

Historical Vegetation Mapping

David C. Powell
Forest Silviculturist

USDA Forest Service
Pacific Northwest Region
Umatilla National Forest

Initial Version: **April 2004**
Current Revision: **December 2009**

INTRODUCTION. With the advent of ecosystem management, ecosystem analysis at the watershed scale, the historical range of variability and related concepts, there is increasing emphasis on using historical information to inform analysts about reference (presettlement) conditions (Dillon et al. 2005, Kaufmann et al. 1998, Meyer et al. 2005). In response to this emphasis, the Umatilla National Forest silviculture library added an archives section in 1993 to organize and manage historical materials.

The silviculture library archives section contains books, aerial photographs, General Land Office survey notes, early government reports and records, journal articles, maps, newspaper articles, photographs and similar items (Powell 1999). Many of these items were obtained from the National Archives and Records Administration, either at its regional office in Seattle, Washington or the national office in College Park, Maryland.

Historical maps displaying vegetation conditions are valuable for comparing current or existing conditions with reference conditions. Many contemporary issues focus on changes in an ecosystem component through time (old growth forest, big-tree abundance, etc.), particularly when current conditions are believed to deviate substantially from conditions at the time of Euro-American settlement (presettlement conditions).

As with any data source, historical mapping can present issues. An example is that some historical maps provide a relatively high amount of detail for commercial forest types but little or no information for nonforest and noncommercial types.

The objective of this document is to describe historical vegetation maps available from the Supervisor's Office of the Umatilla National Forest.

Note that although the maps described below are stored at the Umatilla National Forest Supervisor's Office, many of them pertain to the entire Blue Mountains and also characterize vegetation conditions for all or part of the Malheur and Wallowa-Whitman national forests.

This summary describes two types of maps:

- Those characterizing vegetation conditions directly, and
- Those portraying disturbance processes influencing vegetation conditions (insect outbreaks, wildfires, windstorms, etc.).

Other historical maps are available in the archives section, including forest visitor's maps dating back to 1904, but they are not included in this report unless they also provide information about vegetation conditions.

The following vegetation and disturbance maps are included in the historical archives of the Umatilla National Forest silviculture library, arranged chronologically from oldest to most recent.

1. Interpretation of General Land Office survey notes (1850s to 1930s).

- a. **Source:** Survey notes collected during land surveys by the General Land Office (GLO). For the Umatilla National Forest, many of the townships were surveyed between 1879 and 1887.
- b. **Description:** Between November 1995 and May 2001, Martha King interpreted GLO survey notes for 120 townships located within or adjacent to the Umatilla National Forest. Bearing tree information and many other data items were entered into a non-normalized Paradox database (flat-file format), with each database record linked to its corresponding section corner or section line (quarter-corner data was referenced to section lines). This Paradox database was later converted to a normalized (multi-table) Access database.
- c. **Scale:** Not entered from GLO maps; a GIS coverage is available showing all section lines and corners for which interpreted data is available.
- d. **Status:** A coverage is available in GIS where each section line and section corner was assigned a unique identification number. The unique ID allows the spatial location of each section line or corner to be linked with its corresponding database information.

Titan Geospatial Services and the Oregon Natural Heritage Information Center prepared an interpolated vegetation coverage by cokriging the GLO survey notes; this GLO map is provided in appendix D and as a PDF file on the Forest's history website:

<http://www.fs.fed.us/r6/uma/publications/history/maps.shtml>

- e. **GIS Pathname:** /fsfiles/ref/library/gis/uma/glo

2. Map of the state of Oregon showing the classification of lands and forests (Thompson and Johnson 1900).

- a. **Source:** Included with a report called "The forests of Oregon" by Henry Gannett (1902a).
- b. **Description:** Shows forested areas within the state of Oregon, as classified using volume per acre, while also providing ancillary information about the location of harvested areas, burns (forest fires) and the northern limit of redwood. The following items are included in the legend:
 - Timberless area;
 - Woodland;
 - 0 to 5,000 board feet per acre;
 - 5,000 to 10,000 board feet per acre;
 - 10,000 to 25,000 board feet per acre;
 - 25,000 to 50,000 board feet per acre;
 - 50,000 and over board feet per acre;
 - Barren;
 - Burnt;

- Cut timber, not restocking;
 - Cut timber, restocking; and
 - Northern limit of redwood.
- c. **Scale:** 1:1,000,000 (projection unknown); 29" × 23" colored thematic map sheet.
- d. **Status:** This map was photographically copied, and copies are hanging at several locations in the Supervisor's Office and in Ranger District offices. It is available in GIS for the northeastern Oregon portion only, including the Malheur, Umatilla National Forest, and Wallowa-Whitman national forests.
- Titan Geospatial Services prepared a display version of this map (Umatilla National Forest portion only); it is provided in appendix D and as a PDF file on the Forest's history website: <http://www.fs.fed.us/r6/uma/publications/history/maps.shtml>
- e. **GIS Pathname:** /fsfiles/ref/library/gis/bmprov/hveg_1900
3. Map of Washington showing classification of lands (Plummer et al. 1902).
- a. **Source:** Included with a report called "The forests of Washington, a revision of estimates" by Henry Gannett (1902b).
- b. **Description:** Shows forested areas within the state of Washington, as classified using volume per acre, and also provides ancillary information such as the location of cut (harvested) areas and burns (forest fires). The following items are included in the legend:
- Cut areas;
 - Timberless area;
 - Burned areas;
 - 0 to 2,000 board feet per acre;
 - 2,000 to 5,000 board feet per acre;
 - 5,000 to 10,000 board feet per acre;
 - 10,000 to 25,000 board feet per acre;
 - 25,000 to 50,000 board feet per acre; and
 - 50,000 to 100,000 board feet per acre.
- c. **Scale:** 1:1,000,000 (projection unknown); 29" × 23" colored thematic map.
- d. **Status:** Two portions of this map were copied in color (one 11" × 14" sheet shows the map title, authors, and legend; the other sheet shows southeastern Washington only). It is not available in GIS because the mapping is so coarse as to be unusable, and because the southeastern quarter of the Washington map will not edge match with the greater detail provided by the northeastern quarter of the Oregon map (item 2 above describes the Oregon map).
4. Location and extent of forest fires occurring in 1910 (Plummer 1912).
- a. **Source:** Fire extents for the "fires of 1910" were presented for all of the western United States as figure 5 of "Forest fires: their causes, extent and effects, with a summary of recorded destruction and loss" by Fred G. Plummer (1912).

- b. Description:** The original, large-scale map shows state boundaries and fire extents for the portion of the United States located west of the 100th meridian.
 - c. Scale:** The scale and projection are unknown because this map source was published as a figure in a bulletin and no legend or scale bar were included with the figure.
 - d. Status:** The map was scanned at a high resolution and the resulting image file was georeferenced using the state boundaries for topological control; the location and extent of forest fires shown as occurring anywhere in the Blue Mountains province of northeastern Oregon and southeastern Washington were then entered into the geographical information system using heads-up digitizing. Figure 5 from Plummer (1912) is provided in appendix D as an image file.
 - e. GIS Pathname:** /fsfiles/ref/library/gis/bmprov/firehis_pl
5. Insect control project, northeastern Oregon, 1911 (U.S. Department of Agriculture, Forest Service 1911?).
 - a. Source:** This map was undoubtedly prepared to accompany one of a half dozen or so reports pertaining to an insect control project on the Whitman National Forest, although it is unknown which one because the map margins provide few annotations or notes.
 - b. Description:** The map extends from the Burnt River on the south to the Powder River and Antone Creek on the north (township 6 south, ranges 37 and 38 east). The towns of Hereford, Bourne, Baker City and Sumpter, Oregon are shown on the map. The legend for this map includes three items:
 - Yellow (ponderosa) pine areas treated;
 - Lodgepole areas treated; and
 - Forest boundary.
 - c. Scale:** 1:63,360 (projection unknown); 31" × 43" thematic map sheet.
 - d. Status:** Not available in GIS.

Note: legibility of this map is poor because the original copy in the National Archives was a blue-line or diazo print (white lettering and lines on a dark blue background) and this copy was made on a normal (electrostatic) copier that did not handle the blue background very well.
6. The 1913 infestation of *Dendroctonus monticolae* (Pernot 1913a).
 - a. Source:** Accompanied a report called "The insect situation in 1913 on the Whitman National Forest" by J.F. Pernot (1913b).
 - b. Description:** Base map shows the entire Whitman NF and was compiled from Supervisor's [Office] corrected atlas sheets in Portland, Oregon in April 1912 by draftsman R.H. Robertson. Legend for the base map includes the following items:
 - National Forest boundary;
 - Ranger District boundary;
 - Stock driveways;
 - County lines;

- Telephone lines;
- Forest Service trails;
- Old trails;
- Ranger Station fences;
- Ranger cabins; and
- Fire toolboxes.

The legend for the thematic map includes three items:

- Exterior limits of heavy areas of infestation prior to, and including 1912, according to map of Ranger Smith;
- Areas of active infestation in lodgepole pine, noted in 1913; and
- Areas of active infestation in yellow pine, noted in 1913.

Note: Most of the North Fork John Day Ranger District located in Grant County, OR was previously included in the Whitman National Forest; this means that historical mapping for the Whitman National Forest often provides useful information for the southern third of the Umatilla National Forest.

c. **Scale:** 1:126,720 (projection unknown); 33" × 38" thematic map sheet.

d. **Status:** Not available in GIS.

7. 1912 sketch map showing areas of mountain pine beetle infestation, and areas being treated to control the infestation, on the Whitman National Forest (Edmonston 1913).

a. **Source:** Accompanied a report called "1912 report on northeastern Oregon project no. 38" by W.D. Edmonston.

b. **Description:** A mountain pine beetle outbreak occurred in ponderosa and lodgepole pines in the northern Blue Mountains and Wallowa Mountains in the early 1900s (beginning no later than 1905). This map provides a rough approximation of the infestation area as of 1912, and shows areas that received pine beetle control treatments in 1911 (control work began on April 5th and was completed by June 30th).

It is surmised that this insect control project was one of the first, if not the first, of its kind for the western United States (Burke and Wickman 1990). The outbreak was still quite active in 1912: Edmonston judged that at least 200,000 infested lodgepole and whitebark pines existed between 5,000 and 7,000 feet elevation in an area ranging from Anthony Creek on the north to Elk Creek on the south, and then west to the Elkhorn Range.

The Whitman National Forest map (dated 1912) shows treatment and infestation areas in color. The map has two legends:

- The first one shows five different treated and inspected areas (differentiated by color) and the area of lodgepole and whitebark pines;
- The other shows: area to be worked first, area to be worked second, main area to be protected, limit of forest growth, limit of infestation, insect-infested yellow pine forests, and insect-infested lodgepole pine forests.

Note: Most of the North Fork John Day Ranger District located in Grant County, OR was previously included in the Whitman National Forest; this means that historical mapping for the

Whitman National Forest often provides useful information for the southern third of the Umatilla National Forest.

- c. **Scale:** 1:253,440 (projection unknown); 8, 8½" × 11" colored thematic map sheets.
 - d. **Status:** Not available in GIS, and not available on a Kodak PhotoCD. The map was copied on a series of 8½" × 11" sheets since the National Archives did not have large-format color copying capability.
8. Extensive timberland classification for the Wenaha, Umatilla, and part of the Whitman national forests (Kellogg 1916, Kendall 1914, Smith 1915).
- a. **Source:** This accession consists of a set of 32 map sheets providing a timber volume classification for the Wenaha, Umatilla, and Whitman (portion) national forests.
 - b. **Description:** These maps were probably part of an early timber atlas. The legend for their thematic information is described below:

Code	Description
0	Voided areas
1	2-5 MBF per acre of timber volume
2	5-10 MBF per acre of timber volume
3	10-25 MBF per acre of timber volume
4	Woodland, cordwood, poles, etc.
5	Grasslands, parks, meadows, etc.
6	Sagebrush
7	Brushland
8	Land rejected on application under the homestead act of June 11, 1906
9	Land applied for and classified by the Secretary of Agriculture under the acts of June 11, 1906 and August 10, 1912 as chiefly valuable for forestry
10	Unclassified land held for intensive classification
12	Unknown
77	Unknown

The base map depicts points of elevation (indicated by numbers), the names and approximate locations of old Ranger Stations, locations of homesteads (including homesteader names in some instances), names of watercourses, range (livestock) driveways, and certain other annotations.

Note: the livestock driveways and certain other information on the base maps is valuable and should be entered into the Forest's GIS system at the first opportunity to do so.

- c. **Scale:** 1:63,360 (projection unknown); 32, 18" × 21" colored thematic map sheets.
- d. **Status:** Since the National Archives lacks on-site equipment for large-format color copying, a vendor was used to photograph each sheet – the color negatives were then scanned onto a Kodak PhotoCD.

In September 2001, a contract was awarded to Titan Geospatial Services Division (Portland, Oregon) to digitize these maps (from the tif files contained on the PhotoCD) and then merge them into a single coverage. The merged coverage is now available in GIS.

Titan Geospatial Services prepared a display version of this map (Umatilla National Forest portion only); it is provided in appendix D and as a PDF file on the Forest's history website. Note that the 32 individual map sheets used to compile the merged GIS coverage are provided on the history website as image files, <http://www.fs.fed.us/r6/uma/publications/history/maps.shtml>, so they are not included in appendix D.

e. **GIS Pathname:** /fsfiles/ref/library/gis/uma/hveg_1916

9. Large-scale map of permanent Pw plot no. 1 (Smith 1914).

- a. **Source:** Accompanied a report describing the extent and impact of windfall associated with cut-over areas on the Whitman National Forest (Smith and Weitknecht 1915).
- b. **Description:** This is an extremely detailed, large-format map (1-inch equals 50 feet) of the Pw-1 plot on the W.H. Eccles sale area (a timber sale awarded in December 1910). It shows the location, species, and size of every stump on the surveyed area, along with all live or windthrown trees. For the windthrown trees, their direction of fall is shown with an arrow.

Limited generalization was also done, primarily for small-diameter lodgepole pines (symbolology was included for them, but a stem count was given indicating that more than one tree was present in the vicinity of each symbol). Dotted lines encompass broad areas that were referred to as "lodgepole sapling areas." Contours are shown using a 5-foot contour interval.

Unfortunately, there is no certainty about the location of this 40-acre plot because although it is referenced to two numbered "forties" (86 and 93), there is no township, range, section, or other location information provided.

- c. **Scale:** 1:600 (projection unknown); 28" × 29" thematic map sheet.
- d. **Status:** Not available in GIS, but a scanned version is provided in appendix D as an image file.

10. Natural vegetation of Oregon (Lawrence 1915).

- a. **Source:** Prepared by W.E. Lawrence, Department of Botany, Oregon State College.
- b. **Description:** The legend for thematic information is described here:

Code	Description
1	Mesophytic coniferous forest
2	Xerophytic coniferous forest
3	Yellow pine
4	Juniper
5	Alpine and subalpine forest
6	Alpine meadow
7	Chapparal
8	Grassland – west
9	Grassland – east
10	Semi-desert

Code	Description
11	Marsh

Note that the base map shows the western boundary of range area.

