

# Glossary 5

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## **GLOSSARY**

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### **A**

**Abandoned Road** A road that is no longer (or never was) considered a part of the Forest Service-managed transportation system, but still exists on the ground. Often these are “user-made” roads and were not engineered or constructed by the Forest Service.

**Access and Travel Management Plan** A document that outlines management policies for motorized vehicles and their associated travelways (development and maintenance).

**Aerial Fuels** All green and dead materials located in the upper forest canopy including tree branches and crowns, snags, moss, and high brush.

**Affected Environment** The biological, social, economic, and physical aspects of the environment that will or may be changed by proposed actions.

**Age Class** An interval, usually 10 to 20 years, into which the age ranges of vegetation are divided for classification of use.

**Air Quality** The composition of air with respect to quantities of pollutants; used most frequently in connection with “standards” of maximum acceptable pollutant concentration.

**Allotment** A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under a range allotment permit.

**Allotment Management Plan** The document that contains the action program needed to manage the rangeland resource for livestock grazing with consideration given to soil, watershed, wildlife, recreation, timber, and other resources on lands within a range allotment.

**Alternative** One of several policies, plans, ways, or projects proposed for decision making. An alternative does not necessarily differ from another alternative in all aspects.

**Anadromous Fish** Those species of fish that mature in the sea and migrate into streams to spawn (e.g. salmon and steelhead).

**Analysis Area** A delineated area of land subject to analysis of (1) responses to proposed management practices in the production, enhancement, or maintenance of forest and rangeland outputs and environmental quality objectives, and (2) economic and social impacts (FSM 1905). In this EIS, it refers to all subwatersheds burned in the Tower Fire.

**Aquatic Ecosystems** Stream channels, lakes, marshes or ponds, and the plant and animal communities they support.

### **B**

**Background (in terms of a viewshed)** The portion of a view between 3 and 5 miles from the observer and as far into the distance as the eye can detect the presence of objects.

**Basal Area** The area of the cross-section of a tree stem near the base, generally at breast height and inclusive of bark; a measure of the amount of horizontal growing space occupied by the tree bole, normally measured on a “per acre” basis.

**Best Management Practices (BMP)** Methods, measures, or practices (including technological, economic, and institutional considerations) selected by an agency to meet its nonpoint source control needs. BMP's include, but are not limited to, structural and nonstructural controls and operation and maintenance procedures. BMP's can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutant into receiving waters (40 CFR 130.2).

**Big Game** Large animals that are normally hunted for sport. On the North Fork John Day District, these include Rocky Mountain elk, mule deer, white-tailed deer, and pronghorn antelope.

**Biological Assessment** A "biological evaluation" conducted for major Federal construction projects requiring an environmental impact statement, in accordance with legal requirements under Section 7 of the Endangered Species Act. The purpose of the assessment and resulting document is to determine whether the proposed action is likely to affect an endangered, threatened, or proposed species.

**Biological Diversity** (1) The distribution and abundance of plant and animal communities. (2) The variety of life forms and processes, including a complexity of species, communities, gene pools, and ecological functions.

## C

**Canopy** The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

**Canopy Closure** The progressive reduction of space between tree crowns as they spread laterally; a measure of the percent of potential open space occupied by the collective tree crowns in a stand.

**Cavity** The hollow excavated in trees by birds or other natural phenomena; used for roosting and reproduction by many birds and mammals.

**Ccf** A unit of measurement represented by 100 cubes of wood that are 12 inches wide, 12 inches high, and 12 inches deep.

**Channel Stability** Meandering flow pattern which effectively reduces the force of the stream's energy over longer distances than a straight channel, resulting in a more stable stream.

**Clearcutting** The harvesting in one cut of all merchantable trees on an area for the purpose of creating a new, even-aged stand. The area harvested may be a patch, strip, or stand large enough to be mapped or recorded as a separate class in planning for sustained yield. Advanced regeneration may or may not be removed, depending on its condition and management objectives.

**Closed Road** A road managed by the Forest Service on which motorized traffic has been excluded by regulation, barricade, blockage, or by obscuring the entrance. A closed road may still be used administratively by the Forest Service to suppress fires or conduct other work.

**Compaction** The packing together of soil particles by forces exerted at the soil surface, resulting in increased soil density.

**Cover** Vegetation used by wildlife for protection from predators, to ameliorate conditions of weather, or in which to reproduce.

**Created Opening** Created opening is an opening in the Forest created by the silvicultural practices of shelterwood regeneration cutting at the final harvest, clearcutting, seed tree cutting, or group selection cutting.

**Cultural Resources** Physical remains of districts, sites, structures, buildings, networks, or objects used by humans in the past. They may be historic or prehistoric, archeological, or architectural in nature. Cultural resources are fragile and are non-renewable.

**Cumulative Effects** The impact on the environment which results from the incremental impact when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a time.

## *D*

**Desired Future Condition** The Desired Future Condition is a description of what the Forest should look like in order for it to provide for the resources that a particular management area emphasizes.

**Diameter at Breast Height (d.b.h.)** Tree diameter measured at 4 feet 6 inches above ground on the uphill side of the tree.

**Diversity** The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

## *E*

**Ecosystem** The assemblage and interactions of living and nonliving components of a habitat; components include plants, animals, invertebrates, microorganisms, minerals, soil nutrients, water, and air; examples of ecosystems include alpine meadow, bog, ponderosa pine forest, and prairie ecosystems.

**Effectiveness Monitoring** Process used by Forest Service personnel to determine whether the project and its mitigation are achieving project objectives or Forest Plan management direction, standards, and guidelines. This reveals if adjustments to the project are needed.

**Embeddedness** Degree to which large particles in a streambed (boulders, rubble, gravel) are surrounded or covered by fine sediment, usually measured in classes according to percent coverage.

**Endangered Species** Plant or animal species that is in danger of becoming extinct throughout all or most of its range; endangered species are federally designated by the U.S. Fish and Wildlife Service and the National Marine Fisheries Service.

**Environmental Impact Statement** A statement of the environmental effects of a proposed action and alternatives to it. It is required for major federal actions under Section 102 of the National Environmental Policy Act (NEPA), and released to the public and other agencies for comment and review. It is a formal document that must follow the requirements of NEPA, the Council on Environmental Quality (CEQ) guidelines, and directives of the agency responsible for the project proposal.

## *F*

**Fine Fuels** Fuels such as grass, leaves, dropped pine needles, fern, moss, and some kinds of slash which ignite readily and are consumed rapidly when dry. Fire Intensities Rate of heat energy released during combustion, usually expressed in BTU/second per unit length of fire front (foot). Intensity levels: Low, 0-2 ft.; moderate, 2-4 ft.; high, 4+ feet.

**Forest Land** Land at least 10 percent occupied by Forest trees or formerly having had such tree cover and not currently developed for nonforest use. Lands developed for nonforest use include areas for crops, improved pasture, residential or administrative areas, improved roads by any width, and adjoining road clearings and powerline clearings of any width.

**Forest Road** A road wholly or partly within, or adjacent to, and serving the National Forest System and which is necessary for the protection, administration, and utilization of the National Forest System and the use and developments of its resources.

**Fuel Treatment** The rearrangement or disposal of natural or activity fuels (generated by management activity, such as slash left from logging) to reduce fire hazard. Fuels are defined as both living and dead vegetative materials consumed by fire.

## ***G***

**Grass/Forb** An early forest successional stage where grasses and forbs are the dominant vegetation.

## ***H***

**Hazard Tree** A tree having high probability of falling and coming into contact with either roads and/or recreation areas, and thereby causing a potential hazard to forest visitors.

**Hiding Cover for Elk** Any vegetation capable of hiding 90 percent of a standing adult elk from the view of a human at a distance of 200 feet or less; generally any vegetation used by elk for security or escape from danger and at least 6 1/2 feet tall (also see Marginal Cover).

**Horizontal Diversity** The diversity in an area that results from the number of plant communities or successional stages or both; the greater their number the greater the horizontal diversity; also, the greater the amount of edge the higher the degree of horizontal diversity.

## ***I***

**Implementation Monitoring** Process used by Forest Service personnel to determine whether projects were implemented as planned.

**Indicator Species** A selected wildlife species (or group of species) which is presumed to indicate the habitat needs of other species.

**Infiltration** The movement of water (rainfall or snowmelt) into the soil.

**Interdisciplinary Team (IDT)** A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem.

**Intermittent Stream** A stream that runs water in most months, but does not run water during the dry season during most years.

## ***K***

**Knutson-Vandenberg Act (KV)** Legislation authorizing the collection of money from timber sale receipts for reforestation, stand improvement, or mitigation projects on timber sale areas.

## ***L***

**Ladder Fuels** All green and dead materials between the surface fuels and the upper forest canopy the cause a fire to spread vertically and into the upper forest canopy and include intermediate reproduction, brush, moss, and snags.

