WHITE PAPER

USDA Forest Service   Pacific Northwest Region   Umatilla National Forest

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Potential Natural Vegetation of Umatilla National Forest[1]

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INTRODUCTION

Land managers need information about two types of vegetation to guide their management decisions – existing vegetation (EV) and potential vegetation (PV). Existing vegetation characterizes conditions as they exist today – what a manager finds on the ground and deals with daily. Historically, natural resource management relied primarily on existing vegetation information.

PV has little to do with existing conditions, although it helps us interpret them by putting EV into an ecological context. Although EV data provides valuable insights about current composition and structure, it supplies little information about productivity and other inherent site factors.

Therefore, the two classification approaches – potential vegetation and existing vegetation – tend to be used in different ways and for different purposes: EV is well suited for meeting day-to-day needs because it represents "what is" (current conditions), whereas PV is ideal for planning and assessment needs because it characterizes "what could be" (ecological site potential).

Land managers need maps for both types of vegetation, existing and potential, but the two map types vary in at least one important respect: EV maps are often ephemeral because existing conditions can change rapidly – an EV map is only accurate until the next major wildfire or insect outbreak causes widespread change. In contrast, PV mapping can be largely 'permanent,' except when considering the possible effect of climate change. Barring extremely unusual circumstances, a wildfire or insect outbreak will not change the PV of an area.

This white paper reprints a report called "Potential Natural Vegetation of the Umatilla National Forest," which describes PV concepts, a PV hierarchy adopted by Blue Mountains national forests, and coding used for an Umatilla NF PV map. White paper F14-SO-WP-SILV-30 provides detailed information about how, and why, this report was developed and used.

[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.

Potential Natural Vegetation of the Umatilla National Forest

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June, 1998

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Potential Natural Vegetation of the Umatilla National Forest

Introduction

During the last 3 years, when ecosystem analyses at the watershed scale (EAWS) were completed for almost half of the Umatilla National Forest, it became apparent that *potential natural vegetation*[2] (PNV) information was not being used consistently. [PNV information has typically been provided by stand exams, botanical surveys, inventory plots and other field surveys that record a *plant association* or *plant community type* code.]

As the EAWS work progressed, it became clear that it may not be appropriate to use plant associations at the watershed scale because they are a fine-scale attribute pertaining to individual stands or sites. For example, a single 30-acre site can support two or more associations occurring in a mosaic pattern across the area. Dozens of different vegetation types are commonly found in a typical EAWS analysis area.

Since direct use of plant associations proved burdensome at the watershed scale, associations were grouped into *plant association groups* (PAGs) for ecosystem analysis. Unfortunately, a particular plant association may not have been assigned to the same PAG from one analysis to another. In an effort to ensure consistency for both EAWS and project planning, the Forest decided to establish a standard assignment of plant associations and plant community types to PAGs.

Recently, the Interior Columbia Basin Ecosystem Management Project (ICBEMP) published its scientific assessments and two draft environmental impact statements. Some of ICBEMP's findings were reported by *potential vegetation group* (PVG). To help with implementation of these findings, the Forest decided to assign each of the PAGs to one of ICBEMP's new PVGs. The final result was a hierarchy of potential natural vegetation, ranging from plant associations at the lowest level to potential vegetation groups at the highest level (Figure 1).

Process

A consistent approach for the use of PNV information was established using the following process.

1. A PNV working group (Charlene Bucha-Gentry, Les Holsapple, John Keersemaker, Dave Powell, and Karl Urban) was formed in December of 1996. The goal of the PNV group was to establish a standard set of PAGs and PVGs for use in ecosystem analysis and Forest Planning on the Umatilla National Forest.
2. The vegetation types that occur on the Forest were identified. For forested uplands, a variety of databases were queried to determine the Ecoclasses (vegetation types) that have been coded. The queries showed that over 12,000 field surveys have been completed in which a plant association or plant community type was determined (Table 2). For nonforest lands, the nonforest types in Johnson and Clausnitzer (1992), and the meadow and riparian types in Crowe and Clausnitzer (1997), were screened by the Forest Botanist (Karl Urban) to determine the ones that exist on the Umatilla National Forest.
3. The plant associations and plant community types that exist on the Umatilla National Forest were assigned to a PAG. The initial assignment of each vegetation type to a PAG was based on information developed for ICBEMP by the Area Ecologist (Charlie Johnson) in 1994.
4. The Umatilla working group met with the Area Ecologist in January of 1997 to discuss his assignment of vegetation types to PAGs. As a result of that meeting, and a review of the Ecologist's work by Malheur, Umatilla, and Wallowa-Whitman National Forest employees in January and February of 1997, some types were moved from one PAG to another. [<u>Note</u>: the Area Ecologist provided the list of employees that were asked to review the PAG matrices. He was also consulted on all proposals to change the assignment of a vegetation type from one PAG to another.]

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[2] Any italicized term (except scientific plant names) is defined in the glossary.

5. The Umatilla PNV group met again (March 1997) to finalize the assignment of forest vegetation types to PAGs, based on the Tri-Forest review described above, and to aggregate PAGs into PVGs. These Forest-level results were presented to Umatilla NF District personnel in late June of 1997.
6. The Umatilla PNV group met with representatives from the Malheur and Wallowa-Whitman National Forests in John Day and Baker City in June, August, and September of 1997. At these meetings, the three Blue Mountain Forests (the Tri-Forests) continued to refine the forest vegetation PAGs and PVGs using a provincial perspective.
7. In November of 1997, a Tri-Forest group met to assign the woodland, upland shrubland, upland grassland, riparian forest, riparian shrubland, and riparian herbland vegetation types to PAGs, and to aggregate the PAGs into PVGs.
8. The final PAG and PVG assignments are provided in this document. They reflect the Tri-Forest coordination mentioned above, but include only those vegetation types that are known to exist on the Umatilla National Forest. Tables 3–9 portray the assignments in a matrix format; tables 10–16 provide the same information in a tabular format.
9. As this project progressed, it eventually became clear that the concept of potential natural vegetation is not universally understood. To address that situation, a section called "What Is Potential Natural Vegetation?" was prepared and is included in this document (page 23).
10. An important product of this effort will be a PNV map for the Umatilla National Forest. With the exception of riparian corridors, which are buffered at 75 feet on either side of class 1, 2, and 3 streams, this map will aggregate the potential vegetation of individual polygons into Plant Association Groups (PAGs). Special management considerations relating to Desired Future Conditions will also be coded for each vegetation polygon (see Table 1).
11. An Ecoclass code will be assigned to each vegetation polygon on the PNV map. Coding will be based on: 1) an integration of plot information available in the Forest's GIS system; or, 2) on-the-ground experience of the mapper (Forest Botanist Karl Urban). The resulting PNV map will exist in the Forest's geographic information system as a separate layer or theme; refer to the Blue Mountain Province Data Dictionary for detailed information about the map's coding scheme.
12. It is intended that this document be revised periodically. As new vegetation types are encountered during field surveys, they will be assigned to a PAG and a PVG. If you encounter a plant association or plant community type that is missing from this document, please notify the Forest Silviculturist or the Forest Botanist so that it can be included in future revisions.

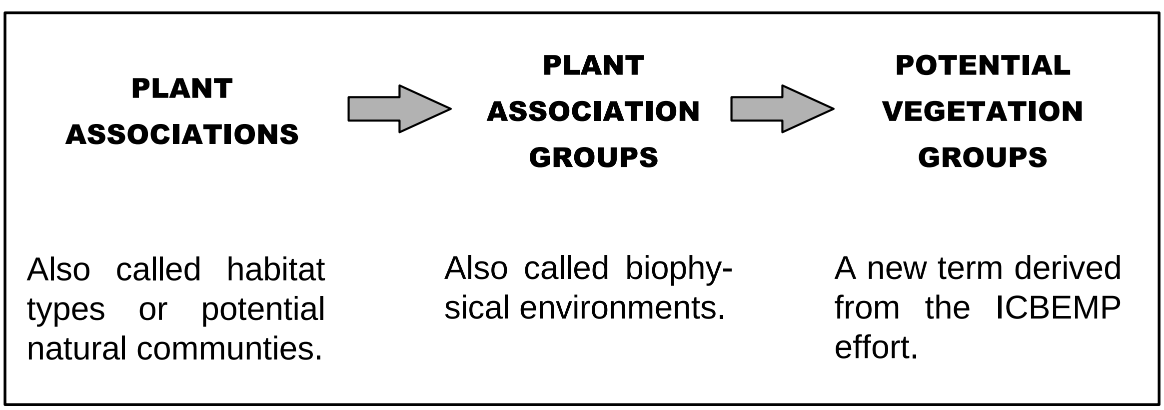

Figure 1 – Potential natural vegetation hierarchy. Similar plant associations were grouped together as a plant association group (PAG); closely related PAGs were combined into a potential vegetation group (PVG).

Table 1: Polygon coding scheme for the Umatilla National Forest's PNV map.

N	F	Potential tree-dominated non-riparian polygon (cover > 10% trees)							
N	W	Potential juniper- dominated non-riparian polygon (cover > 10% juniper)							
N	S	Potential shrubland-dominated non-riparian polygon (cover > 10% shrubs)							
N	G	Potential grassland-dominated non-riparian polygon							
N	L	Lithosere (non-vegetated) non-riparian polygon							
R	F	Forested riparian polygon							
R	S	Riparian shrubland polygon							
R	H	Riparian herbland polygon							
		1	Cold temperature matrix cell						
		2	Cool temperature matrix cell						
		3	Warm temperature matrix cell						
		4	Hot temperature matrix cell						
			1	Wet relative moisture matrix cell					
			2	Very moist relative moisture matrix cell					
			3	Moist relative moisture matrix cell					
			4	Dry relative moisture matrix cell					
				Z	Non-riparian, no soil moisture assignment				
				1	Riparian, high soil moisture				
				2	Riparian, moderate soil moisture				
				3	Riparian, low soil moisture				
					0	0	0	0	No special management related DFCs
					P	I	C	O	Lodgepole long-term seral on sites with other PNV
					P	I	A	L	Whitebark pine potential
					P	I	P	O	Ponderosa pine seral under natural fire regime
					J	U	O	C	Juniper encroachment problematic
					P	I	M	O	Western white pine potential
					P	O	T	R	Quaking aspen potential
									Others may be added
									X X X X X X ← Ecoclass Code
									XX ← Source*

* **Source Codes**: CO – Contractor; CV – CVS plots; EP – Ecoplots; BR – Botanical Resources; DI – District information; others may be added.

Table 2: Ecoclass coding used in forest vegetation databases as of March 1997.