- c. **Scale:** 1:1,000,000 (polyconic); 26" × 20" colored thematic map sheet.
 - d. **Status:** Since the National Archives lacks on-site equipment for large-format color copying, a vendor was used to photograph this map – the color negative was then scanned onto a Kodak PhotoCD. In September 2001, a contract was awarded to Titan Geospatial Services Division (Portland, Oregon) to digitize this map; it is now available in GIS.
Titan Geospatial Services prepared a display version of this map (Umatilla National Forest portion only); it is provided in appendix D and as a PDF file on the Forest's history website: <http://www.fs.fed.us/r6/uma/publications/history/maps.shtml>
 - e. **GIS Pathname:** /fsfiles/ref/library/gis/Oregon/hveg_oreg1915
- 11.** Reconnaissance map for proposed Grande Ronde Lumber Company timber sale in Lookingglass Creek (Drake 1920).
- a. **Source:** Included with a reconnaissance/examination report for a proposed timber sale area applied for by the Grande Ronde Lumber Company of Perry, Oregon.
 - b. **Description:** This is a multi-color reconnaissance map showing the boundary of the area applied for, and some general vegetation types (yellow pine, larch-Douglas-fir-white fir, and open areas). It also includes some disturbance information: "burn restocking to western larch (40%), Douglas-fir (40%), and white fir (20%)" and "cutover by Grande Ronde Lumber Company." The base map shows the location of a sheep camp, a trail up Lookingglass Creek and Summer Creek, and the location of both creeks.
 - c. **Scale:** 1:31,680 (projection unknown); 8½" × 11" colored thematic map sheet.
 - d. **Status:** Available in GIS. A scanned version of the original map is provided as an image file in appendix D. Drake's (1920) entire report is available from the Forest's historical website: <http://www.fs.fed.us/r6/uma/publications/history/Wenaha2.pdf>
 - e. **GIS Pathname:** /fsfiles/ref/library/gis/uma/hveg_look1920
- 12.** Forest type maps for Asotin, Columbia, Garfield, and Walla Walla counties in southeastern Washington (Kemp et al. 1935a, 1935b; Taylor et al. 1935), and for Grant, Morrow, Umatilla, Union, Wallo-wa, and Wheeler counties in northeastern Oregon (Buell et al. 1936a, 1936b; Pelto et al. 1936; Sankela and Lynch 1936a, 1936b; Sankela et al. 1936a, 1936b; Wolfe et al. 1936).
- a. **Source:** Published by the Pacific Northwest Forest Experiment Station, Forest Survey unit for east of the Cascade Range.
 - b. **Description:** These blue-line sheets came from an early mapping effort providing an impressive amount of detail. Not only were forest-type codes provided, but information about stocking (poor, medium, well), age (10-year classes), associated species (western larch, Engelmann spruce, white pine) and evidence of past timber harvest were included. Type codes allowed de-

forested burns and non-restocked cutovers to be shown, with codes added for drought-killed, insect-killed, or windthrown stands. Each of 41 different cover types was denoted using an alphanumeric code, sometimes in conjunction with cross-hatching or other annotations. The numbers of Castell or Dixon colored pencils were provided with the legend so that map users, if they so desired, could hand color the maps using a consistent color scheme.

- c. **Scale:** 1:63,360 (projection unknown); large-format, thematic map sheets.
- d. **Status:** Many of these maps are available in GIS. Original copies of these maps (except Walla Walla County, Washington) are located at the University of Washington libraries in Seattle. The Regional Office Geometronics Unit digitized four of them in 1993 (using a contract with Infotec in Portland; see Holt 1993); seven others were electronically scanned by Olympic Reprographics (Seattle) and then saved in Autocad format.

Note: the maps for southern Umatilla, southern Union, and Wheeler counties were finally located in 2007, so a merged GIS coverage for the 1935-1936 county-level mapping is now available for the entire Umatilla National Forest.

In September 2002, a contract was awarded to Titan Geospatial Services Division (Portland, Oregon) to edge match all eleven county maps and merge them into a single, seamless, geo-referenced GIS coverage covering the entire Umatilla National Forest.

In July 2007, a contract was awarded to Tetra Tech EC (Bothell, Washington) to digitize the maps for southern Umatilla, southern Union, and Wheeler counties, and then merge them into the Forest-wide coverage previously prepared by Titan Geospatial Services in 2002. At this point, complete GIS coverage of the 1935-1936 county-level mapping is available for the Umatilla National Forest.

Appendix A provides a detailed description of this coverage's legend, including a lookup table relating map attributes to cover types, cover type groups, size classes, size class groups, stocking classes, structural classes, structural class groups, and timber harvest.

Titan Geospatial Services and Tetra Tech EC prepared display versions of this mapping for species composition and forest structure classes (Umatilla National Forest portion only); they are provided in appendix D and as PDF files on the Forest's history website:

<http://www.fs.fed.us/r6/uma/publications/history/maps.shtml>

- e. **GIS Pathname:** /fsfiles/ref/library/gis/Oregon/hveg_orwa1936.

13. Forest type maps for southeastern Washington (Andrews and Cowlin 1936) and northeastern Oregon (Andrews and Cowlin 1937).

- a. **Source:** Generalized forest type maps for the southeastern quarter of Washington and the northeastern quarter of Oregon. These "quarter-state" maps were derived from detailed county-level mapping published the previous year (see item 12 above).
- b. **Description:** Unlike the county-level mapping described in item 12 above, detailed information about forest conditions (such as stocking, age, seral species or identification of timber harvest areas) was not provided with this quarter-state mapping. The legend for these maps includes two nonforest types, three noncommercial types, and twenty timberland types (appendix B).
- c. **Scale:** 1:253,440 (Lambert projection); 36" × 61" colored thematic map sheets.

- d. **Status:** This mapping is available in GIS (from a CD attached to the inside back cover of Harrington 2003). Refer to appendix B for a detailed description of the legend. Tetra Tech EC prepared a display version of this mapping for species composition (Umatilla National Forest portion only); it is provided in appendix D and as a PDF file on the Forest's history website: <http://www.fs.fed.us/r6/uma/publications/history/maps.shtml>

e. **GIS Pathname:** /fsfiles/ref/library/gis/bmprov/hveg_sene1936

14. Land exchange – First National Bank of Heppner (Wakeman 1936).

- a. **Source:** Accompanied "Report and accompanying appraisal of First National Bank of Heppner lands in Morrow County, Oregon" by William J. Wakeman (1936).
- b. **Description:** This map shows vegetation types in a large land exchange area in townships 4 and 5 south, range 28 east. The area ranged from Porcupine Ridge in the southwest to Shaw Creek in the northeast, all of which is on the Heppner Ranger District. The legend for thematic information is described here:

Code	Description
0	Voided areas
1	Ponderosa pine, mature
2	Ponderosa pine, immature
3	Ponderosa pine, saplings and poles
4	Ponderosa pine, seedlings
5	White fir, larch, Douglas fir, mature
6	White fir, larch, Douglas fir, immature
7	White fir, larch, Douglas fir, seedlings
8	Douglas fir, mature
9	Lodgepole pine, immature
10	Grassland
11	Brush

The base map shows roads, ridges, elevations, section lines, landmark names, and the presence of old burns.

- c. **Scale:** 1:15,840 (projection unknown); 26" × 30" colored thematic map sheet.
- d. **Status:** In September 2001, a contract was awarded to Titan Geospatial Services Division (Portland, Oregon) to digitize this map. The coverage is now available in GIS.
- e. **GIS Pathname:** /fsfiles/ref/library/gis/uma/hveg_hep1936

15. Location of the Camas Creek timber sale unit (Stevenson 1937).

- a. **Source:** Accompanied a report called "Sale prospectus and timber appraisal report; Camas Creek unit" by George E. Stevenson (1937).
- b. **Description:** The Camas Creek unit was a timber sale containing 221,308,000 board feet of national forest timber located in the Umatilla National Forest. The sale area comprised an area of about 69,645 acres in townships 3, 4, 5, and 6 south, ranges 32, 33, 33½, and 34 east of the Wil-

lamette Meridian. It was located in the watersheds of Camas and Meadow Creeks, with the western boundary of the unit being about 10 miles east of Ukiah, Oregon.

This color map shows the Camas Creek timber sale unit and the following items as well: pine timber located south of the unit on both national forest and private land; location of the Mt. Emily logging railroad; Mt. Emily Lumber Company timberland, and lands logged by the Mt. Emily Lumber Company.

- c. **Scale:** Scale and projection unknown; 1 color and 3 non-color, 8½" × 11" map sheets.
- d. **Status:** Not entered into GIS, but a scanned version is provided in appendix D as an image file. More information about the Camas Creek timber sale and the Milton Box Company is available from the history website:
<http://www.fs.fed.us/r6/uma/publications/centennial/milton%20box%20company%20story.pdf>

16. Vegetation classification of the Desolation watershed from 1937-1940 aerial photography.

- a. **Source:** Delineation of polygons, and characterization of vegetation conditions for each polygon, was accomplished by awarding a contract to BAF, Inc. in 1996 during the Desolation watershed analysis effort.
- b. **Description:** Historical aerial photographs (1937-1940) covering the Desolation watershed on North Fork John Day Ranger District (approximately 70,000 acres) were provided to the contractor, who then delineated polygons and classified vegetation conditions within each polygon.
All delineation was completed on acetate overlays, not on the aerial photographs. Polygon delineation and vegetation classification standards were the same as those used for interpretation of contemporary aerial photography in 1996.
- c. **Scale:** 1:20,000 (scale of aerial photography used for delineation and classification).
- d. **Status:** Available in GIS. Contractor supplied a digital coverage containing the polygon delineations and a digital database file containing the classification data. The digital data is available as a dbf file for use with ArcGIS software.
- e. **GIS Pathname:** /fsfiles/ref/library/gis/uma/hveg_deso1940

17. Location of aerial photograph centers for photography acquired between 1937 and 1981.

- a. **Source:** Contract awarded to BAF, Inc. in September 2001 to determine the center for more than 15,000 aerial photographs acquired between 1937 and 1981. This includes all historical flights of aerial photography providing coverage for the Umatilla National Forest (1930s, 1950s, 1960s, 1970s).
- b. **Description:** One print of each aerial photograph was supplied to the contractor, who registered an acetate overlay to the print using its fiducial marks as registration points, determined the photo center and marked it on the overlay, and then digitized each center using 1994 digital orthophoto quadrangles for georeferencing purposes.
- c. **Scale:** 1:20,000 or 1:15,840 depending upon year (project).

- d. **Status:** The process described above resulted in a GIS coverage depicting the center (as point data) of each aerial photograph acquired between 1937 and 1981. This coverage will allow analysts to determine the historical aerial photographs occurring within a watershed or planning area. Note that photo centers were already available in GIS for the late-1980s flight (1987-1988) and for recent, District-level flights.
 - e. **GIS Pathname:** /fsfiles/ref/library/gis/uma/rpc
18. Survey units no. 3 and 5: north and south Blue Mountain units of the ponderosa pine region (Cowlin et al. 1942).
- a. **Source:** This source came from a report summarizing results of forest surveys completed during the 1930s for eastern Oregon and eastern Washington (Cowlin et al. 1942).
 - b. **Description:** When combined, these two maps depict generalized forest conditions for the entire Blue Mountains province as they existed in the late 1930s (ponderosa pine sawtimber, ponderosa pine second growth, other conifer sawtimber, other conifer second growth, noncommercial forest, deforested land, and nonforest land).
 - c. **Scale:** no scale or projection information was provided; two irregular-sized, colored thematic map sheets.
 - d. **Status:** Two maps from this document were digitized and are available in GIS: “survey unit no. 3 – north Blue Mountain unit – ponderosa pine region” and “survey unit no. 5 – south Blue Mountain unit – ponderosa pine region.” They were edge matched and then merged into a single coverage. Scanned versions of both maps are provided in appendix D.
 - e. **GIS Pathname:** /fsfiles/ref/library/gis/bmprov/hveg_1942
19. Areas defoliated by Douglas-fir tussock moth or western spruce budworm, and sprayed areas to control tussock moth, for season of 1947.
- a. **Source:** Accompanied a report called “Defoliator situation in the fir stands of eastern Oregon and Washington, season of 1947” by W.J. Buckhorn (1948).
 - b. **Description:** Beginning in 1945, northern Blue Mountains mixed-conifer forest near Troy was defoliated by Douglas-fir tussock moth. By 1947, reports of insect-caused defoliation were common throughout eastern Oregon, although some defoliation attributed to tussock moth ultimately turned out to be caused by western spruce budworm. In order to sort out this confusing situation, it was decided to make an aerial survey of the 7,755,000 timbered acres of the Blue Mountain region, and this map and its accompanying report provides results from the survey.
 This turned out to be the first aerial survey conducted in Region 6 to determine the extent and severity of insect damage. Note that an aerial survey has been conducted every year since then.
 Buckhorn’s report included several maps (Blue Mountains, northern Washington, southern Oregon) but not all of them were copied. A color map showing the Blue Mountains situation (tussock moth – sprayed, tussock moth – unsprayed, spruce budworm) was copied.
 With respect to western spruce budworm, the most severe defoliation anywhere in the region was on the Umatilla NF near Dale in the Meadow Creek-Desolation Creek drainages.

Another large area of budworm infestation was a 160,000-acre center near Wall Creek, ranging from Swale Creek on the east to the Spray-Heppner highway on the west. A relatively small infestation center near Battle Mountain State Park caused considerable public reaction.

On the north half of the Umatilla NF, a large outbreak covered about 67,000 acres near the headwaters of Phillips Creek, Umatilla River, and Willow Creek.

- c. **Scale:** 1:126,720 (projection unknown); 6, 8½" × 11" colored thematic map sheets.
- d. **Status:** The map was copied on a series of 8½" × 11" sheets since the National Archives did not have large-format color copying capability. Budworm defoliation has not been entered into GIS. The Douglas-fir tussock moth area, all of which occurred on the Umatilla NF near Troy, was digitized during the Grande Ronde-Rondowa watershed analysis effort in 2000. That map shows two attributes: tussock moth – sprayed and tussock moth – unsprayed.
- e. **GIS Pathname:** /fsfiles/ref/library/gis/uma/treat1947

20. Areas of spruce budworm defoliation in 1948 (Furniss et al. 1948).

- a. **Source:** Accompanied a report called "The spruce budworm in Oregon and Washington, season of 1948" by R.L. Furniss, W.J. Buckhorn, and K.H. Wright (1948).
- b. **Description:** The map accompanied a report based on five years of observations, intensive surveys in 1947 and 1948, and an experimental control project and detailed biological studies in 1948. Maps show the extent and intensity of budworm defoliation.

Two maps (Blue Mountains area, Oregon Cascades area) were present at the end of the report, although map 1, Blue Mountains area, was the only one copied since both maps were in color and oversized.

During August and September of 1948, an intensive survey of budworm defoliation was made by aerial and ground methods; results of the survey are generally summarized by using national forests as reporting units.

For the Umatilla NF, total budworm defoliation increased more than 100% from 1947 (374,000 acres) to 1948 (807,000 acres). Heavy and very heavy defoliation on the Umatilla NF comprised 392,000 acres of the total.

- c. **Scale:** 1 inch = 12 miles (projection unknown); colored thematic map sheet.
- d. **Status:** Not entered in GIS. The Blue Mountains map was copied on 4, 8½" × 11" sheets since the National Archives did not have large-format color copying capability.

21. Forest type maps for Asotin, Columbia, Garfield, and Walla Walla counties in southeastern Washington (Spada et al. 1957a), and for Grant, Morrow, Umatilla, Union, Wallowa, and Wheeler counties in northeastern Oregon (Adams et al. 1953; Bones et al. 1958a, 1958b; Spada et al. 1954, 1957b, 1957c, 1960).

- a. **Source:** County-level forest type maps published by the Pacific Northwest Forest and Range Experiment Station.
- b. **Description:** These blue-line sheets came from an early mapping effort providing an impressive amount of detail. Not only were cover type codes provided, but information about stand size

(based on diameter classes), stocking/density (nonstocked; poor, medium, well stocking), age (10-year classes), nonforest types (grass, shrub, nonvegetated, water), associated species (western larch, Engelmann spruce, white pine, and many others) and evidence of past partial cutting was also included.

- c. **Scale:** 1:63,360; polyconic projection; thematic map sheets.
- d. **Status:** These maps are available in GIS; original copies are located at the University of Washington libraries in Seattle, or at the University of Oregon libraries in Eugene. The Regional Office Geometronics Unit digitized them in 1993 (using a contract with Infotec in Portland; see Holt 1993).

Note: the maps for Asotin, Columbia, Garfield, and Walla Walla counties were finally located in 2007, so a merged GIS coverage for the late 1950s county-level mapping is now available for the entire Umatilla National Forest.

In June 2003, a contract was awarded to Titan Geospatial Services Division (Portland, Oregon) to edge match and merge these maps into a single GIS coverage.

In July 2007, a contract was awarded to Tetra Tech EC (Bothell, Washington) to digitize the maps for Asotin, Columbia, Garfield, and Walla Walla counties, and then merge them into the Forest-wide coverage previously prepared by Titan Geospatial Services in 2002. At this point, complete GIS coverage of the 1950s county-level mapping is available for the Umatilla National Forest.

Appendix C provides a detailed description of this coverage's legend, including a lookup table relating map attributes to cover types, size classes, stocking classes, structural classes, timber harvest, and purity (pure versus mixed composition).

Titan Geospatial Services and Tetra Tech EC prepared display versions of this mapping for species composition and forest structure classes (Umatilla National Forest portion only); they are provided in appendix D and as PDF files on the Forest's history website:

<http://www.fs.fed.us/r6/uma/publications/history/maps.shtml>

- e. **GIS Pathname:** /fsfiles/ref/library/gis/Oregon/hveg_ore1958.

22. Location of 1958 forest inventory plots for the Umatilla National Forest (USDA Forest Service, Date unknown).

- a. **Source:** Unpublished planimetric township maps mounted on yellow, 8½" x 11" paper.
- b. **Description:** This source consists of more than a hundred maps, one per township, that provides two primary sources of information: the center location of early to mid 1950s aerial photographs, and the location of forest inventory plots installed and measured in 1958.

