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Description of Composite Vegetation Database

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Maps are used to represent landscape and forest conditions. Increasingly, maps are created by using a geographical information system (GIS), which is defined as computer hardware, software, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display geospatial data defining the location of features or objects on the ground. Relational databases are often linked to geospatial data; they describe the characteristics (attributes) of each feature. In fact, the primary strength of a GIS is its ability to link map features to a database containing information about each feature (vegetation data for wildland polygons, for example).

Between January and July of 2001, a GIS coverage and associated vegetation database was compiled for the Umatilla National Forest. It contains characterization information for 29,634 polygons (a polygon is a series of line segments defined by x,y coordinates (vectors) that completely encloses an area; see glossary). The vegetation database is referred to as 'Composite' because characterization information was a composite of two data sources: remote sensing (interpretation of aerial photography) and field surveys (walk-throughs and stand examinations).

Since the database was compiled from multiple sources, numerous GIS coverages and their related databases were used during its compilation.[1] The Forest's existing vegetation (EVG) system (a GIS coverage and an Access database) supplied photo-interpretation data; stand examination GIS coverages (organized by Ranger District and year), and a Natural Resource Information System (NRIS) database called Field Sampled Vegetation (FSVeg), supplied stand exam data; EVG supplied walk-through data; and Pomeroy Ranger District updates for recent timber harvest activity supplied other information.

Impetus to create a composite database was a need to designate (map) vegetative habitat for Canada lynx, a threatened species under the Endangered Species Act. Although a lynx habitat map was the first product from Composite, it certainly won't be the last one. For example, Composite was recently used during a watershed prioritization effort (USDA Forest Service 2002b), and it will be used in the future for ecosystem analysis at the watershed scale (REO 1995),

[1] Appendix 1 describes how the composite database GIS coverage was developed.

forest health or insect and disease analyses (Schmitt and Powell 2005), wildfire risk assessments, operational (project) planning, and broad-scale (strategic) assessments.

To improve database usability, a flat-file or spreadsheet format was developed; information for an individual polygon is stored in one record (like a row in a spreadsheet) containing many different fields (like the columns in a spreadsheet). This format differs from a normalized approach where records for an individual polygon can be dispersed across many tables. In a normalized structure, for example, a polygon with three vegetation layers would have at least three data records – one record in each of three layer tables. Experience has repeatedly shown that a spreadsheet format is simpler and more intuitive for users lacking high-level database skills.

An objective of this document is to provide a data dictionary for a flat-file version of the Composite vegetation database – each database field and its codes are described.

Database fields and their descriptions are grouped into four broad categories in this document: geographical and physical data (page 2), potential vegetation data (page 4), existing vegetation data (page 5), and calculated (derived) data (page 11).

1. GEOGRAPHICAL AND PHYSICAL DATA

Polygon Number (**Poly** is the database field name): Polygons were numbered consecutively by using Arc geographical information system software.

Standtag (Standtag): Standtag is used to establish a link between GIS polygons and their associated database information. For photo-interpreted polygons, standtag came from EVG and will vary from a 7-digit (1-digit District code, 2-digit year of survey, consecutive 4-digit poly number) to a 10-digit identifier (1-digit District code, 2-digit quadrangle number, 1-digit north or south quad-half designator, PI for type of survey, 4-digit poly number). For other survey types, a standtag entry may not exist in the database.

Polygon Area (Acres): Total acreage within a polygon boundary; calculated by using Arc GIS software. Note that non-National Forest System (NFS) lands (private land) are frequently (but not always) delineated as separate polygons; NFS and private lands are generally not mixed in the same polygon. Note that during compilation of a GIS polygon coverage, any sliver polygons smaller than two acres were merged with their most similar adjacent neighbor.

Aspect (Asp1; Asp2): A derived field providing mean aspect for a polygon; calculated by Arc GIS software from a 30-meter digital elevation model (DEM). Value is an average of azimuth calculations, in degrees, for 30-meter DEM cells located within a polygon. Azimuth value (Asp1) was converted to a compass direction (Asp2) by using this relationship:

Code	Description
LE	Level (sites with no aspect; slope percents <5%)
NO	North (Asp1 azimuths >338° and ≤23°)
NE	Northeast (Asp1 azimuths >23° and ≤68°)
EA	East (Asp1 azimuths >68° and ≤113°)
SE	Southeast (Asp1 azimuths >113° and ≤158°)
SO	South (Asp1 azimuths >158° and ≤203°)
SW	Southwest (Asp1 azimuths >203° and ≤248°)
WE	West (Asp1 azimuths >248° and ≤293°)
NW	Northwest (Asp1 azimuths >293° and ≤338°)

Elevation (Elev): A derived field providing mean elevation for a polygon, in feet; calculated by Arc GIS software from a 30-meter digital elevation model (DEM). Value is an average for 30-meter DEM cells located within a polygon.

Slope Percent (Slope): A derived field providing mean slope gradient for a polygon, in percent; calculated by Arc GIS software from a 30-meter digital elevation model (DEM). Value is an average for 30-meter DEM cells located within a polygon.

Slope Curvature (Curv1; Curv2): A derived field relating to shape (concavity or convexity) of a land surface. Values of curvature can range between –14 and +14 with most areas on a landscape falling between –4 and +4. Curvature is a relative measure where negative values represent concave surfaces and positive values are convex landforms. As values approach zero, the terrain becomes flat (smooth). This field was derived from 30-meter DEMs. Curvature value (Curv1) was converted to a surface configuration code (Curv2) by using this relationship:

Curv1 Value	Curv2 Description	Curv2 Code
<-2	Highly concave polygons	Hconcave
<-1	Concave polygons	Concave
<1	Flat/smooth polygons	Flat
<2	Convex polygons	Convex
≥2	Highly convex polygons	Hconvex

Watershed Number (HUC5): Watershed numbers were added to the database during a watershed prioritization process completed during summer 2001 (USDA Forest Service 2002b). Watershed numbers are standard hydrologic unit code (HUC) designators for watersheds (fifth-field coding in a hydrologic unit hierarchy). Note that polygons were not subdivided (split) by using watershed boundaries; when a polygon spans more than one watershed, the predominant watershed is coded in this field. These 36 watershed codes exist in the Composite database:

Code	Description
1706010302	Asotin Creek/George Creek
1706010303	Asotin Creek
1706010402	Meadow Creek
1706010404	Grande Ronde River/State Ditch
1706010409	Willow Creek
1706010410	Lookingglass Creek
1706010411	Grande Ronde River/Cabin Creek
1706010601	Grande Ronde River/Grossman Creek
1706010603	Wenaha River
1706010607	Lower Grande Ronde River
1706010705	Upper Tucannon River
1706010706	Tucannon River/Pataha Creek
1707010201	Upper Walla Walla River
1707010202	Mill Creek
1707010203	Upper Touchet River
1707010301	Upper Umatilla River
1707010302	Meacham Creek
1707010303	Umatilla River/Mission Creek
1707010306	Birch Creek
1707010309	Upper Butter Creek
1707010401	Upper Willow Creek
1707010403	Rhea Creek
1707020201	Upper North Fork John Day River
1707020202	Granite Creek

Code	Description
1707020203	North Fork John Day River/Big Creek
1707020204	Desolation Creek
1707020205	Upper Camas Creek
1707020206	Lower Camas Creek
1707020207	North Fork John Day River/Potamus Creek
1707020208	Wall Creek
1707020210	Lower North Fork John Day River
1707020302	Galena
1707020305	Middle Fork Granite to Big Creek
1707020306	Lower Middle Fork
1707020401	Lower John Day River/Kahler Creek
1707020411	Upper Rock Creek

Climatic Regime (Climate): Broad-scale climatic regimes were added to the database during a watershed prioritization process completed during summer 2001 (USDA Forest Service 2002b). Regime coding was based on the watershed field because an entire watershed was assigned to only one climatic regime. Three broad climatic regimes are coded, as based on Caraher and others (1992):

Code	Description
Continental	Climatic regime characterized by a relatively warm, dry climate
Marine	Climatic regime characterized by a relatively cool, moist climate
Mixed	Climatic regime characterized by a mix of marine and continental climates

2. POTENTIAL VEGETATION DATA

Potential Vegetation Type (Ecoclass): A potential vegetation type (plant association, plant community type, plant community, or series) was recorded for each polygon (Hall 1998). Note that due to the absence of a field survey, most PI polygons provide a 2-digit series code in this field (e.g., CA, CD, FM, etc.). When necessary, all ecoclass coding was changed to agree with a recently approved list of Blue Mountains ecoclass codes (see appendix 2).

Potential Vegetation Data Source (EcoSrc): This field provides a data source from which an ecoclass code was derived.

Code	Description
CJ	Ecoclass code derived from a reconnaissance survey of 810 polygons by Area Ecologist Charlie Johnson in August and September of 1999
NA	Not applicable (used for private land and administrative site polygons only)
NF	Ecoclass code derived from historical stand exam layers for the North Fork John Day Ranger District
PI	Ecoclass (series) code assigned by contractors during 1990 or 1998 photo interpretation contracts, or estimated to a 2-digit series code by using existing vegetation data (note that estimated series codes were used primarily to replace CX coding (conifer unknown) from the 1990 PI contract)
PU	Ecoclass code derived by using a “most similar neighbor” approach for Pomeroy RD harvest unit updates; most similar neighbors were walk-thru exams completed in the Asotin and Tucannon watersheds during 1993-1995
SE	Ecoclass code derived from stand examinations completed between 1986 and 2000
WT	Ecoclass code derived from walk-through field surveys (primarily pertaining to Pomeroy’s watershed surveys for the Asotin and Tucannon drainages, 1993-1995)

Plant Association Group (PAG): A derived field based on data in the ecoclass field; refer to appendix 2 for a crosswalk table showing how ecoclass codes were assigned to PAGs. Note that PAG is often not included in Composite (due to the number of polygons lacking a high-resolution ecoclass code), but it is often available for analysis-area databases.

Potential Vegetation Group (PVG): A derived field based on data in the ecoclass field; refer to appendix 2 for a crosswalk table showing how ecoclass codes were assigned to PVGs. Polygons with a 2- or 4-digit series or lifeform code were also assigned a PVG code, but assignments were somewhat subjective. These PVG codes are used in Composite:

Code	Description
Admin	Administrative sites (AB, AR, AX ecoclass codes)
Cold UF	Cold Upland Forest PVG
Cold UH	Cold Upland Herbland PVG
Cold US	Cold Upland Shrubland PVG
Dry UF	Dry Upland Forest PVG
Dry UH	Dry Upland Herbland PVG
Dry US	Dry Upland Shrubland PVG
Low SM RH	Low Soil Moisture Riparian Herbland PVG
Mod SM RH	Moderate Soil Moisture Riparian Herbland PVG
Moist UF	Moist Upland Forest PVG
Moist UH	Moist Upland Herbland PVG
Moist US	Moist Upland Shrubland PVG
Moist UW	Moist Upland Woodland PVG
Nonveg	Non-vegetated sites (NF, NR, NT ecoclass codes)
PVT	Private land polygons
Water	Water sites (WL, WR ecoclass codes)

3. EXISTING VEGETATION DATA

Existing Vegetation Data Source (VegSrc): This field provides a data source from which existing vegetation information was derived.

Code	Description
NA	Not Applicable (used for private land and administrative site polygons only)
PI	Existing vegetation characteristics derived from photo interpretation
PU	Existing vegetation characteristics determined by Pomeroy Ranger District personnel during a harvest-unit update project
SE	Existing vegetation characteristics determined by extracting stand exam data from FSVeg, and then running it through the Forest Vegetation Simulator (FVS) to calculate canopy strata and per-acre polygon attributes by using the StrClass keyword (see Crookston and Stage 1999)
WT	Existing vegetation characteristics derived from a walk-through field exam (primarily relates to Pomeroy's watershed surveys for Asotin and Tucannon drainages, 1993-1995)

Existing Vegetation Lifeform (Lifeform): As used typically with photo-interpretation surveys, this field characterizes predominant existing vegetation composition for a polygon; codes are taken from USDA Forest Service (2002b). Note that this is a non-standard use of the lifeform term because lifeform typically relates to potential vegetation, not existing vegetation.