**Landing** Any place where round timber is assembled for further transport, commonly with a change of method.

**Large Woody Material** Referenced from Hankin and Reeves:

Brush: Diameter > 15 cm (6in), Length > 6.5 m (20ft)

Small: Diameter > 30 cm (12in), Length > 10 m (35ft)

Large: Diameter > 50 cm (20in), Length > 10 m (35ft)

This includes live, leaning material that has the potential to fall into the stream, as well as woody material that is already on the ground within the floodplain or water channel.

## *M*

**Management Areas** The land on which a certain management strategy is applied.

**Marginal Cover** A vegetative stand comprised of trees 10 or more feet high with an average canopy closure of at least 40 percent and generally capable of obscuring at least 90 percent of a standing adult elk from the view of humans at a distance of 200 feet or less.

**Mature Stage** One of six recognizable successional stages in coniferous forests of the Blue Mountains in which the stand is primarily composed of or dominated by mature trees in vigorous condition; the stage at which a tree or stand best fulfills the purpose for which it was managed.

**Mitigation** Mitigation includes: (1) Avoiding the impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by; limiting the degree or magnitude of the action and its implementation; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (5) compensating for the impact by replacing or providing substitute resources of environments. (40 CFR Part 1508.20)

**Monitoring** A process to collect significant data from defined sources to identify departures or deviations from expected plan outputs.

**Mosaic** The intermingling of plant communities and their successional stages in such a manner as to give the impression of an interwoven design.

**Motorized Access and Travel Management Plan** See Access Management Plan.

## *N*

**National Register of Historical Places** A register of cultural resources of national, state, or local significance maintained by the Department of the Interior.

**Natural Fuels** Fuels not directly generated or altered by management activities.

**Natural Regeneration** Reforestation of a site by natural seeding from the surrounding trees of trees left for seed, or seed stored in the soil or slash. Natural regeneration may or may not be preceded by site preparation.

**Nonforest Land** Lands that never have had or that are incapable of having 10 percent or more of the area occupied by forest trees; or lands previously having such cover and currently developed for nonforest use.

**Noxious Weed** Those plants which pose a threat to multiple use (i.e., recreation, wildlife, aesthetics, watersheds, soils, agriculture, etc.) on National Forest System Lands and on adjacent agricultural lands.

## *O*

**Old Growth Stand (Old Growth)** Any stand of trees 10 acres or greater generally containing the following characteristics: (1) Contain mature and overmature trees in the overstory and are well into the mature growth stage; (2) will usually contain a multilayered canopy and trees of several age classes; (3) standing dead trees and down material are present; (4) evidences of man's activities may be present, but do not significantly alter the other characteristics and would be a subordinate factor in a description of such a stand.

**Overland Flow** Water which does not infiltrate into the soil and runs off on the soil surface.

**Overstory** That portion of the trees, in a forest or in a stand or more than one story, forming the upper or uppermost canopy.

## P

**Peak Flows** Short periods of high stream flows caused by rainfall or snowmelt.

**Permittee** One who holds a permit to perform a special activity such as grazing livestock, commercial mushroom gathering, or firewood cutting on National Forest Lands.

**Plant Association** A "climax" plant community containing a definite plant composition, having a similar overall appearance, and growing in uniform habitat conditions. It is named by the climax dominant species followed by a subordinate species of a lower vegetative layer.

**Plant Community** A vegetative complex unique in its combination of plants, which occurs in particular locations under particular influences, is a reflection or integration of the environmental influences on the site (such as soils, temperature, elevation, solar radiation, slope, aspect, and rainfall), and denotes a general kind of climax vegetation, such as ponderosa pine or bunch grass, from which several plant community types may be derived on the basis of characteristic lesser vegetation.

**Plant Community Type** Is a inventory system of combined groups of plant species that are characteristic of a particular environment.

**Prescribed Burning** The skillful application of fire to natural fuels under conditions weather, fuel moisture, etc. that allows confinement of the fire to a predetermined area and produces the intensity of heat and rate of spread to accomplish planned benefits to one or more objectives of silviculture, wildlife management, grazing, or hazard reduction.

**Primary Cavity Excavators** Wildlife species that initially excavate cavities in snags, that secondary cavity nesters and other species utilize.

## R

**Rangelands** Rangelands are defined as areas with less than 10 percent tree cover where the majority of the vegetation is grasses, forbs, and/or shrubs.

**Recreation Opportunity Spectrum (ROS)** Land delineations that identify a variety of recreation experience opportunities categorized into six classes on a continuum from Primitive to Urban. Each class is defined in terms of the degree to which it satisfies certain recreation experience needs, based on the extent to which the natural environment has been modified, the type of facilities provided, the degree of outdoor skills needed to enjoy the area, and the relative density of recreation use. The six of the seven classes dealt with on the Forest are:

*Primitive* - Area is characterized by an essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of human-induced restrictions and controls. Motorized use within the area is not permitted.

*Semi-primitive Nonmotorized* - Area is characterized by a predominantly natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but subtle. Motorized recreation use is not permitted, but local roads used for other resource management activities may be present on a limited basis. Use of such roads is restricted to minimize impacts on recreational experience opportunities.

*Semi-primitive Motorized* - Area is characterized by predominantly natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. The area is managed in such a way that minimum onsite controls and restrictions

may be present, but would be subtle. Motorized recreation use of local primitive or collector roads with predominantly natural surfaces and trails suitable for motor bikes is permitted.

*Roaded Natural* - Area is characterized by predominantly natural-appearing environments with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high, with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is allowed and incorporated into construction standards and design of facilities.

*Roaded Modified* - Area is characterized by a considerably modified natural-appearing environment with considerable evidence of the sights and sounds of humans. Such evidence seldom harmonizes with the natural environment. Interaction between users may be low to moderate, but evidence of other users is prevalent. Resource modification and utilization practices are evident and seldom harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities. The area is managed to meet modified and maximum modified visual quality objectives.

*Rural* - Area is characterized by a substantially modified natural environment. Sights and sounds of people are evident. Renewable resource modification and utilization practices enhance specific recreation activities or provide soil and vegetative cover protection. (Only a very minor amount on the UNF).

NOTE: The other ROS classification, Urban, is not applicable to the Umatilla National Forest.

**Recruitment (of instream wood, snags)** To obtain new replacements for or new supplies of snags or instream large wood.

**Reforestation** The natural or artificial restocking of an area with forest trees; most commonly used in reference to artificial restocking.

**Regeneration** The actual seedlings and saplings existing in stand; or the act of establishing young trees naturally or artificially.

**Resident Fish** Fish that do not migrate long distances to spawn.

**Riparian** Pertaining to areas directly influenced by water. Riparian areas usually have visible vegetation or physical characteristics reflecting this water influence. Streambanks, lakes borders, or marshes are typical riparian areas.

**Riparian Areas** A geographically delineated area with distinctive resource values and characteristics that is comprised of aquatic and riparian ecosystems. This includes floodplains, wetlands, and all areas within a horizontal distance of at least 100 feet from the normal line of high water of a stream channel or from the shoreline of a standing body of water.

**Riparian Habitat Conservation Area** Defined by PACFISH, this is an area adjacent to and including streams, ponds or other bodies of water, wet meadows, and areas of instability, established to protect and emphasize riparian-dependent resources.

**Road Density** The number of miles of roads per square mile of land.

**Roadless Area (Inventoried)** An area generally at least 5,000 acres in size, or adjacent to an existing Wilderness and undeveloped.

**Roadless Area Review and Evaluation II (RARE II)** A comprehensive process directed by the Secretary of Agriculture to identify roadless and undeveloped land areas in the National Forest System, to determine their uses (for either wilderness or other resources management and development), and to determine area that would require further planning to make such a decision.

## S

**Satisfactory Cover** Cover used by animals to ameliorate the effects of weather. For elk, satisfactory thermal cover includes stands of coniferous tree 40 feet or more in height with an average crown closure of 70 percent or more; and for deer, cover may include saplings, shrubs, or trees at least 5 feet tall with 75 percent crown closure. Marginal thermal cover includes conifers stands of trees 10 feet or more in height with a 40-69 percent crown closure.

**Secondary Cavity Nester** Wildlife that occupies a cavity in a snag that was excavated by another species.

**Sediment** Earth material transported, suspended, or deposited by water.

**Sensitive Species** Plant or animal species whose populations are declining in numbers, density, or distribution because of decreasing habitat; these species are designated as sensitive at the regional level of the USDA Forest Service.

**Sensitivity Level** A particular degree or measure of viewer interest in scenic qualities of the landscape.

**Seral** Identifiable stages of vegetation preceding climax communities.

**Silviculture** The art and science of controlling the establishment, composition, and growth of forests to meet the desired future conditions and management objectives.