Note that the 1958 inventory was the first comprehensive (Forest-wide) plot-based inventory completed for the Umatilla National Forest. Plots were installed on a systematic grid system with a 1.7-mile spacing between plots. Each plot consisted of a three-point cluster; points two and three were installed at 6-chain intervals on a compass bearing from point one.

Each point consisted of nested sample plots with specific tree classes (live versus dead trees, for example) and tree sizes sampled on plots of different size; large-diameter trees were sampled on a 1/5-acre plot and smaller plots (1/20th and 1/250th acre) were used for small-

diameter trees. Note that USDA Forest Service (1957) describes codes and plot establishment procedures in more detail.

- c. **Scale:** 1:63,360; projection unknown; thematic map sheets.
- d. **Status:** Available in GIS; the 1950s aerial photograph centers are also available in GIS (see item #17 above) but their location was determined from the photographs themselves, not from these maps.
- e. **GIS Pathname:** /fsfiles/ref/library/gis/uma/hinv_1958

23. Area sprayed with a chemical insecticide (DDT) to control Douglas-fir tussock moth populations (1974).

- a. **Source:** An unpublished map (dated July 31, 1974) that is available in the silviculture section of the Supervisor's Office, Umatilla National Forest.

- b. **Description:** A widespread outbreak of Douglas-fir tussock moth affected the northern Blue Mountains and the northern Rocky Mountains in the early 1970s. By 1974, over 350,000 acres had been defoliated on the Pomeroy and Walla Walla Ranger Districts.

Although DDT had been banned in 1972, an emergency authorization was granted for its use against tussock moth in 1974. Over 30,000 acres were sprayed on the Umatilla NF in June and July of 1974. This map shows areas sprayed with DDT in 1974 to control tussock moth populations.

- c. **Scale:** 1:126,720 (projection unknown); 38" × 43" colored thematic map sheet.
- d. **Status:** Don Justice digitized many, if not all, of the Umatilla NF treatment areas on this map source during the Grande Ronde-Rondowa watershed analysis effort in 2000.
- e. **GIS Pathname:** /fsfiles/ref/library/gis/uma/treat1974

24. Vegetation classification for the Umatilla National Forest as based on 1987-1988 aerial photography.

- a. **Source:** Delineation of polygons, and characterization of vegetation conditions for each polygon, was accomplished by awarding a contract to Camp-II Contracting in 1989.
- b. **Description:** After selecting an aerial photograph to represent the vegetation complexity of an entire 7½-minute quadrangle, the Forest Service delineated polygons using R-6 mapping and classification standards and provided the delineated photograph to the contractor. The contractor then completed a walk-through examination for each polygon on the delineated photograph.

Exam results formed the basis for the contractor's delineation and classification of all other aerial photographs for the same quad (note: from November 1989 to June 1990, the contractor established an office in the Pendleton area when completing the delineation and classification phase of the contract).

The Forest Service inspected at least 20% of the contractor's work. The contractor transferred delineations to orthophoto overlays, numbered the polygons, and matched the classification data (on the coding sheets) with the numbered polygons.

After submitted work was inspected, the Forest Service scanned and edited the orthophoto overlays, and then entered the classification data into an Oracle database (data keypunching was not completed until spring 1991).

- c. **Scale:** 1:12,000 (scale of natural-color aerial photography used for polygon delineation and classification).
- d. **Status:** Available in GIS. The digital data is available as a dbf file for use with Arc GIS software.
- e. **GIS Pathname:** /fsfiles/ref/library/gis/uma/hveg_1987

APPENDIX A: LEGEND AND TYPE DEFINITIONS

1935-1936 County-Level Forest Cover Type Maps¹

<u>TYPE</u>	<u>DEFINITIONS</u>
1	BARRENS: Areas too rocky, exposed, or soil-less to support a real vegetative cover.
2	NONFOREST LAND: Cultivated, pasture, grass, grass swamp, sagebrush, and brush lands.
3	NONFOREST LAND: Agricultural land, including forestlands cleared for agricultural uses (this code was not included in original legend for forest survey of eastern Oregon).
4	OAK: A forest containing 60% or more of oak.
5A	DENSE JUNIPER: A juniper forest occupying over 10% of the land area.
5B	SCATTERED JUNIPER: A juniper forest occupying from 5 to 10% of the land area.
5Mm	Indicates a stand with a predominance of mountain mahogany.
5½	PONDEROSA PINE WOODLAND: A scattered stand of mature ponderosa pine characteristic of the desert fringes.
6	DOUGLAS FIR, LARGE OLD GROWTH: A forest containing over 60% Douglas fir, over 40" DBH.
7	DOUGLAS FIR, SMALL OLD GROWTH: A forest containing over 60% Douglas fir, 20-40" DBH.
8	DOUGLAS FIR, LARGE SECOND GROWTH: A forest containing over 60% Douglas fir, 20-40" DBH.
9A	DOUGLAS FIR, LARGE POLES: A forest containing over 60% Douglas fir, 12-20" DBH.
9B	DOUGLAS FIR, SMALL POLES: A forest containing over 60% Douglas fir, 6-12" DBH.
10	DOUGLAS FIR, SEEDLINGS AND SAPLINGS: A forest containing over 60% Douglas fir, 0-6" DBH.
11	SPRUCE: A forest containing 50% or more, by volume, of spruce (this code was not included in original legend for forest survey of eastern Oregon).
17	WESTERN RED CEDAR, LARGE: A forest containing over 40% western red cedar, over 24" DBH.
19A	WESTERN RED CEDAR, LARGE SECOND GROWTH: A forest containing over 40% western red cedar, 12-24" DBH.
19B	WESTERN RED CEDAR, SMALL SECOND GROWTH: A forest containing over 40% western red cedar, 0-12" DBH.
20	PONDEROSA PINE, LARGE: A forest containing 50-80% ponderosa pine, over 22" DBH.
20.5	PURE PONDEROSA PINE, LARGE: A forest containing over 80% ponderosa pine, over 22" DBH.

¹ Legend descriptions derived from USDA Forest Service (1935, 1936).

<u>TYPE</u>	<u>DEFINITIONS</u>
20A	PONDEROSA-SUGAR PINE, MIXTURE, LARGE: A forest containing over 50% ponderosa pine and 20% or more of sugar pine, over 22" DBH.
20B	SUGAR PINE MIXTURE, LARGE: A forest containing 20% or more of sugar pine and less than 50% ponderosa pine, over 22" DBH.
21	PONDEROSA PINE, SMALL: A forest containing over 50% ponderosa pine, either selectively cut or immature stands, 12-22" DBH.
22	PONDEROSA PINE, SEEDLINGS, SAPLINGS, AND POLES: A forest containing over 50% ponderosa pine, 0-12" DBH.
23	BALSAM FIR-MOUNTAIN HEMLOCK, LARGE: A forest containing over 50% of either noble, silver, subalpine, or Shasta fir and/or mountain hemlock, over 12" DBH.
24	BALSAM FIR-MOUNTAIN HEMLOCK, SMALL: A forest containing over 50% of either noble, silver, subalpine, or Shasta fir and/or mountain hemlock, under 12" DBH.
25	LOGGEPOLE PINE, LARGE: A forest containing over 50% lodgepole pine, over 12" DBH.
26	LOGGEPOLE PINE, MEDIUM: A forest containing over 50% lodgepole pine, 6-12" DBH.
26A	LOGGEPOLE PINE, SMALL: A forest containing over 50% lodgepole pine 0-6" DBH.
27	PINE MIXTURE, LARGE: A mixed forest containing from 20-50% ponderosa pine, over 12" DBH.
28	PINE MIXTURE, SMALL: A mixed forest containing from 20-50% ponderosa pine, 0-12" DBH.
27.5	UPPER SLOPE MIXTURE, LARGE: A mixed forest of larch, white fir, subalpine fir, Douglas fir, Engelmann spruce, lodgepole pine, or white pine, over 12" DBH.
27.5ES	UPPER SLOPE MIXTURE, ENGELMANN SPRUCE PREDOMINATING, LARGE: A mixed forest containing over 50% Engelmann spruce, over 12" DBH.
27.5WP	UPPER SLOPE MIXTURE, WESTERN WHITE PINE PREDOMINATING, LARGE: A mixed forest containing over 40% western white pine, and over 12" DBH. Used only in Spokane, Stevens, and Pend Oreille Counties, Washington.
27.5WL	UPPER SLOPE MIXTURE, WESTERN LARCH PREDOMINATING, LARGE: A mixed forest containing over 50% larch, and over 12" DBH. Used in all counties.
28.5	UPPER SLOPE MIXTURE, SMALL: A mixed forest of larch, white fir, subalpine fir, Douglas fir, Engelmann spruce, lodgepole pine, or white pine, 0-12" DBH.
28.5ES	UPPER SLOPE MIXTURE, ENGELMANN SPRUCE PREDOMINATING, SMALL: A mixed forest containing over 50% Engelmann spruce, under 12" DBH.
28.5WP	UPPER SLOPE MIXTURE, WESTERN WHITE PINE PREDOMINATING, SMALL: A mixed forest containing over 40% western white pine, under 12" DBH. Used only in Spokane, Stevens, and Pend Oreille Counties, Washington.

<u>TYPE</u>	<u>DEFINITIONS</u>
28.5WL	UPPER SLOPE MIXTURE, WESTERN LARCH PREDOMINATING, SMALL: A mixed forest containing over 50% larch. Used in all counties.
29	WHITE FIR, LARGE: A forest containing over 50% white fir, over 12" DBH.
30	WHITE FIR, SMALL: A forest containing over 50% white fir, under 12" DBH.
31	HARDWOODS: A stand in which maple, aspen, or cottonwood predominate.
31.5	Indicates a hardwood type of merchantable size.
33	SUBALPINE: A forest at the upper limits of tree growth, usually unmerchantable.
34	LOGGED: The number 34 does not represent a type but is a prefix to indicate that the area has been logged, either clean cut or selectively, and is now restocking. Whenever the combination symbol 34-21, 34=22, etc. is used, the encircled number indicates the type. Therefore, the type designation 34=22 indicates a cut-over area containing ponderosa pine reproduction 0 to 6" DBH, uneven-aged, and with medium stocking. Or, 21+A80 would indicate an even-aged stand of 80 year-old well stocked ponderosa pine 12 to 22" DBH occurring on an old burn and not on cut-over land.
35	NONRESTOCKED CUT-OVERS: Logged areas not satisfactorily restocked and not carrying a residual stand of 1 M board feet per acre.
35A	Cut after 1920;
35B	Cut before 1920.
36	RECENT CUT-OVER: An area clean-cut since 1920, regardless of the status of regeneration (this code was not included in original legend for forest survey of eastern Oregon).
37	DEFORESTED BURNS: Any non-restocked burn, not cut over.
37A	Drought killed,
37B	Insect killed,
37S	Killed by smelter fumes,
37W	Wind thrown.
38	NONCOMMERCIAL ROCKY AREAS. In type 38, the second number represents the predominating species and size class, i.e., 38 6 is a noncommercial rocky area with old-growth Douglas fir and will be colored with green dots; 38 20 would be colored with orange dots.

NOTES

For even-aged second growth stands, symbols indicating age and density will also be shown on the map. The age is shown by 10-year classes (e.g., A20 or A30) and the stocking by bars, either —, =, +. For uneven-aged stands, stocking only will be shown.

- (poorly stocked) means the area is from 10 to 40% stocked.
- = (medium stocked) means the area is from 40 to 70% stocked.
- + (well stocked) means the area is from 70 to 100% stocked.

The following description of the 1935-1936 forest survey was taken from: "Forest Statistics for Umatilla and Union Counties, Oregon" by MacLean and Orr (1960). Appendix C in Harrington (2003) provides additional information about the 1930s inventory of eastern Oregon and eastern Washington.

"The inventory of the counties' forests was conducted in 1936 by what is known as the 'compilation method.' In this method, existing information on forest types, timber volumes, logged areas, and other inventory data were collected from private timber owners and various public agencies. These data were checked in the field for reliability and were adjusted to Forest Survey specifications and standards. Forest-type and timber-volume data for areas not covered by reliable existing information were obtained through field reconnaissance. Timber-volume estimates for immature stands were determined from normal yield tables adjusted for site, age, and density of stand.

All land in the counties was classified as either forest or nonforest. Forestland was further classified as commercial or noncommercial; the commercial was still further classified by forest type, stand-size or condition class, and – in the case of young-growth stands – by stocking and age classes. Only the even-aged immature forest stands, those in which most of the dominant trees were less than 22 inches in diameter, were classified according to age in 10-year classes and according to their density in three degrees of stocking. All such types and classes were mapped in place on a 1-inch-to-the-mile base map of each forested township.

Next, these township type maps were superimposed over current ownership-status plats and dot counted to obtain forest-type area statistics by ownership class. Type delineation on the township maps was then transferred to a base map of each county to form a county forest type map. The commercial forestland was also classified as to site quality, or forest productive capacity.

In-place, timber-volume estimates were based on 1) existing cruises collected and adjusted to the Forest Survey standard, 2) field samples, and 3) ocular appraisals. Cruises made by commercial cruisers were obtained for most of the privately owned timber, and Forest Service cruises were available for a large part of the national-forest lands. Separate volume estimates were computed for each of the commercial tree species and for each ownership class. Methods used in this inventory did not permit a statistical computation of accuracy of the estimate."

APPENDIX A1: Description of lookup (cross-walk) table for 1935-1936 county-level forest type mapping.

A lookup table was prepared for the 1935-1936 county-level forest type mapping. It relates the map attributes (codes) with 5 primary characteristics (cover type, size class, stocking class, structural class, and evidence of timber harvest) and 3 secondary (calculated) characteristics (cover type group, size class group, and structural class group). The lookup table is too long to reproduce in its entirety here (13 pages) but the coding associated with each of its fields is described. The lookup table itself is available in the same directory where the GIS coverage is stored.

Map code is the attribute code associated with each polygon; see legend described previously for more information about the original map codes.

Cover type characterizes the existing vegetation composition of each polygon. If one species was assumed to comprise more than half of the total stocking for a polygon, then the cover type was assigned using the majority species (e.g., ABGR where grand fir comprised more than 50% of the stocking). If no single species comprised more than half of the stocking, then the cover type was named for the plurality species along with a prefix (mix) to denote the mixed-species composition (e.g., mix-ABGR where grand fir was predominant but did not exceed 50% of the total stocking). Cover type codes are:

Code	Description
ABGR	Grand fir is the majority species
ABLA	Subalpine fir is the majority species
JUOC	Western juniper is the majority species
LAOC	Western larch is the majority species
mix-ABGR	Mixed forest; grand fir is the plurality species
mix-ABLA	Mixed forest; subalpine fir is plurality species
mix-JUOC	Mixed forest; western juniper is plurality species
mix-LAOC	Mixed forest; western larch 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-POTR2	Mixed forest; black cottonwood is the plurality species
mix-PSME	Mixed forest; Douglas-fir is plurality species
Nonforest	Grass/herb and shrub sites
PICO	Lodgepole pine is the majority species
PIEN	Engelmann spruce is the majority species
PIPO	Ponderosa pine is the majority species
POTR2	Black cottonwood is the majority species
PSME	Douglas-fir is the majority species
Unknown	Cover type is unknown (perhaps indicating incorrect coding) or could not be inferred from the original coding

Cover type group is a generalized characterization of existing vegetation composition for broad-scale mapping purposes. Cover type group codes are:

Code	Description
Douglas-fir	Combination of the PSME and mix-PSME cover types
Grand fir	Combination of the ABGR and mix-ABGR cover types
Lodgepole-Larch	Combination of the LAOC, mix-LAOC, PICO, and mix-PICO cover types
Nonforest	Nonforest cover type
Ponderosa Pine	Combination of the PIPO and mix-PIPO cover types
Other Forest	Combination of the JUOC, mix-JUOC, POTR2, mix-POTR2, and unknown cover types

Code	Description
Spruce-Fir	Combination of the ABLA, mix-ABLA, PIEN, and mix-PIEN cover types

Size class characterizes the predominant tree size (based on diameter) for forested polygons. Size class codes are:

Code	Description
2	Seedlings and saplings mixed (trees 1-4.9" DBH)
4	Saplings and poles mixed (trees 1-8.9" DBH)
6	Poles and small trees mixed (trees 5-14.9" DBH)
7.5	Small trees 15-20.9" DBH
8	Small and medium trees mixed
9	Medium trees 21-31.9" DBH
10	Medium and large trees mixed
[blank]	Size class could not be inferred from the original coding

Size class group is a generalized characterization of existing tree size (based on diameter) for broad-scale mapping purposes. Size class group codes are:

Code	Description
Small	Combination of the 2 and 4 size class codes
Medium	The 6 size class code
Large	Combination of the 7.5, 8, 9, and 10 size class codes
Other	Blank size class codes

Stocking class characterizes forest (tree) density for forested polygons. For forested polygons where this item is blank, the stocking class is either nonstocked (less than 10 percent) or a stocking condition could not be inferred from the original coding. Note that stocking was supposed to be coded for "even-aged immature forest stands" only (Harrington 2003), so stands that were uneven-aged, or even-aged but mature-overmature, may not have been coded for stocking intentionally. Stocking codes are:

Code	Description
L	Low stocking (poorly stocked; 10 to 40 percent)
M	Medium stocking (40 to 70 percent)
H	High stocking (70 to 100 percent)
[blank]	Stocking class could not be inferred from the original coding

Structural class is a derived field characterizing vertical structure. Structural class determinations were based on professional judgment; they were designed to replicate the Forest's structural class queries as closely as possible (see appendix 3 in "Description of composite vegetation database" by Powell 2004). Structural class codes are:

Code	Description
NF	Nonforest (grass/herb and shrub cover types)
OFMS	Old Forest Multi Strata structural class
OFSS	Old Forest Single Stratum structural class
SECC	Stem Exclusion Closed Canopy structural class
SEOC	Stem Exclusion Open Canopy structural class
SI	Stand Initiation structural class
UR	Understory Reinitiation structural class
YFMS	Young Forest Multi Strata structural class
WOSS	Woodland Old Single Stratum structural class
[blank]	Structural class could not be inferred from the original coding

Structural class group is a generalized characterization of existing vertical structure for broad-scale mapping purposes. Structural class group codes are:

Code	Description
Old Forest	Combination of the OFMS and OFSS structural classes
Stem Exclusion	Combination of the SECC and SEOC structural classes
Stand Initiation	The SI structural class
Understory Reinitiation	Combination of the UR and YFMS structural classes
Other	Combination of the NF and WOSS structural classes

Timber Harvest characterizes whether the polygon could be considered a residual stand after partial cutting. This field records the presence of timber harvest only; a Y in this field indicates that the polygon is a residual stand after a partial cutting timber harvest.