Code	Description
1. WATER TYPES (Water)	
WE	Estuary systems – interface between fresh and saline water

Code	Description
WL	Lake, pond, impoundment, non-moving water
WO	Oceans, seas, saline water bodies
WR	Running water – streams, creeks, rivers, ditches
WX	Other water

2. ADMINISTRATIVE OR AGRICULTURE TYPES (Nonvegetated land)

AB	Buildings, structures, roads
AC	Cultivated land
AD	Dump for garbage, etc.
AG	Grassland, permanent pasture
AO	Orchards (seed orchards)
AR	Recreation areas, parks, play areas, golf courses
AX	Other administrative and agriculture

3. NONVEGETATED TYPES (Nonvegetated land)

NC	Cinders, lava flow, mudflow, glacial outwash
NF	Floodplain periodically denuded of vegetation
NI	Ice fields, glaciers, ice caves
NL	Landform failure (natural slumps, avalanches)
NM	Mine tailings; dredge piles; other man-caused minimal vegetation potential
NR	Rocky land with minimal vegetation potential
NS	Sand with minimal vegetation, whether shoreline or interior
NT	Talus or scree land (rock slides) with minimal vegetation potential
NX	Other nonvegetated land

4. FORB TYPES (Nonforest land)

FM	Moist forblands in the forest zone
FS	Subalpine forb fields, alpine forb fields
FW	Wet forblands, forb meadows
FX	Other forblands

5. GRASS TYPES (Nonforest land)

GA	Annual grass vegetation
GB	Bunchgrass vegetation
GM	Moist grassland within the forest zone
GR	Rhizomatous grass or sedge vegetation
GS	Subalpine or alpine grassland
GX	Other grassland

6. MEADOW TYPES (Nonforest land)

MD	Dry meadow (water table available part of the season)
MM	Moist meadow (water table available all growing season)
MS	Subalpine/alpine moist to wet meadows
MT	Tule meadow (standing water most of all growing season)
MW	Wet meadow (surface moist or wet all growing season)
MX	Other meadow

7. SHRUB TYPES (Nonforest land)

SC	Chaparral, evergreen shrubland, forest zone and non-forest
SD	Dry shrubland, sagebrush, non-forest zone shrubland
SM	Moist shrubland, forest zone shrubs and shrubland

Code	Description
SS	Alpine and subalpine shrubland
SW	Wet shrubland, shrub meadows
SX	Other shrubland

8. FOREST TYPES (Forest land)

CA	Subalpine fir is predominant
CB	Whitebark pine is predominant
CD	Douglas-fir is predominant
CE	Engelmann spruce is predominant
CJ	Western juniper is predominant
CL	Lodgepole pine is predominant
CM	Mountain hemlock is predominant
CN	Coniferous nonstocked area (recently deforested areas such as wildfires, etc.)
CP	Ponderosa pine is predominant
CT	Western larch (tamarack) is predominant
CW	Grand fir is predominant
CX	Coniferous forest (no specific species predominance)
HC	Black cottonwood is predominant
HN	Hardwood nonstocked area (recently deforested areas such as wildfires, etc.)
HQ	Quaking aspen is predominant
HX	Hardwood forest (no specific species predominance)

Clumpiness (Clumpy): Clumpiness is provided for forest polygons only. Clumpy condition exists for a forest polygon when the following conditions are met: (1) polygon has inclusions of less than 2 acres that differ from the rest of the polygon; (2) tree canopy cover of inclusions varies by 30% or more from remainder of the polygon; and (3) in aggregate, inclusions comprise 20% or more of total polygon area. The clumpy field uses the following codes:

Code	Description
N	No clumpiness; continuous, non-clumpy forest distribution
L	Low or widely scattered clump distribution (<30% of polygon area)
M	Moderate clump distribution (30-70% of polygon occupied by clumps)
H	High (dense) clump distribution (>70% of polygon occupied by clumps)

Snags (SnagS, SnagM, SnagL). Snags are evaluated for forest polygons only. This data item is the number of snags, recorded for three diameter (DBH) classes, *for the total polygon area*:

Field	Example Coding	Description
SnagS	015	15 snags in the small-diameter snag class (< 12" DBH)
SnagM	065	65 snags in the medium-diameter snag class (12-21")
SnagL	109	109 snags in the large-diameter snag class (> 21")

Nontree Cover (NtCov): For vegetated polygons providing data for nontree vegetation (shrubs and/or herbs), this derived field contains the sum of canopy cover values for nontree layers only (layer 4 and 5 cover values for shrubs and herbs, respectively).

Nonvegetated Cover (NvCov): For polygons where the entire ground surface is not obscured by plant foliage (these areas include bare ground or rock outcrop), this field provides the “cover” associated with nonvegetated portions. Note that when cover values for trees (TrCov), nontree vegetation (NtCov), and nonvegetated areas (NvCov) are summed, the result must always equal 100% (e.g., it should never be less than, or greater than, 100%).

Hardwoods (HardSp). For each vegetated polygon (nonforest and forest), newer photo-interpretation surveys record presence of hardwood inclusions within other vegetation types. Note that if a contiguous hardwood inclusion exceeds a minimum polygon size (1 acre for shrub-size hardwoods and 2 acres for tree-size hardwoods), the inclusion should have been delineated as a separate polygon.

Code	Description
N	No hardwoods are apparent or visible in the stand
ALNUS	Alders
BETULA	Birches
MIXED	Mixed hardwood composition (more than one predominant species)
OTHER	Other hardwoods not listed here (dogwood, elder, maple, etc.)
POTR5	Quaking aspen
POBAT	Black cottonwood
PRUNUS	Cherries
SALIX	Willows

Hardwood Size Class (HardSiz). For each vegetated polygon (nonforest and forest) for which "hardwood species" was coded (e.g., any HardSp code other than N), this field provides predominant size class of the hardwoods by using these codes:

Code	Description
3	Saplings, trees 1.0-4.9″ DBH
5	Poles, trees 5.0-8.9″ DBH
77	Small trees, 9.0-15.9″ DBH
88	Small trees, 16.0-20.9″ DBH
9	Medium trees, 21.0-31.9″ DBH
11	Large trees, 32.0-47.9″ DBH
13	Giant trees, 48.0″ DBH or greater
99	Non-tree size hardwoods (hardwood shrubs not attaining tree size). A tree is defined as vegetation with a woody stem at least 3 inches in diameter (or 9.4 inches in circumference) at breast height (4½ feet above average ground level), and at least 13 feet tall.

Canopy Layers (Layers): Number of canopy layers was recorded for all vegetation polygons in the Composite database, as described below:

Code	Description
1	1 layer present
2	2 layers present
3	3 layers present
4	4 layers present
5	5 layers present

Vegetation tends to occur in layers or strata relating to vertical stature (height) of its plant composition. Sometimes, these strata reflect differences in lifeform – trees tend to be taller than shrubs, and shrubs tend to be taller than herbs. In other instances, layering reflects a difference in plant development – old trees tend to be taller than mid-age trees, which tend to be taller than young trees.

Since layering is important for characterizing wildlife habitat and for other purposes, many vegetation characteristics are stored by layer.

No more than three layers are included in the database for older photo-interpretation polygons; table 1 shows the various combinations of layer-data coding available for older, photo-interpretation surveys.

Table 1: Coding combinations for layer fields and their interpretation (these combinations pertain to older photo-interpretation surveys with no more than 3 layers coded).

	Layer A	Layer B	Layer C	Comment/Interpretation
SINGLE LAYER POLY-GONS	1			Trees only
	4			Shrubs only
	5			Herbs only
TWO LAYER POLY-GONS	1	2		Trees only
	1	4		Trees over shrubs
	1	5		Trees over herbs
	4	5		Shrubs over herbs
THREE LAYER POLY-GONS	1	2	3	Trees only
	1	2	4	Two tree layers over shrubs
	1	2	5	Two tree layers over herbs
	1	4	5	One tree layer over shrubs and herbs

Layer A (LayA): This field records the most predominant lifeform associated with a layer (predominance is based on vegetation height by using a top-down approach). This field is blank for private, administrative, non-vegetated, or Pomeroy RD harvest-update polygons.

Code	Description
1	Most predominant lifeform for the layer is dominated by trees
4	Most predominant lifeform for the layer is dominated by shrubs
5	Most predominant lifeform for the layer is dominated by herbs (graminoids/forbs)

Cover for Layer A (CovA): For vegetated polygons, canopy cover associated with layer A was recorded in this field. This field is blank for private, administrative, non-vegetated, or Pomeroy RD harvest-update polygons.

Size Class for Layer A (SizA): For polygons where trees are predominant in layer A (e.g., LayA code is 1), a predominant tree size class for layer A was recorded in this field. This field is blank for private, administrative, non-vegetated, or Pomeroy RD harvest-update polygons.

Code	Description
1	Seedlings; trees less than 1 inch DBH
2	Seedlings and saplings mixed
3	Saplings; trees 1-4.9″ DBH
4	Saplings and poles mixed
5	Poles; trees 5-8.9″ DBH
6	Poles and small trees mixed
6.5	Small trees 9-14.9″ DBH (previous code was 77)
7	Small trees 9-20.9″ DBH
7.5	Small trees 15-20.9″ DBH (previous code was 88)
8	Small and medium trees mixed
9	Medium trees 21-31.9″ DBH
10	Medium and large trees mixed
11	Large trees 32-47.9″ DBH

Layer A Species (Sp1A, Sp2A, Sp3A): For vegetated polygons, one or more plant species codes were recorded in these fields. It is assumed that species are coded in decreasing order of

predominance; Sp1A is more predominant than Sp2A, which is more predominant than Sp3A (see “Existing Cover Type” narrative for more information about species precedence). Species codes stored in these fields are alphanumeric (PIPO for ponderosa pine) and follow coding nomenclature established by the national PLANTS database (http://plants.usda.gov). This field is blank for private, administrative, non-vegetated, or Pomeroy RD harvest-update polygons.

Layer B (LayB): This field records the most predominant lifeform associated with the second layer (predominance is based on vegetation height by using a top-down approach). This field is blank for private, administrative, non-vegetated, or Pomeroy RD harvest-update polygons.

Code	Description
2	Most predominant lifeform for the layer is dominated by trees
4	Most predominant lifeform for the layer is dominated by shrubs
5	Most predominant lifeform for the layer is dominated by herbs (graminoids/forbs)

Cover for Layer B (CovB): For vegetated polygons, canopy cover associated with layer B was recorded in this field. This field is blank for private, administrative, non-vegetated, or Pomeroy RD harvest-update polygons.

Size Class for Layer B (SizB): For polygons where trees are the predominant lifeform in layer B (LayB code is 2), predominant size class for layer B was recorded in this field. This field is blank for private, administrative, non-vegetated, or Pomeroy RD harvest-update polygons.

Code	Description
1	Seedlings; trees less than 1 inch DBH
2	Seedlings and saplings mixed
3	Saplings; trees 1-4.9″ DBH
4	Saplings and poles mixed
5	Poles; trees 5-8.9″ DBH
6	Poles and small trees mixed
6.5	Small trees 9-14.9″ DBH (previous code was 77)
7	Small trees 9-20.9″ DBH
7.5	Small trees 15-20.9″ DBH (previous code was 88)
8	Small and medium trees mixed
9	Medium trees 21-31.9″ DBH
10	Medium and large trees mixed
11	Large trees 32-47.9″ DBH

Layer B Species (Sp1B, Sp2B, Sp3B): For vegetated polygons, one or more plant species codes were recorded in these fields. It is assumed that species are coded in decreasing order of predominance; Sp1B is more predominant than Sp2B, which is more predominant than Sp3B (see “Existing Cover Type” narrative for more information about species precedence). Species codes stored in these fields are alphanumeric (PIPO for ponderosa pine) and follow coding nomenclature established by the national PLANTS database (http://plants.usda.gov). This field is blank for private, administrative, non-vegetated, or Pomeroy RD harvest-update polygons.

Layer C (LayC): This field records the most predominant lifeform associated with the third layer (predominance is based on vegetation height by using a top-down approach). This field is blank for private, administrative, non-vegetated, or Pomeroy RD harvest-update polygons.

Code	Description
3	Most predominant lifeform for the layer is dominated by trees
4	Most predominant lifeform for the layer is dominated by shrubs
5	Most predominant lifeform for the layer is dominated by herbs (graminoids/forbs)

Cover for Layer C (CovC): For vegetated polygons, canopy cover associated with layer C was recorded in this field. This field is blank for private, administrative, non-vegetated, or Pomeroy RD harvest-update polygons.

Size Class for Layer C (SizC): For polygons where trees are the predominant lifeform in layer C (LayC code is 3), predominant size class for layer C was recorded in this field. This field is blank for private, administrative, non-vegetated, or Pomeroy RD harvest-update polygons.