Ecoclass Codes	Plant Associations/ Plant Community Types	Sta-tus	Notes	TFI: CVS	TFI: MSS	HP: EVG	NF: EVG	NF: Des	PM: EVG	PM: PAS	WW: EVG	Total
CWS541	ABGR/ACGL	PA		49	2				88	49	385	573
CWS912	ABGR/ACGL	PA	WScode	39					4		31	74
CWS412	ABGR/ACGL-PHMA	PCT	WStype	53					11		87	151
CWG1	ABGR/ARCO	PCT	TFIcode	25						2		27
CWG211	ABGR/BRVU	PA		17				1	5		49	72
CWG111	ABGR/CAGE	PA		147	1	272	48	11	11	8	66	564
CWG112	ABGR/CARU	PA	WScode	48		217	70	10	2		12	359
CWG113	ABGR/CARU	PA		75	10	106	1	21		14	30	257
CWF421	ABGR/CLUN	PA		189	11	1			50	9	903	1163
CWF611	ABGR/GYDR	PA		2						9	2	13
CWF311	ABGR/LIBO2	PA	WScode	35		107	54	1	3	355	118	673
CWF312	ABGR/LIBO2	PA		155	23	33	5	29	7	7	362	621
CWF612	ABGR/POMU-ASCA3	PA		6					8		28	42
CWS321	ABGR/SPBE	PA	WScode	19							15	34
CWS322	ABGR/SPBE	PA		18	4				10	9	60	101
CWC811	ABGR/TABR/CLUN	PA		12	9				2		123	146
CWF422	ABGR/TABR/CLUN	PA	WScode	43					2		114	159
CWC812	ABGR/TABR/LIBO2	PA		24		9			1	6	39	79
CWF512	ABGR/TRCA3	PA		13	2				9	14	55	93
CWS211	ABGR/VAME	PA	WScode	53		40	167	17	17		489	783
CWS212	ABGR/VAME	PA		76	23	1	1	27	52	99	312	591
CWS811	ABGR/VASC	PA		80	5	20	10	84		1	1	201
CWS812	ABGR/VASC-LIBO2	PA		69	1	8		26			5	109
CEF331*	ABLA2/ARCO	PCT								4		4
CAG111	ABLA2/CAGE	PA		4				33	2		3	42
CEG312	ABLA2/CARU	PCT	WStype	1						2		3
CES131	ABLA2/CLUN	PA	WScode	55					3		119	177
CES314	ABLA2/CLUN	PA		22					76		400	498
CEF221	ABLA2/LIBO2	PA	WScode	16							2	18
CES414	ABLA2/LIBO2	PA		27				18	18	14	11	88
CES221	ABLA2/MEFE	PA								34		34
CEF411	ABLA2/POPU	PCT	WStype	8							12	20
CEF311	ABLA2/STAM	PCT	WStype	5							5	10
CAG4	ABLA2/STOC	PCT	TFIcode	8								8
CEF331	ABLA2/TRCA3	PA		10					6	7	37	60
CES311	ABLA2/VAME	PA		20	23		5	68	40	123	151	430
CES315	ABLA2/VAME	PA	WScode	72							79	151
CES411	ABLA2/VASC	PA		21	2		13	107		19	35	197
CES415	ABLA2/VASC/POPU	PA	WStype	1							7	8
CAF0	ABLA2-PIAL/POPU	PCT		3								3
CAC5	ABLA2 subalpine parks	PCT						8				8
CJS1	JUOC/ARAR	PCT		2								2
CJS8	JUOC/ARRI	PCT		10								10
CJS4	JUOC/CELE/FEID-AGSP	PCT		5				1				6
CJG111	JUOC/FEID-AGSP	PA		32				3				35
CJS321	JUOC/PUTR/FEID-AGSP	PA		2								2
CLS416	PICO/CARU	PA		12								12
CLS6	PICO(ABGR)/ALSI	PCT								3		3
CLS5	PICO(ABGR)/ARNE	PCT	TFIcode	54							5	59
CLS511	PICO(ABGR)/VAME	PCT	73code				22	9		12	6	49
CLF211	PICO(ABGR)/VAME-LIBO2	PCT	WScode							5	1	6
CWS212*	PICO(ABGR)/VAME/CARU	PCT								1		1
CLG211	PICO(ABGR)/VASC/CARU	PCT	73code	47		1	24	23			4	99
CLG1	PICO(ABLA2)/STOC	PCT	TFIcode	5								5
CLS515	PICO(ABLA2)/VAME	PCT	WScode							39	8	47
CLS411	PICO(ABLA2)/VASC	PCT	73code				26	29		5	1	61
CLS415	PICO(ABLA2)/VASC/POPU	PCT	WStype								3	3
CLG2	PICO/Rhizomatous grasses	PCT		27	1	1				1		30
CLM1	PICO grass-sedge wetlands	PCT						3				3
CLM2	PICO shrub/grass wetlands	PCT						1				1
CAC3	PICO subalpine parks	PCT						2				2

Table 2: Ecoclass coding used in forest vegetation databases as of March 1997.

Ecoclass Codes	Plant Associations/ Plant Community Types	Sta-tus	Notes	TFI: CVS	TFI: MSS	HP: EVG	NF: EVG	NF: Des	PM: EVG	PM: PAS	WW: EVG	Total
CPG111	PIPO/AGSP	PA		104	2	36	1			11	4	158
CPG132	PIPO/AGSP	PA	WScode	4								4
CPG222	PIPO/CAGE	PA		46	12	25				3	3	89
CPG221	PIPO/CARU	PA		11	3	3				28	2	47
CPS232	PIPO/CELE/CAGE	PA		8	1	2				7		18
CPS234	PIPO/CELE/FEID-AGSP	PA		3	2					2		7
CPM111	PIPO/ELGL	PA	73code			17	12				1	30
CPG112	PIPO/FEID	PA		20	12	38	5			9	23	107
CPG131	PIPO/FEID	PA	WScode	26								26
CPS222	PIPO/PUTR/CAGE	PA				2						2
CPS221	PIPO/PUTR/CARO	PA		2		1						3
CPS226	PIPO/PUTR/FEID-AGSP	PA		3				3				6
CPS523	PIPO/SPBE	PCT	WStype	6							2	8
CPS522	PIPO/SYAL	PA	WScode	5						7	1	13
CPS524	PIPO/SYAL	PA		78	7	16					1	102
CPS525	PIPO/SYOR	PA		2		5					1	8
CDS722	PSME/ACGL-PHMA	PA	WStype	73					4		64	141
CDG111	PSME/CAGE	PA		163	8	278	18		1	46	4	518
CDG112	PSME/CARU	PA		82	4	24		1		32	35	178
CDG121	PSME/CARU	PA	WScode	10							4	14
CDSD	PSME/CELE/CAGE	PCT		5						18		23
CDS611	PSME/HODI	PA		26		150	10		5	30	164	385
CDS711	PSME/PHMA	PA		145	1	5	6		12	310	289	768
CDS634	PSME/SPBE	PA	WStype	36					2	1	4	43
CDS622	PSME/SYAL	PA	WScode	30							3	33
CDS624	PSME/SYAL	PA		95	3	132		1	4	67	21	323
CDS623	PSME/SYOR	PA	WScode	2								2
CDS625	PSME/SYOR	PA		15		18				3	1	37
CDS821	PSME/VAME	PA		11	1					24	6	42
Miscodes	Unknown/Unrecognized						2			15	15	32
			Total	2727	173	1568	500	537	455	1464	4823	12247

* These types have new codes that refer to the parent plant association from which the plant community type was derived, i.e., ABLA2/ARCO is CEF331-201020, which means it is PCT number 201020 derived from plant association CEF331.

Ecoclass Codes came from Appendix H, "Plant Associations of the Blue and Ochoco Mountains" (Johnson and Clausnitzer 1992); a "Plant Association Codes" list used by the Tri-Forest Inventory Program (dated 6/15/95); a document called "Indicators to identify sub-series for non-forest types" by Frederick C. Hall (6/2/95); an Ecoclass database prepared by Rod Clausnitzer in 1996 (Paradox format); and Appendix 7 of a draft Pacific Northwest Research Station report by Frederick C. Hall ("Pacific Northwest Ecoclass Codes for Seral and Potential Natural Communities"). **Plant Associations/ Plant Community Types** is an abbreviation derived from the scientific names of species used to name a vegetation type. **Status**: PCT is plant community type; PA is plant association. **Notes**: TFIcode refers to a code used by the Tri-Forest Inventory program; 73code refers to a code from the 1973 Blue Mountains classification (Hall 1973); WScode refers to a code for a Wallowa/Snake vegetation type (Johnson and Simon 1987) even though a Blue/Ochoco code also exists for the same type; WStype refers to a type in the Wallowa/Snake classification that does not exist in the Blue/Ochoco classification. **TFI: CVS** refers to Current Vegetation Survey plots. **TFI: MSS** refers to Managed Stand Survey plots. **HP: EVG** refers to Ecoclass codes from the existing vegetation (EVG) database for Heppner District. **NF: EVG** refers to Ecoclass codes from the existing vegetation database for North Fork John Day District. **NF: Des** refers to a plant association contract, along with historical stand exams, for the Desolation area. **PM: EVG** refers to Ecoclass codes from the existing vegetation database for Pomeroy District. **PM: PAS** refers to plant association surveys completed by the Pomeroy District. **WW: EVG** refers to Ecoclass codes from the existing vegetation database for Walla Walla District.

Table 3: Plant Association Groups (PAGs) for upland forest vegetation types.

Cold, Wet PAG	**Cold, Very Moist PAG**	**Cold, Moist PAG**	**Cold, Dry PAG**
None	None Cold Forest PVG	ABLA2/MEFE	ABGR/ARCO ABGR/VASC ABLA2/CAGE ABLA2/POPU ABLA2/STOC ABLA2/VASC ABLA2/VASC/POPU ABLA2-PIAL/POPU PICO(ABGR)/VASC/CARU PICO(ABLA2)/STOC PICO(ABLA2)/VASC PICO(ABLA2)/VASC/POPU
Cool, Wet PAG	**Cool, Very Moist PAG**	**Cool, Moist PAG**	**Cool, Dry PAG**
ABGR/TABR/CLUN ABGR/TABR/LIBO2 ABLA2/STAM	ABGR/GYDR ABGR/POMU-ASCA3 ABGR/TRCA3 PICO(ABGR)/ALSI	ABGR/CLUN ABGR/LIBO2 ABGR/VAME ABGR/VASC-LIBO2 ABLA2/ARCO ABLA2/CLUN ABLA2/LIBO2 ABLA2/TRCA3 ABLA2/VAME PICO(ABGR)/VAME PICO(ABGR)/VAME/CARU PICO(ABGR)/VAME-LIBO2 PICO(ABLA2)/VAME/PTAQ PICO(ABLA2)/VAME	ABLA2/CARU PICO/CARU PICO(ABGR)/ARNE
Warm, Wet PAG	**Warm, Very Moist PAG**	**Warm, Moist PAG**	**Warm, Dry PAG**
None Moist Forest PVG	ABGR/ACGL	ABGR/ACGL-PHMA ABGR/BRVU PSME/ACGL-PHMA PSME/HODI	ABGR/CAGE ABGR/CARU ABGR/SPBE PIPO/CAGE PIPO/CARU PIPO/CELE/CAGE PIPO/ELGL PIPO/PUTR/CAGE PIPO/PUTR/CARO PIPO/SPBE PIPO/SYAL PIPO/SYOR PSME/CAGE PSME/CARU PSME/CELE/CAGE PSME/PHMA PSME/SPBE PSME/SYAL PSME/SYOR PSME/VAME
Hot, Wet PAG	**Hot, Very Moist PAG**	**Hot, Moist PAG**	**Hot, Dry PAG**
None	None Dry Forest PVG	None	PIPO/AGSP PIPO/CELE/FEID-AGSP PIPO/FEID PIPO/PUTR/FEID-AGSP

Note: Plant associations are shown in this table using their alphanumeric abbreviations. Refer to table 10 for their common names and corresponding Ecoclass (database) codes.

