010410	L	M	L	L	M	L	H	L
508	6306	6	C	FS	1706010410	L	M	L	L	M	L	H	L
509	6307	6	C	FS	1706010410	L	M	L	L	M	L	H	L
510	6308	6	C	FS	1706010410	L	M	L	L	M	L	H	L
511	64	6	A	FS	1706010410	L	M	L	L	M	L	H	L
512	64	6	A	FS	1706010410	L	M	L	L	M	L	H	L
513	64	6	A	FS	1706010410	L	M	L	L	M	L	H	L
514	64	6	A	FS	1706010410	L	M	L	L	M	L	H	L
515	64	6	A	FS	1706010410	L	M	L	L	M	L	H	L
516	64	6	A	FS	1706010410	L	M	L	L	M	L	H	L
517	64	6	A	FS	1706010410	L	M	L	L	M	L	H	L
518	64	6	A	FS	1706010410	L	M	L	L	M	L	H	L
519	64	6	A	FS	1707010202	M	L	M	L	H	L	H	M
520	64	6	A	FS	1707010202	M	L	M	L	H	L	H	M
521	64	6	A	FS	1707010202	M	L	M	L	H	L	H	M
522	64	6	A	FS	1707010203	M	M	M	L	M	L	H	M
523	250	6	L	FS	1706010410	L	M	L	L	M	L	H	L
524	650	6	L	FS	1707010203	M	M	M	L	M	L	H	M
525	650	6	L	FS	1707010203	M	M	M	L	M	L	H	M
526	6401	6	C	FS	1707010201	M	M	M	L	H	L	H	M
527	6401	6	C	FS	1707010201	M	M	M	L	H	L	H	M
528	50	6	L	FS	1707010201	M	M	M	L	H	L	H	M

Table 9: Upland-forest restoration ratings by road segment, Umatilla National Forest roads analysis.

Row Num	Road Num	RD	Func. Class	Juris- diction	HUC5	Forest Density	Crown Fire	Low Vigor Ponderosa	Low Vigor Lodgepole	Restore OFSS	JUOC on Dry UF	Restore PIPO	Composite Rating
529	51	6	L	FS	1707010201	M	M	M	L	H	L	H	M
530	6403	6	C	FS	1706010410	L	M	L	L	M	L	H	L
531	6403	6	C	FS	1706010410	L	M	L	L	M	L	H	L
532	6403	6	C	FS	1706010410	L	M	L	L	M	L	H	L
533	6403	6	C	FS	1707010201	M	M	M	L	H	L	H	M
534	6403	6	C	FS	1707010201	M	M	M	L	H	L	H	M
535	120	6	L	FS	1706010410	L	M	L	L	M	L	H	L
536	6406	6	C	FS	1706010410	L	M	L	L	M	L	H	L
537	6411	6	C	FS	1706010410	L	M	L	L	M	L	H	L
538	6413	6	C	FS	1706010410	L	M	L	L	M	L	H	L
539	6413	6	C	FS	1706010410	L	M	L	L	M	L	H	L
540	6415	6	C	FS	1706010603	M	L	M	H	H	L	H	M
541	6415	6	C	FS	1706010603	M	L	M	H	H	L	H	M
542	6415	6	C	FS	1706010410	L	M	L	L	M	L	H	L
543	6436	6	C	FS	1707010203	M	M	M	L	M	L	H	M
544	6436	6	C	FS	1707010203	M	M	M	L	M	L	H	M
545	6437	6	C	FS	1707010203	M	M	M	L	M	L	H	M
546	65	6	A	FS	1707010202	M	L	M	L	H	L	H	M
547	65	6	A	FS	1707010202	M	L	M	L	H	L	H	M
548	65	6	A	FS	1707010202	M	L	M	L	H	L	H	M
549	65	6	A	FS	1706010603	M	L	M	H	H	L	H	M
550	6511	6	C	FS	1707010202	M	L	M	L	H	L	H	M
551	6511	6	C	P									
552	6512	6	C	FS	1707010201	M	M	M	L	H	L	H	M
553	7350	5	C	FS	1707020202	H	H	H	H	H	L	H	H

NOTES FOR TABLE 9

'Row Num' column provides row number of a road segment in a spreadsheet used for Umatilla National Forest roads analysis.

'Road Num' column provides road number (label) for a road segment; note that one road generally occurs as multiple segments in a roads-analysis spreadsheet.