Code	Description
1	Seedlings; trees less than 1 inch DBH
2	Seedlings and saplings mixed
3	Saplings; trees 1-4.9″ DBH
4	Saplings and poles mixed
5	Poles; trees 5-8.9″ DBH
6	Poles and small trees mixed
6.5	Small trees 9-14.9″ DBH (previous code was 77)
7	Small trees 9-20.9″ DBH
7.5	Small trees 15-20.9″ DBH (previous code was 88)
8	Small and medium trees mixed
9	Medium trees 21-31.9″ DBH
10	Medium and large trees mixed
11	Large trees 32-47.9″ DBH

Layer C Species (Sp1C, Sp2C, Sp3C): For vegetated polygons, one or more plant species codes were recorded in these fields. It is assumed that species are coded in decreasing order of predominance; Sp1C is more predominant than Sp2C, which is more predominant than Sp3C (see “Existing Cover Type” narrative for more information about species precedence). Species codes stored in these fields are alphanumeric (PIPO for ponderosa pine) and follow coding nomenclature established by the national PLANTS database (http://plants.usda.gov). This field is blank for private, administrative, non-vegetated, or Pomeroy RD harvest-update polygons.

4. CALCULATED (DERIVED) DATA

Total Canopy Cover (TotCov): Total canopy cover was calculated for all polygons with a live vegetation component; it will not exist for private and administrative polygons, and may not exist for water or non-vegetated polygons. Total cover refers to the percentage of the ground surface obscured by plant foliage. Some polygons include data for both trees and non-tree vegetation, in which case this field is the sum of canopy cover for forest and nonforest layers combined. Note that it was assumed that no canopy overlap could occur. Under this assumption, the sum of layer canopy cover values will never exceed 100 percent (i.e., it is never possible to have more than 100% of the ground surface obscured by foliage or, to put it another way, the ground surface can only be obscured once by foliage).

Tree Canopy Cover (TrCov): For vegetated polygons providing data for trees and non-tree vegetation (shrubs and/or herbs), this derived field contains the sum of canopy cover values for forested (tree dominated) layers only. Note that tree canopy cover was often used when calculating other derived fields.

Understory Tree Cover (UnCov): For forested polygons having more than one tree layer (TrLay = 2 or 3), understory cover was calculated by summing the canopy cover values for layers B and C (CovB + CovC). Note that understory cover was often used when calculating other derived fields such as structure class (see appendix 3 at end of this document).

Tree Layers (TrLay): For vegetated polygons providing data for trees and non-tree vegetation (shrubs and/or herbs), this derived field contains the number of canopy layers where trees are the predominant lifeform. Note that this field was used when calculating other derived fields.

Size Class (SizCls): A derived field characterizing overall (average) size class for forested polygons only. Size-class queries were completed in three steps: (1) for forested polygons with viable overstory canopy cover (NonOS = N), SizCls is based on the size class code for layer A (SizA); (2) for forested polygons with nonviable overstory canopy cover (NonOS = Y), SizCls is based on the size class code for layer B (SizB); (3) for forested polygons with a nonviable overstory (NonOS = Y) and no understory layer (SizB = blank), SizCls is based on the size class for layer A (SizA). Note that this field is used when calculating other derived fields such as density and crown fire potential. An average size class was coded for forested polygons as follows:

Code	Diameter Range	Layer Size Codes	Description
Saps	< 5″	≥ 1, < 5	Seedlings and saplings
Poles	5 to 9″	5 or 6	Pole-size trees
Small	9-21″	> 6, < 8	Small-diameter trees
Large	> 21″	≥ 8	Medium and large trees

Structure Class (Struc): A derived field characterizing vertical structure for both forest and woodland polygons. Structure classes were calculated for forested polygons by using database queries (see appendix 3). The queries use combinations of overstory cover (CovA), overstory size (SizA), understory cover (UnCov), and understory size (SizB). Queries differ slightly by PVG. Note that appendix 3 does not provide queries for woodlands (western juniper); woodland structure classes were derived by using Hessburg et al. (1999; see page 57 in that source). O'Hara et al. (1996) and Powell (2000) provide additional information about structure classes.

Code	Description
NA	Not Applicable; administrative and private-land polygons (no structure class determined)
NF	Nonforest; grassland, herbland, shrubland, and nonvegetated polygons (no structure class determined)
BG	Bare Ground (forested potential; less than 10% existing tree canopy cover)
OFMS	Old Forest Multi Strata structure class
OFSS	Old Forest Single Stratum structure class
SECC	Stem Exclusion Closed Canopy structure class
SEOC	Stem Exclusion Open Canopy structure class
SI	Stand Initiation structure class
UR	Understory Reinitiation structure class
YFMS	Young Forest Multi Strata structure class
WOMS	Woodland Old Multi Strata structure class
WOSS	Woodland Old Single Stratum structure class
WSE	Woodland Stem Exclusion structure class
WSI	Woodland Stand Initiation structure class
WUR	Woodland Understory Reinitiation structure class
WYMS	Woodland Young Multi Strata structure class

Nonviable Overstory (NonOS): A derived field pertaining to forested polygons only. A nonviable overstory is defined as any overstory tree layer (layer A) where the tree canopy cover is 10 percent or less. This field pertains to polygons where the site potential is forest; it is not calculated for nonforest or woodland/juniper polygons. Note that overstory viability is used when calculating forest density/overstocking and certain other derived fields (see Powell 2014).

Code	Description
N	No, a nonviable overstory is not present (CovA > 10%)
Y	Yes, a nonviable overstory is present (CovA ≤ 10%)
NA	Not Applicable (nonforest and woodland polygons)

Forest Density (Density): A derived field identifying overstocked forest polygons in the context of suggested stocking levels (Cochran et al. 1994, Powell 1999). A protocol for evaluating overstocking status is described in Powell (2014). A forest density condition was coded for each polygon as follows:

Code	Description
L	Low; existing forest (tree) density is below lower limit of a management zone and the polygon is not considered to be overstocked
M	Moderate; existing forest (tree) density is between upper and lower limits of a management zone and the polygon is not overstocked now, but it could become so in near future (5-10 years depending on site productivity)
H	High; existing forest (tree) density is above upper limit of a management zone and the polygon is considered to be overstocked now
NA	Not Applicable (nonforest and woodland polygons)

Canopy Fuel Loading (CrwnFire): A derived field relating foliage biomass of forested polygons to their potential for expressing crown fire behavior during a wildfire event. Crown fire potential was assessed by using stand density thresholds related to canopy bulk density (foliage biomass) (Powell 2010, 2017). Crown fire potential status was coded for each polygon as follows:

Code	Description
L	Low; forested polygon has less than .05 kg/m^3 of canopy bulk density, an amount of canopy fuel considered to be insufficient to sustain crown fire behavior
M	Moderate; forested polygon has between .05 and .10 kg/m^3 of canopy bulk density, an amount of canopy fuel considered to have moderate crown fire potential
H	High; forested polygon has more than .10 kg/m^3 of canopy bulk density, an amount of canopy fuel considered to have high crown fire potential
NA	Not Applicable (nonforest and woodland polygons)

Fuel Model (FuelMod): A derived field characterizing fuel characteristics for fire management and planning purposes. Fire analysts at Umatilla NF Headquarters (Supervisor's Office) developed database queries to assign a fuel model code by using vegetation attributes available in Composite. A fuel model was coded for each polygon as follows:

Code	Description
1	Short grass fuel model
2	Timber (grass and understory) fuel model
5	Brush (2 foot) fuel model
8	Closed timber litter fuel model
9	Hardwood litter fuel model
10	Timber (litter and understory) fuel model
NA	Not Applicable (administrative, nonvegetated, private land, etc.)

Fire Regime (FireReg): A derived field characterizing a vegetated polygon's predominant fire regime as defined by fire frequency and severity. Fire analysts at Umatilla NF Headquarters (Supervisor's Office) developed database queries to assign a fuel regime code by using vegetation attributes available in Composite. A fire regime was coded for each polygon as follows:

Code	Description
I	0-35 year fire frequency; low fire severity
II	0-35 year fire frequency; stand-replacement fire severity
III	35-100+ year fire frequency; mixed fire severity
IV	35-100+ year fire frequency; stand-replacement fire severity
V	200+ year fire frequency; stand-replacement fire severity
NA	Not Applicable (administrative, nonvegetated, private land, etc.)

Condition Class (CondClas): A derived field characterizing a vegetated polygon's degree of departure from historical fire regimes. Fire analysts at Umatilla National Forest Supervisor's Office developed database queries to assign a fire-regime condition class code by using vegetation attributes available in Composite. A condition class was coded for each polygon as follows:

Code	Description
1	Fire regimes are within historical range of variability and risk of losing key ecosystem components is low. Key vegetation attributes (composition and structure) are intact and functioning within their historical range
2	Fire regimes have been moderately altered from their historical range of variability. Risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased). This results in moderate changes to one or more of the following regime characteristics: fire size, fire intensity and severity, and landscape patterns. Vegetation attributes have been moderately altered from the historical range
3	Fire regimes have been significantly altered from their historical range of variability. Risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. This results in dramatic changes to one or more of the following regime characteristics: fire size, fire intensity and severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range
NA	Not Applicable (administrative, nonvegetated, private land, etc.)

Existing Cover Type (CovTyp): A derived field characterizing the existing vegetation composition for each polygon. Polygons were considered nonforest when total canopy cover of trees was less than 10 percent. Note that at this time, nonforest cover types are generalized (not well refined) and are based on the ecoclass (lifeform) codes.

Forest cover type codes were derived by using the following process:

1. Canopy cover in a layer was apportioned to plant species occurring in the layer. It is assumed that species are recorded in decreasing order of predominance, as required by Blue Mountains mapping and classification standards: "Vegetation Polygon Mapping and Classification Standards: Malheur, Umatilla, and Wallowa-Whitman National Forests" (Powell 2014). Canopy cover, by layer, was apportioned to species in this way:

Number of Species Recorded For a Layer	PROPORTIONAL ALLOCATION OF CANOPY COVER TO: Species 1 (Entry Order 1)	Species 2 (Entry Order 2)	Species 3 (Entry Order 3)
1	100%		
2	70%	30%	
3	60%	30%	10%

2. Canopy cover was summed for each species occurring in a polygon. If a species was recorded for more than one layer (PSME in both Layer A and B), the canopy cover was summed for all occurrences to derive a species total for the whole polygon.

3. For polygons where one species comprised more than half of total canopy cover, a cover type was assigned by using the majority species (e.g., ABGR where grand fir comprised more than 50% of tree canopy cover); types where no single species comprised more than 50% of tree canopy cover are named for the plurality species along with a prefix (mix) to denote a mixed-species composition (e.g., mix-ABGR where grand fir is predominant but did not exceed 50% of tree canopy cover) (Eyre 1980).

Cover type codes are described below.

Code	Description
ABGR	Grand fir is majority species
ABLA2	Subalpine fir is majority species
Admin	Administrative sites (AB, AC, etc. codes from Hall 1998; see pages 5-6)
Bareground	Polygons without species information (recent harvest units, burns, etc.)
Forb	Forbland sites (FM, FS, etc. codes from Hall 1998; see pages 5-6)
Grass	Grassland sites (GA, GB, etc. codes from Hall 1998; see pages 5-6)
JUOC	Western juniper is majority species
LAOC	Western larch is majority species
Meadow	Meadow sites (MD, MM, etc. codes from Hall 1998; see pages 5-6)
mix-ABGR	Mixed forest; grand fir is plurality species
mix-ABLA2	Mixed forest; subalpine fir is plurality species
mix-JUOC	Mixed forest; western juniper is plurality species
mix-OTHER	Mixed forest; other species (yew, willow, etc.) comprise plurality of stocking
mix-LAOC	Mixed forest; western larch is plurality species
mix-PIAL	Mixed forest; whitebark pine is plurality species
mix-PICO	Mixed forest; lodgepole pine is plurality species
mix-PIEN	Mixed forest; Engelmann spruce is plurality species
mix-PIPO	Mixed forest; ponderosa pine is plurality species
mix-PSME	Mixed forest; Douglas-fir is plurality species
Nonveg	Non-vegetated sites (NF, NR, etc. codes from Hall 1998; see pages 5-6)
PIAL	Whitebark pine is majority species
PICO	Lodgepole pine is majority species
PIEN	Engelmann spruce is majority species
PIPO	Ponderosa pine is majority species
POTR	Quaking aspen is majority species
POTR2	Black cottonwood is majority species
PSME	Douglas-fir is majority species
PVT	Private land polygons
Shrub	Shrubland sites (SC, SD, etc. codes from Hall 1998; see pages 5-6)
Water	Water sites (WL, WR codes from Hall 1998; see pages 5-6)

Forest Insect and Disease Susceptibility Ratings: Forested polygons may be evaluated to determine their susceptibility to nine insects, diseases, or parasites. Schmitt and Powell (2005) was the source of susceptibility rating protocols for these organisms. Note that these ratings were not included in Composite but are often calculated for analysis-area databases. Each of the susceptibility rating categories is described individually below.