**Site Preparation** (1)An activity (such as prescribed burning, disking, and tilling) performed on a reforestation area, before introduction of reforestation, to ensure adequate survival and growth of the future crop; or (2) manipulation of the vegetation or soil of an area prior to planting or seeding. The manipulation follows harvest, wildfire, or construction in order to encourage the growth of favored species. Site preparation may include the application of herbicides; burning or cutting of living vegetation that competes with the favored species; tilling the soil; or burning or organic debris (usually logging slash) that makes planting or seeding difficult.

**Slash** The residue left on the ground after timber cutting and/or accumulating as a result of storm, fire, or other damage. It includes unused logs, uprooted stumps, small broken trees, branches, twigs, needles and leaves, bark and chips.

**Slash Buster** A machine mounted on a tractor or rubber-tired skidder that breaks or chops slash into smaller, more compact debris so it may deteriorate more rapidly and pose less risk as fuel for a natural or planned fire.

**Snag** A standing dead tree from which the needles or leaves and most of the limbs have fallen.

**Snowpack** The mass of snow which accumulates during the winter.

**Stand (Tree stand)** An aggregation of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition, as to be distinguishable from adjoining forest areas.

**Stand Diversity** Any attribute that makes one timber stand biologically or physically different from other stands. This difference can be measured by, but not limited to different age classes, species, identities, or non-tree floristic composition.

**Stocking** The degree of occupancy of land by trees as measured by basal area or number of trees and as compared to a stocking standard; that is, the basal area or number of trees required to fully use the growth potential of the land.

**Stream Class** Four stream classes are defined by the extent of the perennial or fish bearing portion of the stream. While streams or parts of streams can be classified, one stream may be sectionalized into several classes.

**Class I:** Streams or segments thereof that are used by anadromous and resident fish (usually perennial).

**Class II:** Streams or segments thereof that are used only by resident fish (usually perennial).

**Class III:** All other perennial streams or segments thereof not previously classified.

**Class IV:** All other intermittent streams or segments thereof not classified above.

**Stream Channel** Any channel which carries water flow during some part of the year including permanent, intermittent, and ephemeral streams.

**Subsoil** An activity that breaks up soil compaction; usually involves a tractor with an attachment of shanks that penetrate deep in the soil to lift and fracture the compaction with a minimum amount of surface disturbance.

**Substrate** material (silt, gravel, cobble, etc.) that forms a streambed.

**Subwatershed** A division or part of a defined watershed.

**Succession** The progressive development of vegetation toward its highest ecological expression, the climax community, replacement of one plant community by another.

**Successional stage** A stage or recognizable condition of a plant community which occurs during its development from bare ground to climax. For example, coniferous forests in the Blue Mountains progress through six recognized stages: grass-forb, shrub-seedling, pole-sapling, young, mature, and overmature as described below:

**Grass-forb:** A successional stage dominated by grasses and forbs.

**Shrub-seedling:** The dominant vegetation of the stand is shrubs, tree seedlings, or both.

**Pole-sapling:** The dominant vegetation is trees that qualify as poles or sapling or both.

**Young:** A stand of trees dominated by trees that are no longer poles but have not yet reached maturity.

**Mature:** The stand is primarily composed of or dominated by mature trees in vigorous condition.

**Overmature:** A stand that is past full maturity and showing decay and deterioration; the last stage in forest succession. The USDA Forest Service's working definition for old growth stands in the Blue Mountains in 37 live trees or more per hectare (15 per acre) over 53-centimeter (21-in) d.b.h., 2 or more snags per hectare (0.5 snag per acre) over 53-centimeter (21-in) d.b.h., two or more canopy levels, heart rot and other signs of stand decadent present and obvious, overstory canopy closure of 10-40 percent, usually with a definite shrub-sapling layer with a canopy closure of combined exceeding 70 percent, and logs obvious on the ground.

Timber type mapping classes and their tie to wild life habitat successional stages have the following relationship:

<b><u>Timber Size Class</u></b>	<b><u>Successional Stage</u></b>
No size class - (use data from timber harvest or reforestation records)	I Grass-forbs
Seedling 6" tall - 0.9" dbh	II Shrub-seedling
Sapling 1.0" - 4.9" dbh	III Pole-Sapling
Pole 5.0" - 8.9" dbh	IV Young
Medium sawlog (MS) 9.0" - 20.9" dbh	V Mature
Large Sawlog (LS) 21.0" + dbh	VI Overmature

**Suppression** All the work and activities connected with fire-extinguishing operations, beginning with discovery and continuing until the fire is completely extinguished.

## T

**Temporary Road** Those roads needed only for short-term access (e.g., to haul timber from landings to Forest development roads, access to build water developments, etc.). Location and clearing widths are determined through a contract or agreement.

**Thinning** Killing trees in an immature stand primarily to maintain or accelerate growth and also to improve the average form of the remaining trees without permanently breaking the canopy.

**Threatened Species** A plant or wildlife species officially designated by the U.S. Fish and Wildlife Service and National Marine Fisheries Service as having its existence threatened in a localized area, such as a state or province or lesser area. These species populations are declining in numbers, density, or distribution because its habitat is threatened with destruction, drastic modification, or severe curtailment or because of over-exploitation, disease, predation, or other factors.

**Timber Stand Improvement** Measures, such as thinning, pruning, release cutting, prescribed fire, girdling, weeding, or poisoning of unwanted trees, aimed at improving growing conditions for the remaining trees.

## U

**Underburning** A type of prescribed fire, burning under a live tree overstory, intended to meet specific management and/or resource objective.

**Understory** The trees and other woody species growing under a more-or-less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

## V

**Vertical Diversity** The diversity in an area that results from the complexity of the above ground structure of the vegetation; the more tiers of vegetation or the more diverse the species makeup or both, the higher the degree of vertical diversity.

**Viable Population** The number of individuals of a species required to ensure the long-term existence of the species in natural, self-sustaining populations adequately distributed throughout a region.

**Viewshed** Portion of the forest that is seen from a major travel route or high use location.

**Visual Condition** The visual appearance of a landscape described in terms of the degree of alteration of the natural-appearing landscape (see FSM 2383, 3/84 R-6 Supp 70). The following ratings for existing visual conditions (EVC) have been established:

**Natural Appearance:** A viewshed in which no more than 5 percent of the area actually seen appears to be visually altered. The altered area may include as much as 1 percent modification, but no maximum modification or unacceptable modification.

**Slightly Altered Appearance:** A viewshed in which no more than 10 percent of the area actually seen appears to be visually altered. The altered area may include as much as 5 percent modification, but no more than 3 percent at maximum modification.

**Moderately Altered Appearance:** A viewshed in which no more than 20 percent of the area actually seen appears to be visually altered. The altered area may include as much as 10 percent modification or lower, but no more than 5 percent maximum modification or unacceptable modification.

**Heavily Altered Appearance:** A viewshed in which more than 20 percent of the area actually seen appears to be visually altered. All the altered areas may be maximum modification or more heavily impacted.

Viewshed condition ratings also serve to describe the appearance that is predicted to exist as a result of implementing Visual Quality Objectives. Equivalent terms are:

<u>Visual Condition</u>	<u>Visual Quality Objective</u>
Natural Appearing	Preservation or Retention
Slightly Altered	Partial Retention
Moderately Altered	Partial Retention or Modification
Heavily Altered	Modification or Maximum Modification

**Visual Quality Objective** A desired level of excellence based on physical and sociological characteristics of an area. Refers to degree of acceptable alteration of the characteristic landscape measured in degrees of deviation from the natural-appearing landscape. Levels or objectives are:

Preservation: Ecological change only.

Retention: Human activities are not evident to the casual forest visitor.

Partial Retention: Human activity may dominate the characteristic landscape, but must, at the same time, follow naturally established form, line, color, and texture. It should remain visually subordinate when viewed in foreground or middle ground.

Modification: Human activity may dominate the characteristic landscape, but must, at the same time, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middle ground.

Maximum Modification: Human activity may dominate the characteristic landscape, but should appear as a natural occurrence when viewed as background.

**Visual Resource** The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

## W

**Waterbar** A ditch, constructed by hand or machine, which is used to divert surface runoff from areas of bare mineral soil.

**Water Quality** The biological, physical, and chemical properties of water to make it suitable for given specified uses.

**Watershed** One of the 52 delineated major drainage basins to which the Umatilla National Forest contributes runoff waters.

**Wetlands** Areas that are inundated by surface water or ground water with a frequency sufficient to support, and under normal circumstances does or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction (Executive Order 11990).

**Width to Depth Ratio** A measurement that compares the stream bankfull width to its bankfull depth in order to determine stream characteristics and channel classification. A stream reaches the “bankfull” stage just before flooding.

**Wildfire** Any wildland fire not designated and managed as a prescribed fire within an approved prescription.

## Literature Cited

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### Economics

Bergstrom, J.C. and Loomis, J.B. (forthcoming). Economic Dimensions of Ecosystem Management in Cordell, H.K. and J.C. Bergstrom (editors). Integrating Social Sciences in Ecosystem Management. Sagamore Press.

Hancock, K. 1998. Personal Communication, Umatilla National Forest.