APPENDIX B: LEGEND AND TYPE DEFINITIONS

1936-1937 State-Level Forest Cover Type Maps

<u>NUMBER</u>	<u>TYPE DEFINITION</u>
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NONFOREST LAND TYPES

01 NON-FOREST LAND.

Includes barrens, cities, natural grass areas, brush, desert, sand dunes, tide-flats, and agricultural areas with less than 10 percent of the area in woods.

02 AGRICULTURAL ZONES.

Large areas of land used principally for agriculture but with some incidental wooded areas ordinarily too small and scattered to be mapped in place.

NONCOMMERCIAL FOREST TYPES

03 SUBALPINE AND CERTAIN NONCOMMERCIAL FORESTS.

Includes areas at upper limits of tree growth, usually unmerchantable because of poor form and small size, and areas within the range of commercial timber types and below the limits of subalpine types, which are too rocky, steep, sterile, or swampy to produce a stand of commercial size, density, or quality.

04 LODGEPOLE PINE.

Forests containing more than 50 percent by volume of lodgepole or knobcone pine, usually almost pure. Includes all size and age classes.

05 JUNIPER.

Forests composed principally of any species of juniper of any size class and degree of density. Occasionally includes small areas of ponderosa pine woodland.

TIMBERLAND TYPES

06 DOUGLAS-FIR, OLD GROWTH.

Forests containing over 60 percent old growth Douglas-fir regardless of size.

07 DOUGLAS-FIR, LARGE SECOND GROWTH.

Forests, not yet mature, containing over 60 percent Douglas-fir where the majority of the volume is in trees 20 to 40 inches in diameter.

08 DOUGLAS-FIR, SMALL SECOND GROWTH.

Young forests containing over 60 percent Douglas-fir, in which most of the volume is in trees 6 to 20 inches in diameter.

09 DOUGLAS-FIR, SEEDLINGS AND SAPLINGS.

Very young forests containing over 60 percent Douglas-fir, in which most of the trees are 6 inches and under in diameter.

10 SPRUCE-HEMLOCK, LARGE.

Forests containing over 50 percent by volume of either western hemlock or Sitka spruce, in which most of the volume is in trees over 20 to 24 inches in diameter.

<u>NUMBER</u>	<u>TYPE DEFINITION</u>
11	SPRUCE-HEMLOCK-CEDAR, SMALL. Forests containing over 50 percent by volume of either western hemlock, Sitka spruce, western red cedar, or Port Orford cedar, in which most of the volume is in trees under 20 to 24 inches in diameter.
12	CEDAR-REDWOOD, LARGE. Forests of sawtimber size containing either 40 percent or more by volume of western red cedar, 20 percent of Port Orford cedar, or 80 percent of redwood, in which the majority of the volume is in trees over 24 to 30 inches in diameter.
13	PONDEROSA PINE, LARGE. Forests containing at least 50 percent by volume of ponderosa pine, sugar pine or Jeffrey pine, or all of them in combination, where the predominating trees are over about 22 inches in diameter (over about 150 or 200 years old), and where no material amount of the stand has ever been cut.
14	PURE PONDEROSA PINE, LARGE. Forests containing at least 80 percent by volume of ponderosa or Jeffrey pine, where the predominating trees are over about 22 inches in diameter (over about 150 or 200 years old), and where no material amount of the stand has ever been cut.
15	PONDEROSA PINE, SMALL. Forests containing at least 50 percent by volume of either ponderosa pine, sugar pine, or Jeffrey pine, or all of them in combination, where the majority of the volume is in immature trees ordinarily between 12 and 22 inches in diameter and amounts to more than 1,000 board feet per acre; such stands may consist either of (a) selectively cut stands of any age, or (b) uncut immature stands (so called "bull pine" stands, under 150 or 200 years old).
16	PONDEROSA PINE, SEEDLINGS, SAPLINGS, AND/OR POLES. Forests on old burns or heavily cut land where the majority of the trees under 12 inches in diameter are ponderosa pine and the stand of larger ponderosa pine, if any, amounts to less than 1,000 board feet of sawtimber per acre.
17	PINE MIXTURE, LARGE. A mixed forest in which ponderosa pine comprises about 20 to 50 percent by volume, with a variable amount of western larch, white fir, Douglas-fir, white pine, and other species, where the majority of the volume is in trees over 12 inches in diameter and where no material amount of cutting has been done.
18	PINE MIXTURE, SMALL. A mixed forest where 20 to 50 percent of the dominant trees are ponderosa pine and are less than 12 inches in diameter.

<u>NUMBER</u>	<u>TYPE DEFINITION</u>
19	BALSAM FIRS, MOUNTAIN HEMLOCK, AND UPPER SLOPE TYPES, LARGE. Forests in which either noble fir, silver fir, Shasta red fir, white fir, mountain hemlock or occasionally western hemlock, western larch, Engelmann spruce, or any combination of these species, comprise over 50 percent of the volume of the stand. Small amounts of alpine fir, Douglas-fir, lodgepole pine, white pine, and occasionally other species, may also be found in mixture. Commonly found on upper slopes of the mountain ranges. The majority of the dominant trees are over about 16 inches in diameter where this type is used west of the summit of the Cascade Range and over 12 inches in diameter east of the summit of the Cascade Range.
20	BALSAM FIRS, MOUNTAIN HEMLOCK, AND UPPER SLOPE TYPES, SMALL. Forests with the same species combination as in type 19, where most of the dominant trees are under about 16 inches in diameter west of the summit of the Cascade Range and under 12 inches east of the summit of the Cascade Range.
21	HARDWOODS—ALDER, ASH, MAPLE. Forests in which alder, ash, maple, cottonwood, or myrtle predominate, of any size and age class.
22	HARDWOOD—OAK, MADRONE. Forests composed of approximately 60 percent or more of any species of oak (including tan oak) or madrone, or any combination of them, of any size class.
23	RECENT CUT-OVERS. Areas clean-cut since January 1920, regardless of the status of regeneration. Used only for that part of Oregon and Washington west of the summit of the Cascade Range.
24	NONRESTOCKED CUT-OVERS. West of the summit of the Cascade Range includes areas clean-cut prior to 1920, which are less than 10 percent restocked and are not put to other than forest use. East of the summit of the Cascade Range includes areas logged over at any time, which are less than 10 percent restocked.
25	DEFORESTED BURNS. Lands not cut over on which the stand has been killed by fire, and which are less than 10 percent restocked.

APPENDIX C: Legend for County-Level Forest Type Mapping

To be used with maps dated after January 1, 1949 (except Coos Co., OR)

PREFIXES TO FOREST TYPE SYMBOLS

R Residual stand after partial cutting

COMMERCIAL FOREST TYPES

C Cedar; composition symbols show whether the type is Western Red, Port Orford, Alaska Yellow or Incense cedar
D Douglas-fir
FM True fir-mountain hemlock
H Western hemlock
HD Hardwoods; composition symbols show the species
LP Lodgepole pine
P Ponderosa pine
S Sitka spruce
W White pines; composition symbols show whether the type is Western white or Sugar pine
WF White fir
WL Western larch

F Area deforested by fire
I Area deforested by insects
WT Area deforested by wind throw
X Recent clear-cut area; non-stocked
XO Old clear-cut area; non-stocked

NONCOMMERCIAL FORESTS AND WOODLAND

J Sierra juniper
NR Non-commercial rocky; area within commercial forest zone too rocky, steep, or sterile to be commercial
OM Oak-madrone scrub stands
SA Subalpine; non-merchantable stands above commercial forest zone

NONFOREST

G Cultivated, grass or brush pasture, or brush non-forest
O Open; non-vegetative land including barrens and cities
W Water; streams, lakes, and tide-flats

STAND-SIZE CLASSES (first numeric character)

1 seedlings and saplings; 0 to 5 inches D.B.H.
2 pole timber; 5 to 11 inches D.B.H.
3 small saw timber; 11 to 21 inches D.B.H., mainly young growth
4 large saw timber; 21 inches and larger D.B.H., mainly old growth (except for D4 which is chiefly so-called "red fir")
5 large old growth Douglas-fir saw timber; 21 inches and larger D.B.H., so-called "yellow fir"

DENSITY OF STOCKING CLASS SYMBOLS (second numeric character)

Density of stocking determined from either stocked quadrant counts of number of stems or from aerial photos on basis of degree from crown closure. Absence of this portion indicates nonstocked.

blank	Nonstocked; less than 10 percent
1	Poorly stocked; 10 to 40 percent
2	Medium stocked; 40 to 70 percent
3	Well stocked; 70 to 100 percent

AGE CLASSES AND SYMBOLS

Year of origin to nearest decadal year is shown thus: 1890, 1940, etc. Year of stand originating in 1944 would be shown as 1940, 1945 as 1950.

ASSOCIATED SPECIES COMPOSITION

No species is recognized unless it comprises at least 20% of type unit based on cubic-foot volume; symbols are listed in decreasing order of abundance based on cubic-foot volume; ordinarily only 3 species are recognized in any type unit.

Code	Species
A	Pacific silver fir
AF	Subalpine fir
B	Western paper birch, northwestern paper birch
BC	Black cottonwood, quaking aspen
C	Western cedar
CH	Golden chinkapin
CLO	Canyon live oak
CO	California black oak
D	Douglas-fir
ES	Engelmann spruce
H	Western hemlock
IC	Incense cedar
J	Western juniper
LP	Lodgepole pine, shore pine, knobcone pine
M	Bigleaf maple
MAD	Pacific madrone
MH	Mountain hemlock
MY	California laurel
NF	Noble fir
OA	Oregon ash
OO	Oregon white oak
P	Ponderosa pine, Jeffrey pine
PC	Port Orford cedar
R	Redwood
RA	Red alder

Code	Species
S	Sitka spruce
SP	Sugar pine
SRF	Shasta red fir
TO	Tanoak
W	Western white pine, whitebark pine
WF	White fir, grand fir
WL	Western larch, alpine larch
YC	Alaska cedar

NOTES

UNKNOWN indicates that the attribute on the original map was indecipherable or absent.

Some character substitution occurred to insure compatibility with MOSS capabilities. Thus, periods (.) were generally replaced with underscores (_). Attributes circled on the map were bracketed with capital Z's (Z). Opening and closing brackets "()" were replaced with carets (^).

The following description of the 1953-1960 forest survey was taken from: "Forest Statistics for Umatilla and Union Counties, Oregon" by MacLean and Orr (1960).

"In the reinventory of 1957-58, the forest type maps of both counties were completely revised. This revision was accomplished through interpretation, classification, and field mapping on aerial photos that covered all the land area in the two counties. In mapping on aerial photos, types whose classification was difficult were examined more closely in the field. Likewise, species composition of mixed stands was checked on the ground. The use of aerial photos in mapping resulted in type delineations of much greater accuracy and detail than was possible through the ground reconnaissance employed in the initial inventory (1936). In the preparation of a revised type map, the delineations on the aerial photos were transferred to a 2-inch county base map through use of a reflecting projector.

For those areas outside the national forests, and for the Union and Elkhorn Working Circles of the Wallowa-Whitman National Forests, type areas were determined by a dot count on the forest type map. The average per-acre volumes for sawtimber, poletimber, and seedling and sapling stands were obtained through a sampling procedure in which stands were sampled with a systematic grid of plots evenly distributed over each county.

A different procedure was used for the remainder of the national-forest area. Land classification for the North Fork, Grande Ronde, and Wenaha working circles of the Umatilla National Forest was based on a systematic grid of plots. Each subplot was first classified as commercial forest, noncommercial forest, or nonforest. The ratio of subplots in each class to the total number of subplots was applied to the total land area to determine the acreage of each classification. Subplots falling on commercial forestland were also classified by forest type and stand-size class as indicated by plot tally. The percentage of subplots falling in each type was applied to the total area of commercial forestland in the working circle to determine the acreage of land in that type."

APPENDIX C1: Description of lookup (cross-walk) table for 1953-1960 county-level forest type mapping.

A lookup table was prepared for the 1953-1960 county-level forest type mapping. It relates the map attributes (codes) with 5 primary characteristics (cover type, size class, stocking class, structural class, and evidence of timber harvest) and 3 secondary (calculated) characteristics (cover type group, size class group, and structural class group). The lookup table is too long to reproduce in its entirety here (29 pages) but the coding associated with each of its fields is described. The lookup table itself is available in the same directory where the GIS coverage is stored.

Map code is the attribute code associated with the polygons; this code is a concatenated string consisting of the items described previously for the original map legend (cover type code + stand size class + density, if available + age class, if available + associated species, if available).