Defoliators Susceptibility Rating: Forested polygons may be evaluated to determine their susceptibility to Douglas-fir tussock moth and western spruce budworm, two important defoliating insects affecting Blue Mountains mixed-conifer forests. For defoliators as a group (tussock moth and spruce budworm combined), a susceptibility rating is coded as follows:

Code	Description
L	Low potential for defoliation during outbreaks

Code	Description
M	Moderate potential for defoliation during outbreaks
H	High potential for defoliation during outbreaks
NA	Not applicable; nonforest polygons

Douglas-fir Beetle Susceptibility Rating: Forested polygons may be evaluated to determine their susceptibility to Douglas-fir beetle, an important cambium-feeding insect affecting Blue Mountains mixed-conifer forests. For Douglas-fir beetle, a susceptibility rating is coded as follows:

Code	Description
L	Low potential for Douglas-fir beetle-caused tree mortality
M	Moderate potential for Douglas-fir beetle-caused tree mortality
H	High potential for Douglas-fir beetle-caused tree mortality
NA	Not applicable; nonforest polygons

Fir Engraver Beetle Susceptibility Rating: Forested polygons may be evaluated to determine their susceptibility to fir engraver beetle, an important cambium-feeding insect affecting Blue Mountains mixed-conifer forests. For fir engraver beetle, a susceptibility rating is coded as follows:

Code	Description
L	Low potential for fir engraver-caused tree mortality
M	Moderate potential for fir engraver-caused tree mortality
H	High potential for fir engraver-caused tree mortality
NA	Not applicable; nonforest polygons

Spruce Beetle Susceptibility Rating: Forested polygons may be evaluated to determine their susceptibility to spruce beetle, an important cambium-feeding insect affecting Blue Mountains mixed-conifer forests. For spruce beetle, a susceptibility rating is coded as follows:

Code	Description
L	Low potential for spruce beetle-caused tree mortality
M	Moderate potential for spruce beetle-caused tree mortality
H	High potential for spruce beetle-caused tree mortality
NA	Not applicable; nonforest polygons

Bark Beetles in Ponderosa Pine Susceptibility Rating: Forested polygons may be evaluated to determine their susceptibility to western and mountain pine beetles, two important cambium-feeding insects affecting Blue Mountains ponderosa pine and mixed-conifer forests. For bark beetles in ponderosa pine (western and mountain pine beetles combined), a susceptibility rating is coded as follows:

Code	Description
L	Low potential for bark beetle-caused tree mortality
M	Moderate potential for bark beetle-caused tree mortality
H	High potential for bark beetle-caused tree mortality
NA	Not applicable; nonforest polygons

Mountain Pine Beetle in Lodgepole Pine Susceptibility Rating: Forested polygons may be evaluated to determine their susceptibility to mountain pine beetle in lodgepole pine, an important cambium-feeding insect affecting Blue Mountains mixed-conifer and subalpine forests. For mountain pine beetle in lodgepole pine, a susceptibility rating is coded as follows:

Code	Description
L	Low potential for mountain pine beetle-caused tree mortality
M	Moderate potential for mountain pine beetle-caused tree mortality

Code	Description
H	High potential for mountain pine beetle-caused tree mortality
NA	Not applicable; nonforest polygons

Dwarf Mistletoe in Douglas-fir Susceptibility Rating: Forested polygons may be evaluated to determine their susceptibility to Douglas-fir dwarf mistletoe, an important parasite affecting Blue Mountains mixed-conifer forests. For dwarf mistletoe in Douglas-fir, a susceptibility rating is coded as follows:

Code	Description
L	Low potential for Douglas-fir dwarf mistletoe
M	Moderate potential for Douglas-fir dwarf mistletoe
H	High potential for Douglas-fir dwarf mistletoe
NA	Not applicable; nonforest polygons

Dwarf Mistletoe in Western Larch Susceptibility Rating: Forested polygons may be evaluated to determine their susceptibility to western larch dwarf mistletoe, an important parasite affecting Blue Mountains mixed-conifer forests. For dwarf mistletoe in western larch, a susceptibility rating is coded as follows:

Code	Description
L	Low potential for western larch dwarf mistletoe
M	Moderate potential for western larch dwarf mistletoe
H	High potential for western larch dwarf mistletoe
NA	Not applicable; nonforest polygons

Root Diseases Susceptibility Rating: Forested polygons may be evaluated to determine their susceptibility to root diseases, a group that includes laminated root rot and Armillaria root disease. Both of these fungal pathogens affect Blue Mountains mixed-conifer forests. For root diseases (laminated root rot and Armillaria root disease combined), a susceptibility rating is coded as follows:

Code	Description
L	Low potential for root disease
M	Moderate potential for root disease
H	High potential for root disease
NA	Not applicable; nonforest polygons

GLOSSARY

Aerial photography. Photographs taken from the air, often at periodic intervals, which are used in photo interpretation to characterize forest and landform conditions.

Aspect. The direction toward which a slope faces, typically expressed in degrees azimuth (clockwise from north), or categorized as generalized compass points (north, northeast, south, southwest, etc.).

Basal area. The cross-sectional area of a single tree stem, including the bark, measured at breast height (4½ feet above the ground surface on the upper side of the tree); also, the cross-sectional area of all stems in a stand and expressed per unit of land area (basal area per acre).

Canopy. The foliar cover in a forest stand consisting of one or several layers (Helms 1998).

Canopy cover. Proportion of ground or water surface covered by a vertical projection of the outermost perimeter of natural spread of foliage or plants, including small openings within a canopy. In some applications of this concept, total canopy cover can exceed 100 percent because layering of different vegetative strata results in canopy covering the ground more than once. In most remote-sensing applications, the ground surface can only be obscured by foliage once and canopy cover can never exceed 100 percent.

Condition class (also known as fire regime condition class). An assessment of a vegetation polygon's degree of departure from the historical fire regime, possibly resulting in alterations of key ecosystem components (Schmidt et al. 2002).

Cover type. The plant species forming a plurality of the composition across a given land area, e.g., the Engelmann spruce-subalpine fir, ponderosa pine-Douglas-fir, or lodgepole pine forest cover types (Helms 1998). Forest cover types of the United States and Canada are described in Eyre (1980). Rangeland cover types of the United States are described in Shiflet (1994).

Crown fire. An intense fire that burns primarily in the leaves and needles of live trees, spreading from one tree crown to another above the ground (Brenner 1998); three primary crown fire types are recognized (Scott and Reinhardt 2001):

Active – a crown fire in which the entire fuel complex becomes involved, but the crowning phase remains dependent upon heat released from the surface fuels for continued spread. Also called running and continuous crown fire.

Independent – a crown fire that spreads without the aid of a supporting surface fire.

Passive – a crown fire in which individual trees, or small groups of trees, torch out, but solid flaming in the canopy cannot be maintained except for short periods or distances.

Data dictionary. Technical information necessary to construct a GIS layer such as database table formats, attribute 'column' definitions, spatial coverage tolerances, and so forth (USDA Forest Service 1999).

Delineation. A process of separating map units (repeating patterns with homogeneous characteristics) by using a consistent set of mapping criteria (Winthers et al. 2005).

Digital elevation model (DEM). A digital data file containing an array of elevation information for a portion of the earth's surface. This array is developed by using information extracted from digitized elevation contours from Primary Base Series or US Geological Survey maps (Winthers et al. 2005).

Digital orthophoto quadrangle (DOQ). A digital representation of an aerial photograph with ground features located in their 'true' positions. Displacements in imagery caused by camera tilt, sensor orientation, and terrain relief are removed. DOQs combine the image characteristics of a

photograph with the accuracy and scale of a map. Though not usable for stereoscopic photo interpretation, they can serve as an excellent digital base map for heads-up digitizing, or for georeferencing or spatial registration purposes (Winthers et al. 2005).

Ecoclass. An alphanumeric code that is used to record potential vegetation type determinations on field forms and in computerized databases; Pacific Northwest Region ecoclass codes are described in Hall (1998).

Elevation. For a polygon, elevation records mean altitude above sea level.

Field. A column in a table (database) describing an attribute of the map feature. Also called column or item.

Fire regime. The role fire plays in an ecosystem; a function of the frequency of fire occurrence, fire intensity, seasonal timing, and fire size (Brenner 1998).

Flat file. A database that contains all data in a single large table formatted like a spreadsheet; each polygon has one record in the database (like a row in a spreadsheet) and many fields in which its characterization information is stored (fields are like the columns in a spreadsheet, with each individual data item (species, canopy cover, etc.) being a separate field).

Forbland. Land areas of sufficient size to be delineated as a mapping unit where the predominant vegetation lifeform consists of forbs (broad-leaf herbaceous plants other than grasses, sedges, and rushes).

Forest (tree) density. A quantitative measure of stocking expressed absolutely in terms of numbers of trees, basal area, or volume per unit area (such as trees per acre) (Helms 1998).

Forestland. Land at least 10 percent stocked by forest trees of any size, including land that formerly had such tree cover and will be naturally or artificially regenerated to trees (Helms 1998).

Fuel load. The amount of combustible material (living and dead organic matter) that is found in an area (Brenner 1998).

Fuel model. An assessment of a vegetation polygon's fuel characteristics (load, surface-area-to-volume ratio by size class, heat content, depth) for fire management and planning purposes.

Geographic information system (GIS). A set of computer hardware and software designed for collecting, storing, retrieving, transforming, and displaying spatial data from the real world for a particular set of purposes. Spatial items in a GIS are characterized by their position, attributes, and spatial interrelationships (topology) (Winthers et al. 2005).

Grassland. Land areas of sufficient size to be delineated as a mapping unit where the predominant vegetation lifeform consists of graminoids (grasses and grass-like plants such as sedges and rushes).

Herbland. Land areas of sufficient size to be delineated as a mapping unit where the predominant vegetation lifeform consists of herbs (combination of graminoids and forbs).

Lifeform. Structure, form, habits, and life history of an organism. In plants, characteristic lifeforms based on morphological features (physiognomy) tend to be associated with different environments (Allaby 1998).

Map unit. Map units represent areas on the ground (polygons) distinguishable from one another based on certain biological or physical properties. Criteria for creating map units are determined by mapping objectives. Map units typically repeat across a landscape and consist of one to many polygons comprised of the same set of biophysical properties (Winthers et al. 2005).

Normalization. The process of taking a large table with all its attribute data and breaking it down into smaller tables while maintaining necessary linkages (generally by establishing a key or common field to join or link them) in a relational database structure.

Overstocked. Forestland stocked with more trees than normal, or more trees than full stocking would require (Dunster and Dunster 1996). In an overstocked stand, forest (tree) density is high enough that intertree competition is occurring and large trees are killing small trees in a process called self-thinning (Powell 1999).

Overstory. In a forest with more than one story (layer), the overstory is comprised of those trees forming the uppermost canopy layer; in a two-storied forest (stands with two clearly defined canopy layers), taller trees are the overstory and shorter trees are the understory (Helms 1998).

Photo interpretation. A determination of the nature of objects whose images appear on an aerial photograph (Helms 1998).

Polygon. A series of line segments defined by x,y geographical coordinates (vectors) that completely enclose a land or water area.

Potential vegetation. The vegetation that would develop if all successional sequences were completed under present site conditions (Dunster and Dunster 1996).

Potential vegetation group (PVG). An aggregation of plant association groups (PAGs) with similar environmental regimes and similar dominant plant species. Each PVG typically includes PAGs representing a similar or controlling temperature or moisture regime (Powell 2000).

Potential vegetation type (PVT). Any taxonomic unit (except series) described in a fine-scale potential vegetation report for the Blue Mountains section (e.g., Crowe and Clausnitzer 1997, Johnson and Clausnitzer 1992, Johnson and Simon 1987); PVTs include plant associations, plant community types, and plant communities.

Primary base series (PBS) maps. Large-scale (1:24,000) Forest Service maps compiled from U.S. Geological Survey (USGS) topographic quadrangle maps. In addition to base information provided by USGS maps, PBS maps contain additional Forest Service information such as ownership status, Forest Service route numbers (roads, trails), administrative units such as Ranger District boundaries, and facilities (Winthers et al. 2005).

Relational database. A database that consists of a collection of tables and uses keys to connect the tables.

Shrubland. Land areas of sufficient size to be delineated as a mapping unit where the predominant vegetation lifeform consists of shrubs.

Size class. A characterization of a vegetation layer's predominant situation with respect to tree size by using diameter at breast height; a layer with a pole size class has a predominance of trees whose diameter is between 5 and 8.9 inches at breast height (breast height is defined as 4½ feet above ground surface on upper side of the tree).