Table 4: Plant Association Groups (PAGs) for woodland vegetation types.

Cold, Wet PAG	Cold, Very Moist PAG	Cold, Moist PAG	Cold, Dry PAG
None	None	None	None
Cool, Wet PAG	**Cool, Very Moist PAG**	**Cool, Moist PAG**	**Cool, Dry PAG**
None	None	None	None
Warm, Wet PAG	**Warm, Very Moist PAG**	**Warm, Moist PAG**	**Warm, Dry PAG**
None	None	None	None
Hot, Wet PAG	**Hot, Very Moist PAG**	**Hot, Moist PAG**	**Hot, Dry PAG**
None	None	JUOC/ARTRV/FEID-AGSP JUOC/CELE/CAGE JUOC/CELE/FEID-AGSP JUOC/FEID-AGSP JUOC/PUTR/FEID-AGSP Moist Woodland PVG	JUOC/ARRI Dry Woodland PVG

Note: Plant associations are shown in this table using their alphanumeric abbreviations. Refer to table 11 for their common names and corresponding Ecoclass (database) codes.

Table 5: Plant Association Groups (PAGs) for upland shrubland vegetation types.

Cold, Wet PAG	Cold, Very Moist PAG	Cold, Moist PAG	Cold, Dry PAG
None	ALSI	ARTRV/CAGE (alpine)	None
Cool, Wet PAG	**Cool, Very Moist PAG**	**Cool, Moist PAG**	**Cool, Dry PAG**
None	None Cold Shrubland PVG	None	ARTRV/STOC
Warm, Wet PAG	**Warm, Very Moist PAG**	**Warm, Moist PAG**	**Warm, Dry PAG**
None Moist Shrubland PVG	None	ARTRV/CAGE ARTRV-SYOR/BRCA ARTRV/BRCA ARTRV/CAGE (montane) ARTRV/FEID-AGSP CELE/CAGE CELE/FEID-AGSP CEVE PHMA-SYAL PUTR/FEID-AGSP SYAL SYAL/FEID-LUSE SYAL-ROSA SYOR	None Dry Shrubland PVG
Hot, Wet PAG	**Hot, Very Moist PAG**	**Hot, Moist PAG**	**Hot, Dry PAG**
None	PHLE2-Talus	ARTRV-PUTR/FEID PUTR/AGSP	ARRI/POSA3 CHNA GLNE/AGSP RHGL/AGSP

Note: Plant associations are shown in this table using their alphanumeric abbreviations. Refer to table 12 for their common names and corresponding Ecoclass (database) codes.

Table 6: Plant Association Groups (PAGs) for upland grassland vegetation types.

Cold, Wet PAG	**Cold, Very Moist PAG**	**Cold, Moist PAG**	**Cold, Dry PAG**	
None	None	FEID FEVI	CAGE	Cold Grassland PVG
Cool, Wet PAG	**Cool, Very Moist PAG**	**Cool, Moist PAG**	**Cool, Dry PAG**	
None	None	CAHO STOC	None	
Warm, Wet PAG	**Warm, Very Moist PAG**	**Warm, Moist PAG**	**Warm, Dry PAG**	
None	CACU-Seep FEID-DAIN-CAREX	FEID-AGSP FEID-AGSP-BASA FEID-AGSP-LUSE FEID-AGSP-Ridge FEID-CAGE FEID-CAHO FEID-KOCR-Low	None	Moist Grassland PVG
Hot, Wet PAG	**Hot, Very Moist PAG**	**Hot, Moist PAG**	**Hot, Dry PAG**	
None	ELCI	None	AGSP-ERHE AGSP-POSA3 AGSP-POSA3-DAUN AGSP-POSA3-OPPO ERUM-Ridge POSA3-DAUN	Dry Grassland PVG

Note: Plant associations are shown using their alphanumeric abbreviations. Refer to table 13 for their common names and Ecoclass codes.

Table 7: Plant Association Groups (PAGs) for riparian forest vegetation types.

Cold, Wet RF High Soil Moisture PAG	**Cold, Wet RF Moderate Soil Moisture PAG**	**Cold, Wet RF Low Soil Moisture PAG**
ABLA2/ATFI ABLA2/CAAQ ABLA2/CADI ABLA2/SETR PICO/CAAQ PIEN/CADI PIEN/SETR	ABLA2/CACA PICO/ALIN/Mesic Forb PICO/CACA PICO/CALA3 PICO/DECE PIEN/CILA2 PIEN/COST PIEN/EQAR	PICO/POPR PIEN/BRVU
Cool, Wet RF High Soil Moisture PAG	**Cool, Wet RF Moderate Soil Moisture PAG**	**Cool, Wet RF Low Soil Moisture PAG**
None	None	None
Warm, Wet RF High Soil Moisture PAG	**Warm, Wet RF Moderate Soil Moisture PAG**	**Warm, Wet RF Low Soil Moisture PAG**
ABGR/ATFI ABGR/CALA3 ALRU/ATFI POTR/CAAQ	ABGR/ACGL-Floodplain ABGR/GYDR ALRU/Alluvial Bar ALRU/COST ALRU/PEFRP ALRU/PHCA3 ALRU/SYAL POTR/ALIN-COST POTR/ALIN-SYAL POTR/CACA POTR/CALA3 POTR/Mesic Forb POTR2/ACGL POTR2/ALIN-COST PSME/ACGL-PHMA-Floodplain PSME/TRCA3	ABGR/SYAL-Floodplain PSME/SYAL-Floodplain Wet Riparian Forest PVG
Hot, Dry RF High Soil Moisture PAG	**Hot, Dry RF Moderate Soil Moisture PAG**	**Hot, Dry RF Low Soil Moisture PAG**
None Dry Riparian Forest PVG	POTR/SYAL POTR2/SALA2 POTR2/SYAL	PIPO/POPR PIPO/SYAL-Floodplain POTR/POPR

Note: Plant associations are shown in this table using their alphanumeric abbreviations. Refer to table 14 for their common names and corresponding Ecoclass (database) codes.

Table 8: Plant Association Groups (PAGs) for riparian shrubland vegetation types.

Cold, Wet RS High Soil Moisture PAG	**Cold, Wet RS Moderate Soil Moisture PAG**	**Cold, Wet RS Low Soil Moisture PAG**
SACO2/CAPR5 SACO2/CASC5 SACO2/CAUT	None Wet Riparian Shrubland PVG	None
Cool, Wet RS High Soil Moisture PAG	**Cool, Wet RS Moderate Soil Moisture PAG**	**Cool, Wet RS Low Soil Moisture PAG**
None	None	None
Warm, Wet RS High Soil Moisture PAG	**Warm, Wet RS Moderate Soil Moisture PAG**	**Warm, Wet RS Low Soil Moisture PAG**
ALIN/ATFI ALIN/CAAM ALIN/CAAQ ALIN/CALU ALIN/CAUT ALIN/GLEL ALIN/SCMI ALSI/ATFI ALSI/CILA2 BEOC/CAREX COST/SAAR4 RIBES/GLEL RIBES/CILA2 SALIX/CAAQ SALIX/CAUT	ALIN-CADE ALIN-COST/Mesic Forb ALIN-RIBES/Mesic Forb ALIN/CACA ALIN/CALA3 ALIN/CALEL2 ALIN/EQAR ALIN/GYDR ALIN/HELA ALSI/Mesic Forb BEOC/Mesic Forb POFR/DECE RHAL2/Mesic Forb RIBES/Mesic Forb SALIX/CALA3 SALIX/Mesic Forb	ALIN-SYAL ALIN/POPR POFR/POPR SALIX/POPR
Hot, Dry RS High Soil Moisture PAG	**Hot, Dry RS Moderate Soil Moisture PAG**	**Hot, Dry RS Low Soil Moisture PAG**
None Dry Riparian Shrubland PVG	COST SAEX SARI	AMAL CRDO SASC/ELGL

Note: Plant associations are shown in this table using their alphanumeric abbreviations. Refer to table 15 for their common names and corresponding Ecoclass (database) codes.

Table 9: Plant Association Groups (PAGs) for riparian herbland vegetation types.

Cold, Wet RH High Soil Moisture PAG	**Cold, Wet RH Moderate Soil Moisture PAG**	**Cold, Wet RH Low Soil Moisture PAG**
ALVA CALA CALU CASC5 CILA2 ELBE Riparian Herbland High Soil Moisture PVG	None Riparian Herbland Moderate Soil Moisture PVG	None Riparian Herbland Low Soil Moisture PVG
Cool, Wet RH High Soil Moisture PAG	**Cool, Wet RH Moderate Soil Moisture PAG**	**Cool, Wet RH Low Soil Moisture PAG**
None	None	None
Warm, Wet RH High Soil Moisture PAG	**Warm, Wet RH Moderate Soil Moisture PAG**	**Warm, Wet RH Low Soil Moisture PAG**
ADPE GLEL CAAM METR CAAQ PUPA CACU2 SAAR4 CAST SCMI CAUT SETR CAVEV VEAM	CACA CALA3 CALEL2 DECE VERAT EQAR	AGDI ALPR POPR
Hot, Dry RH High Soil Moisture PAG	**Hot, Dry RH Moderate Soil Moisture PAG**	**Hot, Dry RH Low Soil Moisture PAG**
CANU4 ELPA TYLA	CANE CASH JUBA	None

Note: Plant associations are shown in this table using their alphanumeric abbreviations. Refer to table 16 for their common names and corresponding Ecoclass (database) codes.

Table 10: Vegetation types, plant association groups, and potential vegetation groups for upland forests.