Haynes, R.W. and Horne, A.L. 1997. Economic Assessment of the Basin. In an assessment of ecosystem components in the Interior Columbia Basin and portions of the Klamath and Great basins: Volume IV, tech eds., Quigley, T.M. and S.J. Arbelbide. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, Oregon.

Niemi, E. and Whitelaw, E. 1997. Assessing Economic Tradeoffs in Forest Management, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-403.

Olsen, D., Richards, J. and Scott, D.R. 1991. Existence and Sport Values for Doubling the Size of Columbia River Basin Salmon and Steelhead Runs, Rivers, Volume 2, Number 1, pages 44-56.

Reyna, N.E.; Phillips, R.H.; and Williams, G.W. 1998. Economic and Social Conditions of Communities: Economic and Social Characteristics of Interior Columbia Basin Communities and an Estimation of Effects on Communities from the Alternatives of the Eastside and Upper Columbia River Basin Draft Environmental Impact Statements. U.S. Department of Agriculture, Forest Service, and U.S. Department of Interior, Bureau of Land Management, Interior Columbia Basin Ecosystem Management Project.

Swanson, C. and Loomis, J. B. 1996. Role of Nonmarket Economic Values in Benefit-Cost Analysis of Public Forest Management, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, General Technical Report, PNW-GTR-361.

U.S. Department of Agriculture, Forest Service. 1998. 1997 Monitoring and Evaluation Report for the National Forests of the Blue Mountains, Malheur, Umatilla, and Wallowa-Whitman National Forests.

U.S. Department of Agriculture, Forest Service. 1998. South Tower Project EA, Environmental Consequences, Socio-economic resources, Final.

U.S. Department of Agriculture, Forest Service. 1997. Environmental Consequences on Socio-economic Resources, Tower Recovery Project.

U.S. Department of Agriculture, Forest Service. 1997. Monitoring and Evaluation Report, Fiscal Year 1996, Umatilla National Forest, Forest Plan.

U.S. Department of Agriculture, Forest Service. 1996. Tower Fire Fish Status Report. North Fork John Day Ranger District, Umatilla National Forest.

U.S. Department of Agriculture, Forest Service. 1990. Final Environmental Impact Statement, Land and Resource Management Plan, Appendices-Volume 1, Umatilla National Forest.

## Fish and Aquatic Habitat

Amaranthus, M. H.; Jubas, H., and Arthur, D. Stream shading, summer streamflow, and maximum water temperature following intense wildfire in headwater streams. in: Berg, N. H., Editor. Symposium on fire and watershed management. Pacific Southwest Range and Experiment Station, Berkeley, CA: U. S. Forest Service; 1989: pages 75-78.

Belt, George H., Jay O'Laughlin and Troy Merrill. Design of forest riparian buffer strips for the protection of water quality: Analysis of Scientific literature. Moscow, Idaho. College of Forestry, Wildlife and Range Sciences. 1992: IV, 35p. (Report: (Idaho forest Wildlife and Range Policy analysis Group); no. 8).

Beschta, R. L. Long-term patterns of sediment production following road construction and logging in the Oregon Coast Range. *Water Resources Research*. 1978; 14, (6): pages 1011-1016.

Birge, W.J., Hoyt, R.D, Black, J.A., Kercher, M.D., Robinson, W.A. Effects of chemical stresses on behavior of larval and juvenile fishes. pp 55-65 in: Fuiman, L.A. ed. *Water Quality and early life stages of fishes*. American Fisheries Society Symposium, 14, American Fisheries Society, Bethesda, MD.1993

Brooks, Kenneth N., Ffolliott, Peter F., Gregersen, Hans M., and Thames, John L. 1991. *Hydrology and the management of watersheds*. Iowa State University Press, Ames Iowa. 392p

Brown, George W. and Krygier, James T. Effects of clear-cutting on stream temperature. *Water Resources Research*. 1970 Aug; 6, (4): 1133-1139.

Brown, J.K. Effects of fire on aquatic ecosystems. pp 106-110 in *Proceedings of Wild Trout IV Symposium*, Yellowstone National Park, 18-19 Sept., 1989. Mammoth, WY

Buchanan, D.V. and S.V. Gregory. 1997. Development of water temperature standards to protect and restore habitat for bull trout and other cold water species in Oregon. *Proceedings of the Friends of the Bull Trout Conference*. Calgary, Alberta.

Case, Richard L. and Kauffman, J. Boone. Wild ungulate influences on the recovery of willows, black cottonwood and thin-leaf alder following cessation of cattle grazing in Northeastern Oregon. *Northwest Science*. 1997; 71, (2): 115-126.

Federal Register, 1998. Endangered and Threatened Wildlife and Plants; Determination of Threatened status For the Klamath River and Columbia River Distinct Population segments of Bull Trout. vol 63, no. 111, pp 31647 - 31674. (June 10, 1998)

Federal Register, 1999. Endangered and Threatened Species: Threatened Status for Two ESUs of Steelhead in Washington and Oregon. vol. 64, no. 57, pp 14517-14528. (March 25, 1999)

Furniss, M.J., T.D. Roelofs and C.S. Yee, 1991. Road construction and maintenance. in: Meehan, W.R. (ed), *Influences of forest and rangeland management on salmonid fishes and their habitats*. American Fisheries Society Special Publication 19: 297-32

Gresswell, Robert E., 1999. Fire and aquatic ecosystems in forested biomes of North America. *Transactions of the American Fisheries Society*. 128 (2): 193-221-

Helvey, J. D. First-year effects of wildfire on water yield and stream temperature in North Central Washington. in. *Watersheds in Transition*. Fort Collins, CO: American Water Resources Association and Colorado State University; 1972: pages 308-312.

Janz, David M.; Farrell, Anthony P.; MOrgan, H.D.; Vigers, Gary A.; 1991. Acute physiological stress responses of huvenile coho salmon (*Oncorhynchus kisutch*) to sublethal concentrations of Garlon 4â, Garlon 3Aâ, and Visionâ herbicides.

Johansen, J. A. and Geen, G. H. Sublethal and acute toxicity of the ethylene glycol butyl ether ester formulation of triclopyr to juvenile coho salmon (*Oncorhynchus kisutch*). *Arch. Environ. Contam. Toxicol*. 1990; 19, 610-616.

Klock, G.O., 1971. Streamflow nitrogen loss following forest erosion control fertilization. U.S. Forest Service Research Note PNW-169. Pac. Northwest Forest and Range Exp. Sta., Portland OR

# Literature Cited **5**

- Klock, Glen O., 1975. Impact of five post fire salvage logging systems on soils and vegetation. *J. Soil and Water Conservation*, 30: 78-81
- Klock, G. O. and J. D. Helvey, 1976. Debris flows following wildfire in North Central Washington. Proceedings 3rd sedimentation conference. Denver, CO. pp 91-98.
- Kreutzweiser, David P.; Holmes, Stephen B.; Behmer, David J. 1992. Effects of herbicides hexazinone and triclopyr ester on aquatic insects. *Ecotoxicology and environmental safety* 23: 364-374
- Kreutzweiser, D.P., S.B. Holmes, D.C. Eichenberg. Influence of exposure duration on the toxicity of triclopyr ester to fish and aquatic insects. 1994. *Arch. Environ. Contamin. Toxicol.* 26:124-129
- Kreutzweiser, David P.; Thompson, Dean G.; Staznik, Bozena; Shepherd, Janelle A. 1998. Accumulation dynamics of triclopyr ester in aquatic leaf packs and effects on detritivorous insects. *J. Environ. Qual.*, 27:1138-1147
- Larkin, Gillian A. and Pat A. Slaney. 1997. Implications of trends in marine-derived nutrient influx to South Coastal British Columbia salmonid production. *Fisheries*, 22:16-24
- Little, Edward E.; Archeski, Richard D.; Flerov, Boris A.; Kozlovskaya, Vera I. Behavior indicators of sublethal toxicity in rainbow trout. *Arch. Environ. Contam. Toxicol.* 1990; 19, 380-385.
- Marston, Richard A., and David H. Haire. Runoff and soil loss following the 1988 Yellowstone fires. *Great Plains - Rocky Mountain Geographic Journal.* 18(1):1-8
- McKinney, Shaun P., Jim O'Conner, C. Kerry Overton, Ken MacDonald, Ken Tu, and Shari Whitwell. 1996. A Characterization of Inventoried Streams in the Columbia River Basin. *Aqua-Talk no. 11 (R-6 Fish Habitat Relationship Technical Bulletin)*. United States Department of Agriculture, Pacific Northwest Region.
- Meehan, W. R. Some effects of shade cover on stream temperature in southeast Alaska. Portland, OR: US Forest Service, Pacific Northwest Forest and Range Experiment Station; 1970: pp 1-11.
- Megahan, Walter F. Sedimentation in relation to logging activities in the mountains of central Idaho. in. Present and prospective technology for predicting sediment yields and sources. U.S. Gov. Printing Office; 1975: 74-82.
- Megahan, W. F., 1987. Sedimentation following helicopter logging and prescribed burning on granitic soil. *Erosion and Sedimentation in the Pacific Rim. Proceedings of the Corvallis Symposium*, August, 1987. pp 259-260. International Assoc. Hydrol. Sci. Pub. no. 165, Wallingford, UK.
- Minshall, G. W. and Brock, J. T. Observed and anticipated effects of forest fire on Yellowstone stream ecosystems. in: Keiter, R. B. New Haven, CT: Yale University Press; 1991; pp. 123-135.
- Minshall, G. Wayne; Brock, James t., and Varley, John D. Wildfires and Yellowstone's stream ecosystems. *Bioscience.* 1989 Nov; 39, (10): pages 707-715.
- Morgan, John D.; Vigers, Gary A.; Farrell, Anthony P.; Janz, David M., and Manville, John F. Acute avoidance reactions and behavioral responses of juvenile rainbow trout (*Oncorhynchus mykiss*) to garlon 4, garlon 3a and vision herbicides. *Experimental Toxicology and Chemistry.* 1991; 10, 73-79.
- Morgan, M.J. and Kiceniuk, J.W. Response of rainbow trout to a two month exposure to Vision®, a glyphosate herbicide. *Bull. Environ. Contam. Toxicol.* (1992) 48:772-780
- Patton, David R. A literature review of timber-harvesting effects on stream temperatures: research needs for the southwest. Fort Collins, CO: U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station; 1973: pp 1-4.
- Platts, W. S. 1991. Livestock Grazing. *American Fisheries Society Special Publication* 19:389-424
- Potyondy, John P.; Cole, Gene F., and Megahan, Walter F. A procedure for estimating sediment yields from forested watersheds. in. Proceedings: Fifth federal interagency sedimentation conf. Washington, D. C.: Federal Energy Regulatory Comm.; 1991: pages 12-46 to 12- 54.