Slope. Angle of the ground relative to horizontal, expressed in degrees or as a percentage of the run to the rise (Helms 1998).

Stocking. The amount of anything on a given area, particularly in relation to what is considered optimum; an indication of growing-space occupancy relative to a pre-established standard.

Structure class (stage). A stage or recognizable condition relating to physical orientation and arrangement of vegetation; size and arrangement (both vertical and horizontal) of trees and tree parts. These structure classes have been described (O'Hara et al. 1996, Oliver and Larson 1996):

Stand initiation: one canopy stratum of seedlings and saplings is present; grasses, forbs, and shrubs typically coexist with the trees.

Stem exclusion: one canopy stratum of mostly pole-sized trees (5-8.9" DBH) is present. The canopy layer may be open (**stem exclusion open canopy**) on sites where moisture is limiting, or closed (**stem exclusion closed canopy**) on sites where light is limiting.

Young forest multi strata: three or more canopy layers are present; size class of the uppermost stratum is typically small trees (9-20.9" DBH). Large trees may be absent or scarce.

Understory reinitiation: two canopy strata are present; a second tree layer is established under a taller (and presumably older) overstory. Overstory mortality created growing space for the establishment of understory trees.

Old forest: a predominance of large trees (> 21" DBH) is present in a stand with one or more canopy strata. On warm dry sites with frequent, low-intensity fires, a single stratum may be present (**old forest single stratum**). On cool moist sites without recurring underburns, multi-layer stands with large trees in the uppermost stratum may be present (**old forest multi strata**).

Understory. All vegetation growing under a forest overstory. In some applications, understory is only considered to be small trees (e.g., in a forest comprised of multiple canopy layers, taller trees form an overstory, shorter trees an understory); in other instances, understory is assumed to include herbaceous and shrubby plants in addition to trees. When understory is assumed to refer to trees only, other plants (herbs and shrubs) are often called ‘undergrowth’ to differentiate between the two components (Helms 1998).

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APPENDIX 1

Composite Vegetation Database: GIS Coverage Development

Don Justice
June 6, 2001

This appendix provides a brief description of the process used to create the composite vegetation database GIS coverage for the Umatilla National Forest. The following steps were taken to create the coverage and its associated data:

Creating the coverage:

1. **Source Covers:**

   - EVG-PI
   - Stand examination coverages for the Heppner, Pomeroy, and Walla Walla Ranger Districts (covers ranged from 1986 to 2000)
   - PMHARV_UPD created from the Pomeroy District's harvest coverage
   - Pveg (the Forest's potential vegetation coverage and associated database)

2. **ARC and ARCVIEW Processes:** ARC processes used to create the Composite cover involved the use of five commands: ERASE, UPDATE, ELIMINATE, ZONALGEOMORPH, and IDENTITY.

   - ERASE – this command erases features found on one coverage from another coverage. This process was used to prepare the EVG-PI, stand exam, and Pomeroy's harvest covers for the update process.

   - UPDATE – this command uses a cut and paste process to bring two overlapping covers together. It provides the capability to bring three existing covers (EVG-PI, PMHARV_UPD, and stand exam covers) together into one new coverage.

   - ELIMINATE – this is an ARC command that eliminates polygons meeting specific criteria. It allows the eliminated polygons to be absorbed into larger adjoining polygons. Due to how the ERASE and UPDATE processes operate, and due to differences between covers, small islands (sliver polygons) were created by these processes. These slivers were typically less than one acre in size.
     By using the ELIMINATE command, polygons less than two acres in size were eliminated from the coverage. The only exceptions were edge polygons (those adjacent to the national forest boundary) because they needed to be retained to maintain the cover's exterior integrity.

   - ZONALGEOMORPH – is an ARC AML that is used to calculate geomorphic data such as aspect, slope, elevation and curvature for polygon coverages. This AML was used to obtain physiographic information for each individual polygon within the Composite coverage.

- IDENTITY – this command overlays point, line, or polygon features onto a polygon coverage but only retains attributes from the input cover that fall within the overlay cover. In order to provide ecoclass data for PI polygons, the Pveg cover was used as the input cover and it was overlaid onto the Composite cover.

  Results from the identity process were used to calculate a maximum ecoclass area (greater than 50% of the area) for each individual polygon; whichever ecoclass represented the maximum area was then assigned to the entire polygon.

  In some cases, this process was also used to assign an ecoclass code for stand exam and harvest unit (Pomeroy's PV updates) polygons that did not have an existing ecoclass from other sources.

3. FSVeg Database:

- Ecoclass codes for stand exams were obtained from the FSVeg (Field Sampled Vegetation) database. This database contains both the Forest's legacy and current stand exam data. The codes came from the "NRV_SETTING_MEASUREMENTS" table's potential vegetation field (PV_Code).

4. Percent Canopy Cover and Stand Structure:

- For the stand exam polygons, canopy cover and stand structure had to be calculated to make their information consistent with the EVG-PI data. This was done by extracting the raw stand-exam data from the FSVeg database and then running a UNIX script called "FSVeg2FVS." This script creates three file types that are then available for use with the Forest Vegetation Simulator model (FVS) and its associated Suppose interface program (these are the location, stand list, and tree-data files).

  Once the data was loaded into FVS, the structure class keyword was used to generate canopy cover percentages, species composition, and stand structure for each of the stand exam polygons.

5. Covers Created and their Locations:

- UM_LYNX323a. Location: /fsfiles/unit/gis/lynx01
- UM_VEG2001. Location: /fsfiles/unit/gis/lynx01

Appendix 2: Potential vegetation types (PVT) of the Blue Mountains section (from Powell et al. 2007)[1]

PVT CODE	PVT COMMON NAME	STATUS	ECOCLASS	PAG	PVG
ABGR/ACGL	grand fir/Rocky Mountain maple	PA	CWS912	Warm Very Moist UF	Moist UF
ABGR/ACGL (FLOODPLAIN)	grand fir/Rocky Mountain maple (floodplain)	PA	CWS543	Warm Moderate SM RF	Moderate SM RF
ABGR/ACGL-PHMA	grand fir/Rocky Mountain maple-ninebark	PCT	CWS412	Warm Moist UF	Moist UF
ABGR/ARCO	grand fir/heartleaf arnica	PCT	CWF444	Cold Dry UF	Cold UF
ABGR/ATFI	grand fir/ladyfern	PA	CWF613	Warm High SM RF	High SM RF
ABGR/BRVU	grand fir/Columbia brome	PA	CWG211	Warm Moist UF	Moist UF
ABGR/CAGE	grand fir/elk sedge	PA	CWG111	Warm Dry UF	Dry UF
ABGR/CALA3	grand fir/woolly sedge	PC	CWM311	Warm High SM RF	High SM RF
ABGR/CARU	grand fir/pinegrass	PA	CWG112	Warm Dry UF	Dry UF
ABGR/CLUN	grand fir/queencup beadlily	PA	CWF421	Cool Moist UF	Moist UF
ABGR/COOC2	grand fir/goldthread	PA	CWF511	Cool Dry UF	Cold UF
ABGR/GYDR	grand fir/oakfern	PA	CWF611	Cool Very Moist UF	Moist UF
ABGR/LIBO2	grand fir/twinflower	PA	CWF311	Cool Moist UF	Moist UF
ABGR/POMU-ASCA3	grand fir/sword fern-ginger	PA	CWF612	Cool Very Moist UF	Moist UF
ABGR/SPBE	grand fir/birchleaf spiraea	PA	CWS321	Warm Dry UF	Dry UF
ABGR/SYAL (FLOODPLAIN)	grand fir/common snowberry (floodplain)	PCT	CWS314	Warm Low SM RF	Low SM RF
ABGR/TABR/CLUN	grand fir/Pacific yew/queencup beadlily	PA	CWC811	Cool Wet UF	Moist UF
ABGR/TABR/LIBO2	grand fir/Pacific yew/twinflower	PA	CWC812	Cool Wet UF	Moist UF
ABGR/TRCA3	grand fir/false bugbane	PA	CWF512	Cool Very Moist UF	Moist UF
ABGR/VAME	grand fir/big huckleberry	PA	CWS211	Cool Moist UF	Moist UF
ABGR/VASC	grand fir/grouse huckleberry	PA	CWS811	Cold Dry UF	Cold UF
ABGR/VASC-LIBO2	grand fir/grouse huckleberry-twinflower	PA	CWS812	Cool Moist UF	Moist UF
ABGR-CHNO/VAME	grand fir-Alaska yellow cedar/big huckleberry	PCT	CWS232	Cool Moist UF	Moist UF
ABLA2/ARCO	subalpine fir/heartleaf arnica	PCT	CEF412	Cool Moist UF	Moist UF
ABLA2/ATFI	subalpine fir/ladyfern	PA	CEF332	Cold High SM RF	High SM RF
ABLA2/CAAQ	subalpine fir/aquatic sedge	PCT	CEM123	Cold High SM RF	High SM RF
ABLA2/CACA	subalpine fir/bluejoint reedgrass	PA	CEM124	Cold Moderate SM RF	Moderate SM RF
ABLA2/CADI	subalpine fir/softleaved sedge	PCT	CEM122	Cold High SM RF	High SM RF
ABLA2/CAGE	subalpine fir/elk sedge	PA	CAG111	Cold Dry UF	Cold UF
ABLA2/CARU	subalpine fir/pinegrass	PCT	CEG312	Cool Dry UF	Cold UF
ABLA2/CLUN	subalpine fir/queencup beadlily	PA	CES131	Cool Moist UF	Moist UF
ABLA2/LIBO2	subalpine fir/twinflower	PA	CES414	Cool Moist UF	Moist UF
ABLA2/MEFE	subalpine fir/fool's huckleberry	PA	CES221	Cold Moist UF	Cold UF
ABLA2/POPU	subalpine fir/skunkleaved polemonium	PCT	CEF411	Cold Dry UF	Cold UF
ABLA2/RHAL	subalpine fir/white rhododendron	PCT	CES214	Cold Moist UF	Cold UF
ABLA2/SETR	subalpine fir/arrowleaf groundsel	PA	CEF333	Cold High SM RF	High SM RF
ABLA2/STAM	subalpine fir/twisted stalk	PCT	CEF311	Cool Wet UF	Moist UF
ABLA2/STOC	subalpine fir/western needlegrass	PCT	CAG4	Cold Dry UF	Cold UF
ABLA2/TRCA3	subalpine fir/false bugbane	PA	CEF331	Cool Moist UF	Moist UF
ABLA2/VAME	subalpine fir/big huckleberry	PA	CES311	Cool Moist UF	Moist UF
ABLA2/VASC	subalpine fir/grouse huckleberry	PA	CES411	Cold Dry UF	Cold UF

