Analysis of Existing versus Historic Condition for Structural Stages and Biophysical Settings within the Malheur, Umatilla, and Wallowa-Whitman National Forests

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Introduction

This paper summarizes the existing condition for structural stages and biophysical settings found on public lands managed by the Malheur, Umatilla, and Wallowa-Whitman National Forests within the Blue Mountains in northeastern Oregon. Site specific project level analysis teams can use this data to identify areas where treatments are appropriate to move landscapes closer to the desired mix of structural stages.

Site-specific, project-level work will need to follow existing Forest Plan direction including the plan amendment commonly known as the Eastside Screens (USDA 1995) unless this direction is modified through a plan amendment or revision. Site-specific projects that have sound rational for deviating from the Eastside Screens can utilize the site-specific forest plan amendment process as needed. See Regional Forester's letter dated June 11, 2003 for examples of cases in which harvest in old forest or removal of trees greater than 21 inches diameter breast height (DBH) may better meet desired conditions (Appendix C). Project teams should work with the Regional Screens Team if a site-specific Forest Plan amendment is needed, to insure that the amendment can be supported through appeal/and or litigation.

The existing condition data is used as a baseline against which to measure progress towards attaining desired conditions on the three national forests, and in particular, desired conditions for late and old-structured stands. The departure between the existing condition and the estimated historical landscape prior to 1850 is summarized in this report. The departure analysis will be used to help identify those areas that are most at risk of losing critical ecosystem elements, and where vegetation management may be useful in preserving or developing those elements. Data for this analysis were collected from existing vegetation polygon information collected at a variety of scales. Data sources include walk-through examinations, photo-interpretation, remote sensing, intensive stand examinations, and most similar neighbor (MSN) modeling.

The data from this analysis indicate that there appear to be opportunities within some biophysical settings (dry forest in particular) to move multi-strata old forest and mid age forest (UR, YFMS) towards the old forest single story condition. The dry single story old forest (below HRV) and the mid age multi-strata forest (above HRV) are those conditions that are probably the most departed from historic levels

Description of Biophysical Settings

Biophysical settings are aggregations of plant associations found in the Blue Mountains (Powell 1998, Johnson 1987, 1992, 2005) and represent a combination of temperature and moisture regimes. See Appendix A for a complete description. The biophysical settings represent areas on the landscape that have evolved with similar disturbance histories and which will respond to management in a similar manner. Knowing which processes formed these settings, as well as relationships to the associated plant and animal species found in theses settings, allows us to establish desired conditions and monitoring elements specific to local conditions. The Blue Mountains biophysical settings have been cross-walked to classifications used in National level fire regime-condition class (FRCC) and Johnson and O'Neil wildlife habitat relationships of Oregon and Washington.protocols.

The whitebark pine forest biophysical settings contain high elevation forests of subalpine fir and whitebark pine. These forests historically burned infrequently, with mixed intensities. The cold forests group can contain subalpine fir, Englemann spruce, grand fir, and lodgepole pine and is typified by large, infrequent and high intensity fires when the right series of extreme weather events aligned with the drying out of fuels. Both the whitebark and cold forest can also have very small, almost single tree, lightning caused fires when the fuels are damp. The moist forests can contain grand fir, western larch, lodgepole pine, Englemann spruce, Douglas-fir, and ponderosa pine. These types historically had the most complex and variable fire history and stand

structures, as a result of mixed intensity fires at highly variable frequency and sizes. The dry grand fir biophysical setting had ponderosa pine, Douglas-fir, and grand fir species composition that was maintained in a relatively open condition by large, frequent, and low intensity fire. The hot dry pine and dry Douglas-fir and dry ponderosa pine groups had variable mixtures of ponderosa pine and Douglas-fir characterized by large scale, frequent and low intensity fire.

Structural Stages

Structural stages are described in Powell (1996), O'Hara (1996), Oliver (1996), and Hessburg and other (1999) (PNW-GTR-458). See Appendix B for the data parameters that were used to classify each vegetation polygon into a structural stage. The following structural classification is similar to what was used in the Interior Columbia Basin Ecosystem Management Project. This classification system has been cross-walked to classification systems developed for National level FRCC and Johnson and O'Neil wildlife habitat relationships of Oregon and Washington.