'RD' column provides Ranger District number for a road segment (2=Heppner, 4=Pomeroy, 5=North Fork John Day, 6=Walla Walla).

'Func. Class' column provides functional class for a road segment (A=arterial, C=collector, L=local).

'Jurisdiction' column provides jurisdiction (political entity) having management authority over a road segment (C=county, FS=Forest Service, P=private).

'HUC5' column provides a code for 5th field hydrologic unit code (watershed) in which a road segment occurs; upland-forest restoration ratings for each HUC5 were also applied to all road segments occurring in a HUC5.

'Forest Density' column shows a rating (high, medium, low) for 'percent of overstocked area' restoration-evaluation criterion.

'Crown Fire' column shows a rating (high, medium, low) for 'crown fire potential' restoration-evaluation criterion.

'Low Vigor Ponderosa' column shows a rating (high, medium, low) for 'percent of high density low vigor ponderosa pine' restoration-evaluation criterion.

'Low Vigor Lodgepole' column shows a rating (high, medium, low) for 'percent of high density low vigor lodgepole pine' restoration-evaluation criterion.

'Restore OFSS' column shows a rating (high, medium, low) for 'opportunity to restore the old forest single stratum' restoration-evaluation criterion.

'JUOC on Dry UF' column shows a rating (high, medium, low) for 'percent of western juniper invasion' restoration-evaluation criterion.

'Restore PIPO' column shows a rating (high, medium, low) for 'percent of ponderosa pine cover type' restoration-evaluation criterion.

'Composite Rating' column provides an overall rating (high, medium, low) derived from scores for seven restoration-evaluation criteria combined.

APPENDIX 2: SILVICULTURE WHITE PAPERS

White papers are internal reports, and they are produced with a consistent formatting and numbering scheme – all papers dealing with Silviculture, for example, are placed in a silviculture series (Silv) and numbered sequentially. Generally, white papers receive only limited review and, in some instances pertaining to highly technical or narrowly focused topics, the papers may receive no technical peer review at all. For papers that receive no review, the viewpoints and perspectives expressed in the paper are those of the author only, and do not necessarily represent agency positions of the Umatilla National Forest or the USDA Forest Service.

Large or important papers, such as two papers discussing active management considerations for dry and moist forests (white papers Silv-4 and Silv-7, respectively), receive extensive review comparable to what would occur for a research station general technical report (but they don't receive blind peer review, a process often used for journal articles).

White papers are designed to address a variety of objectives:

(1) They guide how a methodology, model, or procedure is used by practitioners on the Umatilla National Forest (to ensure consistency from one unit, or project, to another).

(2) Papers are often prepared to address ongoing and recurring needs; some papers have existed for more than 20 years and still receive high use, indicating that the need (or issue) has long standing – an example is white paper #1 describing the Forest's big-tree program, which has operated continuously for 25 years.

(3) Papers are sometimes prepared to address emerging or controversial issues, such as management of moist forests, elk thermal cover, or aspen forest in the Blue Mountains. These papers help establish a foundation of relevant literature, concepts, and principles that continuously evolve as an issue matures, and hence they may experience many iterations through time. [But also note that some papers have not changed since their initial development, in which case they reflect historical concepts or procedures.]

(4) Papers synthesize science viewed as particularly relevant to geographical and management contexts for the Umatilla National Forest. This is considered to be the Forest's self-selected 'best available science' (BAS), realizing that non-agency commenters would generally have a different conception of what constitutes BAS – like beauty, BAS is in the eye of the beholder.

(5) The objective of some papers is to locate and summarize the science germane to a particular topic or issue, including obscure sources such as master's theses or Ph.D. dissertations. In other instances, a paper may be designed to wade through an overwhelming amount of published science (dry-forest management), and then synthesize sources viewed as being most relevant to a local context.

(6) White papers function as a citable literature source for methodologies, models, and procedures used during environmental analysis – by citing a white paper, specialist reports can include less verbiage describing analytical databases, techniques, and so forth, some of which change little (if at all) from one planning effort to another.

(7) White papers are often used to describe how a map, database, or other product was developed. In this situation, the white paper functions as a 'user's guide' for the new product. Examples include papers dealing with historical products: (a) historical fire extents for the Tucannon watershed (WP Silv-21); (b) an 1880s map developed from General Land Office survey notes (WP Silv-41); and (c) a description of historical mapping sources (24 separate items) available from the Forest's history website (WP Silv-23).