PVT CODE	PVT COMMON NAME	STATUS	ECOCLASS	PAG	PVG
ABLA2/VASC/POPU	subalpine fir/grouse huckleberry/skunkleaved polemonium	PA	CES415	Cold Dry UF	Cold UF
ABLA2/VAUL/CASC5	subalpine fir/bog blueberry/Holm's sedge	PCT	CEM313	Cold High SM RF	High SM RF
ABLA2-PIAL/JUDR	subalpine fir-whitebark pine/Drummond’s rush	PCT	CAG3	Cold Dry UF	Cold UF
ABLA2-PIAL/POPH	subalpine fir-whitebark pine/fleeceflower	PCT	CAF2	Cold Dry UF	Cold UF
ABLA2-PIAL/POPU	subalpine fir-whitebark pine/skunkleaved polemonium	PCT	CAF0	Cold Dry UF	Cold UF
ADPE	maidenhair fern	PCT	FW4213	Warm High SM RH	High SM RH
AGDI	thin bentgrass	PCT	MD4111	Warm Low SM RH	Low SM RH
AGSP	bluebunch wheatgrass	PA	GB41	Hot Dry UH	Dry UH
AGSP-ERHE	bluebunch wheatgrass-Wyeth’s buckwheat	PA	GB4111	Hot Dry UH	Dry UH
AGSP-POSA3	bluebunch wheatgrass-Sandberg’s bluegrass	PA	GB4121	Hot Dry UH	Dry UH
AGSP-POSA3-ASCU4	bluebunch wheatgrass-Sandberg’s bluegrass-Cusick’s milkvetch	PA	GB4114	Hot Dry UH	Dry UH
AGSP-POSA3 (BASALT)	bluebunch wheatgrass-Sandberg’s bluegrass (basalt)	PA	GB4113	Hot Dry UH	Dry UH
AGSP-POSA3-DAUN	bluebunch wheatgrass-Sandberg’s bluegrass-onespike oatgrass	PA	GB4911	Hot Dry UH	Dry UH
AGSP-POSA3-ERPU	bluebunch wheatgrass-Sandberg’s bluegrass-shaggy fleabane	PA	GB4115	Hot Dry UH	Dry UH
AGSP-POSA3 (GRANITE)	bluebunch wheatgrass-Sandberg’s bluegrass (granite)	PA	GB4116	Hot Dry UH	Dry UH
AGSP-POSA3-OPPO	bluebunch wheatgrass-Sandberg’s bluegrass-pricklypear	PA	GB4118	Hot Dry UH	Dry UH
AGSP-POSA3-PHCO2	bluebunch wheatgrass-Sandberg’s bluegrass-Snake River phlox	PA	GB4117	Hot Dry UH	Dry UH
AGSP-POSA3-SCAN	bluebunch wheatgrass-Sandberg’s bluegrass-narrowleaf skullcap	PA	GB4112	Hot Dry UH	Dry UH
AGSP-SPCR-ARLO3	bluebunch wheatgrass-sand dropseed-red threeawn	PCT	GB1911	Hot Dry UH	Dry UH
ALIN/ATFI	mountain alder/ladyfern	PA	SW2116	Warm High SM RS	High SM RS
ALIN/CAAM	mountain alder/bigleaved sedge	PA	SW2114	Warm High SM RS	High SM RS
ALIN/CAAQ	mountain alder/aquatic sedge	PC	SW2126	Warm High SM RS	High SM RS
ALIN/CACA	mountain alder/bluejoint reedgrass	PA	SW2121	Warm Moderate SM RS	Moderate SM RS
ALIN/CADE	mountain alder/Dewey’s sedge	PCT	SW2118	Warm Moderate SM RS	Moderate SM RS
ALIN/CALA3	mountain alder/woolly sedge	PA	SW2123	Warm Moderate SM RS	Moderate SM RS
ALIN/CALEL2	mountain alder/densely tufted sedge	PC	SW2127	Warm Moderate SM RS	Moderate SM RS
ALIN/CALU	mountain alder/woodrush sedge	PC	SW2128	Warm Low SM RS	Low SM RS
ALIN/CAUT	mountain alder/bladder sedge	PA	SW2115	Warm High SM RS	High SM RS
ALIN/EQAR	mountain alder/common horsetail	PA	SW2117	Warm Moderate SM RS	Moderate SM RS
ALIN/GLEL	mountain alder/tall mannagrass	PA	SW2215	Warm High SM RS	High SM RS
ALIN/GYDR	mountain alder/oakfern	PCT	SW2125	Warm Moderate SM RS	Moderate SM RS
ALIN/HELA	mountain alder/common cowparsnip	PCT	SW2124	Warm Moderate SM RS	Moderate SM RS
ALIN/POPR	mountain alder/Kentucky bluegrass	PCT	SW2120	Warm Low SM RS	Low SM RS
ALIN/SCMI	mountain alder/smallfruit bulrush	PCT	SW2122	Warm High SM RS	High SM RS
ALIN-COST/MESIC FORB	mountain alder-redosier dogwood/mesic forb	PA	SW2216	Warm Moderate SM RS	Moderate SM RS
ALIN-RIBES/MESIC FORB	mountain alder-currants/mesic forb	PA	SW2217	Warm Moderate SM RS	Moderate SM RS
ALIN-SYAL	mountain alder-common snowberry	PA	SW2211	Warm Low SM RS	Low SM RS
ALPR	meadow foxtail	PCT	MD2111	Warm Low SM RH	Low SM RH
ALRU (ALLUVIAL BAR)	red alder (alluvial bar)	PCT	HAF226	Warm Moderate SM RF	Moderate SM RF
ALRU/ATFI	red alder/ladyfern	PCT	HAF227	Warm High SM RF	High SM RF
ALRU/COST	red alder/redosier dogwood	PC	HAS511	Warm Moderate SM RF	Moderate SM RF
ALRU/PEFRP	red alder/sweet coltsfoot	PCT	HAF211	Warm Moderate SM RF	Moderate SM RF
ALRU/PHCA3	red alder/Pacific ninebark	PA	HAS211	Warm Moderate SM RF	Moderate SM RF

PVT CODE	PVT COMMON NAME	STATUS	ECOCLASS	PAG	PVG
ALRU/SYAL	red alder/common snowberry	PCT	HAS312	Warm Moderate SM RF	Moderate SM RF
ALSI	Sitka alder snow slides	PCT	SM20	Cold Very Moist US	Cold US
ALSI/ATFI	Sitka alder/ladyfern	PA	SW2111	Warm High SM RS	High SM RS
ALSI/CILA2	Sitka alder/drooping woodreed	PA	SW2112	Warm High SM RS	High SM RS
ALSI/MESIC FORB	Sitka alder/mesic forb	PCT	SW2113	Warm Moderate SM RS	Moderate SM RS
ALVA	swamp onion	PCT	FW7111	Cold High SM RH	High SM RH
AMAL	western serviceberry	PCT	SW3114	Hot Low SM RS	Low SM RS
ARAR/FEID-AGSP	low sagebrush/Idaho fescue-bluebunch wheatgrass	PA	SD1911	Warm Moist US	Moist US
ARAR/POSA3	low sagebrush/Sandberg's bluegrass	PA	SD9221	Hot Dry US	Dry US
ARCA/DECE	silver sagebrush/tufted hairgrass	PA	SW6111	Hot Moderate SM RS	Moderate SM RS
ARCA/POCU	silver sagebrush/Cusick's bluegrass	PCT	SW6114	Hot Low SM RS	Low SM RS
ARCA/POPR	silver sagebrush/Kentucky bluegrass	PCT	SW6112	Hot Low SM RS	Low SM RS
ARRI/POSA3	stiff sagebrush/Sandberg's bluegrass	PCT	SD9111	Hot Dry US	Dry US
ARTRV/BRCA	mountain big sagebrush/mountain brome	PCT	SS4914	Warm Moist US	Moist US
ARTRV/CAGE	mountain big sagebrush/elk sedge	PA	SS4911	Cold Moist US	Cold US
ARTRV/FEID-AGSP	mountain big sagebrush/Idaho fescue-bluebunch wheatgrass	PA	SD2911	Warm Moist US	Moist US
ARTRV/POCU	mountain big sagebrush/Cusick's bluegrass	PA	SW6113	Hot Low SM RS	Low SM RS
ARTRV/STOC	mountain big sagebrush/western needlegrass	PCT	SS4915	Cool Dry US	Cold US
ARTRV-PUTR/FEID	mountain big sagebrush-bitterbrush/Idaho fescue	PCT	SD2916	Hot Moist US	Moist US
ARTRV-SYOR/BRCA	mountain big sagebrush-mountain snowberry/mountain brome	PCT	SD2917	Warm Moist US	Moist US
BEOC/MESIC FORB	water birch/mesic forb	PCT	SW3112	Warm Moderate SM RS	Moderate SM RS
BEOC/WET SEDGE	water birch/wet sedge	PCT	SW3113	Warm High SM RS	High SM RS
CAAM	bigleaved sedge	PA	MM2921	Warm High SM RH	High SM RH
CAAQ	aquatic sedge	PA	MM2914	Warm High SM RH	High SM RH
CACA	bluejoint reedgrass	PA	GM4111	Warm Moderate SM RH	Moderate SM RH
CACA4	silvery sedge	PCT	MS3113	Warm Moderate SM RH	Moderate SM RH
CACU (SEEP)	Cusick's camas (seep)	PCT	FW3911	Warm Very Moist UH	Moist UH
CACU2	Cusick's sedge	PA	MM2918	Warm High SM RH	High SM RH
CAGE (ALPINE)	elk sedge (alpine)	PCT	GS3911	Cold Dry UH	Cold UH
CAGE (UPLAND)	elk sedge (upland)	PCT	GS39	Cool Dry UH	Cold UH
CAHO	Hood's sedge	PCT	GS3912	Cool Moist UH	Cold UH
CALA	smoothstemmed sedge	PC	MW2913	Cold High SM RH	High SM RH
CALA3	woolly sedge	PA	MM2911	Warm Moderate SM RH	Moderate SM RH
CALA4	slender sedge	PC	MM2920	Warm High SM RH	High SM RH
CALEL2	densely tufted sedge	PA	MM2919	Warm Moderate SM RH	Moderate SM RH
CALU	woodrush sedge	PA	MM2916	Cold High SM RH	High SM RH
CAMU2	star sedge	PCT	MS3112	Warm Moderate SM RH	Moderate SM RH
CANE	Nebraska sedge	PCT	MM2912	Hot Moderate SM RH	Moderate SM RH
CANU4	torrent sedge	PCT	MM2922	Hot High SM RH	High SM RH
CAPR5	clustered field sedge	PCT	MW2912	Cold High SM RH	High SM RH
CASC5	Holm's sedge	PA	MS3111	Cold High SM RH	High SM RH
CASH	Sheldon's sedge	PCT	MM2932	Hot Moderate SM RH	Moderate SM RH
CASI2	shortbeaked sedge	PCT	MM2915	Warm High SM RH	High SM RH

PVT CODE	PVT COMMON NAME	STATUS	ECOCLASS	PAG	PVG
CAST	sawbeak sedge	PCT	MW1926	Warm High SM RH	High SM RH
CAUT	bladder sedge	PA	MM2917	Warm High SM RH	High SM RH
CAVEV	inflated sedge	PA	MW1923	Warm High SM RH	High SM RH
CELE/CAGE	mountain mahogany/elk sedge	PCT	SD40	Hot Moist US	Moist US
CELE/FEID-AGSP	mountain mahogany/Idaho fescue-bluebunch wheatgrass	PA	SD4111	Hot Moist US	Moist US
CERE2/AGSP	netleaf hackberry/bluebunch wheatgrass	PA	SD5611	Hot Moist US	Moist US
CEVE	snowbrush ceanothus	PCT	SM33	Warm Moist US	Moist US
CILA2	drooping woodreed	PC	MW2927	Cold High SM RH	High SM RH
COST	redosier dogwood	PA	SW5112	Hot Moderate SM RS	Moderate SM RS
COST/SAAR4	redosier dogwood/brook saxifrage	PCT	SW5118	Warm High SM RS	High SM RS
CRDO	Douglas hawthorne	PCT	SW3111	Hot Low SM RS	Low SM RS
DECE	tufted hairgrass	PA	MM1912	Warm Moderate SM RH	Moderate SM RH
ELBE	delicate spikerush	PC	MS4111	Cold High SM RH	High SM RH
ELCI	basin wildrye	PA	GB7111	Hot Very Moist UH	Moist UH
ELPA	creeping spikerush	PA	MW4912	Hot High SM RH	High SM RH
ELPA2	fewflowered spikerush	PCT	MW4911	Cold High SM RH	High SM RH
EQAR	common horsetail	PA	FW4212	Warm Moderate SM RH	Moderate SM RH
ERDO-POSA3	Douglas buckwheat/Sandberg's bluegrass	PCT	FM9111	Hot Dry UH	Dry UH
ERIOG/PHOR	buckwheat/Oregon bladderpod	PA	SD9322	Hot Dry UH	Dry UH
ERST2-POSA3	strict buckwheat/Sandberg's bluegrass	PCT	FM9112	Hot Dry UH	Dry UH
ERUM (RIDGE)	sulphurflower (ridge)	PCT	FM9113	Hot Dry UH	Dry UH
FEID (ALPINE)	Idaho fescue (alpine)	PCT	GS12	Cold Moist UH	Cold UH
FEID-AGSP	Idaho fescue-bluebunch wheatgrass	PA	GB59	Warm Moist UH	Moist UH
FEID-AGSP (RIDGE)	Idaho fescue-bluebunch wheatgrass (ridge)	PCT	GB5915	Warm Moist UH	Moist UH
FEID-AGSP-BASA	Idaho fescue-bluebunch wheatgrass-balsamroot	PA	GB5917	Warm Moist UH	Moist UH
FEID-AGSP-LUSE	Idaho fescue-bluebunch wheatgrass-silky lupine	PA	GB5916	Warm Moist UH	Moist UH
FEID-AGSP-PHCO2	Idaho fescue-bluebunch wheatgrass-Snake River phlox	PA	GB5918	Warm Moist UH	Moist UH
FEID-CAGE	Idaho fescue-elk sedge	PCT	GB5922	Warm Moist UH	Moist UH
FEID-CAHO	Idaho fescue-Hood's sedge	PA	GB5921	Warm Moist UH	Moist UH
FEID-DAIN-CAREX	Idaho fescue-timber oatgrass-sedge	PA	GB5920	Warm Very Moist UH	Moist UH
FEID-KOCR (HIGH)	Idaho fescue-prairie junegrass (high)	PA	GB5913	Cool Moist UH	Cold UH
FEID-KOCR (LOW)	Idaho fescue-prairie junegrass (low)	PA	GB5914	Warm Moist UH	Moist UH
FEID-KOCR (MOUND)	Idaho fescue-prairie junegrass (mound)	PA	GB5912	Cool Moist UH	Cold UH
FEID-KOCR (RIDGE)	Idaho fescue-prairie junegrass (ridge)	PA	GB5911	Cool Moist UH	Cold UH
FEVI	green fescue	PCT	GS11	Cold Moist UH	Cold UH
FEVI-CAHO	green fescue-Hood's sedge	PCT	GS1111	Cold Moist UH	Cold UH
FEVI-LULA2	green fescue-spurred lupine	PA	GS1112	Cold Moist UH	Cold UH
GLEL	tall mannagrass	PA	MM2925	Warm High SM RH	High SM RH
GLNE/AGSP	spiny greenbush/bluebunch wheatgrass	PA	SD65	Hot Dry US	Dry US
JUBA	Baltic rush	PCT	MW3912	Hot Moderate SM RH	Moderate SM RH
JUOC/ARAR	western juniper/low sagebrush	PCT	CJS1	Hot Dry UW	Dry UW
JUOC/ARRI	western juniper/stiff sagebrush	PCT	CJS8	Hot Dry UW	Dry UW
JUOC/ARTRV	western juniper/mountain big sagebrush	PCT	CJS2	Hot Moist UW	Moist UW