Stand initiation (SI): Growing space is reoccupied following fire or other stand-replacing disturbances.
Stem exclusion (SE): Establishment of new trees is precluded by lack of sunlight or moisture. This stage generally consists of a continuous single layer of trees and can vary from small trees up to those approaching 21 inches in diameter.
Understory reinitiation (UR): A second tree layer is established under an older overstory. Overstory mortality has created growing space for new understory trees.
Young forest multi strata (YFMS): Three or more tree layers have become established, often following a disturbance. A mix of tree sizes is present, although large trees are absent or scarce.
Old forest single story (OFSS): A predominance of large trees is present in the stand. Only one canopy layer is present. The definition of a large tree varies depending on the productive potential of the site. This stage is often maintained by frequent and low intensity fires.
Old forest multi story (OFMS): A predominance of large trees is present in the stand. Two or more canopy layers are present. The definition of a large tree varies depending on the productive potential of the site.

Existing Condition for Structural Stages and Biophysical Settings

The Blue Mountains are dominated by forested settings (80 percent), with an additional 20 percent comprised of shrubland, herbland, and non-vegetated (rock, water) settings (Table 1). The forested environment in the Blue Mountains is dominated by the dry biophysical setting (62 percent), followed by the moist setting at 24 percent and 14 percent in the cold forest setting (Table 2). The percentage of forested biophysical settings varies by national forest (Table 2), with the Malheur National Forest having the lowest percent in cold and the highest percent in the dry setting. The Umatilla National Forest with a Columbia River maritime influence on the north end of the forest, has the highest share of moist environment of the three forests. The Wallowa-Whitman National Forest is dominated by dry forest but also has significant areas of moist and cold forest.

TABLE 1 - PERCENT TOTALS FOR ALL BIOPHYSICAL SETTINGS				
Biophysical Setting	**Malheur NF**	**Umatilla NF**	**Wallowa-Whitman NF**	**Total Blue Mountains NFs (weighted by acres)**
Cold forest	2	13	14	10
Whitebark pine forest	<1	<1	2	1
Moist forest	13	27	19	19
Dry grand fir forest	24	15	13	17
Dry Douglas-fir forest	16	17	12	15
Dry ponderosa pine forest	21	6	7	11
Hot dry pine forest	10	4	2	5
Juniper woodland	3	1	1	1
Cool/Cold Riparian Forest	<1	0	0	<1
Warm Riparian Forest	<1	<1	<1	<1
Dry herbland	3	13	15	11
Dry shrubland	6	1	2	3
Cold shrubland	<1	<1	1	<1
Cold herbland	<1	<1	2	<1
Moist herbland	<1	1	3	<1
Moist shrubland	<1	2	1	<1
Warm Riparian herbland	1	<1	<1	<1
Warm Riparian shrubland	<1	<1	<1	<1
Cool/Cold Riparian herbland	<1	0	<1	<1
Cool/Cold Riparian shrubland	<1	0	0	<1
Non-vegetated	<1	<1	5	2

TABLE 2- FORESTED BIOPHYSICAL SETTINGS (PERCENT of TOTAL FORESTED ACRES)				
Biophysical Setting	**Malheur NF**	**Umatilla NF**	**Wallowa-Whitman NF**	**Total Blue Mountains NFs (weighted by acres)**
Cold forest*	2	16	23	14
Moist forest	15	33	27	24
Dry forest**	83	51	49	62

* Includes cold forest and whitebark pine forest.

** Includes dry Douglas-fir, dry grand fir, dry ponderosa pine, hot dry pine, and juniper woodland biophysical settings.

The table below shows the breakdown by forest of structural stages.

TABLE 3- PERCENT STRUCTURAL STAGE (BASED ON TOTAL FORESTED ACRES)				
Structural Stage	**Malheur NF**	**Umatilla NF**	**Wallowa-Whitman NF**	**Total Blue Mountains NFs (weighted by acres)**
Stand initiation	8	12	14	11
Stem exclusion	17	20	15	17
Understory reinitiation	23	24	22	24
Young forest multi-story	29	14	29	25
Old forest multi-story	21	19	19	20
Old forest single story	2	10	1	3

Old forest stands (OFMS and OFSS) are dominated by multi-layered conditions at 20 percent, with only 3 percent in the old forest single-story category (Table 3). The breakdown of old forest varies between national forests, ranging from 20 percent on the Wallowa-Whitman to 29 percent on the Umatilla. The amount of old forest varies by biophysical setting (Table 4 and 5) with 45 percent in the dry forest, 34 percent in the moist setting, and 21 percent in the cold environment. The amount of old forest within each biophysical setting also varies by national forest. Most of the dry setting old forest is located on the Malheur, which has 74 percent in this category. Most of the moist old forest is located in the Umatilla, with 57 percent. The Wallowa-Whitman has a mix, with 31 percent dry, 42 percent cold, and 27 percent moist.