PVG	PAG	Abbreviation	Common Name of Vegetation Type	Ecoclass
Cold Upland Forest	Cold Moist	ABLA2/MEFE	Subalpine Fir/Fool's Huckleberry	CES221
	Cold Dry	ABGR/ARCO	Grand Fir/Heartleaf Arnica	CWG1*
		ABGR/VASC	Grand Fir/Grouse Huckleberry	CWS811
		ABLA2/CAGE	Subalpine Fir/Elk Sedge	CAG111
		ABLA2/POPU	Subalpine Fir/Polemonium	CEF411*♦
		ABLA2/STOC	Subalpine Fir/Western Needlegrass	CAG4*
		ABLA2/VASC	Subalpine Fir/Grouse Huckleberry	CES411
		ABLA2/VASC/POPU	Subalpine Fir/Grouse Huckleberry/Polemonium	CES415♦
		ABLA2-PIAL/POPU	Subalpine Fir-Whitebark Pine/Polemonium	CAF0*
		PICO(ABGR)/VASC/CARU	Lodgepole Pine (Grand Fir)/Grouse Huckleberry/ Pinegrass	CLG211*
		PICO(ABLA2)/STOC	Lodgepole Pine (Subalpine Fir)/Needlegrass	CLG1*
		PICO(ABLA2)/VASC	Lodgepole Pine (Subalpine Fir)/Grouse Huckleberry	CLS411*
		PICO(ABLA2)/VASC/POPU	Lodgepole Pine (Subalpine Fir)/Grouse Huckle-berry/Polemonium	CLS415*♦
	Cool Dry	ABLA2/CARU	Subalpine Fir/Pinegrass	CEG312*♦
		PICO/CARU	Lodgepole Pine/Pinegrass	CLS416
		PICO(ABGR)/ARNE	Lodgepole Pine (Grand Fir)/Pinemat Manzanita	CLS3*
Moist Upland Forest	Cool Wet	ABGR/TABR/CLUN	Grand Fir/Pacific Yew/Queen's Cup Beadlily	CWC811
		ABGR/TABR/LIBO2	Grand Fir/Pacific Yew-Twinflower	CWC812
		ABLA2/STAM	Subalpine Fir/Twisted Stalk	CEF311*♦
	Cool Very Moist	ABGR/GYDR	Grand Fir/Oakfern	CWF611
		ABGR/POMU-ASCA3	Grand Fir/Sword Fern-Ginger	CWF612
		ABGR/TRCA3	Grand Fir/False Bugbane	CWF512
		PICO(ABGR)/ALSI	Lodgepole Pine (Grand Fir)/Sitka Alder	CLS6*
	Cool Moist	ABGR/CLUN	Grand Fir/Queen's Cup Beadlily	CWF421
		ABGR/LIBO2	Grand Fir/Twinflower	CWF312
		ABGR/VAME	Grand Fir/Big Huckleberry	CWS212
		ABGR/VASC-LIBO2	Grand Fir/Grouse Huckleberry-Twinflower	CWS812
		ABLA2/ARCO	Subalpine Fir/Heartleaf Arnica	CEF391*♣
		ABLA2/CLUN	Subalpine Fir/Queen's Cup Beadlily	CES314
		ABLA2/LIBO2	Subalpine Fir/Twinflower	CES414
		ABLA2/TRCA3	Subalpine Fir/False Bugbane	CEF331
		ABLA2/VAME	Subalpine Fir/Big Huckleberry	CES311
		PICO(ABGR)/VAME	Lodgepole Pine (Grand Fir)/Big Huckleberry	CLS511*
		PICO(ABGR)/VAME/CARU	Lodgepole Pine (Grand Fir)/Big Huckleberry/Pinegrass	CLS591*♣
		PICO(ABGR)/VAME-LIBO2	Lodgepole Pine (Grand Fir)/Big Huckleberry-Twin-flower	CLS592*♣
		PICO(ABGR)/VAME/PTAQ	Lodgepole Pine (Grand Fir)/Big Huckleberry/Bracken	CLS593*♣
		PICO(ABLA2)/VAME	Lodgepole Pine (Subalpine Fir)/Big Huckleberry	CLS594*♣
	Warm Very Moist	ABGR/ACGL	Grand Fir/Rocky Mountain Maple	CWS541
	Warm Moist	ABGR/ACGL-PHMA	Grand Fir/Rocky Mountain Maple-Ninebark	CWS412*♦
		ABGR/BRVU	Grand Fir/Columbia Brome	CWG211
		PSME/ACGL-PHMA	Douglas-fir/Rocky Mountain Maple-Ninebark	CDS722♦
		PSME/HODI	Douglas-fir/Oceanspray	CDS611

Table 10: Vegetation types, PAGs, and PVGs for upland forests (CONTINUED).

PVG	PAG	Abbreviation	Common Name of Vegetation Type	Ecoclass
Dry Upland Forest	Warm Dry	ABGR/CAGE	Grand Fir/Elk Sedge	CWG111
		ABGR/CARU	Grand Fir/Pinegrass	CWG113
		ABGR/SPBE	Grand Fir/Birchleaf Spirea	CWS322
		PIPO/CAGE	Ponderosa Pine/Elk Sedge	CPG222
		PIPO/CARU	Ponderosa Pine/Pinegrass	CPG221
		PIPO/CELE/CAGE	Ponderosa Pine/Mountain-mahogany/Elk Sedge	CPS232
		PIPO/ELGL	Ponderosa Pine/Blue Wildrye	CPM111
		PIPO/PUTR/CAGE	Ponderosa Pine/Bitterbrush/Elk Sedge	CPS222
		PIPO/PUTR/CARO	Ponderosa Pine/Bitterbrush/Ross Sedge	CPS221
		PIPO/SPBE	Ponderosa Pine/Birchleaf Spirea	CPS523*♦
		PIPO/SYAL	Ponderosa Pine/Common Snowberry	CPS524
		PIPO/SYOR	Ponderosa Pine/Mountain Snowberry	CPS525
		PSME/CAGE	Douglas-fir/Elk Sedge	CDG111
		PSME/CARU	Douglas-fir/Pinegrass	CDG112
		PSME/CELE/CAGE	Douglas-fir/Mountain-mahogany/Elk Sedge	CDSD*
		PSME/PHMA	Douglas-fir/Ninebark	CDS711
		PSME/SPBE	Douglas-fir/Birchleaf Spirea	CDS634♦
		PSME/SYAL	Douglas-fir/Common Snowberry	CDS624
		PSME/SYOR	Douglas-fir/Mountain Snowberry	CDS625
		PSME/VAME	Douglas-fir/Big Huckleberry	CDS821
	Hot Dry	PIPO/AGSP	Ponderosa Pine/Bluebunch Wheatgrass	CPG111
		PIPO/CELE/FEID-AGSP	Ponderosa Pine/Mountain-mahogany/Idaho Fescue-Bluebunch Wheatgrass	CPS234
		PIPO/FEID	Ponderosa Pine/Idaho Fescue	CPG112
		PIPO/PUTR/FEID-AGSP	Ponderosa Pine/Bitterbrush/Idaho Fescue-Bluebunch Wheatgrass	CPS226

* These are successional (seral) plant community types; all others are plant associations.
♦ These Wallowa-Snake types apparently exist on the Umatilla NF as based on database coding.
♣ The Umatilla NF assigned these interim codes because none existed previously.

Table 11: Vegetation types, plant association groups, and potential vegetation groups for woodlands.

PVG	PAG	Abbreviation	Common Name of Vegetation Type	Ecoclass
Moist Woodland	Hot Moist	JUOC/ARTRV/FEID-AGSP	Western Juniper/Sagebrush/Idaho Fescue-Bluebunch Wheatgrass	CJS2*
		JUOC/CELE/CAGE	Western Juniper/Mountain-mahogany/Elk Sedge	CJS4*
		JUOC/CELE/FEID-AGSP	Western Juniper/Mountain-mahogany/Idaho Fescue-Bluebunch Wheatgrass	CJS4*
		JUOC/FEID-AGSP	Western Juniper/Idaho Fescue-Bluebunch Wheatgrass	CJG111
		JUOC/PUTR/FEID-AGSP	Western Juniper/Bitterbrush/Idaho Fescue-Bluebunch Wheatgrass	CJS321
Dry Wood-land	Hot Dry	JUOC/ARRI	Western Juniper/Stiff Sagebrush	CJS8*

* These are successional (seral) plant community types; all others are plant associations.

Table 12: Vegetation types, plant association groups, and potential vegetation groups for upland shrublands.

PVG	PAG	Abbreviation	Common Name of Vegetation Type	Ecoclass
Cold Shrubland	Cold Very Moist	ALSI	Alder Snow Slides	SM20*
	Cold Moist	ARTRV/CAGE (alpine)	Alpine Sage/Elk Sedge	SS4911
	Cool Dry	ARTRV/STOC	Big Sagebrush/Western Needlegrass	None*
Moist Shrubland	Warm Moist	ARTRV/CAGE	Mountain Big Sagebrush/Elk Sedge	SD2915*
		ARTRV-SYOR/BRCA	Mountain Big Sagebrush-Mountain Snowberry/ Mountain Brome	SD2917*
		ARTRV/BRCA	Big Sagebrush/Mountain Brome	None*
		ARTRV/CAGE (montane)	Mountain Big Sagebrush/Elk Sedge	SD2915
		ARTRV/FEID-AGSP	Mountain Big Sagebrush/Idaho Fescue-Bluebunch Wheatgrass	SD2911
		CEVE	Snowbrush Ceanothus	None*
		PHMA-SYAL	Mallow Ninebark-Common Snowberry	SM1111
		PUTR/FEID-AGSP	Bitterbrush/Idaho Fescue-Bluebunch Wheatgrass	SD3111
		SYAL	Snowberry Shrubland	SM31*
		SYAL/FEID-LUSE	Snowberry/Idaho Fescue-Lupine	GB5121*
		SYAL-ROSA	Common Snowberry-Rose	SM3111
		SYOR	Mountain Snowberry Shrubfields	SM32*
	Hot Very Moist	PHLE2-Talus	Syringa Bordered Talus Strips	NTS111*
	Hot Moist	ARTRV-PUTR/FEID	Mountain Big Sagebrush-Bitterbrush/Idaho Fescue	SD2916*
		CELE/CAGE	Mountain Mahogany/Elk Sedge	SD40*
		CELE/FEID-AGSP	Mountain Mahogany/Fescue-Wheatgrass	SD4111
		PUTR/AGSP	Bitterbrush/Bluebunch Wheatgrass	SD3112
Dry Shrubland	Hot Dry	ARRI/POSA3	Rigid Sage/Bluegrass Scabland	SD9111
		CHNA	Rabbitbrush	SD70*
		GLNE/AGSP	Spiny Greenbush/Bluebunch Wheatgrass	SD65
		RHGL/AGSP	Smooth Sumac/Wheatgrass	SD6121

* These are successional (seral) plant community types; all others are plant associations.