- Reeves, Gordon H.; Everest, Fred H., and Sedell, James R. Diversity of juvenile anadromous salmonid assemblages in coastal Oregon basins with different levels of timber harvest. *Transactions of the American Fisheries Society*. 1993 May; 122, (3): 309-317.
- Rieman, Bruce and Clayton, Jim. Wildfire and native fish: issues of forest health and conservation of native species. *Fisheries*. 1997 Nov; 22, (11): 6-15.
- Rieman, Bruce, Danny Lee, Gwynne Chandler, and Deborah Myers. 1995. Does wildfire threaten extinction for salmonids? responses of redband trout and bull trout following recent large fires on the Boise National Forest. *Proceedings: Fire effects on rare and endangered species and habitats conference*. Nov. 13-16, 1995. Coeur d' Alene Idaho. pp 47-57
- Servizi, J. A.; Gordon, R. W., and Martens, D. W. Acute toxicity of garlon 4 and roundup herbicides to salmon, daphnia, and trout. *Bull. Environ. Contam. Toxicol.* 1987; 39, 15- 22.
- Solomon, Keith R., Cindy S. Bowhey, Karsten Liber, and Gerald R. Stephenson. Persistence of hexazinone (Velpar), triclopyr (Garlon), and 2,4-D in a Northern Ontario Aquatic environment. *J. Agric. Food. Chem.*, 1988. 36:1314-1318
- Thompson, D. G., SAtaznik, B., Fontain, D.D., Mackay, T., Oliver, G.R., and Troth, J.L., 1991. Fate of Triclopyr ester (Release) in a boreal forest stream. *Environ. Toxicol. Chem.* 10:619-632
- Thompson, D. G., Kreutweiser, D. P., Capell, S. S. , Thomas, D. R. , Staznik, B., and Viinikka, T. 1995. Fate and effects of triclopyr ester in a first-order forest stream. *Environ. Toxicol. Chem.* 14: 1307 - 1317.
- Torstensson, N.T.L., Lundgren, L.N., and Stenstrom, J. Influence of climatic and edaphic factors on persistence of glyphosate and 2,4-d in forest soils. *Exotoxicology and environmental safety*, 18:230-239 (1989)
- USDA Forest Service, 1984. *Pesticide Background Statements, Volume 1. Herbicides. Agriculture Handbook Number 633*
- USDA Forest Service, Pacific Northwest Region, 1988. *Final Environmental Impact Statement for Managing Competing and Unwanted Vegetation. USDA Forest Service, Portland Oregon.*
- USDA Forest Service, Pacific Northwest Region, 1994. *Section 7 fish habitat monitoring protocol for the Upper Columbia River Basin. USDA Forest Service, Pacific Northwest Region, Intermountain Region, Northern Region, Publication no. R6-F&W-CRB-TP-10-94.*
- USDA Forest Service, Pacific Northwest Region, 1996, 1997. *Herbicide Information Profiles. USDA Forest Service, Portland, Oregon.*
- Wan, M. T.; Moul, D. J., and Watts, R. G. Acute toxicity to juvenile pacific salmonids of garlon 3a, Garlon 4, triclopyr, triclopyr ester, and their transformation products: 3,5,6-trichloro-- pyridinol and 2-methoxy-3,5,6-trichloropyridine. *Bull. Environ. Contam. Toxicol.* 1987; 39, 721-728.

## **Forest Vegetation**

- Agee, James K. *Fire ecology of pacific northwest forests*. Washington D.C.: Island Press; 1993. 491 p.
- Balfour, Patty M. 1989. *Effects of forest herbicides on some important wildlife forage species. FRDA Report 020. Victoria, BC: B.C. Ministry of Environment, Wildlife Branch. 58 p.*
- Beaudry, Pierre G. 1990. *Downslope movement of the herbicide hexazinone in the SBS zone. FRDA Report No. 154. Victoria, BC: Ministry of Forests, Research Branch. 23 p.*
- Beschta, Robert L.; Frissell, Christopher A.; Gresswell, Robert [and others]. 1995. *Wildfire and salvage logging. Unpublished Report. [Place of publication unknown]: [Publisher unknown].*
- Beschta, Robert. *Electronic communication with Dave Powell, 1999. On file at Umatilla National Forest, North Fork John Day Ranger District, P.O. Box 158, Ukiah, OR, 97880*

# Literature Cited 5

- Blake, John; Crooker, Dave. 1986. Growth response of ponderosa pine following release from grass competition. In: Baumgartner, David M.; Boyd, Raymond J.; Breuer, David W.; Miller, Daniel L., compilers. Weed control for forest productivity in the Interior West. Symposium Proceedings; 1985 February 5-7; Spokane, WA. Pullman, WA: Washington State University, Coop. Extension: 145-146.
- Botanical Resources Group. 1996. A pocket guide to the plants of the Umatilla National Forest, Oregon and Washington. F14-SO-02-96. Pendleton, OR: Pendleton, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Umatilla National Forest. 219 p.
- Boyd, Raymond J.; Miller, Daniel L.; Kidd, Frank A.; Ritter, Catherine P. 1985. Herbicides for forest weed control in the Inland Northwest: a summary of effects on weeds and conifers. General Technical Report INT-195. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 66 p.
- Burton, Philip J. 1996. When is vegetation control needed? In: Comeau, Philip G.; Harper, George J.; and others, editors. Integrated forest vegetation management: options and applications. FRDA Report No. 251. Victoria, BC: Ministry of Forests, Research Branch: 11-16.
- Caraher, David L.; Henshaw, John; Hall, Fred [and others]. 1992. Restoring ecosystems in the Blue Mountains: a report to the Regional Forester and the Forest Supervisors of the Blue Mountain forests. Portland, OR: U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Region. 14 p.
- Chakravarty, P.; Sidhu, S. S. 1987. Effect of hexazinone (Pronone 5G) on the seedling growth and mycorrhizal incidence of *Pinus contorta* var. *latifolia* and *Picea glauca*. European Journal of Forest Pathology 17: 282-291.
- Clausnitzer, Rodrick R. 1993. The grand fir series of northeastern Oregon and southeastern Washington: successional stages and management guide. Publication R6-ECO-TP-050-93. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest. 193 p.
- Coates, K. Dave; Haeussler, Sybille; Lindeburgh, Scott; Pojar, Rosamund; Stock, Arthur J. 1994. Ecology and silviculture of interior spruce in British Columbia. FRDA Report 220. Victoria, BC: Canadian Forest Service, Pacific Forestry Centre. 182 p.
- Coates, D.; Haeussler, S.; Mather, J. 1990. A guide to the response of common plants in British Columbia to management treatments. FRDA Handbook 008. Victoria, BC: Forestry Canada, Pacific Forestry Centre. 154 p.
- Cochran, P. H.; Geist, J. M.; Clemens, D. L.; Clausnitzer, Rodrick R.; Powell, David C. 1994. Suggested stocking levels for forest stands in northeastern Oregon and southeastern Washington. Research Note PNW-RN-513. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 21 p.
- Cole, Elizabeth C.; McComb, William C.; Newton, Michael; Chambers, Carol L.; Leeming, J. P. 1997. Response of amphibians to clearcutting, burning, and glyphosate application in the Oregon Coast Range. Journal of Wildlife Management. 61(3): 656-664.
- Comeau, Philip G.; Braumandl, Thomas F.; Xie, Chang-Yi. 1993. Effects of overtopping vegetation on light availability and growth of Engelmann spruce (*Picea engelmannii*) seedlings. Canadian Journal of Forest Research. 23: 2044-2048.
- Conard, Susan G.; Jaramillo, Annabelle E.; Cromack, Kermit, Jr.; Rose, Sharon. 1985. The role of the genus *Ceanothus* in western forest ecosystems. General Technical Report PNW-182. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 72 p.
- Crouch, Glenn L. 1979. Atrazine improves survival and growth of ponderosa pine threatened by vegetative competition and pocket gophers. Forest Science. 25(1): 99-111.