TABLE 4 - PERCENT OLD FOREST BETWEEN BIOPHYSICAL SETTINGS				
Biophysical Setting	**Malheur NF**	**Umatilla NF**	**Wallowa-Whitman NF**	**Total Blue Mountains NFs (weighted by acres)**
Cold forest*	8	21	42	21
Moist forest	18	57	27	34
Dry forest**	74	22	31	45

* Includes cold forest and whitebark pine forest.

** Includes dry Douglas-fir, dry grand fir, dry ponderosa pine, hot dry pine,and juniper woodland biophysical settings.

TABLE 5 - OLD FOREST WITHIN EACH BIOPHYSICAL SETTING (percent of total forested acres within each biophysical setting)								
Biophysical Setting	**Malheur NF**		**Umatilla NF**		**Wallowa-Whitman NF**		**Total Blue Mountains NFs (weighted by acres)**	
	OFSS	**OFMS**	**OFSS**	**OFMS**	**OFSS**	**OFMS**	**OFSS**	**OFMS**
Cold forest	-	13	8	28	1	35	3	32
Whitebark pine forest	-	36	0	81	1	36	1	37
Moist forest	3	27	21	30	<1	19	8	25
Dry grand fir forest	4	27	2	7	1	15	3	19
Dry Douglas-fir forest	2	18	9	12	<1	10	4	13
Dry ponderosa pine forest	3	20	1	4	1	11	1	16
Hot dry pine forest	1	10	1	3	2	5	1	8
Juniper woodland	-	1	0	7	0	6	-	3

OFSS = old forest single story
OFMS = old forest multi story

Development of the Historic Range of Variability Estimates

Ranges for estimates of the historic range of variability (HRV) for structural stages were derived from ranges currently in use on the Umatilla and Wallowa-Whitman National Forests that were developed through literature searches, workshops, and professional experience (Table 6). The original work to develop these ranges was completed in 1993 and based on work by Hall (1993) and Johnson (1993). The 1993 ranges were further refined by numbers developed during national level fire regime condition class (FRCC) vegetation dynamics development tool (VDDT) and national Landfire modeling. Ranges may be further modified as additional information becomes available.

TABLE 6 - ESTIMATED HISTORIC RANGES FOR STRUCTURAL STAGES (Percent range within each biophysical setting)						
Biophysical Setting	**Stand Initiation**	**Stem Exclusion**	**Understory Reinitiation**	**Young Forest Multistory**	**Old Forest Single-story**	**Old Forest Multistory**
Cold forest	1-20	0-20	5-25	20-40	0-5	20-60
Whitebark pine forest	1-25	0-20	5-25	10-40	0-5	10-40
Moist forest	1-20	0-25	5-25	20-60	0-5	10-60
Dry Grand Fir Forest	5-15	5-20	1-10	5-25	15-55	5-20
Dry Douglas-fir Forest	5-15	10-25	1-10	5-25	15-55	5-20
Dry Ponderosa Pine Forest	5-15	10-25	5-10	5-25	15-55	5-20
Hot Dry Pine Forest	5-15	10-20	0-5	5-10	20-70	5-15
Juniper Woodland	5-15	5-20	0-5	5-10	20-70	5-15

Departure Analysis

Our departure analysis summarizes the departure between our estimates for historic conditions and our measured existing condition. Although HRV may not necessarily be a target, especially if current factors preclude re-establishing historic conditions; research in ICBEMP has shown that the further deviated you are from HRV, the lower the likelihood that you will have species sustainability. Our departure analysis is formatted to be consistent with methodology currently used in assessing projects in relationship to the Eastside Screens, but will also be useful as we move ahead with Forest Plan Revision. Departure indices were generated for each biophysical setting regardless of total extent of the type. Departure estimates for those types with limited extent should be used with caution.

Dry multi-story old forest (OFMS) is within HRV at the scale of the Blue Mountains, but varies from slightly above to slightly below when viewed at the scale of the individual national forest (Table 5 and Table 7). Dry single-story old forest (OFSS) is below HRV, both at the scale of the Blue Mountains, and for each national forest. Multi-story old forests (OFMS) in cold and moist biophysical settings are generally within the HRV but average age percentages fall near the mid-point or below. Single-story old forest (OFSS) cold and moist biophysical settings also fall within HRV.

The stand initiation structural stage is within HRV for most biophysical settings at the scale of the forest, but some individual watersheds in the dry and moist biophysical settings are above HRV due to recent large stand-replacement fires such as the School and Monument Fires (Table 8).

The stem exclusion stage is generally within HRV. The mid-age multi-story stages (understory reinitiation and young multi-story) are within HRV for the cold and moist types, and above HRV for the dry biophysical settings.