Table 13: Vegetation types, plant association groups, and potential vegetation groups for upland grasslands.

PVG	PAG	Abbreviation	Common Name of Vegetation Type	Ecoclass
Cold Grassland	Cold Moist	FEID	Alpine Idaho Fescue	GS12*
		FEVI	Green Fescue	GS11*
	Cold Dry	CAGE	Elk Sedge	GS39*
	Cool Moist	CAHO	Hood's Sedge	None*
		STOC	Alpine Bunchgrass	GS10*
Moist Grassland	Warm Very Moist	CACU-Seep	Cusick's Camas Seepage	FW3911*
		FEID-DAIN-CAREX	Idaho Fescue-Timber Oatgrass-Sedge	GB5920
	Warm Moist	FEID-AGSP	Fescue-Wheatgrass Grasslands	GB59
		FEID-AGSP-BASA	Idaho Fescue-Bluebunch Wheatgrass-Balsamroot	GB5917
		FEID-AGSP-LUSE	Idaho Fescue-Bluebunch Wheatgrass-Silky Lupine	GB5916
		FEID-AGSP-Ridge	Idaho Fescue-Bluebunch Wheatgrass Ridges	GB5915*
		FEID-CAGE	Idaho Fescue-Elk Sedge	GB5922*
		FEID-CAHO	Idaho Fescue-Hood's Sedge	GB5921
		FEID-KOCR-Low	Idaho Fescue-Prairie Junegrass-Low Elevation	GB5914
	Hot Very Moist	ELCI	Basin Wildrye	GB7111
Dry Grassland	Hot Dry	AGSP-ERHE	Bluebunch Wheatgrass-Wyeth's Buckwheat	GB4111
		AGSP-POSA3	Bluebunch Wheatgrass	GB41
		AGSP-POSA3-DAUN	Wheatgrass Scabland	GB4911*
		AGSP-POSA3-OPPO	Wheatgrass-Sandberg's Bluegrass-Prickly Pear	GB4118
		ERUM-Ridge	Sulfurflower Ridgetops	FM9113*
		POSA3-DAUN	Bluegrass-Onespike Oatgrass	GB9111

* These are successional (seral) plant community types; all others are plant associations.

Table 14: Vegetation types, plant association groups, and potential vegetation groups for riparian forests.

PVG	PAG	Abbreviation	Common Name of Vegetation Type	Ecoclass
Wet Riparian Forest	Cold Wet RF High Soil Moisture	ABLA2/ATFI	Subalpine Fir/Lady Fern	CEF332
		ABLA2/CAAQ	Subalpine Fir/Aquatic Sedge	None
		ABLA2/CADI	Subalpine Fir/Soft-leaved Sedge	None
		ABLA2/SETR	Subalpine Fir/Arrowleaf Groundsel	CEF333
		PICO/CAAQ	Lodgepole Pine/Aquatic Sedge	CLM114
		PIEN/CADI	Engelmann Spruce/Soft-leaved Sedge	CEM121
		PIEN/SETR	Engelmann Spruce/Arrowleaf Groundsel	CEF335
	Cold Wet RF Moderate Soil Moisture	ABLA2/CACA	Subalpine Fir/Bluejoint Reedgrass	None
		PICO/ALIN/Mesic Forb	Lodgepole Pine/Mountain Alder/Mesic Forb	None*
		PICO/CACA	Lodgepole Pine/Bluejoint Reedgrass	None*
		PICO/CALA3	Lodgepole Pine/Woolly Sedge	None*
		PICO/DECE	Lodgepole Pine/Tufted Hairgrass	CLM115
		PIEN/CILA2	Engelmann Spruce/Drooping Woodreed	None
		PIEN/COST	Engelmann Spruce/Red-osier Dogwood	CES511
		PIEN/EQAR	Engelmann Spruce/Common Horsetail	CEM211
	Cold Wet RF Low Soil Moisture	PICO/POPR	Lodgepole Pine/Kentucky Bluegrass	CLM112*
		PIEN/BRVU	Engelmann Spruce/Columbia Brome	None*
	Warm Wet RF High Soil Moisture	ABGR/ATFI	Grand Fir/Lady Fern	CWF613
		ABGR/CALA3	Grand Fir/Woolly Sedge	None
		ALRU/ATFI	Red Alder/Lady Fern	None
		POTR/CAAQ	Quaking Aspen/Aquatic Sedge	None
	Warm Wet RF Moderate Soil Moisture	ABGR/ACGL-Floodplain	Grand Fir/Rocky Mountain Maple Floodplain	CWS543
		ABGR/GYDR	Grand Fir/Oak Fern	CWF611
		ALRU/Alluvial Bar	Red Alder/Alluvial Bar	None*
		ALRU/COST	Red Alder/Red-osier Dogwood	None
		ALRU/PEFRP	Red Alder/Sweet Coltsfoot	HAF211
		ALRU/PHCA3	Red Alder/Pacific Ninebark	HAS211
		ALRU/SYAL	Red Alder/Common Snowberry	None*
		POTR/ALIN-COST	Quaking Aspen/Alder-Red-osier Dogwood	None
		POTR/ALIN-SYAL	Quaking Aspen/Alder-Common Snowberry	None
		POTR/CACA	Quaking Aspen/Bluejoint Reedgrass	HQM123
		POTR/CALA3	Quaking Aspen/Woolly Sedge	HQM211
		POTR/Mesic Forb	Quaking Aspen/Mesic Forb	None
		POTR2/ACGL	Black Cottonwood/Rocky Mountain Maple	HCS114*
		POTR2/ALIN-COST	Black Cottonwood/Alder-Red-osier Dogwood	HCS113
		PSME/ACGL-PHMA-Floodplain	Douglas-fir/Rocky Mountain Maple-Mallow Ninebark Floodplain	CDS724
		PSME/TRCA3	Douglas-fir/False Bugbane	None
	Warm Wet RF Low Soil Moisture	ABGR/SYAL-Floodplain	Grand Fir/Common Snowberry Floodplain	CWS314
		PSME/SYAL-Floodplain	Douglas-fir/Common Snowberry Floodplain	CDS628

* These are successional (seral) plant community types; all others are plant associations.

Table 14: Vegetation types, PAGs, and PVGs for riparian forests (CONTINUED).

PVG	PAG	Abbreviation	Common Name of Vegetation Type	Ecoclass
Dry Riparian Forest	Hot Dry RF Moderate Soil Moisture	POTR/SYAL	Quaking Aspen/Common Snowberry	HQS221
		POTR2/SALA2	Black Cottonwood/Pacific Willow	HCS112
		POTR2/SYAL	Black Cottonwood/Common Snowberry	HCS311*
	Hot Dry RF Low Soil Moisture	PIPO/POPR	Ponderosa Pine/Kentucky Bluegrass	CMP112*
		PIPO/SYAL-Floodplain	Ponderosa Pine/Common Snowberry Floodplain	CPS511
		POTR/POPR	Quaking Aspen/Kentucky Bluegrass	HQM122*

* These are successional (seral) plant community types; all others are plant associations.

Table 15: Vegetation types, plant association groups, and potential vegetation groups for riparian shrublands.

PVG	PAG	Abbreviation	Common Name of Vegetation Type	Ecoclass
Wet Riparian Shrubland	Cold Wet RS High Soil Moisture	SACO2/CAPR5	Undergreen Willow/Clustered Field Sedge	None
		SACO2/CASC5	Undergreen Willow/Holm's Sedge	SW1121
		SACO2/CAUT	Undergreen Willow/Bladder Sedge	None
	Warm Wet RS High Soil Moisture	ALIN/ATFI	Mountain Alder/Lady Fern	SW2116
		ALIN/CAAM	Mountain Alder/Big-leaved Sedge	SW2114
		ALIN/CAAQ	Mountain Alder/Aquatic Sedge	None
		ALIN/CALU	Mountain Alder/Woodrush Sedge	None
		ALIN/CAUT	Mountain Alder/Bladder Sedge	SW2115
		ALIN/GLEL	Mountain Alder/Tall Mannagrass	SW2215
		ALIN/SCMI	Mountain Alder/Small-fruit Bulrush	SW2122
		ALSI/ATFI	Sitka Alder/Lady Fern	SW2111
		ALSI/CILA2	Sitka Alder/Drooping Woodreed	SW2112
		BEOC/CAREX	Water Birch/Wet Sedge	None
		COST/SAAR4	Red-osier Dogwood/Brook Saxifrage	None
		RIBES/GLEL	Currants/Tall Mannagrass	None
		RIBES/CILA2	Currants/Drooping Woodreed	SW5111
		SALIX/CAAQ	Willow/Aquatic Sedge	SW1114
		SALIX/CAUT	Willow/Bladder Sedge	SW1123
	Warm Wet RS Moderate Soil Moisture	ALIN-CADE	Mountain Alder/Dewey's Sedge	SW2118
		ALIN-COST/Mesic Forb	Mountain Alder-Redosier Dogwood/Mesic Forb	SW2216
		ALIN-RIBES/Mesic Forb	Mountain Alder-Currants/Mesic Forb	SW2217
		ALIN/CACA	Mountain Alder/Bluejoint Reedgrass	SW2121
		ALIN/CALA3	Mountain Alder/Woolly Sedge	SW2123
		ALIN/CALEL2	Mountain Alder/Densely-tufted Sedge	None
		ALIN/EQAR	Mountain Alder/Common Horsetail	SW2117
		ALIN/GYDR	Mountain Alder/Oak Fern	None
		ALIN/HELA	Mountain Alder/Common Cowparsnip	SW2124
		ALSI/Mesic Forb	Sitka Alder/Mesic Forb	None
		BEOC/Mesic Forb	Water Birch/Mesic Forb	None
		POFR/DECE	Shrubby Cinquefoil/Tufted Hairgrass	SW5113
		RHAL2/Mesic Forb	Alder-leaved Buckthorn/Mesic Forb	None*
		RIBES/Mesic Forb	Currants/Mesic Forb	None
		SALIX/CALA3	Willow/Woolly Sedge	SW1112
		SALIX/Mesic Forb	Willow/Mesic Forb	None*
	Warm Wet RS Low Soil Moisture	ALIN-SYAL	Mountain Alder-Common Snowberry	SW2211
		ALIN/POPR	Mountain Alder/Kentucky Bluegrass	SW2120*
		POFR/POPR	Shrubby Cinquefoil/Kentucky Bluegrass	SW5114*
		SALIX/POPR	Willow/Kentucky Bluegrass	SW1111*
Dry Riparian Shrubland	Hot Dry RS Moderate Soil Moisture	COST	Red-osier Dogwood	SW5112
		SAEX	Coyote Willow	SW1117
		SARI	Rigid Willow	None
	Hot Dry RS Low Soil Moisture	AMAL	Western Serviceberry	None
		CRDO	Black Hawthorn	SW3111*
		SASC/ELGL	Scouler Willow/Blue Wildrye	None*

* These are successional (seral) plant community types; all others are plant associations.