## Literature Cited 5

- Dimock, Edward J. II. 1981. Herbicide and conifer options for reforesting upper slopes in the Cascade Range. Research Paper PNW-292. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 14 p.
- Dimock, Edward J. II; Beebe, Thomas F.; Collard, Ernest B. 1983. Planting-site preparation with herbicides to aid conifer reforestation. *Weed Science*. 31(2): 215-221.
- Dimock, Edward J. II; Collard, Ernest B. 1981. Postplanting sprays of dalapon and atrazine to aid conifer establishment. Research Paper PNW-280. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 16 p.
- DiTomaso, Joseph M.; Marcum, Daniel B.; Rasmussen, Michelle S.; Healy, Evelyn A.; Kyser, Guy B. 1997. Post-fire herbicide sprays enhance native plant diversity. *California Agriculture*. 51(1): 6-11.
- Dost, Frank N.; Boateng, Jacob; Stobie, James. 1996. Worker safety in forest vegetation management. In: Comeau, Philip G.; Harper, George J.; and others, editors. *Integrated forest vegetation management: options and applications*. FRDA Report No. 251. Victoria, BC: Ministry of Forests, Research Branch: 85.
- Edgerton, Paul J. 1971. The effect of cattle and big game grazing on a ponderosa pine plantation. Research Note PNW-172. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 8 p.
- Everett, Richard. 1995. Review of recommendations for post-fire management. 4410-1-2 memorandum to Regional Forester, R-6. Wenatchee, WA: Pacific Northwest Research Station, Wenatchee Forestry Sciences Laboratory. 19 p.
- Ferguson, Dennis E.; Boyd, Raymond J. 1988. Bracken fern inhibition of conifer regeneration in northern Idaho. Research Paper INT-388. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 11 p.
- Gannett, Henry. 1902. The forests of Oregon. Professional Paper No. 4, Series H, Forestry, No. 1. Washington, DC: U.S. Department of Interior, Geological Survey. 36 p (and map).
- Gast, William R., Jr.; Scott, Donald W.; Schmitt, Craig [and others]. 1991. Blue Mountains forest health report: "new perspectives in forest health." Portland, OR: US Department of Agriculture, Forest Service, Pacific Northwest Region, Malheur, Umatilla, and Wallowa-Whitman National Forests.
- Gratowski, H.; Lauterback, P. 1974. Releasing Douglas-firs from varnishleaf ceanothus. *Journal of Forestry*. 72(3): 150-152.
- Haeussler, S.; Coates, D. 1986. Autecological characteristics of selected species that compete with conifers in British Columbia: a literature review. Land Management Report Number 33. Victoria, BC: Ministry of Forests, Information Services Branch. 180 p.
- Hall, Dale O. 1971. Ponderosa pine planting techniques, survival, and height growth in the Idaho batholith. Research Paper INT-104. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 28 p.
- Hermann, Frederick J. 1970. Manual of the Carices of the Rocky Mountains and Colorado Basin. Agriculture Handbook No. 374. Washington, DC: U.S. Department of Agriculture, Forest Service. 397 p.
- Hessburg, Paul F.; Mitchell, Russel G.; Filip, Gregory M. 1994. Historical and current roles of insects and pathogens in eastern Oregon and Washington forested landscapes. General Technical Report PNW-GTR-327. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72 p.
- Johnson, Charles Grier, Jr.; Clausnitzer, Rodrick R. 1992. Plant associations of the Blue and Ochoco Mountains. Publication R6-ERW-TP-036-92. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest. 164 p.
- Jones, Melanie D.; Durall, Daniel M.; Simard, Suzanne W. 1996. Ectomycorrhiza formation on lodgepole pine seedlings as affected by site preparation on a dry grassy site in the IDF zone of the Lillooet Forest

- District. FRDA Research Memo No. 233. Victoria, BC: Canadian Forest Service, Pacific Forestry Centre. 7 p.
- Kittams, Jay A.; Ryker, Russell A. 1975. Habitat type and site preparation affect survival of planted Douglas-fir in central Idaho brushfields. Research Note INT-198. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. 6 p.
- Kitzhaber, John A. 1997 (June). Proposed Eastside Forest Health Strategy. Salem, OR: State Capitol, Governor's Office. 1 p.
- Kohrman, Elaine. 1998. Economics report for South Tower environmental analysis. Pendleton, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Umatilla National Forest.
- Lautenschlager, R. A. 1993. Response of wildlife to forest herbicide applications in northern coniferous ecosystems. Canadian Journal of Forest Research. 23: 2286-2299.
- Lee, Choon H.; Oloffs, Peter C.; Szeto, Sunny Y. 1986. Persistence, degradation, and movement of triclopyr and its ethylene glycol butyl ether ester in a forest soil. Journal of Agricultural and Food Chemistry. 34: 1075-1079.
- Lehmkuhl, John F.; Hessburg, Paul F.; Everett, Richard L.; Huff, Mark H.; Ottmar, Roger D. 1994. Historical and current forest landscapes of eastern Oregon and Washington. Part 1: Vegetation pattern and insect and disease hazards. General Technical Report PNW-GTR-328. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 88 p.
- Lopushinsky, W.; Klock, G. O. 1990. Soil water use by *Ceanothus velutinus* and two grasses. Research Note PNW-RN-496. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 9 p.
- Lotan, James E. 1986. Silvicultural management of competing vegetation. In: Baumgartner, David M.; Boyd, Raymond J.; Breuer, David W.; Miller, Daniel L., compilers. Weed control for forest productivity in the Interior West. Symposium Proceedings; 1985 February 5-7; Spokane, WA. Pullman, WA: Washington State University, Cooperative Extension: 9-16.
- McDonald, Philip M. 1986. Grasses in young conifer plantations – hindrance and help. Northwest Science. 60(4): 271-278.
- McDonald, Philip M.; Fiddler, Gary O. 1989. Competing vegetation in ponderosa pine plantations: ecology and control. General Technical Report PSW-113. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station. 26 p.
- McDonald, Philip M.; Fiddler, Gary O. 1993. Feasibility of alternatives to herbicides in young conifer plantations in California. Canadian Journal of Forest Research. 23: 2015-2022.
- McDonald, Philip M.; Fiddler, Gary O. 1995. Development of a mixed shrub-ponderosa pine community in a natural and treated condition. Research Paper PSW-RP-224. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 19 p.
- McDonald, Philip M.; Fiddler, Gary O.; Meyer, Peter W. 1996. Vegetation trends in a young conifer plantation after grazing, grubbing, and chemical release. Research Paper PSW-RP-228. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 17 p.
- McDonald, Philip M.; Helgerson, Ole T. 1990. Mulches aid in regenerating California and Oregon forests: past, present, and future. General Technical Report PSW-123. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 19 p.
- McLean, Herbert E. 1992. The Blue Mountains: forest out of control. American Forests. 98 (9/10): 32, 34-35, 58, 61.
- McMahon, Charles K.; Miller, James H.; Thomas, David F. 1994. The role of low impact herbicide treatments in ecosystem management. In: Proceedings of the Fifteenth Annual Forest Vegetation Management Conference; 1994 January 25-27; Redding, CA: 171-182.
- McMinn, R. G. 1951. The vegetation of a burn near Blaney Lake, B.C. Ecology. 32(1): 135-140.