The following papers are available from the Forest's website: [Silviculture White Papers](#)

Paper # **Title**
1 Big tree program
2 Description of composite vegetation database
3 Range of variation recommendations for dry, moist, and cold forests
4 Active management of Blue Mountains dry forests: Silvicultural considerations
5 Site productivity estimates for upland forest plant associations of Blue and Ochoco Mountains
6 Blue Mountains fire regimes
7 Active management of Blue Mountains moist forests: Silvicultural considerations
8 Keys for identifying forest series and plant associations of Blue and Ochoco Mountains
9 Is elk thermal cover ecologically sustainable?
10 A stage is a stage is a stage…or is it? Successional stages, structural stages, seral stages
11 Blue Mountains vegetation chronology
12 Calculated values of basal area and board-foot timber volume for existing (known) values of canopy cover
13 Created opening, minimum stocking, and reforestation standards from Umatilla National Forest Land and Resource Management Plan
14 Description of EVG-PI database
15 Determining green-tree replacements for snags: A process paper
16 Douglas-fir tussock moth: A briefing paper
17 Fact sheet: Forest Service trust funds
18 Fire regime condition class queries
19 Forest health notes for an Interior Columbia Basin Ecosystem Management Project field trip on July 30, 1998 (handout)
20 Height-diameter equations for tree species of Blue and Wallowa Mountains
21 Historical fires in headwaters portion of Tucannon River watershed
22 Range of variation recommendations for insect and disease susceptibility
23 Historical vegetation mapping
24 How to measure a big tree
25 Important Blue Mountains insects and diseases
26 Is this stand overstocked? An environmental education activity
27 Mechanized timber harvest: Some ecosystem management considerations

Paper #	Title
28	Common plants of south-central Blue Mountains (Malheur National Forest)
29	Potential natural vegetation of Umatilla National Forest
30	Potential vegetation mapping chronology
31	Probability of tree mortality as related to fire-caused crown scorch
32	Review of "Integrated scientific assessment for ecosystem management in the interior Columbia basin, and portions of the Klamath and Great basins" – Forest vegetation
33	Silviculture facts
34	Silvicultural activities: Description and terminology
35	Site potential tree height estimates for Pomeroy and Walla Walla Ranger Districts
36	Stand density protocol for mid-scale assessments
37	Stand density thresholds related to crown-fire susceptibility
38	Umatilla National Forest Land and Resource Management Plan: Forestry direction
39	Updates of maximum stand density index and site index for Blue Mountains variant of Forest Vegetation Simulator
40	Competing vegetation analysis for southern portion of Tower Fire area
41	Using General Land Office survey notes to characterize historical vegetation conditions for Umatilla National Forest
42	Life history traits for common Blue Mountains conifer trees
43	Timber volume reductions associated with green-tree snag replacements
44	Density management field exercise
45	Climate change and carbon sequestration: Vegetation management considerations
46	Knutson-Vandenberg (K-V) program
47	Active management of quaking aspen plant communities in northern Blue Mountains: Regeneration ecology and silvicultural considerations
48	Tower Fire…then and now. Using camera points to monitor postfire recovery
49	How to prepare a silvicultural prescription for uneven-aged management
50	Stand density conditions for Umatilla National Forest: A range of variation analysis
51	Restoration opportunities for upland forest environments of Umatilla National Forest
52	New perspectives in riparian management: Why might we want to consider active management for certain portions of riparian habitat conservation areas?
53	Eastside Screens chronology
54	Using mathematics in forestry: An environmental education activity
55	Silviculture certification: Tips, tools, and trip-ups
56	Vegetation polygon mapping and classification standards: Malheur, Umatilla, and Wallowa-Whitman National Forests
57	State of vegetation databases for Malheur, Umatilla, and Wallowa-Whitman National Forests

Paper # **Title**

58 Seral status for tree species of Blue and Ochoco Mountains

REVISION HISTORY

March 2013: minor formatting and text edits were made throughout the document, and a new appendix (app. 2) was added describing the white paper system, including a list of available white papers.

April 2017: minor formatting and text edits were made throughout the document, and a new appendix (app. 1) was added describing a roads analysis pertaining to upland-forest restoration needs.