Table 16: Vegetation types, plant association groups, and potential vegetation groups for riparian herblands.

PVG	PAG	Abbreviation	Common Name of Vegetation Type	Ecoclass
Riparian Herbland High Soil Moisture	Cold Wet RH High Soil Moisture	ALVA	Swamp Onion	None
		CALA	Smooth Stemmed Sedge	None
		CALU	Wood Rush Sedge	MM2916
		CASC5	Holm's Sedge	MS3111
		CILA2	Drooping Woodreed	None
		ELBE	Delicate Spikerush	None
	Warm Wet RH High Soil Moisture	ADPE	Maidenhair Fern	FW4213
		CAAM	Big Leaved Sedge	MM2921
		CAAQ	Aquatic Sedge	MM2914
		CACU2	Cusick's Sedge	MM2918
		CAST	Saw Beak Sedge	None*
		CAUT	Bladder Sedge	MM2917
		CAVEV	Inflated Sedge	MW1923
		GLEL	Tall Mannagrass	MM2925
		METR	Buckbean	None
		PUPA	Weak Alkaligrass	None
		SAAR4	Brook Saxifrage	None
		SCMI	Small Fruit Bulrush	MM2924
		SETR	Arrowleaf Groundsel	None
		VEAM	American Speedwell	None
	Hot Dry RH Moderate Soil Moisture	CANU4	Torrent Sedge	MM2922
		ELPA	Creeping Spike Rush	MW4912
		TYLA	Common Cattail	None
Riparian Herbland Moderate Soil Moisture	Warm Wet RH Moderate Soil Moisture	CACA	Bluejoint Reedgrass	GM4111
		CALA3	Woolly Sedge	MM2911
		CALEL2	Densely Tufted Sedge	MM2919
		DECE	Tufted Hairgrass	MM1912
		VERAT	False Hellebore	FW5121*
		EQAR	Common Horsetail	FW4212
	Hot Dry RH Moderate Soil Moisture	CANE	Nebraska Sedge	MM2912
		CASH	Sheldon's Sedge	None
		JUBA	Baltic Rush	MW3912*
Riparian Herbland Low Soil Moisture	Warm Wet RH Low Soil Moisture	AGDI	Thin Bentgrass	None*
		ALPR	Meadow Foxtail	None*
		POPR	Kentucky Bluegrass	MD3111*

* These are successional (seral) plant community types; all others are plant associations.

What Is Potential Natural Vegetation?

(David C. Powell, June 1998)

Introduction.

Why are certain plant communities found only in specific situations (subalpine fir forest at high elevations, for example)? Why are some structural stages associated most often with a particular set of site conditions (the "old forest single stratum" structural stage with warm dry sites)? And why do certain disturbance processes have different results depending on which vegetation type they occur in (low-intensity fire is lethal on cold forest sites but not on dry forest sites)? These and other questions are best addressed by using a concept called potential natural vegetation (PNV).

Mountainous areas have a diversity of landforms, topography, climate, soils, slope exposure, geology, and other biophysical factors. Each combination of these factors affects a site's temperature and moisture status. Since plant distributions are influenced primarily by temperature and moisture, any significant change in these factors causes a change in plant composition. On the Umatilla National Forest, temperature and moisture varies somewhat predictably with changes in elevation, aspect, and slope exposure (Figure 2).

The genetic structure of a plant species allows it to be adapted to a specific range of environmental conditions, which is called its *ecological amplitude* (Daubenmire 1968). Common yarrow, for example, is found from hot dry woodlands at low elevations to cold moist grasslands in the alpine zone. Obviously, it has wide ecological amplitude for both temperature and moisture. Plants with wide ecological amplitudes tend to be common – they are "generalists" and can occupy a wide variety of *ecological niches* (or a very wide niche, depending on how a niche is defined).

Plants with narrow amplitudes are found only in certain environments. Thinleaf alder and bluejoint reedgrass are examples of plants with rather narrow amplitudes; both are restricted almost exclusively to wet sites. Since species with narrow amplitudes tend to occupy very specific ecological niches, they are often used as *indicator plants* when classifying potential natural vegetation.

PNV Taxonomic Hierarchy.

Potential natural vegetation has been classified using a taxonomic approach based on extensive sampling of *climax* and near-climax plant communities (Pfister and Arno 1980). All vascular plant species in the sampled communities are recorded and used in the analysis. Grouping of similar communities results in a taxonomic hierarchy. For forest vegetation, the first (highest) subdivision of the hierarchy is based on the expected climax dominant tree species and is called the *series* (for example, the subalpine fir series includes all plant associations where subalpine fir is presumed to be the dominant tree species at climax).

The second level of the PNV hierarchy is based on the combination of an overstory tree dominant and one or more indicator species (or groups of ecologically similar species called *unions*) in the undergrowth vegetation layer. These units are called a plant association.[3] Forested plant associations are named for their dominant overstory (tree) and undergrowth (shrub or herb) plants, such as the *Abies grandis/Clintonia uniflora* plant association (abbreviated ABGR/CLUN). From an ecological perspective, it is assumed that the dominant tree species (*Abies grandis*) reflects an area's macroclimate, whereas the undergrowth indicator plant (*Clintonia uniflora*) represents a site's microclimate and soils.

The third or lowest level of the hierarchy is called a phase, which represents a subdivision of a plant association. Although commonly used elsewhere in the Rocky Mountains, phases have not been included in vegetation classifications for the Blue Mountains (Johnson and Clausnitzer 1992, Johnson and Simon 1987).

[3] In central Idaho and other Rocky Mountain areas, the lowest level of the PNV hierarchy is called a *habitat type*.

Environmental conditions vary continuously across the landscape, so the resulting plant composition also varies. For this reason, a plant association is not an exact assemblage of species from one location to another, or even in the same place from year to year. Even though the plant composition may vary, the variation occurs within narrow limits. For example, any particular plant species may be found in more than one association, but its frequency and abundance would differ between them. Plant compositions are also regional – the Douglas-fir/mountain snowberry plant association occurs both in central Idaho (Steele and others 1981) and the Blue Mountains, but its composition differs slightly in each area.

Sites in the same plant association exhibit less variation than sites in different associations. For example, areas supporting the ABGR/CLUN plant association may have slightly different proportions of Engelmann spruce or western larch in their tree canopies, or Scouler willow or twinflower in their undergrowths, but they still represent equivalent *ecological environments* because both sites have a cool moist temperature/moisture regime.

Tolerance and Competition.

Ecological amplitude controls whether a plant's seeds can germinate under the temperature and moisture conditions of a particular site, but an individual will survive and prosper only if it is more competitive than other species who can also occupy the same environment. The ability of a plant to handle competition is referred to as its *tolerance*.

Generally, tolerance is used in the context of a plant's ability to endure shade. Some tree species, for example, can survive in the diffuse light found beneath a forest canopy, whereas others require open, sunny conditions. However, root-trenching research conducted many years ago (Zon 1907) seemed to show that some species cannot survive under a forest canopy because of excessive root competition. Thus, tolerance is now considered to be the ability of a plant to complete its life cycle, from seedling to adult, under a forest canopy, regardless of whether that ability is derived from tolerance to shade, to root competition, or both (Harlow and others 1996).

It must be emphasized that the ability of a plant to endure shade or root competition is considered a tolerance for good reason. There are few examples of trees that seem to require shade for their development. After initial establishment, when light shade is beneficial for most species, many shade-tolerant trees attain their highest vigor when growing in full sunlight (Harlow and others 1996). Tolerant species are often found beneath other trees, but it's usually because overstory shade helps conserve soil moisture and serves to moderate air temperatures near the ground. Or, put more simply, their presence in the understory is for temperature and moisture reasons, not because of a physiological requirement for shade.