Cover type characterizes the existing vegetation composition of each polygon. If one species was assumed to comprise more than half of the total stocking for a polygon, then the cover type was assigned using the majority species (e.g., ABGR where grand fir comprised more than 50% of the stocking). If no single species comprised more than half of the stocking, then the cover type was named for the plurality species along with a prefix (mix) to denote the mixed-species composition (e.g., mix-ABGR where grand fir was predominant but did not exceed 50% of the total stocking). Cover type codes are:

Code	Description
ABGR	Grand fir is the majority species
ABLA	Subalpine fir is the majority species
Grass	Grass is the majority species
JUOC	Western juniper is the majority species
LAOC	Western larch is the majority species
mix-ABGR	Mixed forest; grand fir is the plurality species
mix-ABLA	Mixed forest; subalpine fir is plurality species
mix-LAOC	Mixed forest; western larch is plurality species
mix-PICO	Mixed forest; lodgepole pine is plurality species
mix-PIEN	Mixed forest; Engelmann spruce is plurality species
mix-PIMO	Mixed forest; western white pine is plurality species
mix-PIPO	Mixed forest; ponderosa pine is plurality species
mix-POTR2	Mixed forest; black cottonwood is plurality species
mix-PSME	Mixed forest; Douglas-fir is plurality species
Nonveg	Nonvegetated sites (exclusive of water)
PICO	Lodgepole pine is the majority species
PIEN	Engelmann spruce is the majority species
PIMO	Western white pine is the majority species
PIPO	Ponderosa pine is the majority species
POTR2	Black cottonwood is the majority species
PSME	Douglas-fir is the majority species
Water	Water (lakes, rivers, etc.)
[blank]	Cover type is unknown (perhaps indicating incorrect coding) or could not be inferred from the original coding

Cover type group is a generalized characterization of existing vegetation composition for broad-scale mapping purposes. Cover type group codes are:

Code	Description
Douglas-fir	Combination of the PSME and mix-PSME cover types
Grand fir	Combination of the ABGR and mix-ABGR cover types

Code	Description
Lodgepole-Larch	Combination of the LAOC, mix-LAOC, PICO, and mix-PICO cover types
Nonforest	Combination of the grass, nonveg, water, and some blank cover types
Ponderosa Pine	Combination of the PIPO and mix-PIPO cover types
Other Forest	Combination of the JUOC, PIMO, mix-PIMO, POTR2, mix-POTR2, and some blank cover types
Spruce-Fir	Combination of the ABLA, mix-ABLA, PIEN, and mix-PIEN cover types

Size class characterizes the predominant tree size (based on diameter) for forested polygons. Size class codes are:

Code	Description
2	Seedlings and saplings mixed (trees 1-4.9" DBH)
6	Poles and small trees mixed (trees 5-14.9" DBH)
7.5	Small trees 15-20.9" DBH
10	Medium trees 21-31.9" DBH and large trees 32-47.9" DBH

Size class group is a generalized characterization of existing tree size (based on diameter) for broad-scale mapping purposes. Size class group codes are:

Code	Description
Small	The 2 size class code
Medium	The 6 size class code
Large	Combination of the 7.5 and 10 size class codes
Other	Blank size class codes

Stocking class characterizes forest (tree) density for forested polygons. For forested polygons where this item is blank, the stocking condition is either nonstocked (less than 10 percent) or a stocking class could not be inferred from the original coding. Stocking codes are:

Code	Description
L	Low stocking (poorly stocked; 10 to 40 percent)
M	Medium stocking (40 to 70 percent)
H	High stocking (70 to 100 percent)
[blank]	Stocking class could not be inferred from the original coding

Structural class is a derived field characterizing vertical structure. Structural class determinations, which were based on professional judgment, were designed to replicate the Forest's structural class queries as closely as possible (see appendix 3 in "Description of composite vegetation database" by Powell, 2001). For forested polygons where this item is blank, a structural class condition could not be inferred. Structural class codes are:

Code	Description
BG	Bare Ground structural class
NF	Nonforest (grass/herb, shrub, water, nonvegetated cover types)
OFMS	Old Forest Multi Strata structural class
OFSS	Old Forest Single Stratum structural class
SECC	Stem Exclusion Closed Canopy structural class
SEOC	Stem Exclusion Open Canopy structural class
SI	Stand Initiation structural class
UR	Understory Reinitiation structural class
YFMS	Young Forest Multi Strata structural class
WOSS	Woodland Old Single Stratum structural class
WSI	Woodland Stand Initiation structural class
[blank]	Structural class could not be inferred from the original coding

Structural class group is a generalized characterization of existing vertical structure for broad-scale mapping purposes. Structural class group codes are:

Code	Description
Old Forest	Combination of the OFMS and OFSS structural classes
Stem Exclusion	Combination of the SECC and SEOC structural classes
Stand Initiation	Combination of the BG and SI structural class
Understory Reinitiation	Combination of the UR and YFMS structural classes
Other	Combination of the NF, WOSS, WSI and blank structural classes

Timber Harvest characterizes whether the polygon could be considered a residual stand after partial cutting. This field records timber harvest presence only; a Y in this field indicates that the polygon is a residual stand after a partial cutting timber harvest.

APPENDIX D: Image Files of Historical Maps

This appendix provides image files for many of the historical maps described in this document. Image files were derived from GIS presentation maps (PDF format) prepared for the history website (<http://www.fs.fed.us/r6/uma/publications/history/maps.shtml>) or by scanning a map from the original report or other source material. The following maps are provided in this appendix:

General Land Office survey notes (GLO) – see item #1

1900 map of the state of Oregon – see item #2

Location and extent of forest fires in 1910 – see item #4

Extensive timberland classification – see item #8

Large-scale map of permanent Pw plot no. 1 – see item #9

Natural vegetation of Oregon – see item #10

Reconnaissance map of Lookingglass Creek timber sale – see item #11

County forest type mapping for 1935-1936 – see item #12

County forest structural stage mapping for 1935-1936 – see item #12

Quarter-state forest type mapping for 1936-1937 – see item #13

Camas Creek timber sale unit map – see item #15

Survey unit #3 – north Blue Mountain unit – see item #18

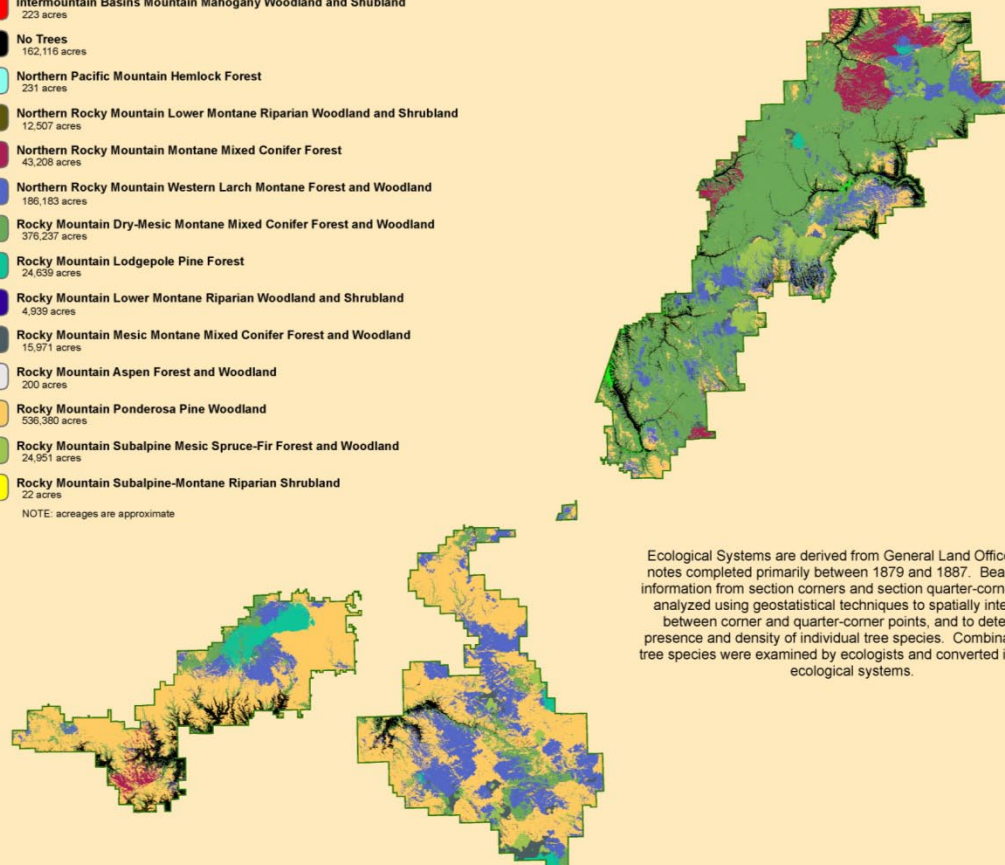
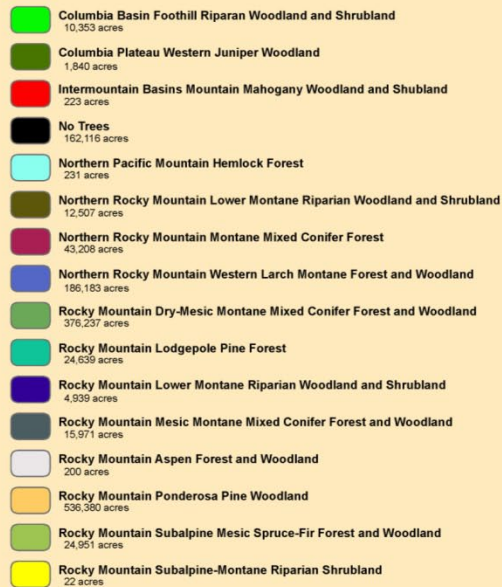
Survey unit #5 – south Blue Mountain unit – see item #18

County forest type mapping for 1950s – see item #21

County forest structural stage mapping for 1950s – see item #21

Umatilla National Forest Historic Vegetation

Ecological Systems



Ecological Systems are derived from General Land Office survey notes completed primarily between 1879 and 1887. Bearing tree information from section corners and section quarter-corners were analyzed using geostatistical techniques to spatially interpolate between corner and quarter-corner points, and to determine presence and density of individual tree species. Combinations of tree species were examined by ecologists and converted into forest ecological systems.



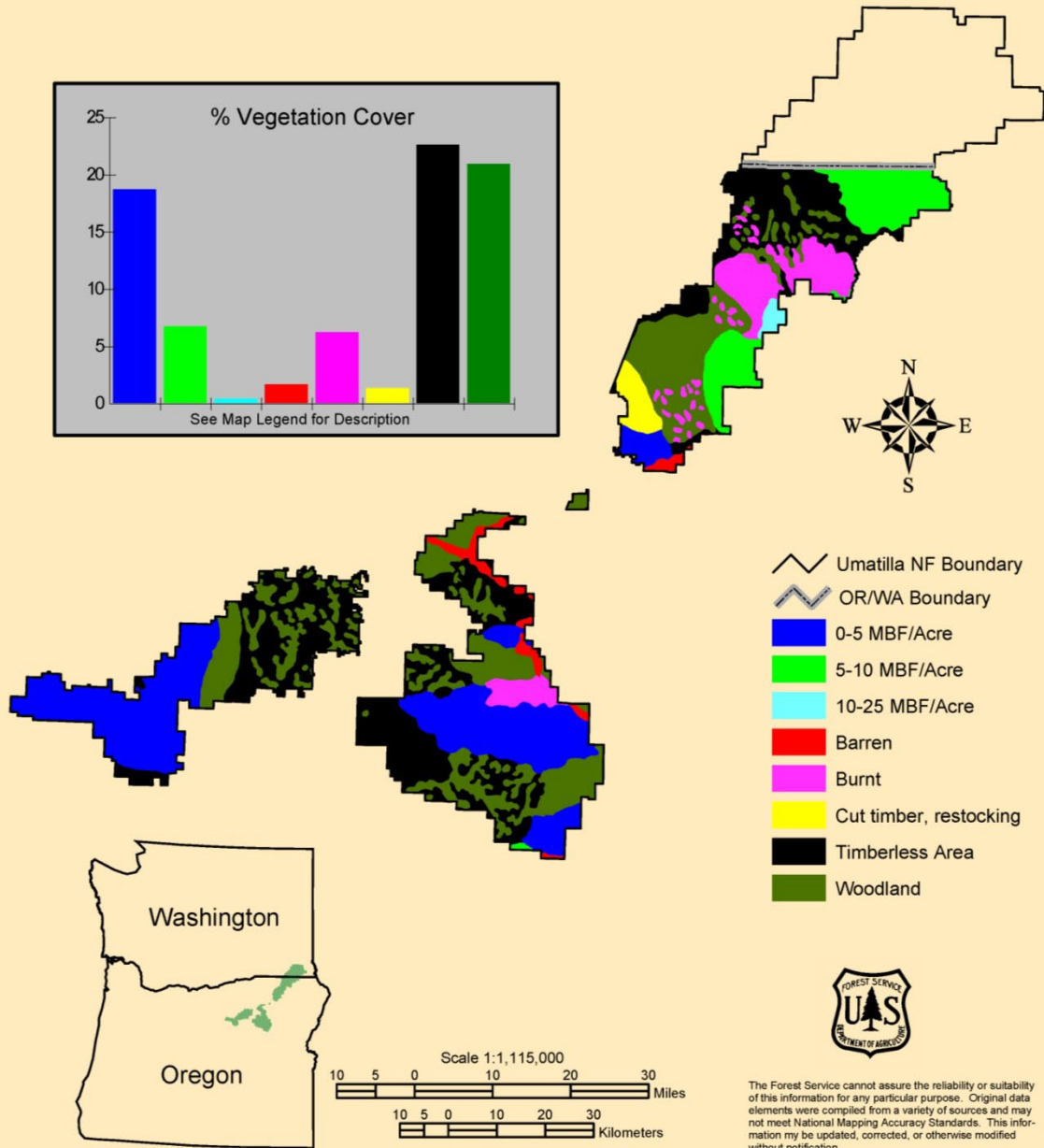
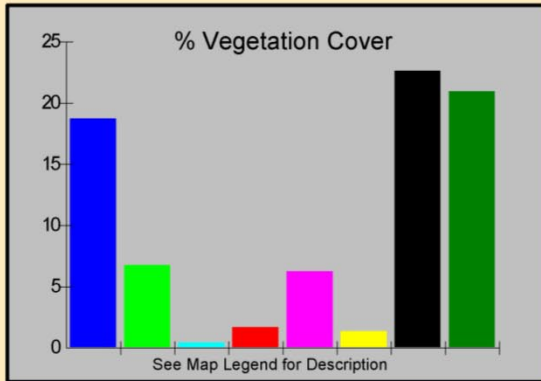
1:600,000



The Forest Service cannot assure the reliability or suitability of this information for any particular purpose. Original data elements were compiled from a variety of sources and may not meet National Mapping Accuracy Standards. This information may be updated, corrected, or otherwise modified without notification.