PVT CODE	PVT COMMON NAME	STATUS	ECOCLASS	PAG	PVG
JUOC/ARTRV/FEID-AGSP	western juniper/mountain big sagebrush/fescue-wheatgrass	PA	CJS211	Hot Moist UW	Moist UW
JUOC/CELE/CAGE	western juniper/mountain mahogany/elk sedge	PCT	CJS42	Hot Moist UW	Moist UW
JUOC/CELE/FEID-AGSP	western juniper/mountain mahogany/fescue-wheatgrass	PCT	CJS41	Hot Moist UW	Moist UW
JUOC/FEID-AGSP	western juniper/Idaho fescue-bluebunch wheatgrass	PA	CJG111	Hot Moist UW	Moist UW
JUOC/PUTR/FEID-AGSP	western juniper/bitterbrush/Idaho fescue-bluebunch wheatgrass	PA	CJS321	Hot Moist UW	Moist UW
LECOW	Wallowa Lewisia	PCT	FX4111	Hot Dry UH	Dry UH
METR	buckbean	PC	FW6111	Warm High SM RH	High SM RH
PERA3-SYOR	squaw apple-mountain snowberry	PCT	SD30	Hot Moist US	Moist US
PHLE2 (TALUS)	syringa bordered strips (talus)	PCT	NTS111	Hot Very Moist US	Moist US
PHMA-SYAL	ninebark-common snowberry	PA	SM1111	Warm Moist US	Moist US
PICO(ABGR)/ALSI	lodgepole pine(grand fir)/Sitka alder	PCT	CLS58	Cool Very Moist UF	Moist UF
PICO(ABGR)/ARNE	lodgepole pine(grand fir)/pinemat manzanita	PCT	CLS57	Cool Dry UF	Cold UF
PICO(ABGR)/CARU	lodgepole pine(grand fir)/pinegrass	PCT	CLG21	Cool Dry UF	Cold UF
PICO(ABGR)/LIBO2	lodgepole pine(grand fir)/twinflower	PCT	CLF211	Cool Moist UF	Moist UF
PICO(ABGR)/VAME	lodgepole pine(grand fir)/big huckleberry	PCT	CLS513	Cool Moist UF	Moist UF
PICO(ABGR)/VAME/CARU	lodgepole pine(grand fir)/big huckleberry/pinegrass	PCT	CLS512	Cool Moist UF	Moist UF
PICO(ABGR)/VAME/PTAQ	lodgepole pine(grand fir)/big huckleberry/bracken	PCT	CLS519	Cool Moist UF	Moist UF
PICO(ABGR)/VASC/CARU	lodgepole pine(grand fir)/grouse huckleberry/pinegrass	PCT	CLS417	Cold Dry UF	Cold UF
PICO(ABLA2)/CAGE	lodgepole pine(subalpine fir)/elk sedge	PCT	CLG322	Cold Dry UF	Cold UF
PICO(ABLA2)/STOC	lodgepole pine(subalpine fir)/western needlegrass	PCT	CLG11	Cold Dry UF	Cold UF
PICO(ABLA2)/VAME	lodgepole pine(subalpine fir)/big huckleberry	PCT	CLS514	Cool Moist UF	Moist UF
PICO(ABLA2)/VAME/CARU	lodgepole pine(subalpine fir)/big huckleberry/pinegrass	PCT	CLS516	Cool Moist UF	Moist UF
PICO(ABLA2)/VASC	lodgepole pine(subalpine fir)/grouse huckleberry	PCT	CLS418	Cold Dry UF	Cold UF
PICO(ABLA2)/VASC/POPU	lodgepole pine(subalpine fir)/grouse huckleberry/polemonium	PCT	CLS415	Cold Dry UF	Cold UF
PICO/ALIN/MESIC FORB	lodgepole pine/mountain alder/mesic forb	PC	CLM511	Cold Moderate SM RF	Moderate SM RF
PICO/CAAQ	lodgepole pine/aquatic sedge	PA	CLM114	Cold High SM RF	High SM RF
PICO/CACA	lodgepole pine/bluejoint reedgrass	PC	CLM117	Cold Moderate SM RF	Moderate SM RF
PICO/CALA3	lodgepole pine/woolly sedge	PC	CLM116	Cold Moderate SM RF	Moderate RF
PICO/CARU	lodgepole pine/pinegrass	PA	CLS416	Cool Dry UF	Cold UF
PICO/DECE	lodgepole pine/tufted hairgrass	PA	CLM115	Cold Moderate SM RF	Moderate SM RF
PICO/POPR	lodgepole pine/Kentucky bluegrass	PCT	CLM112	Cold Low SM RF	Low SM RF
PIEN/ATFI	Engelmann spruce/ladyfern	PCT	CEF334	Cold High SM RF	High SM RF
PIEN/BRVU	Engelmann spruce/Columbia brome	PCT	CEM125	Cold Low SM RF	Low SM RF
PIEN/CADI	Engelmann spruce/softleaved sedge	PA	CEM121	Cold High SM RF	High SM RF
PIEN/CILA2	Engelmann spruce/drooping woodreed	PC	CEM126	Cold Moderate SM RF	Moderate SM RF
PIEN/COST	Engelmann spruce/redosier dogwood	PA	CES511	Cold Moderate SM RF	Moderate SM RF
PIEN/EQAR	Engelmann spruce/common horsetail	PA	CEM211	Cold Moderate SM RF	Moderate SM RF
PIEN/SETR	Engelmann spruce/arrowleaf groundsel	PCT	CEF335	Cold High SM RF	High SM RF
PIMO/DECE	western white pine/tufted hairgrass	PCT	CQM111	Warm Moderate SM RF	Moderate SM RF
PIPO/AGSP	ponderosa pine/bluebunch wheatgrass	PA	CPG111	Hot Dry UF	Dry UF
PIPO/ARAR	ponderosa pine/low sagebrush	PCT	CPS61	Hot Moist UF	Dry UF
PIPO/ARTRV/CAGE	ponderosa pine/mountain big sagebrush/elk sedge	PCT	CPS132	Hot Dry UF	Dry UF
PIPO/ARTRV/FEID-AGSP	ponderosa pine/mountain big sagebrush/fescue-wheatgrass	PA	CPS131	Hot Dry UF	Dry UF

PVT CODE	PVT COMMON NAME	STATUS	ECOCLASS	PAG	PVG
PIPO/CAGE	ponderosa pine/elk sedge	PA	CPG222	Warm Dry UF	Dry UF
PIPO/CARU	ponderosa pine/pinegrass	PA	CPG221	Warm Dry UF	Dry UF
PIPO/CELE/CAGE	ponderosa pine/mountain mahogany/elk sedge	PA	CPS232	Warm Dry UF	Dry UF
PIPO/CELE/FEID-AGSP	ponderosa pine/mountain mahogany/fescue-wheatgrass	PA	CPS234	Hot Dry UF	Dry UF
PIPO/CELE/PONE	ponderosa pine/mountain mahogany/Wheeler's bluegrass	PA	CPS233	Hot Dry UF	Dry UF
PIPO/ELGL	ponderosa pine/blue wildrye	PA	CPM111	Warm Dry UF	Dry UF
PIPO/FEID	ponderosa pine/Idaho fescue	PA	CPG112	Hot Dry UF	Dry UF
PIPO/PERA3	ponderosa pine/squaw apple	PCT	CPS8	Hot Dry UF	Dry UF
PIPO/POPR	ponderosa pine/Kentucky bluegrass	PCT	CPM112	Hot Low SM RF	Low SM RF
PIPO/PUTR/AGSP	ponderosa pine/bitterbrush/bluebunch wheatgrass	PCT	CPS231	Hot Dry UF	Dry UF
PIPO/PUTR/CAGE	ponderosa pine/bitterbrush/elk sedge	PA	CPS222	Warm Dry UF	Dry UF
PIPO/PUTR/CARO	ponderosa pine/bitterbrush/Ross sedge	PA	CPS221	Warm Dry UF	Dry UF
PIPO/PUTR/FEID-AGSP	ponderosa pine/bitterbrush/Idaho fescue-bluebunch wheatgrass	PA	CPS226	Hot Dry UF	Dry UF
PIPO/RHGL	ponderosa pine/sumac	PCT	CPS9	Hot Dry UF	Dry UF
PIPO/SPBE	ponderosa pine/birchleaf spiraea	PCT	CPS523	Warm Dry UF	Dry UF
PIPO/SYAL	ponderosa pine/common snowberry	PA	CPS522	Warm Dry UF	Dry UF
PIPO/SYAL (FLOODPLAIN)	ponderosa pine/common snowberry (floodplain)	PA	CPS511	Hot Low SM RF	Low SM RF
PIPO/SYOR	ponderosa pine/mountain snowberry	PA	CPS525	Warm Dry UF	Dry UF
POFR/DECE	shrubby cinquefoil/tufted hairgrass	PA	SW5113	Warm Moderate SM RS	Moderate SM RS
POFR/POPR	shrubby cinquefoil/Kentucky bluegrass	PCT	SW5114	Warm Low SM RS	Low SM RS
POPR (DEGEN BENCH)	Kentucky bluegrass (degenerated bench)	PCT	MD3112	Cool Moist UH	Cold UH
POPR (MEADOW)	Kentucky bluegrass (meadow)	PCT	MD3111	Warm Low SM RH	Low SM RH
POSA3-DAUN	Sandberg's bluegrass-onespike oatgrass	PA	GB9111	Hot Dry UH	Dry UH
POTR/ALIN-COST	quaking aspen/mountain alder-redosier dogwood	PCT	HQS222	Warm Moderate SM RF	Moderate SM RF
POTR/ALIN-SYAL	quaking aspen/mountain alder-common snowberry	PCT	HQS223	Warm Moderate SM RF	Moderate SM RF
POTR/CAAQ	quaking aspen/aquatic sedge	PCT	HQM212	Warm High SM RF	High SM RF
POTR/CACA	quaking aspen/bluejoint reedgrass	PCT	HQM123	Warm Moderate SM RF	Moderate SM RF
POTR/CALA3	quaking aspen/woolly sedge	PA	HQM211	Warm Moderate SM RF	Moderate SM RF
POTR/MESIC FORB	quaking aspen/mesic forb	PCT	HQM511	Warm Moderate SM RF	Moderate SM RF
POTR/POPR	quaking aspen/Kentucky bluegrass	PCT	HQM122	Hot Low SM RF	Low SM RF
POTR/SYAL	quaking aspen/common snowberry	PCT	HQS221	Hot Moderate SM RF	Moderate SM RF
POTR2/ACGL	black cottonwood/Rocky Mountain maple	PCT	HCS114	Warm Moderate SM RF	Moderate SM RF
POTR2/ALIN-COST	black cottonwood/mountain alder-redosier dogwood	PA	HCS113	Warm Moderate SM RF	Moderate SM RF
POTR2/SALA2	black cottonwood/Pacific willow	PA	HCS112	Hot Moderate SM RF	Moderate SM RF
POTR2/SYAL	black cottonwood/common snowberry	PCT	HCS311	Hot Moderate SM RF	Moderate SM RF
PSME/ACGL-PHMA	Douglas-fir/Rocky Mountain maple-mallow ninebark	PA	CDS722	Warm Moist UF	Moist UF
PSME/ACGL-PHMA (FLOODPLAIN)	Douglas-fir/Rocky Mountain maple-mallow ninebark (floodplain)	PA	CDS724	Warm Moderate SM RF	Moderate SM RF
PSME/CAGE	Douglas-fir/elk sedge	PA	CDG111	Warm Dry UF	Dry UF
PSME/CARU	Douglas-fir/pinegrass	PA	CDG121	Warm Dry UF	Dry UF
PSME/CELE/CAGE	Douglas-fir/mountain mahogany/elk sedge	PCT	CDSD	Warm Dry UF	Dry UF
PSME/HODI	Douglas-fir/oceanspray	PA	CDS611	Warm Moist UF	Moist UF
PSME/PHMA	Douglas-fir/ninebark	PA	CDS711	Warm Dry UF	Dry UF
PSME/SPBE	Douglas-fir/birchleaf spiraea	PA	CDS634	Warm Dry UF	Dry UF