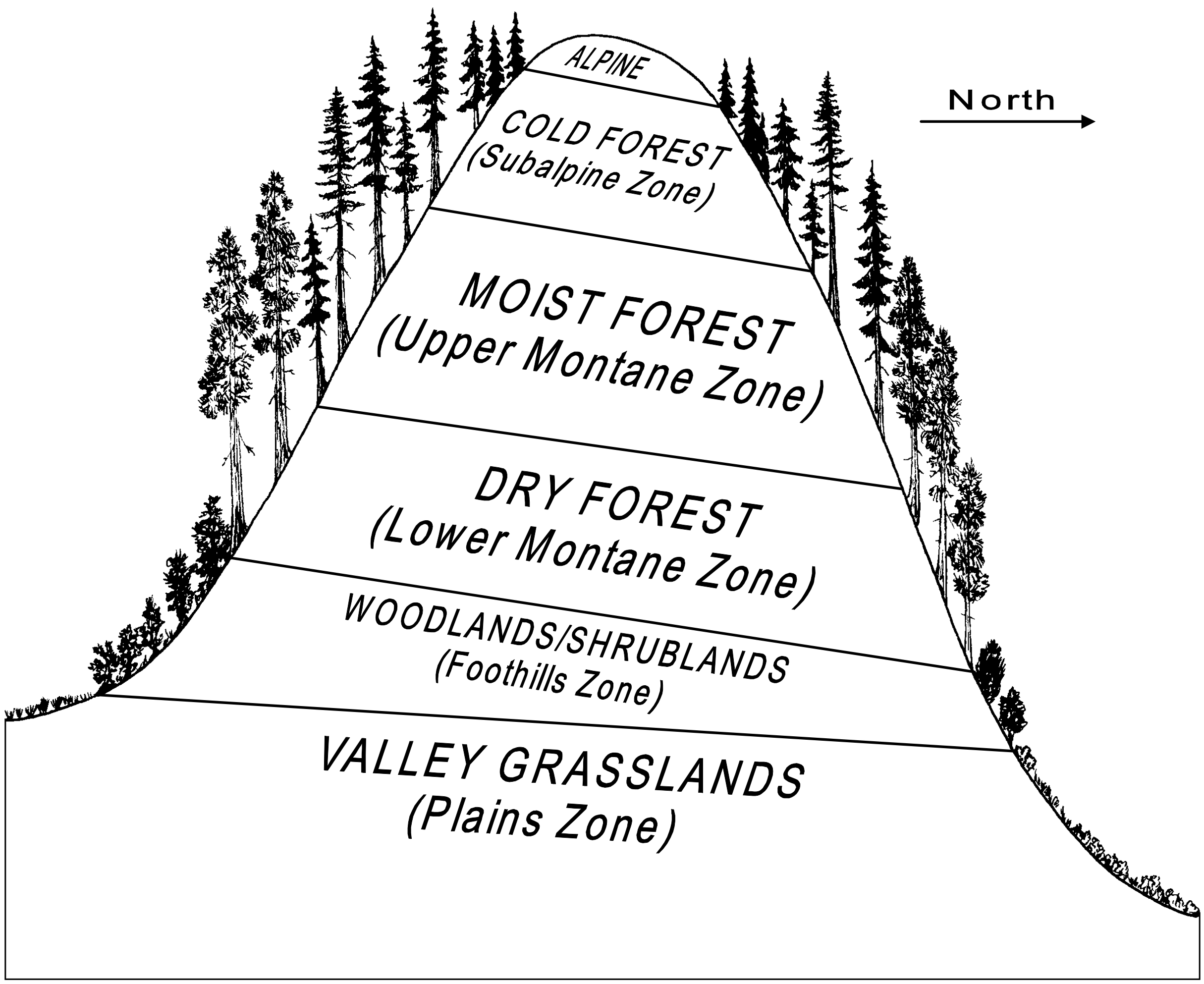

Figure 2 – Vegetation zones of the Blue Mountains (adapted from Powell 1996). Vegetation types tend to occur in zones as one moves up or down in elevation. In the Northern Hemisphere, a south-facing slope receives more solar radiation than a flat surface, and a north-facing slope receives less. Thus the same temperature conditions found on a plateau or bench may occur higher on an adjacent south-facing slope, and lower on a north aspect. Because of this, a particular vegetation type will be found above its ordinary elevational range on south slopes and below it on north slopes (Bailey 1996). The end result is shown above – vegetation zones arranged vertically in response to elevation (moisture), and sloping downward from south to north in response to slope exposure (temperature). Each of the three forest zones typically occupies about 2,000 feet of elevation, with the upper edge of a zone controlled by tolerance to low temperatures and the lower edge by tolerance to a lack of moisture. Note that these effects can be modified by the direction of moisture-bearing winds, by variations in fog or cloud cover, and by latitude since the marine climatic influence gradually deteriorates from north to south in the Blue Mountains. Also, fire suppression has blurred the historical zonation of forest vegetation; Douglas-fir, grand fir and Engelmann spruce have expanded their range to lower elevations over the last 90 years. **Valley grasslands** occur at low elevations where moisture is too limiting to support trees except along waterways. The **foothills zone** tends to be dominated by western juniper in the central and southern Blue Mountains, although shrublands (serviceberry, hawthorne, chokecherry, etc.) occupy this zone in the northern Blues where a marine climate prevails. **Dry forests** occur on warm dry sites where ponderosa pine, Douglas-fir or grand fir are the climax species. These sites were historically dominated by ponderosa pine because it is well adapted to survive a natural disturbance regime that features low-intensity wildfires occurring every 8 to 20 years. The **moist forest** zone is relatively common, especially in the northern Blue Mountains. It includes cool moist sites where Douglas-fir, grand fir or subalpine fir are the climax species. Lodgepole pine and western larch are common seral species. Western white pine occurs in this forest zone. **Cold forests** occur at high elevations in the subalpine zone and are dominated by forests of subalpine fir and Engelmann spruce. Lodgepole pine often forms persistent plant communities there. Above the cold-forest zone is a treeless **alpine zone**, although alpine environments are uncommon in the relatively low-elevation Blue Mountains.

Plant Succession and Disturbance.

Historically, many ecologists believed that vegetation develops according to a *relay floristics* pattern (Clements 1936). In relay floristics, a species or group of species invades after a *disturbance* and becomes dominant. As they mature, they cast shade, add organic matter to the soil, and cause other changes in the environment, which has the ironic effect of setting the stage for their eventual replacement by another species or group. This cycle continues until a species or group invades and is able to replace itself rather than being supplanted by other species. The model of one species following another in a "relay-like" progression is the foundation of the *plant succession* concept (Oliver and Larson 1996).

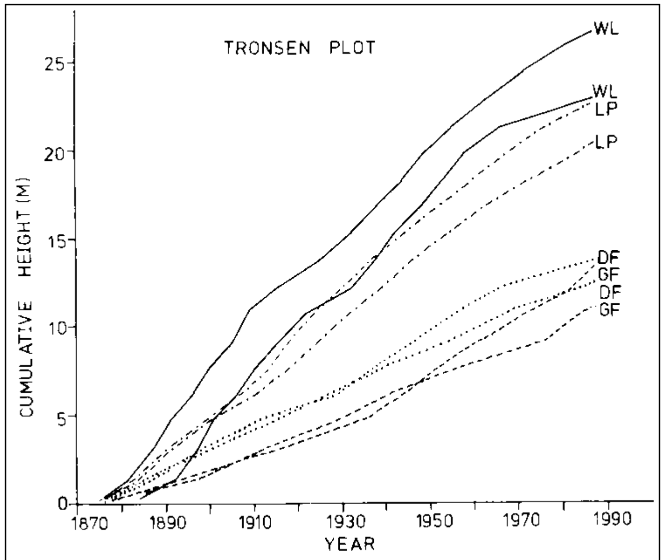

Figure 3 – Development of mixed-species, single-cohort (even aged) stands (from Cobb and others 1993).

After a major disturbance destroys the forest, relay floristics predicts that grasses and forbs would first invade the site, followed by shrubs that crowd out the herbs. Soon, certain tree species would displace the shrubs, and in the shade of the first trees other species would come in and eventually eliminate the original trees. Except for the first one, each stage in this progression depends on changes caused by the previous stage. What's important here is that the changes are not random or accidental – without the environmental modifications provided by an earlier stage, it is assumed that the plants associated with a later stage could not get established or survive.

Some sites support many different plant species following disturbance and develop according to an *initial floristics* pattern. In initial floristics situations, dominance is not determined by which species can invade first, but by the growth rates and development patterns of the different species (Oliver and Larson 1996). Since plants get established at approximately the same time, the development and structure of an initial-floristics community is directly related to how well each species can capitalize on the post-disturbance environment.

An example of initial floristics is mixed-species, single-cohort (even aged) forests containing a mix of early- and late-seral species. Since trees grow and develop at different rates, these stands gradually develop a multi-storied, stratified structure with the fast-growing western larches and lodgepole pines in the upper stratum, and the slower-growing Douglas-firs and grand firs in the lower stratum (Cobb and others 1993). Although stratified stands are often assumed to be uneven-aged (due to the relay floristics concept once again), the multi-storied structure of initial-floristics stands is simply the result of dramatically different growth rates for the early- and late-seral species (Figure 3 above).

Now, which of these concepts is correct, relay floristics or initial floristics? Actually, both of them are valid since both patterns occur in nature. Relay floristics occurs in situations experiencing *primary succession*, such as vegetation colonizing bare rock, landslides, glacial deposits, lava flows, and other areas that never supported plant life before. Since these substrates are uncommon, relay floristics is not a widespread development pattern.

Initial floristics is associated with *secondary succession*, which occurs when disturbance has modified or temporarily removed the vegetation from a site. Forest clearcuts, burned areas, windthrow pockets, budworm-killed stands, and abandoned agricultural fields are some examples of secondary succession. Since disturbance processes are widespread, initial floristics is an extremely common development pattern.

Potential natural vegetation develops when an area has been undisturbed long enough to produce a plant composition that reflects the environment. On many forest sites, the PNV is not present now – a *seral stage* resulting from fire, wind, or another disturbance process is currently occupying the area. In some instances, an early seral stage is a nonforest type such as grassland or shrubland; in others, it may be lodgepole pine or another forest type adapted to disturbance.

Seral vegetation is that which has not attained a steady state; other plants are replacing current populations of some species. Seral communities are categorized as early-seral, mid-seral, or late-seral, depending on how much time has passed since the last disturbance. Often, the plant composition varies for each of the seral stages. For example, table 17 portrays the composition associated with early-, mid-, and late-seral stages developing on grand fir plant associations in the Blue Mountains.

Some seral communities are very stable, especially those that developed in response to recurring disturbance. An example from the Blue Mountains is park-like ponderosa pine, a forest type with large, widely spaced trees growing above a dense undergrowth of tall grasses. These attractive landscapes had been created and maintained by low-intensity wildfires occurring every 8 to 20 years. On most sites that historically supported ponderosa pine, suppression of a recurrent disturbance process – natural underburning – had the unintended result of allowing grand firs and Douglas-firs to replace the pines.

Many late-seral stages persist for a long time and have been referred to as plant community types in vegetation classifications. Some plant community types refer to vegetation that may be climax, but about which there is uncertainty. Forest community types have one or more dominant tree species in the overstory, and a well-developed undergrowth. The undergrowth may reflect the climax composition, but the overstory dominants are often long-lived seral trees that exist because a previous disturbance favored their establishment instead of the climax species.

The interaction between disturbance processes and plant succession results in most tree species being able to fill several ecological roles. Ponderosa pine is a good example. On hot dry sites at low elevations, it is typically the climax species. On warm dry sites where Douglas-fir or grand fir are climax, ponderosa pine is a long-lived, seral dominant. On cool moist sites where grand fir or subalpine fir are climax, it is a minor or accidental species. And on cold dry sites at high elevations, ponderosa pine doesn't occur because it cannot survive in these ecological environments (Powell 1996).

Ecologists traditionally believed that ecosystems exist in a state of equilibrium, and that they return quickly to a condition of stability or homeostasis following disturbance. Recent research refutes that theory by showing that nature is in a continual state of flux. Change and turmoil, rather than constancy and balance, is the rule. We now know that the concept of a forest evolving to a stable (climax) stage, which then becomes its naturally permanent condition, is incorrect (Stevens 1990). Wild and human-caused fires, windstorms, insect outbreaks, disease epidemics, and other disturbances are the harbingers of change; they prevent many forest environments from ever reaching a climax seral stage.

Table 17: Seral-stage plant composition associated with grand fir plant associations.