General Land Office survey notes (GLO) – see item #1

Umatilla National Forest 1900 Forests of Oregon



1900 map of the state of Oregon – see item #2

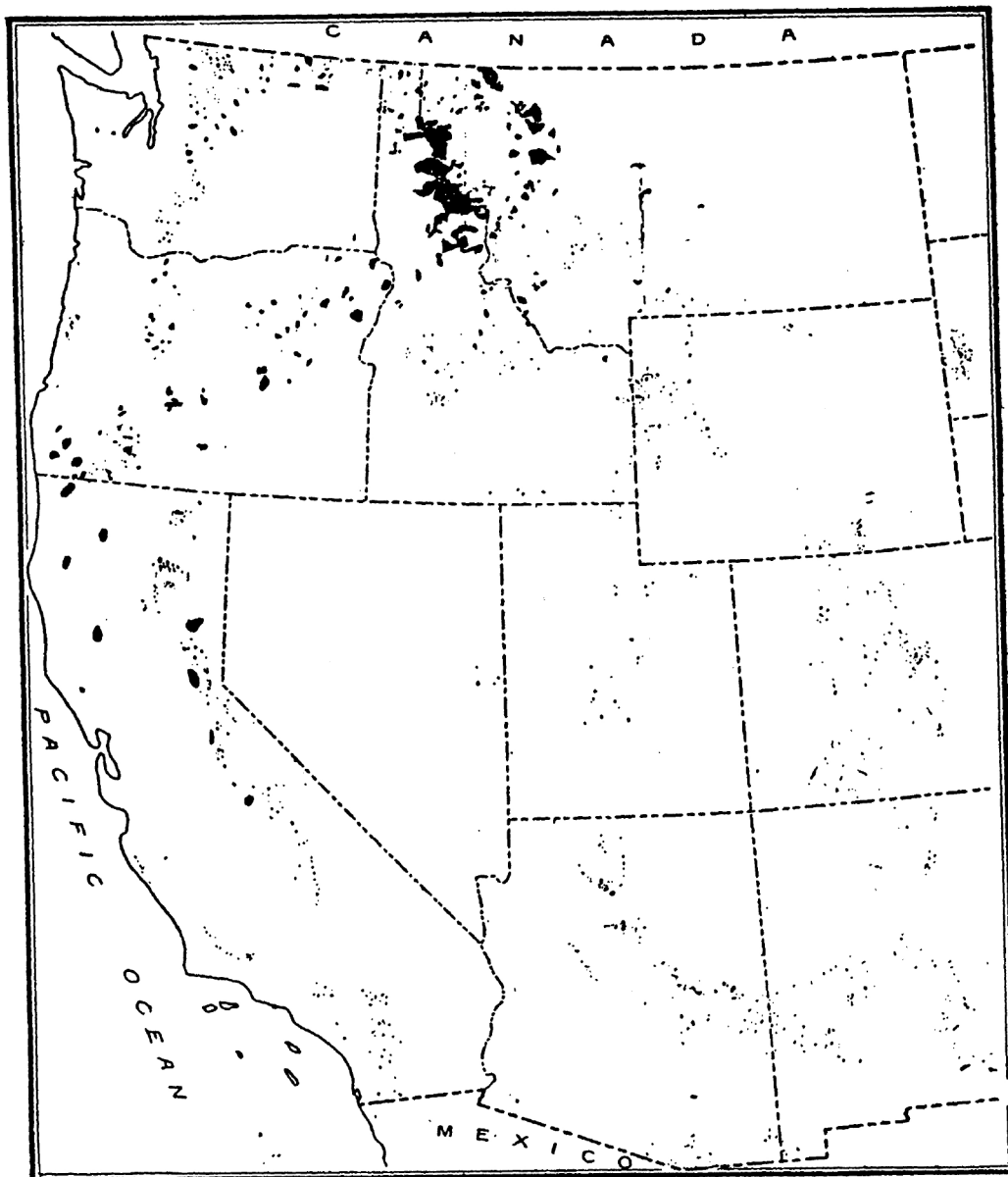
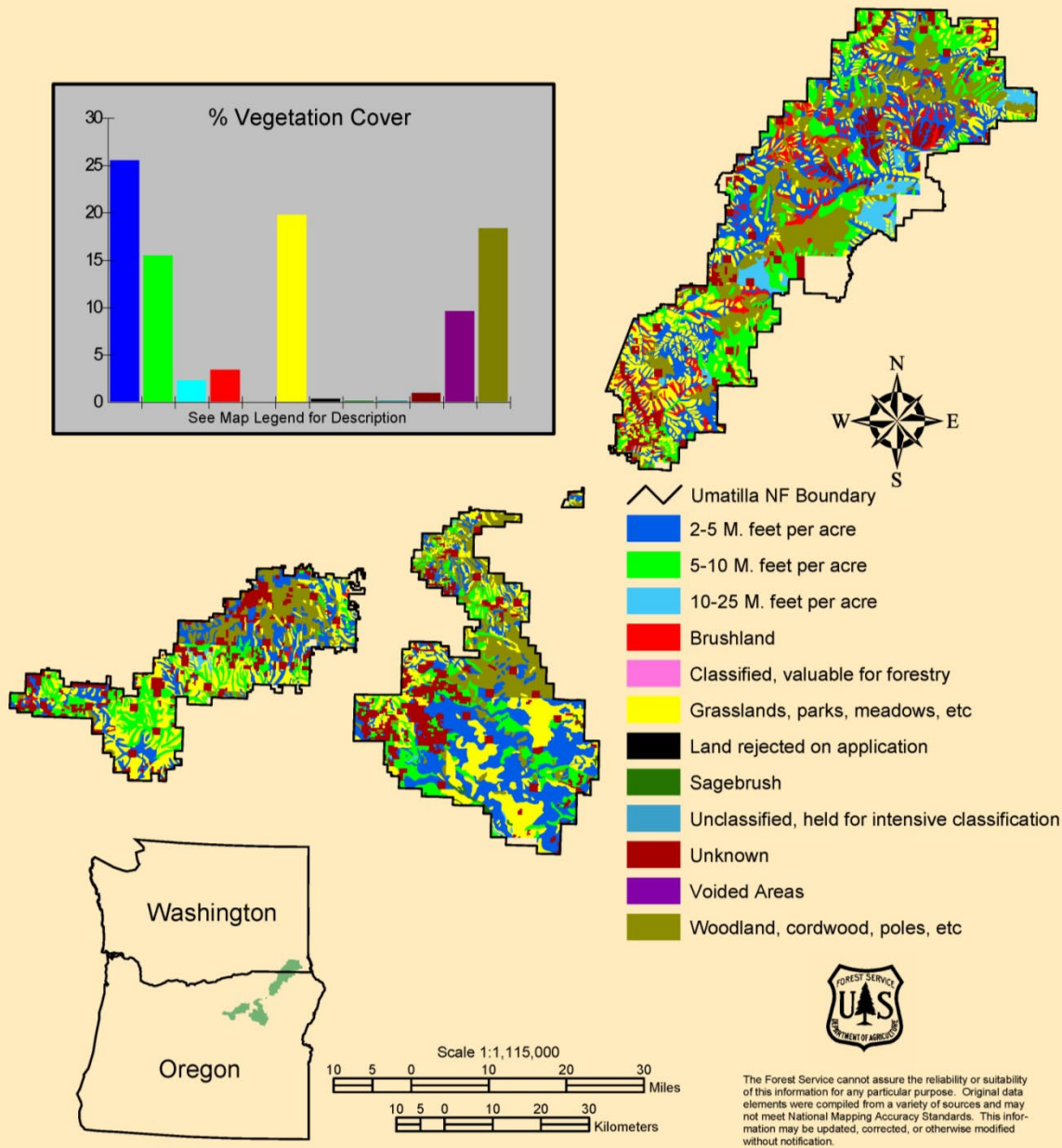
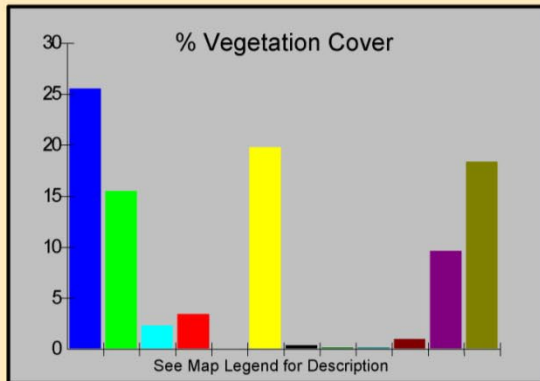


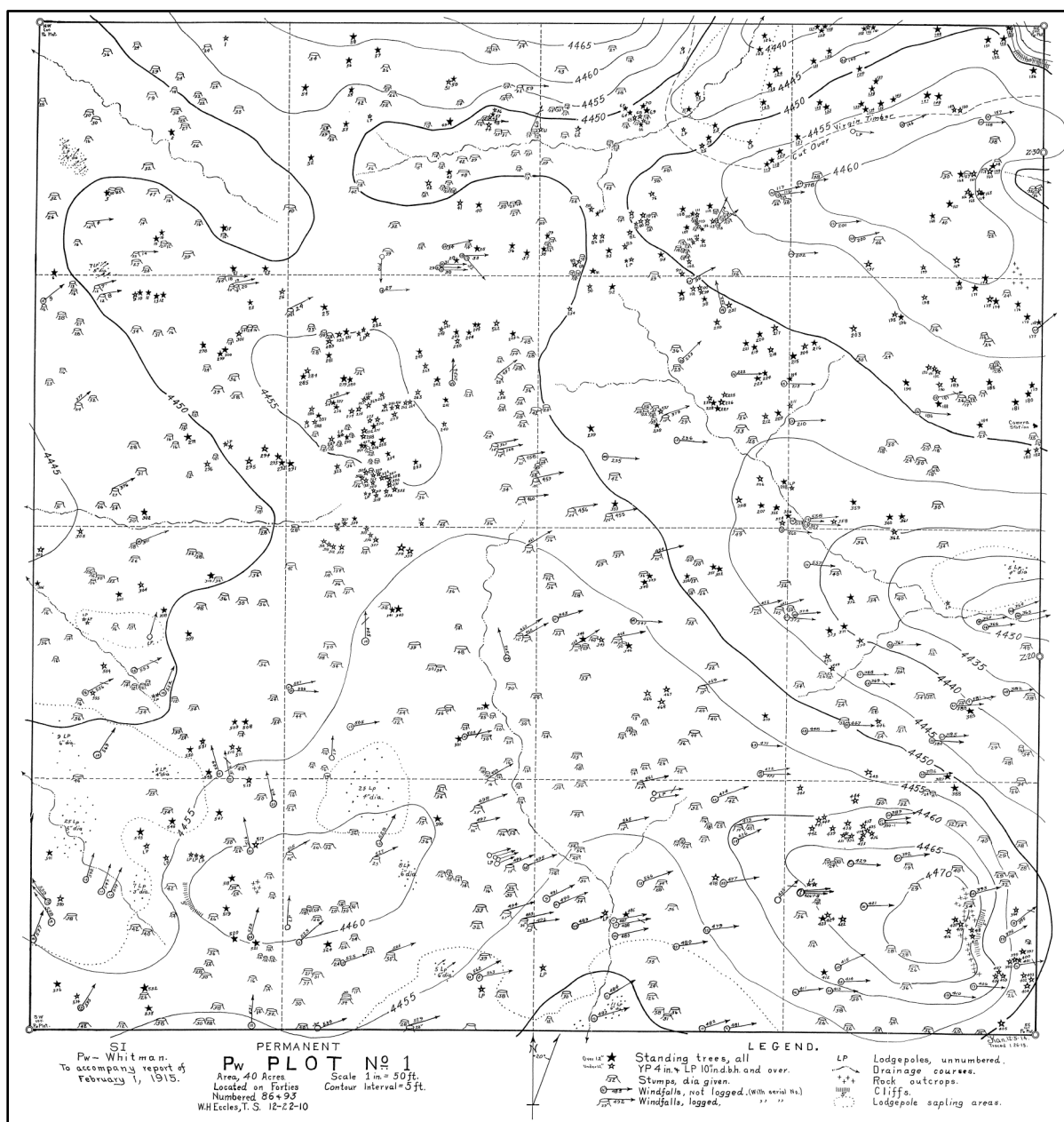
FIG. 5.—Fires of 1910 in the western United States.