At the scale of the watershed (HUC 5), 45-75 percent (Table 9) of watersheds in the dry forest multi-story setting are within or above the historic range. The percent of watersheds with old forest single story dry settings within HRV is generally less than 10 percent. The percent of moist and cold old single strata watersheds within HRV is higher than the dry settings.

TABLE 7 - DEPARTURE FROM HISTORIC FOR OLD FOREST								
Biophysical Setting	**Malheur NF**		**Umatilla NF**		**Wallowa-Whitman NF**		**Total Blue Mountains NFs (weighted by acres)**	
	OFSS	**OFMS**	**OFSS**	**OFMS**	**OFSS**	**OFMS**	**OFSS**	**OFMS**
Cold forest	W	B	A	W	W	W	W	W
Whitebark pine forest	W	W	W	A	W	W	W	W
Moist forest	W	W	A	W	W	W	A	W
Dry grand fir forest	B	A	B	W	B	W	B	W
Dry Douglas-fir forest	B	W	B	W	B	W	B	W
Dry ponderosa pine forest	B	W	B	B	B	W	B	W
Hot dry pine forest	B	W	B	B	B	W	B	W
Juniper woodland	B	B	B	W	B	W	B	B

A = above historic range
B = below historic range
W = within historic range

TABLE 8 - DEPARTURE FROM HISTORIC FOR ALL STRUCTURAL STAGES (Total for Blue Mountains NFs)						
Biophysical Setting	**Stand Initiation**	**Stem Exclusion**	**Understory Reinitiation**	**Young Forest Multistory**	**Old Forest Single-story**	**Old Forest Multistory**
Cold Forest	(17) W	(15) W	(11) W	(22) W	(3) W	(32) W
Whitebark pine forest	(19) W	(23) A	(2) B	(19) W	(1) W	(37) W
Moist forest	(12) W	(11) W	(14) W	(30) W	(8) A	(25) W
Dry grand fir Forest	(11) W	(14) W	(25) A	(28) W	(3) B	(19) W
Dry Douglas-fir forest	(5) W	(19) W	(33) A	(26) A	(4) B	(13) W
Dry ponderosa pine forest	(10) W	(20) W	(32) A	(21) W	(1) B	(16) W
Hot dry pine forest	(13) W	(33) A	(29) A	(16) A	(1) B	(8) W
Juniper woodland	(24) A	(56) A	(10) A	(7) W	(0) B	(3) B

A = above historic range existing percent coverage in ( )
B = below historic range
W = within historic range

TABLE 9 - PERCENT OF WATERSHEDS WITHIN, OR ABOVE HRV FOR OLD FOREST								
Biophysical Setting	**Malheur NF**		**Umatilla NF**		**Wallowa-Whitman NF**		**Total Blue Mountains NFs (weighted by acres)**	
	OFSS	**OFMS**	**OFSS**	**OFMS**	**OFSS**	**OFMS**	**OFSS**	**OFMS**
Cold forest	0	36	52	71	47	68	36	60
Whitebark pine forest	0	71	0	73	33	75	14	73
Moist forest	79	71	57	60	30	67	50	66
Dry grand fir forest	3	97	9	63	2	67	3	74
Dry Douglas-fir forest	0	94	27	84	2	52	8	69
Dry ponderosa pine forest	0	89	14	24	0	55	4	58
Hot dry pine forest	0	59	11	36	0	37	3	44
Juniper woodland	0	3	0	25	0	11	0	7

A = above historic range
B = below historic range
W = within historic range

Use of this Analysis for Site-specific Project-level Work

This analysis provides the most current evaluation of structural stages at multiple scales within the Blues. Site specific project level analysis teams can use this data to identify areas where treatments are appropriate to move landscapes closer to the desired mix of structural stages.

The classified data for structural stage and biophysical setting of each vegetation polygon in the Blues, as well as acre totals and departure estimates by watershed, are located within the Blue Mountain forest plan revision GIS space. GIS coverages of the intersected vegetation polygon and watershed boundaries are also in the revision GIS space. The data tables of departure by watershed can be linked to the vegetation maps and other GIS layers, such as current management areas, to facilitate spatial identification of potential opportunities. The Revision Team GIS specialist can be contacted for access to the maps and data tables.

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Appendix A - Biophysical Setting Descriptions

Appendix B – Structural Stage Query Parameters

Appendix C –
Departure from Historic Estimates for Each Structural Stage within Each Biophysical Setting by Forest and Watershed

Appendix D – Regional Forester Letter