PVT CODE	PVT COMMON NAME	STATUS	ECOCLASS	PAG	PVG
PSME/SYAL	Douglas-fir/common snowberry	PA	CDS622	Warm Dry UF	Dry UF
PSME/SYAL (FLOODPLAIN)	Douglas-fir/common snowberry (floodplain)	PA	CDS628	Warm Low SM RF	Low SM RF
PSME/SYOR	Douglas-fir/mountain snowberry	PA	CDS625	Warm Dry UF	Dry UF
PSME/TRCA3	Douglas-fir/false bugbane	PCT	CDF313	Warm Moderate SM RF	Moderate SM RF
PSME/VAME	Douglas-fir/big huckleberry	PA	CDS812	Warm Dry UF	Dry UF
PUPA	weak alkaligrass	PA	MM2926	Warm High SM RH	High SM RH
PUTR/AGSP	bitterbrush/bluebunch wheatgrass	PA	SD3112	Hot Moist US	Moist US
PUTR/FEID-AGSP	bitterbrush/Idaho fescue-bluebunch wheatgrass	PA	SD3111	Warm Moist US	Moist US
RHAL2/MESIC FORB	alderleaved buckthorn/mesic forb	PCT	SW5117	Warm Moderate SM RS	Moderate SM RS
RHGL/AGSP	smooth sumac/bluebunch wheatgrass	PA	SD6121	Hot Dry US	Dry US
RIBES/CILA2	currants/drooping woodreed	PCT	SW5111	Warm High SM RS	High SM RS
RIBES/GLEL	currants/tall mannagrass	PCT	SW5116	Warm High SM RS	High SM RS
RIBES/MESIC FORB	currants/mesic forb	PCT	SW5115	Warm Moderate SM RS	Moderate SM RS
SAAR4	brook saxifrage	PCT	FW6113	Warm High SM RH	High SM RH
SACO2/CAPR5	undergreen willow/clustered field sedge	PC	SW1128	Cold High SM RS	High SM RS
SACO2/CASC5	undergreen willow/Holm’s sedge	PA	SW1121	Cold High SM RS	High SM RS
SACO2/CAUT	undergreen willow/bladder sedge	PCT	SW1127	Cold High SM RS	High SM RS
SAEA-SATW/CAAQ	Eastwood willow-Tweedy willow/aquatic sedge	PC	SW1129	Warm High SM RS	High SM RS
SAEX	coyote willow	PA	SW1117	Hot Moderate SM RS	Moderate SM RS
SALIX/CAAQ	willow/aquatic sedge	PA	SW1114	Warm High SM RS	High SM RS
SALIX/CACA	willow/bluejoint reedgrass	PC	SW1124	Warm Moderate SM RS	Moderate SM RS
SALIX/CALA3	willow/woolly sedge	PA	SW1112	Warm Moderate SM RS	Moderate SM RS
SALIX/CAUT	willow/bladder sedge	PA	SW1123	Warm High SM RS	High SM RS
SALIX/MESIC FORB	willow/mesic forb	PCT	SW1125	Warm Moderate SM RS	Moderate SM RS
SALIX/POPR	willow/Kentucky bluegrass	PCT	SW1111	Warm Low SM RS	Low SM RS
SARI	rigid willow	PCT	SW1126	Hot Moderate SM RS	Moderate SM RS
SASC/ELGL	Scouler willow/blue wildrye	PC	SW1130	Cool Moist US	Cold US
SCMI	smallfruit bulrush	PA	MM2924	Warm High SM RH	High SM RH
SETR	arrowleaf groundsel	PA	FW4211	Warm High SM RH	High SM RH
SPCR (RIVER TERRACE)	sand dropseed (river terrace)	PA	GB1211	Hot Dry UH	Dry UH
STOC	western needlegrass	PCT	GS10	Cool Moist UH	Cold UH
SYAL/FEID-AGSP-LUSE	common snowberry/fescue-wheatgrass-silky lupine	PCT	GB5121	Warm Moist US	Moist US
SYAL/FEID-KOCR	common snowberry/Idaho fescue-prairie junegrass	PCT	GB5919	Warm Moist US	Moist US
SYAL-ROSA	common snowberry-rose	PCT	SM3111	Warm Moist US	Moist US
SYOR	mountain snowberry	PCT	SM32	Warm Moist US	Moist US
TSME/VAME	mountain hemlock/big huckleberry	PA	CMS231	Cold Dry UF	Cold UF
TSME/VASC	mountain hemlock/grouse huckleberry	PA	CMS131	Cold Dry UF	Cold UF
TYLA	common cattail	PCT	MT8121	Hot High SM RH	High SM RH
VEAM	American speedwell	PA	FW6112	Warm High SM RH	High SM RH
VERAT	false hellebore	PC	FW5121	Warm Moderate SM RH	Moderate SM RH

[1] This appendix is organized alphabetically by PVT code. Column descriptions are:

PVT CODE provides an alphanumeric code for each of the 296 potential vegetation types described for the Blue Mountains section.

PVT COMMON NAME provides a common name for each potential vegetation type.

STATUS provides the classification status of each potential vegetation type: PA is Plant Association; PCT is Plant Community Type; PC is Plant Community.

ECOCLASS codes are used to record potential vegetation type determinations.

PAG (Plant Association Group) and PVG (Potential Vegetation Group) are two levels of a mid-scale potential vegetation hierarchy; PAG and PVG codes use the following abbreviations: SM is Soil Moisture, UF is Upland Forest physiognomic class, UW is Upland Woodland physiognomic class, US is Upland Shrubland physiognomic class, UH is Upland Herbland physiognomic class, RF is Riparian Forest physiognomic class, RS is Riparian Shrubland physiognomic class, and RH is Riparian Herbland physiognomic class.

APPENDIX 3. Methodology used to derive forest structure classes for Composite vegetation database.

PVG[1]	Order[2]	SizA[3]	CovA[4]	UnCov[5]	SizB[6]	Class[7]	Remarks
	1					PVT/ADM	Private land (PVT) or administrative sites (ADM)
	2	[TrCov <10% + nonforest ecoclass code]				NF	Non-forest (shrub, herb) and non-vegetated (water, rock)
	3	[TrCov <10% + forest ecoclass code]				BG	Existing tree cover is less than 10% (recent harvest, etc.)
COLD UPLAND FOREST	1	≥ 7.5	≥ 30	> 20		OFMS	Size class 7.5 included to account for LP and SF types
	2	≥ 7.5	≥ 30	≤ 20		OFSS	Size class 7.5 included to account for LP and SF types
	3	≥ 5	> 60	≥ 10		UR	
	4	≥ 5	≥ 10, ≤ 60	≥ 10		YFMS	Differs from Hessburg et al. 1999; they used: CovA ≥ 10, ≤ 60
	5	≥ 5	> 70	< 10		SECC	
	6	≥ 5	≥ 10, ≤ 70	< 10		SEOC	Note: >10% CovA was not used by Hessburg et al. 1999
	7	< 5	≥ 10			SI	Overstory consists of seedlings and saplings
	8	[≥ 5]	[< 10]	≥ 10	< 5	SI	Nonviable overstory; understory is seedlings and saplings
	9	[≥ 5]	[< 10]	≥ 30	≥ 7.5	OFSS	Nonviable overstory; query based on understory data
	10	[≥ 5]	[< 10]	> 70	≥ 5	SECC	Nonviable overstory; query based on understory data
	11	[≥ 5]	[< 10]	≤ 70	[≥ 5]	SEOC	Nonviable overstory; query based on understory data
	12	[≥ 5]	[< 10]	[≤ 70]	< 5	SI	Nonviable overstory; query based on understory data
MOIST UPLAND FOREST	1	≥ 8	≥ 30	> 20		OFMS	
	2	≥ 8	≥ 30	≤ 20		OFSS	
	3	≥ 5	> 60	≥ 10		UR	
	4	≥ 5	≥ 10, ≤ 60	≥ 10		YFMS	Differs from Hessburg et al. 1999; they used: CovA ≥ 10, ≤ 60
	5	≥ 5	> 70	< 10		SECC	
	6	≥ 5	≥ 10, ≤ 70	< 10		SEOC	Note: >10% CovA was not used by Hessburg et al. 1999
	7	< 5	≥ 10			SI	Overstory consists of seedlings and saplings
	8	[≥ 5]	[< 10]	≥ 10	< 5	SI	Nonviable overstory; understory is seedlings and saplings
	9	[≥ 5]	[< 10]	≥ 30	≥ 8	OFSS	Nonviable overstory; query based on understory data
	10	[≥ 5]	[< 10]	> 70	≥ 5	SECC	Nonviable overstory; query based on understory data
	11	[≥ 5]	[< 10]	≤ 70	[≥ 5]	SEOC	Nonviable overstory; query based on understory data
	12	[≥ 5]	[< 10]	[≤ 70]	< 5	SI	Nonviable overstory; query based on understory data

APPENDIX 3. Methodology used to derive forest structure classes for composite vegetation database [CONTINUED].

PVG[1]	Order[2]	SizA[3]	CovA[4]	UnCov[5]	SizB[6]	Class[7]	Remarks
DRY UPLAND FOREST	1	≥ 8	≥ 15	≥ 10		OFMS	Note: Except for SI, Dry UF queries used ½ of CovA values used for Cold UF and Moist UF queries
	2	≥ 8	≥ 15	< 10		OFSS	
	3	≥ 5	> 30	≥ 10		UR	
	4	≥ 5	≥ 10, ≤ 30	≥ 10		YFMS	Differs from Hessburg et al. 1999; they used: CovA ≥ 10, ≤ 30
	5	≥ 5	> 35	< 10		SECC	
	6	≥ 5	≥ 10, ≤ 35	< 10		SEOC	Note: >10% CovA was not used by Hessburg et al. 1999
	7	< 5	≥ 10			SI	Overstory consists of seedlings and saplings
	8	[≥ 5]	[< 10]	≥ 10	< 5	SI	Nonviable overstory; understory is seedlings and saplings
	9	[≥ 5]	[< 10]	≥ 15	≥ 8	OFSS	Nonviable overstory; query based on understory data
	10	[≥ 5]	[< 10]	> 35	≥ 5	SECC	Nonviable overstory; query based on understory data
	11	[≥ 5]	[< 10]	≤ 35	[≥ 5]	SEOC	Nonviable overstory; query based on understory data
	12	[≥ 5]	[< 10]	≤ 35	< 5	SI	Nonviable overstory; query based on understory data

Sources/Notes: These queries were based on Hessburg and others (1999; page 47); deviations from Hessburg and others (1999) are noted in remarks.

[1] Potential vegetation groups are middle level of a three-level, mid-scale hierarchy for potential vegetation (Powell et al. 2007).

[2] Order is important for these calculations because if a polygon could meet more than one query option, a structure class code should be assigned by a query option with lowest order number.

[3] Size class for overstory layer (layer A); see SizA description on page 9.

Note that items in brackets, shown in this and other columns, are provided for information only; it is not necessary to include these items when using "blank, changeto" query statements completed **in this order of precedence**.

[4] Canopy cover for overstory layer (layer A); see CovA description on page 9.

[5] Canopy cover associated with understory tree layers (layers B and C); see UnCov description on page 11.

[6] Size class for predominant understory layer (layer B); see SizB description on page 10.

[7] Although queries for woodlands structure classes are not shown in this table, woodlands structure classes were calculated for Composite, and they are also based on Hessburg et al. (1999; page 57).

APPENDIX 4: 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

Paper #	Title
33	Silviculture facts
34	Silvicultural activities: Description and terminology
35	Site potential tree height estimates for Pomeroy and Walla Walla Ranger Districts
36	Stand density protocol for mid-scale assessments
37	Stand density thresholds 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

February 2013: minor formatting and editing changes were made; appendix 4 was added describing a white paper system, including a list of available white papers.