Location and extent of forest fires in 1910 – see item #4

Umatilla National Forest 1914-1916 Timberland Classification

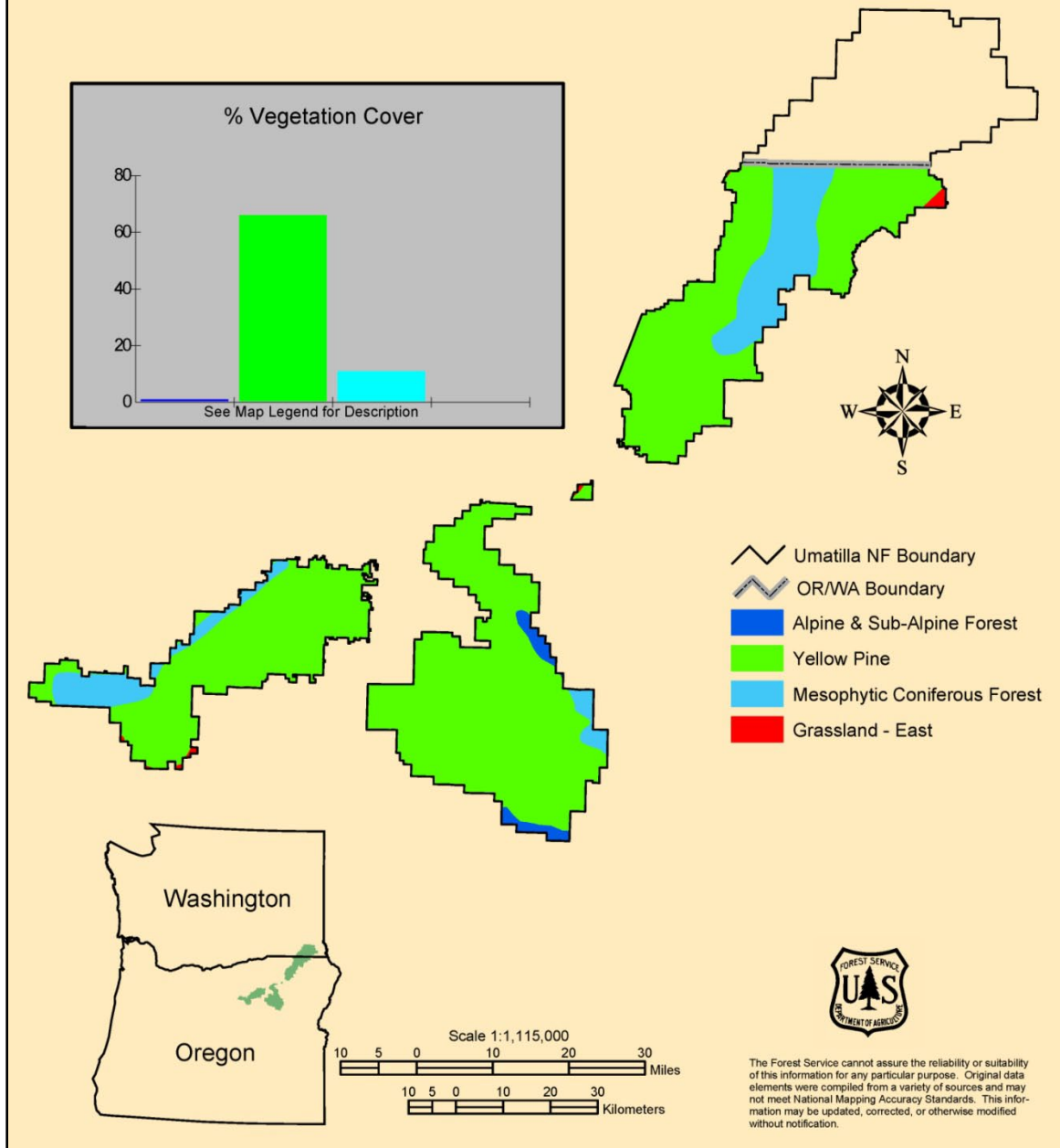


Extensive timberland classification – see item #8

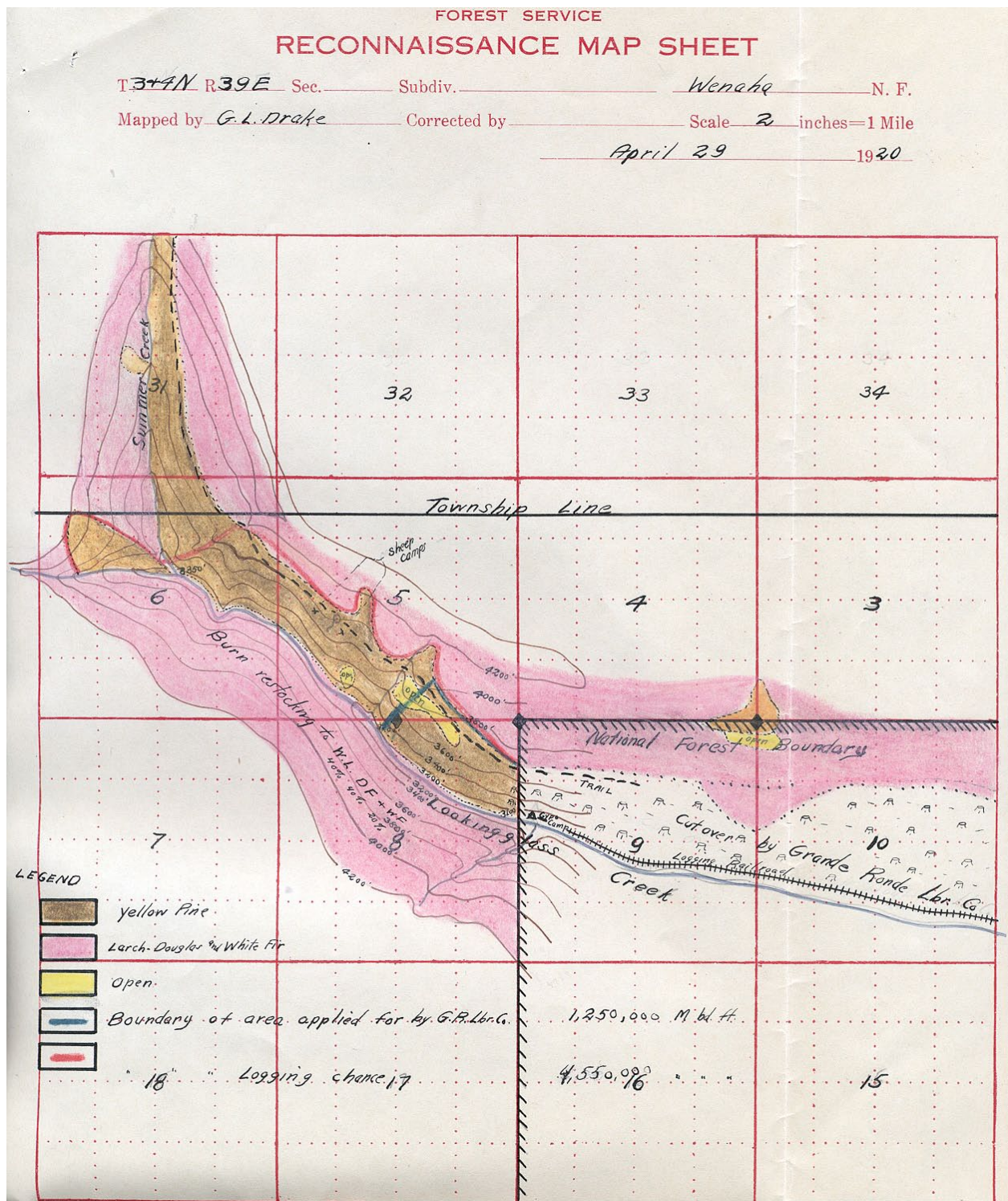


Large-scale map of permanent Pw plot no. 1 – see item #9

Umatilla National Forest 1915 Natural Vegetation of Oregon

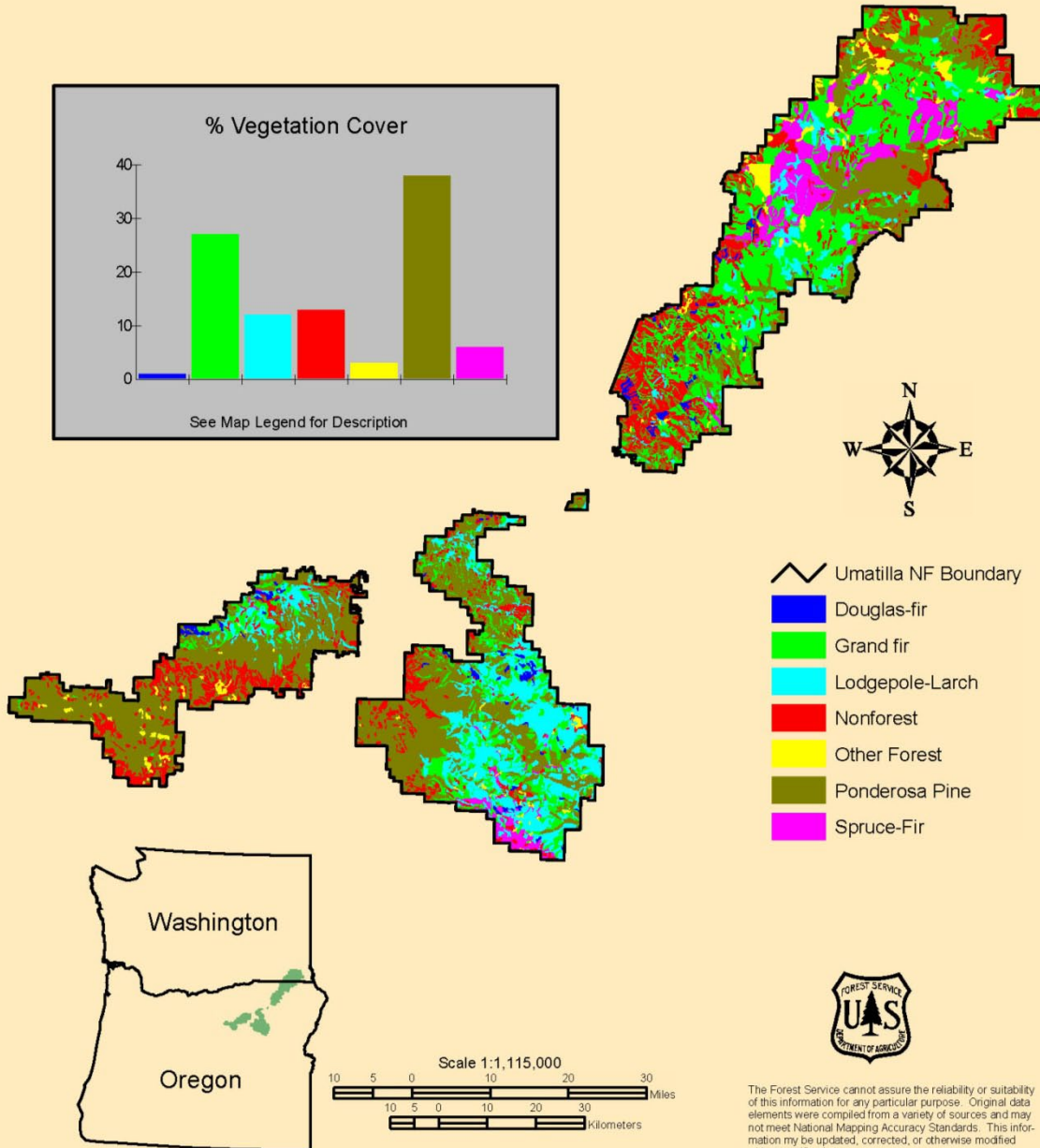
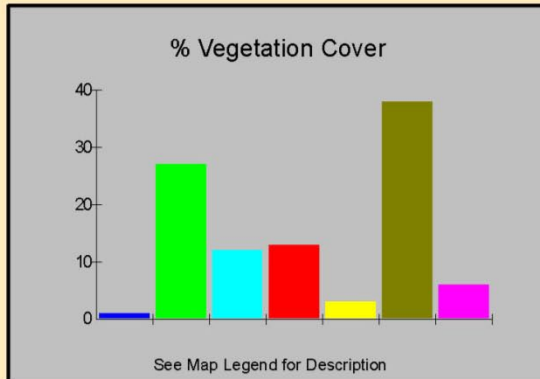


Natural vegetation of Oregon – see item #10



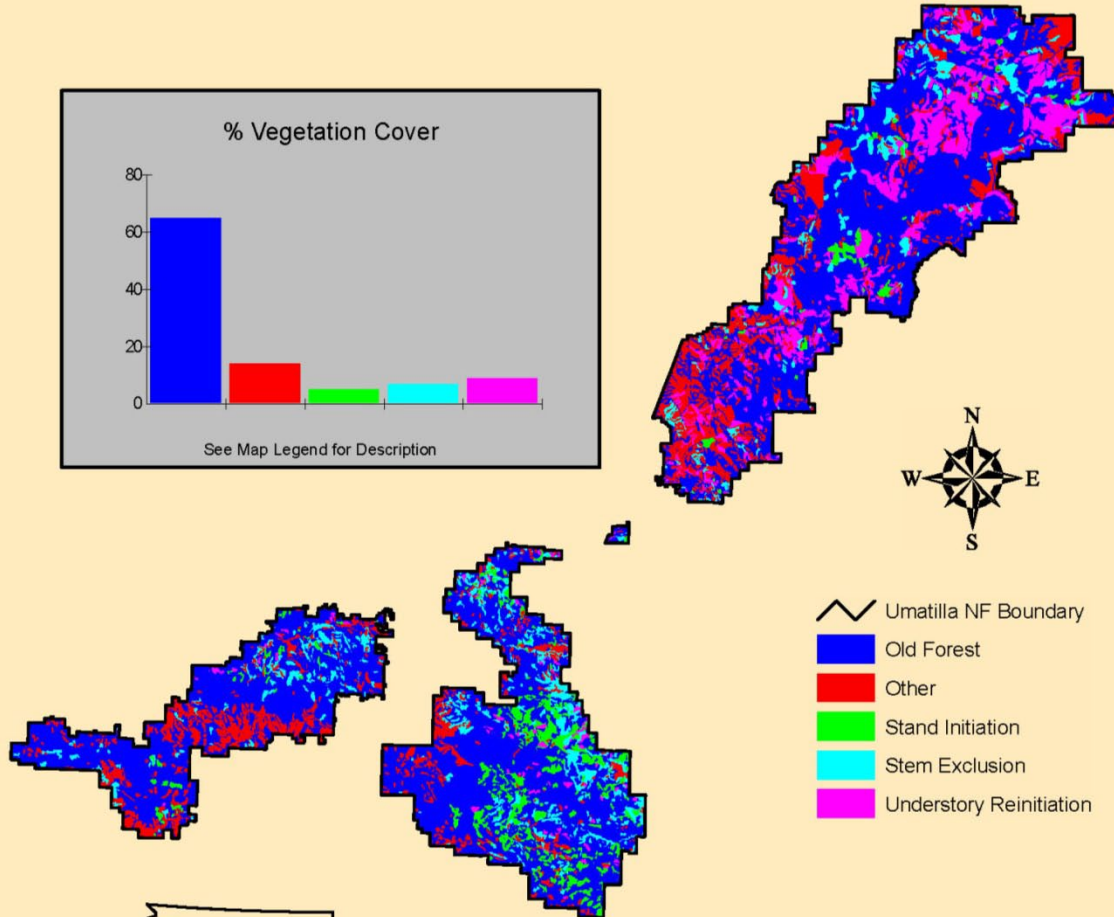
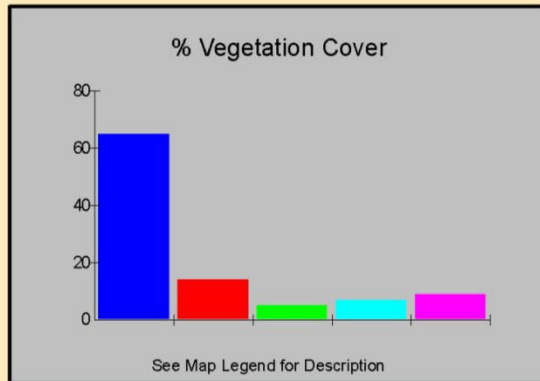
Reconnaissance map of Lookingglass Creek timber sale – see item #11

Umatilla National Forest 1935-1936 Forest Types

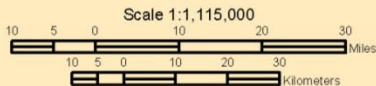


County forest type mapping for 1935-1936 – see item #12

Umatilla National Forest 1935-1936 Structure Class



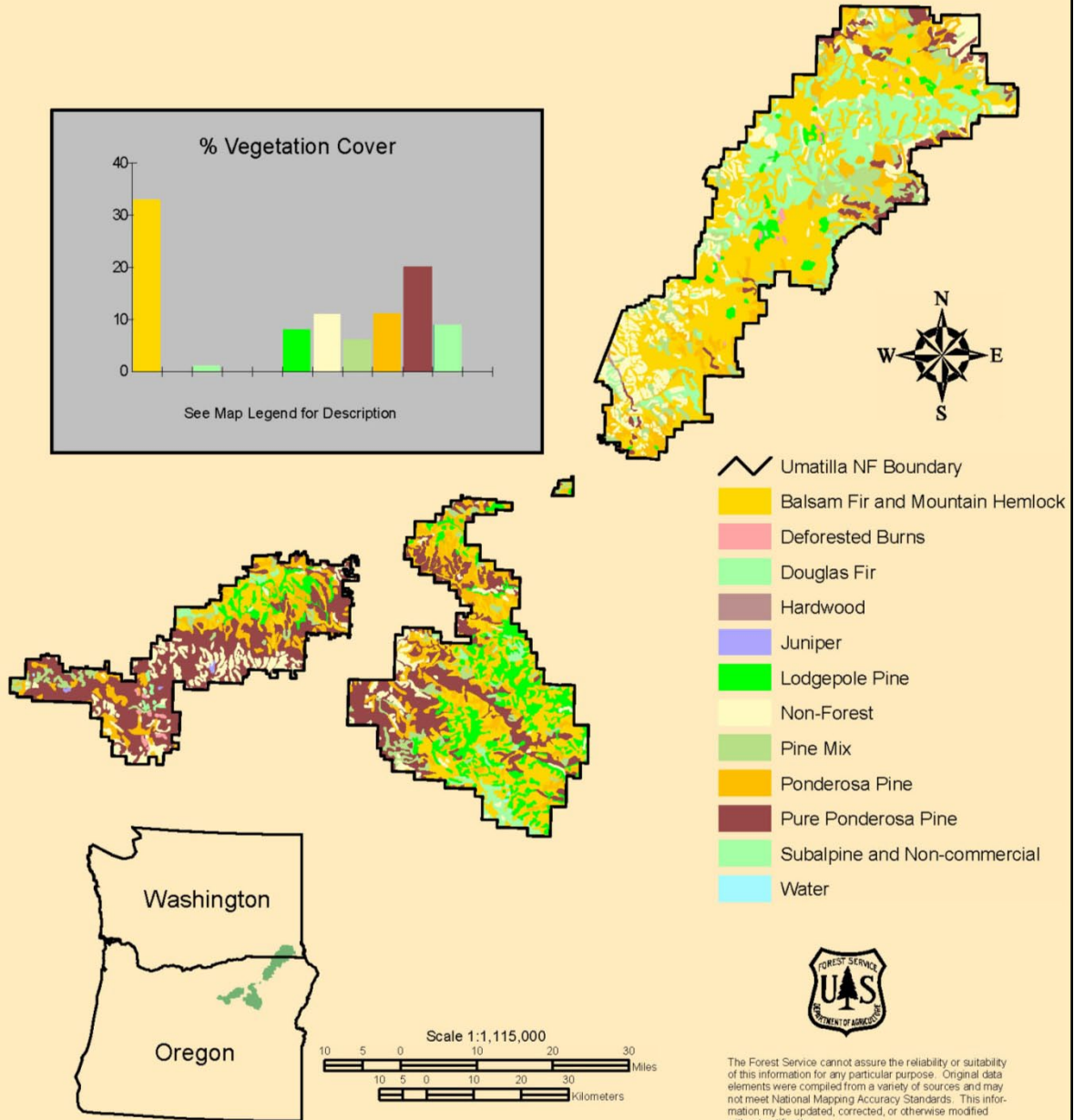
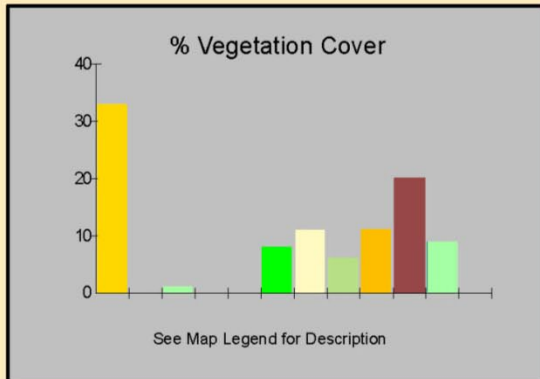
- Umatilla NF Boundary
- Old Forest
- Other
- Stand Initiation
- Stem Exclusion
- Understory Reinitiation



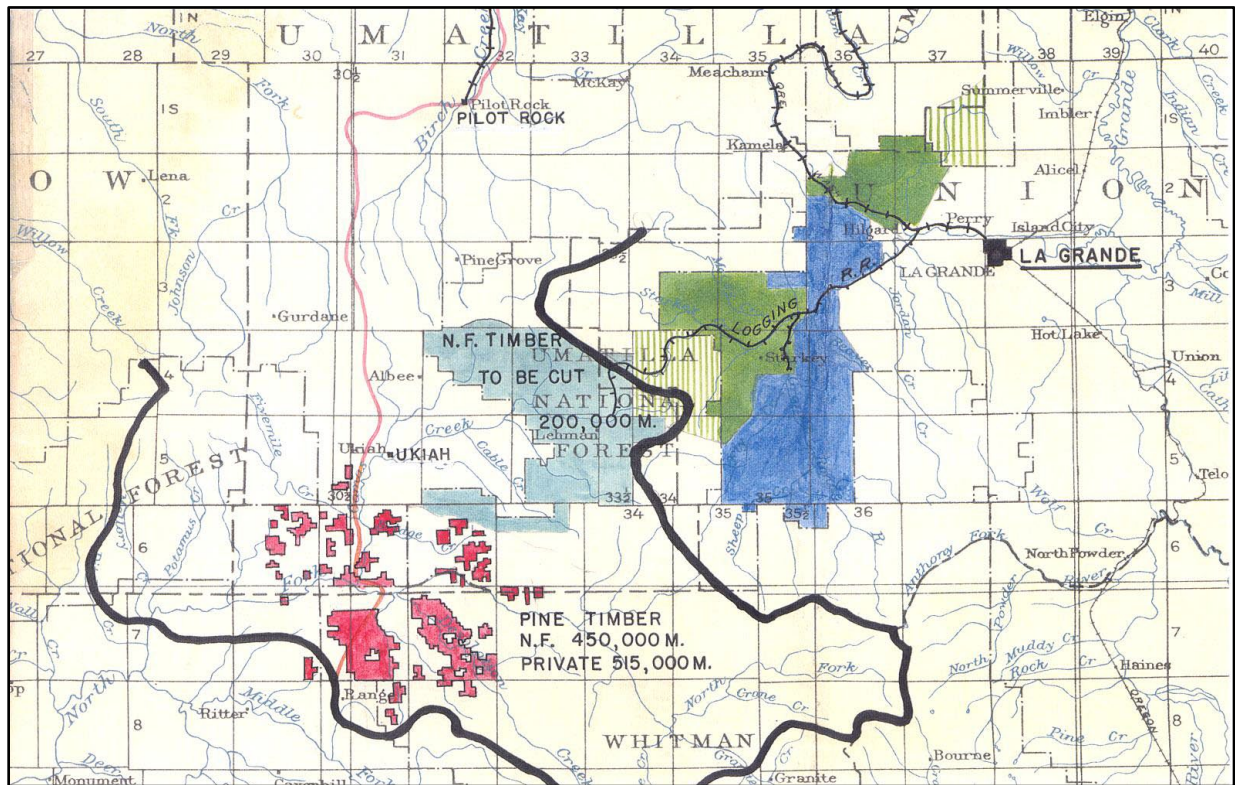
The Forest Service cannot assure the reliability or suitability of this information for any particular purpose. Original data elements were compiled from a variety of sources and may not meet National Mapping Accuracy Standards. This information may be updated, corrected, or otherwise modified without notification.