- McNabb, Ken. 1991. Forestry herbicides are environmentally safe. *Forest Farmer*. 50(3): 16-18.
- Miller, Daniel L. 1986a. Conifer release in the Inland Northwest – effects. *In*: Baumgartner, David M.; Boyd, Raymond J.; Breuer, David W.; Miller, Daniel L., compilers. *Weed control for forest productivity in the Interior West. Symposium Proceedings; 1985 February 5-7; Spokane, WA. Pullman, WA: Washington State University, Cooperative Extension: 17-24.*
- Miller, Daniel L. 1986b. Manual and mechanical methods of vegetation control – what works and what doesn't. *In*: Baumgartner, David M.; Boyd, Raymond J.; Breuer, David W.; Miller, Daniel L., compilers. *Weed control for forest productivity in the Interior West. Symposium Proceedings; 1985 February 5-7; Spokane, WA. Pullman, WA: Washington State University, Cooperative Extension: 55-60.*
- Mutch, Robert W.; Arno, Stephen F.; Brown, James K. [and others]. 1993. Forest health in the Blue Mountains: a management strategy for fire-adapted ecosystems. General Technical Report PNW-GTR-310. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 14 p.
- Neary, Daniel G.; Michael, Jerry L. 1996. Herbicides – protecting long-term sustainability and water quality in forest ecosystems. *New Zealand Journal of Forestry Science*. 26(1/2): 241-264.
- Neuenschwander, L. F.; Osborne, H. L.; Morgan, P. 1986. Integrating harvest practices and site-preparation activities to manage competing vegetation. *In*: Baumgartner, David M.; Boyd, Raymond J.; Breuer, David W.; Miller, Daniel L., compilers. *Weed control for forest productivity in the Interior West. Symposium Proceedings; 1985 February 5-7; Spokane, WA. Pullman, WA: Washington State University, Cooperative Extension: 29-34.*
- Newsome, Teresa. 1996. The use of sheep in forest vegetation management. *In*: Comeau, Philip G.; Harper, George J.; and others, editors. *Integrated forest vegetation management: options and applications. FRDA Report No. 251. Victoria, BC: Ministry of Forests, Research Branch: 67-74.*
- Newton, Mike. 1997. Forestry. *In*: William, Ray D.; Ball, Dan [and others], compilers. *Pacific Northwest weed control handbook. Corvallis, OR: Oregon State University: 166-185.*
- Newton, Michael; Howard, Kerry M.; Kelpsas, Bruce R. [and others]. 1984. Fate of glyphosate in an Oregon forest ecosystem. *Journal of Agricultural and Food Chemistry*. 32(5): 1144-1151.
- Newton, Michael; Roberts, Frederic; Allen, Adrian [and others]. 1990. Deposition and dissipation of three herbicides in foliage, litter, and soil of brushfields of southwest Oregon. *Journal of Agricultural and Food Chemistry*. 38(2): 574-583.
- Nicholson, Alison. 1989. Water relations, survival and growth of Douglas-fir seedlings at a pinegrass dominated site in south-central British Columbia; Project No. 3.1. FRDA Research Memo No. 121. Victoria, BC: Ministry of Forests, Research Branch. 2 p.
- Norris, Logan A. 1981. The behavior of herbicides in the forest environment and risk assessment. *In*: *Proceedings of the 1981 John S. Wright Forestry Conference: Weed Control in Forest Management. West Lafayette, IN: Purdue University: 192-215.*
- Noss, Reed F.; LaRoe, Edward T., III; Scott, J. Michael. 1995. Endangered ecosystems of the United States: a preliminary assessment of loss and degradation. Biological Report 28. Washington, DC: U.S. Department of the Interior, National Biological Service. 58 p.
- Noste, Nonan V. 1985. Influence of fire severity on response of evergreen ceanothus. *In*: Lotan, James E.; Brown, James K., compilers. *Fire's effects on wildlife habitat – symposium proceedings. General Technical Report INT-186. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station: 91-96.*
- Noste, Nonan V.; Bushey, Charles L. 1987. Fire response of shrubs of dry forest habitat types in Montana and Idaho. General Technical Report INT-239. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 22 p.
- Oester, Paul T.; Emmingham, William; Larson, Pat; Clements, Stephen. 1995. Performance of ponderosa pine seedlings under four herbicide regimes in northeast Oregon. *New Forests*. 10: 123-131.

## Literature Cited 5

- Oliver, Chadwick D.; Irwin, Larry L.; Knapp, Walter H. 1994. Eastside forest management practices: historical overview, extent of their applications, and their effects on sustainability of ecosystems. General Technical Report PNW-GTR-324. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72 p.
- Oliver, Chadwick D.; Larson, Bruce C. 1996. Forest stand dynamics. Second edition. New York: John Wiley. 520 p.
- Oliver, William W. 1984. Brush reduces growth of thinned ponderosa pine in northern California. Research Paper PSW-172. Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station. 7 p.
- Petersen, James D. 1992. Grey ghosts in the Blue Mountains. Evergreen (January/February issue): 3-8.
- Petersen, T. D. 1982. Guidelines for using Velpar for site preparation in Montana based on second year research trials. Research Note RM-82-9. Champion International Corporation.
- Petersen, Terry D. 1988. Effects of interference from *Calamagrostis rubescens* on size distributions in stands of *Pinus ponderosa*. Journal of Applied Ecology. 25: 265-272.
- Phillips, Jeff. 1995. The crisis in our forests. Sunset. 195(1): 87-92.
- Pimentel, David; Levitan, Lois. 1986. Pesticides: amounts applied and amounts reaching pests. Bio-Science. 36(2): 86-91.
- Powell, David C.; Erickson, Vicky. 1996 Forest vegetation report for the Burned Area Emergency Rehabilitation assessment; Tower fire. Pendleton, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Umatilla National Forest. 44 p.
- Powers, Robert F. 1989. Maintaining long-term forest productivity in the Pacific Northwest: defining the issues. In: Perry, D.A., Meurisse, R., Thomas, B. et. al. Maintaining the long-term productivity of Pacific Northwest forest ecosystems. Portland, OR: Timber Press: 3-16.
- Quigley, Thomas M.; Arbelbide, Sylvia J., technical editors. 1997. An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basins: volume 2. General Technical Report PNW-GTR-405. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 1055 p.
- Quigley, Thomas M.; Haynes, Richard W.; Graham, Russell T., technical editors. 1996. Integrated scientific assessment for ecosystem management in the Interior Columbia Basin and portions of the Klamath and Great Basins. General Technical Report PNW-GTR-382. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 303 p.
- Randall, John M.; Rejmanek, Marcel. 1993. Interference of bull thistle (*Cirsium vulgare*) with growth of ponderosa pine (*Pinus ponderosa*) seedlings in a forest plantation. Canadian Journal of Forest Research. 23: 1507-1513.
- Ratliff, Raymond D.; Denton, Renee G. 1995. Grazing on regeneration sites encourages pine seedling growth. Research Paper PSW-RP-223. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 11 p.
- Reed, Clyde F.; Hughes, Regina O. 1970. Selected weeds of the United States. Washington, DC: U.S. Department of Agriculture, Agricultural Research Service. 463 p.
- Robbins, William G.; Wolf, Donald W. 1994. Landscape and the Intermontane Northwest: an environmental history. General Technical Report PNW-GTR-319. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 32 p.
- Ross, D. W.; Scott, W.; Heninger, R. L.; Walstad, J. D. 1986. Effects of site preparation on ponderosa pine (*Pinus ponderosa*), associated vegetation, and soil properties in south central Oregon. Canadian Journal of Forest Research. 16: 612-618.

# Literature Cited **5**

- Schmitt, Craig. 1994. Technical Assistance, Insect and Disease Review; Droopy Analysis Area, Umatilla National Forest, North Fork John Day Ranger District. BMZ-95-01.
- Schmitt, Craig; Scott, Don, 1996. Insect and Disease Evaluation of Tower and Bull Fires, North Fork John Day Ranger District, Umatilla National Forest. La Grande, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest. Irregular pagination.
- Sharrow, Steven H. 1993. Animal grazing in forest vegetation management: a research synthesis. In: Harrington, Timothy B.; Parendes, Laurie A., editors. Forest vegetation management without herbicides; proceedings of a workshop held February 18-19, 1992, at Oregon State University, Corvallis. Corvallis, OR: Oregon State University, Forest Research Laboratory: 53-60.
- Shindler, Bruce; Reed, Michelle. 1996. Forest management in the Blue Mountains: public perspectives on prescribed fire and mechanical thinning. Corvallis, OR: Oregon State University, Department of Forest Resources. 58 p.
- Sloan, John P.; Ryker, Russell A. 1986. Large scalps improve survival and growth of planted conifers in central Idaho. Research Paper INT-366. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 9 p.
- Stewart, R. E. 1977. Chemical site preparation in the Inland Empire. In: Tree Planting in the Inland Northwest; Conference proceedings; 1976 February 17-19; Pullman, WA: 158-171.
- Stewart, R. E.; Beebe, T. 1974. Survival of ponderosa pine seedlings following control of competing grasses. Proceedings of Western Society of Weed Science. 21: 55-58.
- Stewart, Ronald E.; Gross, Larry L.; Honkala, Barbara H., compilers. 1984. Effects of competing vegetation on forest trees: a bibliography with abstracts. General Technical Report WO-43. Washington, DC: U.S. Department of Agriculture, Forest Service, Washington Office.
- Stickney, Peter F. 1990. Early development of vegetation following holocaustic fire in northern Rocky Mountain forests. Northwest Science. 64(5): 243-246.
- Sullivan, Thomas P.; Sullivan, Druscilla S.; Lautenschlager, R. A.; Wagner, Robert G. 1997. Long-term influence of glyphosate herbicide on demography and diversity of small mammal communities in coastal coniferous forest. Northwest Science. 71(1): 6-17.
- Tower Fire Ecosystem Analysis. 1997. Tower Fire Ecosystem Analysis (Final). Pendleton, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Umatilla National Forest, North Fork John Day Ranger District. Irregular pagination.
- Trumbo, Joel. 1996. The aquatic toxicology of forest herbicides In: Proceedings of the Seventeenth Annual Forest Vegetation Management Conference; 1996 January 16-18; Redding, CA: 37-39.
- U.S. Department of Agriculture, Forest Service. 1988. Final environmental impact statement for managing competing and unwanted vegetation. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. Irregular pagination and multiple volumes.
- U.S. Department of Agriculture, Forest Service. 1990. Land and resource management plan: Umatilla National Forest. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. Irregular pagination.
- U.S. Department of Agriculture, Forest Service. 1992. Hexazinone herbicide information profile. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 13 p.
- U.S. Department of Agriculture, Forest Service. 1996a. Triclopyr herbicide information profile. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 14 p.
- U.S. Department of Agriculture, Forest Service. 1996b. Environmental assessment: seed orchard and evaluation plantation protection project. John Day, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Malheur National Forest. 51 p (plus appendices).
- U.S. Department of Agriculture, Forest Service. 1997a. Glyphosate herbicide information profile. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 16 p.