	Early Seral Species			Mid Seral Species			Late Seral Species		
	Tree	Shrub	Herb	Tree	Shrub	Herb	Tree	Shrub	Herb
ABGR/ TABR/ CLUN	LAOC PIPO	CEVE RIVI	CIVU RUOC	PSME	SASC ALSI	THMO PTAQ FRVE	PIEN ABGR	LIBO2 TABR	ARCO THOC CLUN
ABGR/ ACGL	LAOC PIPO	CEVE RIVI	CIVU AGUR	PSME	SASC ALSI	ASCA7 PTAQ FRVE	PIEN ABGR	SYAL VAME ACGL	ARCO VIOR2
ABGR/ CLUN	PICO LAOC PIPO	CEVE RIVI	CIVU CARO RUOC	PSME	SASC ALSI	PTAQ FRVE	PIEN ABGR	VAME LIBO2	ARCO VIOR2 CLUN
ABGR/ LIBO2	PICO LAOC PIPO	CEVE ARNE RIVI	CIVU CARO	PSME	SASC ALSI	ASCA7 FRVE	PIEN ABGR	VASC VAME LIBO2	ARCO VIOR2
ABGR/ VAME	PICO LAOC PIPO	CEVE ARNE RIVI	CIVU CARO	PSME	SASC AMAL	LUPIN PTAQ FRVE	PIEN ABGR	SPBE VASC VAME	CAGE CARU THOC
ABGR/ VASC-LIBO2	PICO LAOC	ARNE SHCA	CIVU CARO	PSME	SASC ALSI	LUPIN FRVE	PIEN ABGR	VASC LIBO2	CAGE CARU
ABGR/ VASC	PICO LAOC PIPO	ARNE SHCA	CIVU CARO	PSME	SASC	LUPIN FRVE	PIEN ABGR	VASC	CAGE CARU
ABGR/ SPBE	PICO LAOC PIPO	CEVE ARNE	CIVU CARO	PSME	SASC	LUPIN PTAQ FRVE	ABGR	AMAL SPBE	CAGE CARU
ABGR/ CARU	PICO LAOC PIPO	CEVE ARNE RICE	CIVU CARO	PSME	SASC	LUPIN FRVE	ABGR	SYOR	CAGE CARU
ABGR/ CAGE	LAOC PIPO	CEVE ARNE	CIVU	PSME	CELE SASC	CARO	ABGR	SYOR	CAGE

Notes: Information derived from Clausnitzer (1993). Plant species codes are as follows – ABGR: Grand fir; ACGL: Rocky Mountain maple; AGUR: Horsemint; ALSI: Sitka alder; AMAL: Serviceberry; ARCO: Heartleaf arnica; ARNE: Pinemat manzanita; ASCA7: Canada milkvetch; CAGE: Elk sedge; CARO: Ross sedge; CARU: Pinegrass; CELE: Mountain mahogany; CEVE: Ceanothus; CIVU: Bull thistle; CLUN: Queen-cup beadlily; FRVE: Woods strawberry; LAOC: Western larch; LIBO2: Twinflower; LUPIN: Lupine; PICO: Lodgepole pine; PIEN: Engelmann spruce; PIPO: Ponderosa pine; PSME: Douglas-fir; PTAQ: Bracken; RICE: Wax currant; RIVI: Sticky currant; RUOC: Western coneflower; SASC: Scouler willow; SHCA: Russet buffaloberry; SPBE: Birchleaf spirea; SYAL: Common snowberry; SYOR: Mountain snowberry; TABR: Pacific yew; THMO: Mountain thermopsis; THOC: Western meadowrue; VAME: Big huckleberry; VASC: Grouse huckleberry; VIOR2: Round-leaved violet.

Management Implications.

It is important to understand that forests are more than timber stands – they are complexes of living organisms that interact not only with each other, but also with their environment. These complexes are called ecosystems. There are many kinds of ecosystems, but not an infinite number and one soon learns that similar ecosystems occur repeatedly across the landscape. It has been found that similar ecosystems (plant associations) respond in much the same way to a particular management practice. The response of an ecosystem to a practice or activity has been termed a *management implication*, as explained below:

- **Developing reforestation recommendations**. In the old days, foresters typically planted the same species that were harvested, often not realizing that late-seral trees are poorly adapted to post-harvest conditions. Sometimes, they planted a commercially valuable species where it couldn't survive and grow, such as ponderosa pine on cold or wet sites. Knowing the successional status of each tree species that occurs in a plant association can greatly improve reforestation success.
- **Prescribing silvicultural treatments**. One of the most challenging aspects of silviculture is the choice of a regeneration cutting method because it controls canopy openings, shading, and ultimately the species composition of a new stand. Many silvicultural implications, including natural regeneration probabilities and seed-seedling ratios, are tied to plant associations or habitat types.
- **Anticipating response to fire**. The vegetative response to wildfire or another disturbance will vary, but can be predicted with relative certainty (Crane and Fischer 1986). Consider ponderosa pine – burning could create delightful stands of grass, all of the browse that deer and elk could ever want, an abundance of little pine trees, or an understory free of invading grand fir. It mostly depends on which plant association is being burned!
- **Responding to insect and disease risk**. Recent research identified the vegetation types that are most susceptible to Armillaria root disease and certain other pathogens or insects (Steele and others 1996). By considering such information when planning a treatment, land managers can minimize future insect or disease risk by favoring resistant species or modifying the treatment parameters.
- **Identifying site capability and productivity**. PNV is an ideal tool for land stratification because many plant associations encompass a relatively narrow range of site productivity. For that reason, the Forest Vegetation Simulator (FVS) and many other computer models use plant association as an important measure of site quality. It is likely that our next Forest Plan will base yield tables and other response variables on a PNV hierarchical level (PAGs or PVGs).
- **Assessing tree stocking**. Manipulation of stocking levels has important impacts on stand development and the appearance of future forest landscapes. Suggested stocking levels were recently developed for all plant associations in the Blue Mountains and the Wallowa-Snake province (Cochran and others 1994). Plant associations are also valuable for identifying sites with limited capacity for tree growth – a situation called "low inherent stockability."

Glossary

Climax. The culminating seral stage in plant succession for any given site where, in the absence of catastrophic disturbances, the vegetation has reached a highly stable condition and undergoes change very slowly (Dunster and Dunster 1996). A self-replacing community that is relatively stable over several generations of the dominant plant species, or very persistent in comparison to other seral stages (Kimmins 1997).

Ecological amplitude. The degree to which an organism can tolerate variations in environmental conditions (Dunster and Dunster 1996).

Ecological environments. The composite temperature and moisture condition resulting from a combination of edaphic and physiographic factors (soil, aspect, elevation, topographic position, etc.). A steep, south-facing slope at 5,000 feet elevation could be an equivalent ecological environment to a moderate, north-facing slope at 4,000 feet (Powell 1996).

Ecological niche. An organism's actual place within a community, including its tolerances for the physical environment, its interactions with other organisms, and the manner in which it uses the component parts of its habitat. Ecological niche is analogous to ecological range, which describes the range of environmental conditions within which an organism can live and survive (Dunster and Dunster 1996).

Habitat type. A basic ecological unit in classifying lands based on potential natural vegetation. It represents, collectively, all parts of the landscape that support, or have the capability to support, the same plant association (Alexander 1985). In effect, habitat types are mapping or land classification units; plant associations are their descriptors or taxonomic labels. See also *plant association* and *potential natural community*.

Indicator plant. Plant species that convey information about the ecological nature of a site, such as the nitrogen content of a soil, its alkalinity or acidity, etc. A plant species that has a sufficiently consistent association with some environmental condition or other species so that its presence can be used to indicate or predict the environmental condition or the potential for that other species (Kimmins 1997).

Initial floristics. A successional pathway in which the pattern of seral stages is determined by the particular mixture of species that arrive, or are already present, in an ecosystem after disturbance. The later successional species do not require environmental alteration by the early successional species (Kimmins 1997).

Management implications. An index or attribute that can be quantified to determine the success of implementing land management planning guidelines. An example is the use of wildlife indicator species (Dunster and Dunster 1996).

Plant association. A plant community with similar physiognomy (form and structure) and floristics; commonly it is a climax community (Allaby 1994). It is believed that 1) the individual species in the association are, to some extent, adapted to each other; 2) the association is made up of species that have similar habitat requirements; and 3) the association has some degree of integration (Kimmins 1997). See also *habitat type* and *potential natural community*.

Plant association group. Groupings of plant associations that represent similar ecological environments; synonymous with ecological settings or biophysical environments.

Plant community type. An aggregation of all plant communities with similar structure and floristic composition. A vegetation classification unit with no particular successional status implied (Dunster and Dunster 1996).

Plant succession. The process by which a series of different plant communities and associated animals and microbes successively occupy and replace each other over time in a particular ecosystem or landscape location following a disturbance to that ecosystem (Kimmins 1997).

Potential natural community. The community of plants that would become established if all successional sequences were completed, without interference by people, under existing environmental conditions. Existing environmental conditions incorporate the current climate and eroded or damaged soils (Hall and others 1995). See also *habitat type* and *plant association*.

Potential natural vegetation. The vegetation that would develop if all successional sequences were completed under the present site conditions (Dunster and Dunster 1996). See also *potential natural community*.

Potential vegetation group. A group of potential vegetation types that have similar environmental conditions and are dominated by similar types of plants. Groupings are often made using similar life forms.

Primary succession. Successional development of an ecosystem beginning after a disturbance that has removed all of the modifications to microclimate and the geological substrate produced by the previous succession. Succession on bare rock, in shallow lakes, or on parent soil materials (Kimmins 1997).

Relay floristics. A pathway of primary succession in which early seral communities alter the soil and microclimate in a way that facilitates the invasion and growth of subsequent seral communities. The early stages of this pathway are typically predictable and invariable. Mid seral stages often require the prior occupancy of the site by the pioneer stages before they can become established (Kimmins 1997).

Secondary succession. Succession that begins in an environment that has already been more or less modified by a period of occupancy by living organisms. Forest clearcuts and abandoned agricultural fields both undergo secondary succession (Kimmins 1997).

Seral stage. The identifiable stages in the development of a sere, from an early pioneer stage, through various early and mid-seral stages, to late seral, subclimax, and climax stages. The stages are identified by different plant communities, different ages of the dominant vegetation, and by different microclimatic, soil and forest conditions (Kimmins 1997).

Series. A level in the potential vegetation hierarchy that represents major environmental differences reflected by distributions of tree species at climax. A series is named for the projected climax tree species – the grand fir series includes all plant associations where grand fir is presumed to be the dominant tree species at climax.

Tolerance. A forestry term expressing the relative ability of a plant (tree) to complete its life history, from seedling to adult, under the cover of a forest canopy and while experiencing competition with other plants (Harlow and others 1996).

Union. A group of plant species that is used to represent a particular ecological environment or microclimatic condition; usually consisting of multiple species with a similarity in lifeform, phenology, stature, or a somewhat coextensive distribution in a local vegetation mosaic. The union includes only a fraction of the total floristic composition for a vegetation type – only the combination of species that is useful for vegetation classification purposes is designated as a union (Daubenmire 1968).

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APPENDIX: 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
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

Paper #	Title
34	Silvicultural activities: Description and terminology
35	Site potential tree height estimates for the Pomeroy and Walla Walla Ranger Districts
36	Stand density protocol for mid-scale assessments
37	Stand density thresholds as 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
58	Seral status for tree species of Blue and Ochoco Mountains

REVISION HISTORY

June 1998: First version of "Potential Natural Vegetation of Umatilla National Forest" report was prepared in December 1997 and circulated to some Umatilla NF employees for their review. Review comments were incorporated into the report before publishing a final version in June 1998.

January 2017: Minor formatting and editing changes were made during this revision, including adding a white-paper header and assigning a white-paper number. An appendix was added describing a silviculture white paper system, including a list of available white papers. A short Introduction section was also added.