County forest structural stage mapping for 1935-1936 – see item #12

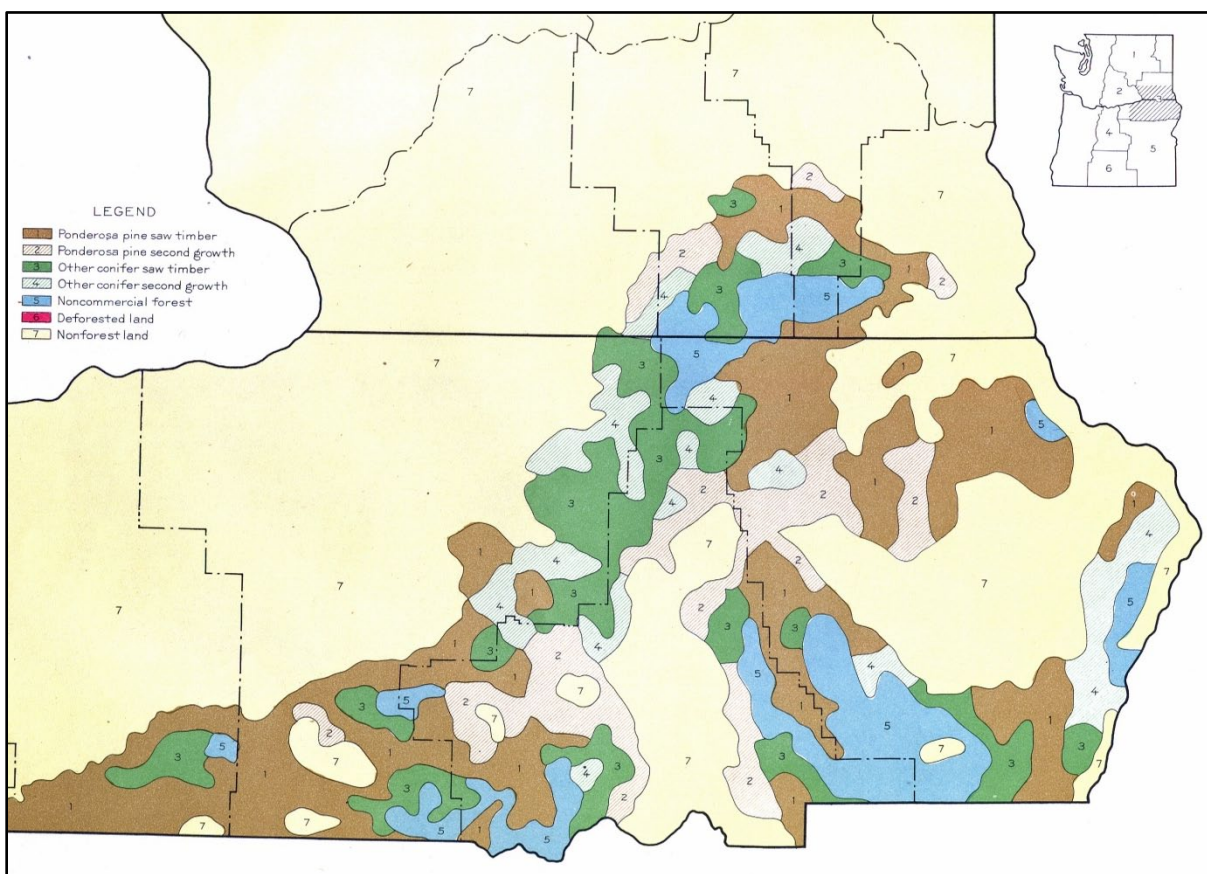
Umatilla National Forest 1936-1937 Forest Types



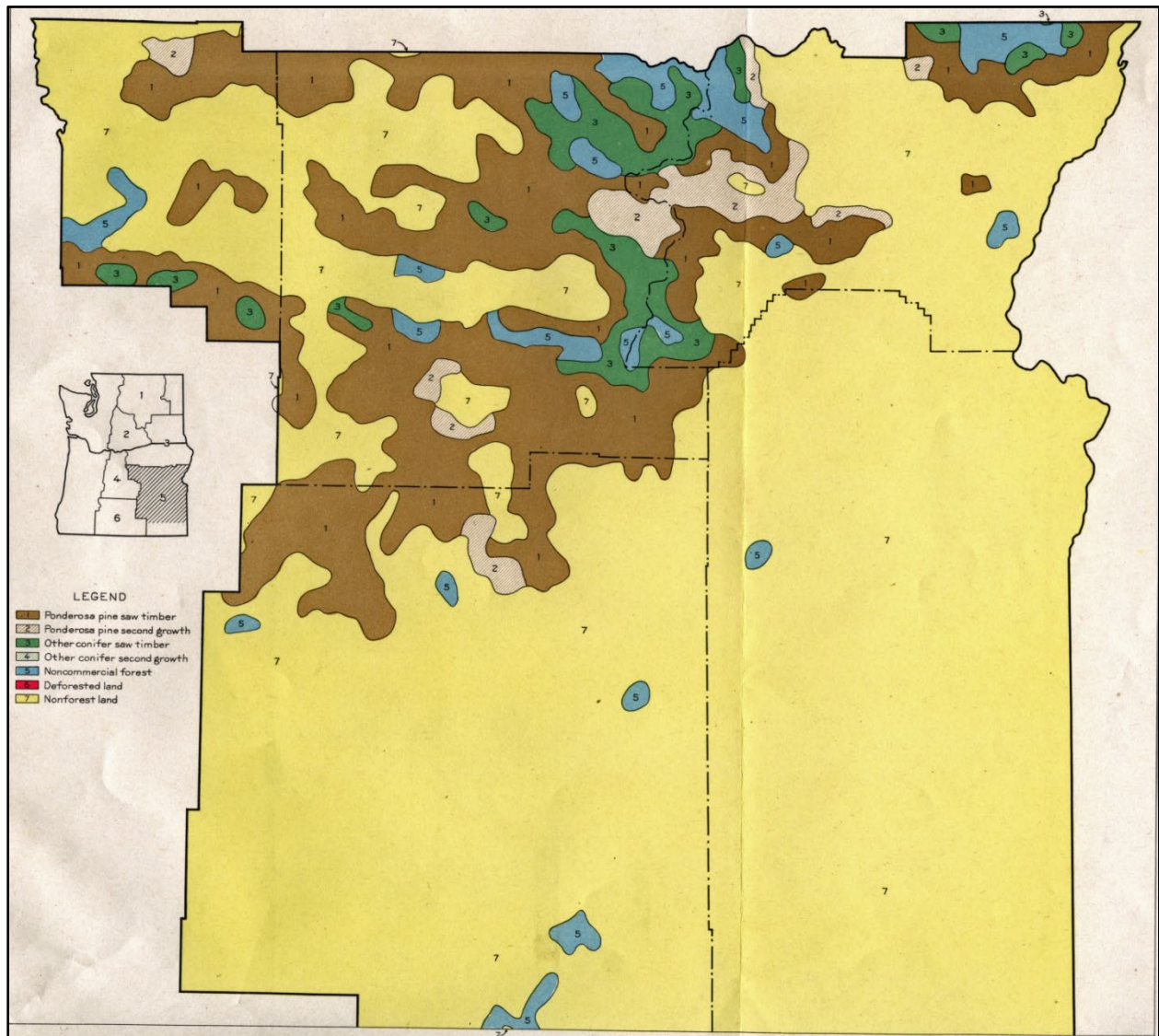
Quarter-state forest type mapping for 1936-1937 – see item #13



Camas Creek timber sale unit map – see item #15

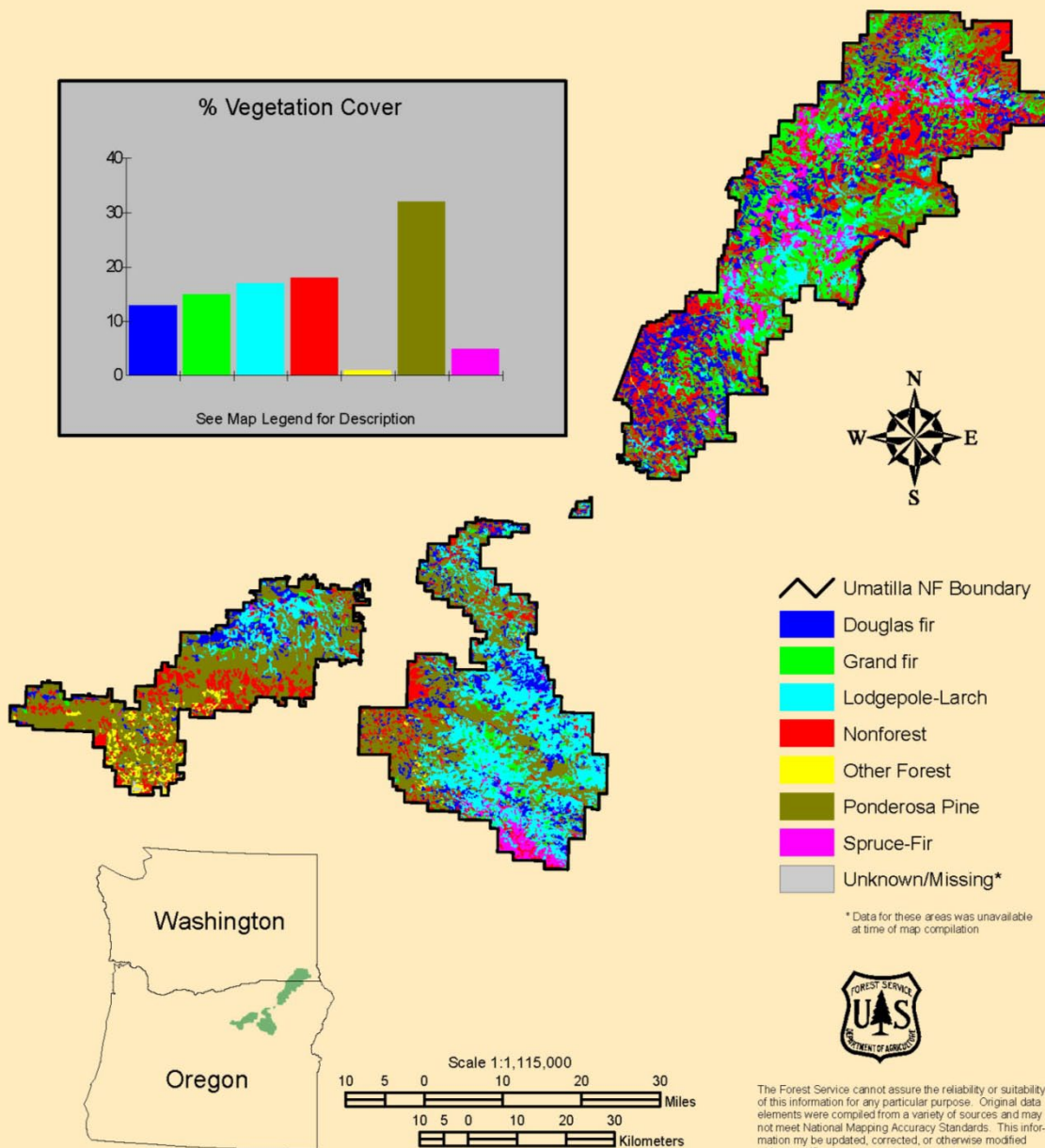
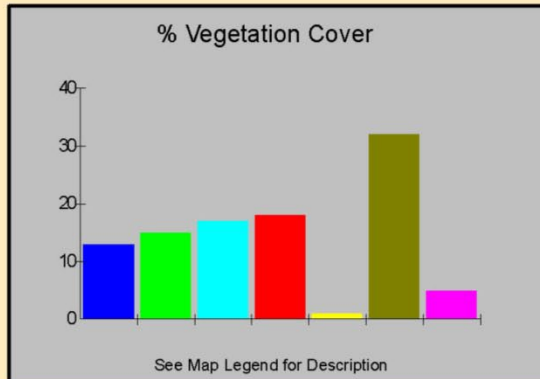


Survey unit #3 – north Blue Mountain unit – see item #18



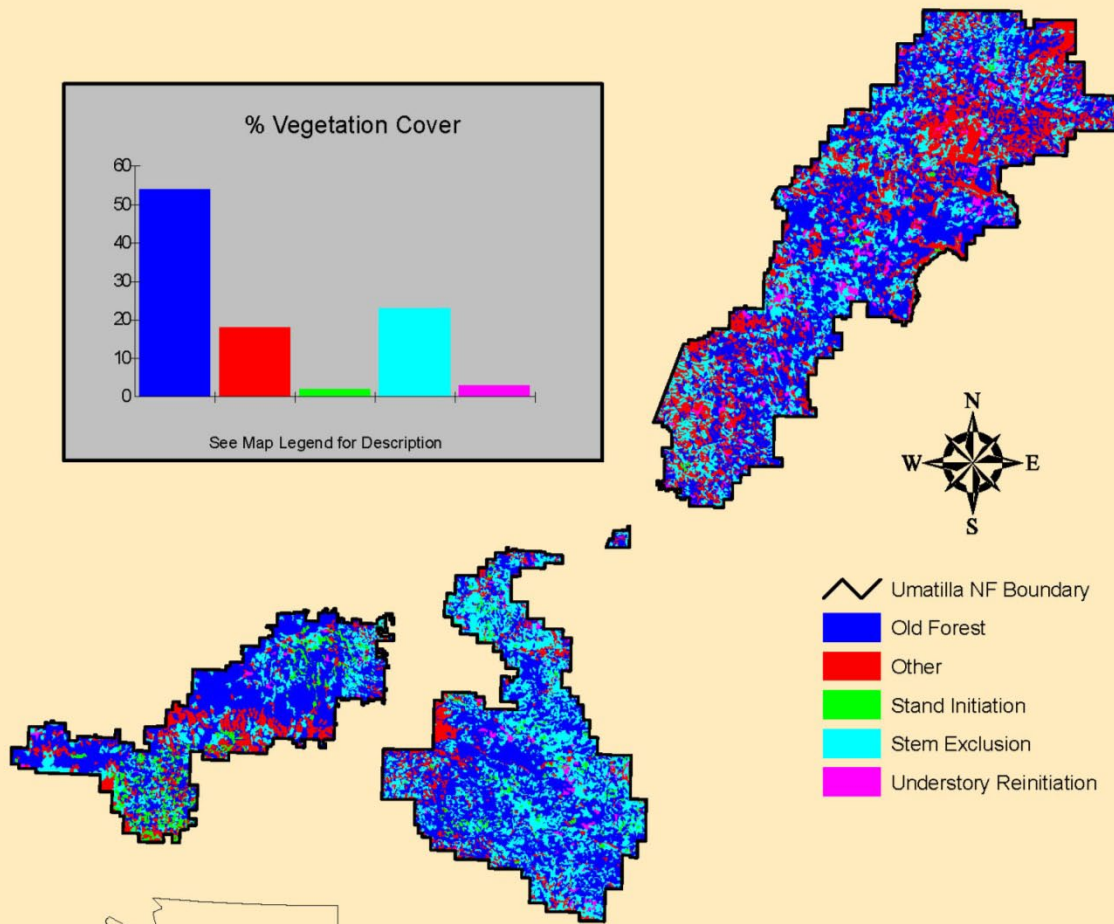
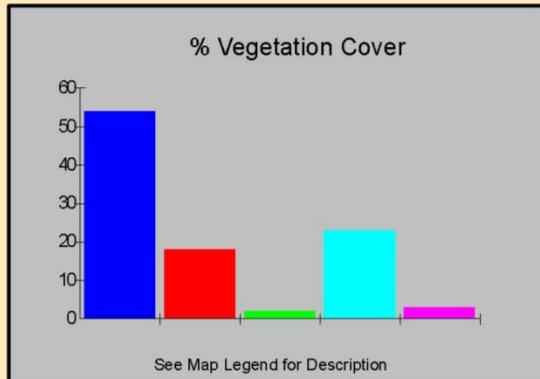
Survey unit #5 – south Blue Mountain unit – see item #18

Umatilla National Forest 1953-1960 Forest Types

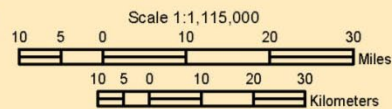


County forest type mapping for 1950s – see item #21

Umatilla National Forest 1953-1960 Structure Class



- Umatilla NF Boundary
- Old Forest
- Other
- Stand Initiation
- Stem Exclusion
- Understory Reinitiation



The Forest Service cannot assure the reliability or suitability of this information for any particular purpose. Original data elements were compiled from a variety of sources and may not meet National Mapping Accuracy Standards. This information may be updated, corrected, or otherwise modified without notification.

County forest structural stage mapping for 1950s – see item #21

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