# Literature Cited **5**

- U.S. Department of Agriculture, Forest Service. 1997b. Environmental assessment for Big Tower salvage and revegetation project. Pendleton, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Umatilla National Forest. 51 p.
- U.S. Department of Agriculture, Forest Service. 1988. Managing Competing and Unwanted Vegetation Final Environmental Impact Statement. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. Irregular pagination.
- U.S. Department of Agriculture, Forest Service. 1991. Blue Mountains Forest Health Report. La Grande, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Malheur, Umatilla, Wallowa-Whitman National Forests. Irregular pagination.
- U.S. Department of Agriculture, Forest Service. 1992a. Restoring Ecosystems in the Blue Mountains. Portland, OR: U.S. Department of Agriculture, Pacific Northwest Region. 14p.
- U.S. Department of Agriculture, Forest Service. 1992b. Hexazinone herbicide information profile. Portland, OR: U.S. Department of Agriculture, Pacific Northwest Region. 13p.
- U.S. Department of Agriculture, Forest Service. 1993. Diseases of pacific coast conifers. Agriculture Handbook 521. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 199 p.
- U.S. Department of Agriculture, Forest Service. 1994. Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales, Regional Forester's Plan Amendment #2. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region.
- U.S. Department of Agriculture, Forest Service. Date? Advanced Training for Silviculturists. Pacific Northwest Region, Pacific Northwest Research Laboratory, La Grande, OR. Localized training publication. Irregular pagination.
- U.S. Department of Agriculture, Forest Service. 1997a. Glyphosate herbicide information profile. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 16 p.
- U.S. Department of Agriculture, Forest Service. 1997b. Tower Fire Ecosystem Analysis (Final). Pendleton, OR: U.S. Department of Agriculture, Pacific Northwest Region, Umatilla National Forest, North Fork John Day Ranger District. Irregular pagination.
- U.S. Department of Agriculture, Forest Service. 1998. South Tower Upland Forest and Competing Vegetation Analyses. Pendleton, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Umatilla National Forest, North Fork John Day Ranger District. 56 p.
- U.S. Department of Agriculture, Forest Service. 1998b. Final environmental impact statement for managing competing and unwanted vegetation. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. Irregular pagination and multiple volumes.
- U.S. District Court, District of Oregon. 1989. Mediated agreement and exhibit A to stipulated order, Civil No. 83-6272-E-Bu. 28 p.
- Wagner, Robert G.; Petersen, Terry D.; Ross, Darrell W.; Radosevich, Steven R. 1989. Competition thresholds for the survival and growth of ponderosa pine seedlings associated with woody and herbaceous vegetation. *New Forests*. 3: 151-170.
- Wall, R. E.; Shamoun, S. F. 1990. Experiments on vegetation control with native pathogenic fungi in the southern interior of British Columbia. FRDA Report 134. Victoria, BC: Forestry Canada, Pacific Forestry Centre. 18 p.
- Willoughby, Ian. 1997. Glyphosate rain fastness. *Quarterly Journal of Forestry*. 91(3): 203-210.
- Windell, Keith; Haywood, James D. 1996. Mulch mat materials for improved tree establishment. Technical Report 9624-2811-MTDC. Missoula, MT: U.S. Department of Agriculture, Forest Service, Technology and Development Program. 124 p.
- Zavitkowski, J.; Newton, Michael; El-Hassan, Babiker. 1969. Effects of snowbrush on growth of some conifers. *Journal of Forestry*. 67(4): 242-246.

## **Fuels and Air Quality**

- Agee, J.K. 1994. Fire Ecology of Pacific Northwest Forests. Washington, D.C. Island Press
- Anderson, H.E. 1982. Aids to Determining Fuel Models For Estimating Fire Behavior. General Technical Report INT-122. NFES # 1574. Ogden, UT
- Brown, J.K. 1974. Handbook for Inventorying Downed Woody Material. General Technical Report INT-16. Ogden, UT.
- Beschta, R.L. (and others) 1995. Wildfire and Salage Logging. Recommendations for Ecologically Sound Post-Fire Salvage Logging and Other Post-Fire Treatments On Federal Lands in the West.
- Conard, S.G., Everett, R.L., Husari, S., Harvey, A.E., Reeves, G.H., Saveland, J., Weatherspoon, C.P., Ziemer, R.R. 1995. Forest Service Review of Wildfire and Salvage Logging by R.L. Beschta (and others). Washington, D.C.
- Everett, R. 1995. Review of Recommendations for Post-Fire Management. USDA Forest Service PNW. Portland, OR
- Heyerdahl, Emily K. 1996. Historical Fire Regimes of Four Sites in the Blue Mountains, Oregon and Washington, Final Report. University of Washington, Seattle, WA
- Maxwell, W.G, Ward, F.R. 1976. Photo Series for Quantifying Forest Residues in the: Ponderosa Pine Type, Ponderosa Pine and Associated Species Type, Lodgepole Pine Type. General Technical Report PNW-52. U.S. Department of Agriculture, Forest Service, Portland, OR
- Maxwell, W.G, Ward, F.R. 1976. Photo Series for Quantifying Natural Forest Residues in Common Vegetation Types of the Pacific Northwest. General Technical Report PNW-105. U.S. Department of Agriculture, Forest Service, Portland, OR
- Umatilla National Forest, 1997. Tower Fire Ecosystem Analysis. North Fork John Day Ranger District. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. Ukiah, OR .
- Umatilla National Forest, 1997. Big Tower Salvage and Revegetation Project E.A.. North Fork John Day Ranger District. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. Ukiah, OR
- Umatilla National Forest, 1998. South Tower Fire Recovery Project E.A.. North Fork John Day Ranger District. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. Ukiah, OR
- Umatilla National Forest, 1998. Cable Fire Recovery E.A.. North Fork John Day Ranger District. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. Ukiah, OR
- Umatilla National Forest, 1997. Harry Hazard C.E.. North Fork John Day Ranger District. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. Ukiah, OR
- Umatilla National Forest, 1998. Tower Fire Salvage E.A.. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. Ukiah, OR
1985. Debris Prediction Tables developed from DEBMOD6 Debris Prediction Program.

## **Water**

- Harr, R.D., A. Levno, R. Mersereau, 1982. Streamflow Changes after Logging 130-Year-Old Douglas Fir in Two Small Watersheds. Water Resources Research. Vol. 18, No. 3, pp. 637-644.
- Harris, R.M. and C.F. Clifton, 1999. Upper Umatilla River Sediment Analysis. In press.
- Helvey, J.D., 1980. Effects of a North Central Washington Wildfire on Runoff and Sediment Production. Water Resources Bulletin, Vol. 16. No. 4.
- Helvey, J.D., A.R. Tiedemann, and T.D. Anderson, 1985. Plant Nutrient losses by soil erosion and mass movement after wildfire. Journal of Soil and Water Conservation, Vol. 40, no. 1.

- Helvey, J.D., W.B. Fowler, 1995. Effects of timber forest on the hydrology and climate of four small watersheds. In press
- King, J.G. and L.C. Tennyson, 1984. Alterations of Streamflow Characteristics Following Road Construction in North Central Idaho. *Water Resources Research*, Vol. 20, No. 8 pp. 1159-1163.
- Klock, G.O., and J.D. Helvey, 1976. Soil-water trends following wildfire on the Entiat Experimental Forest. *Ann. Proc. Tall Timbers Fire Ecol. Conf.*, No. 15, p. 193-200.
- Oregon Department of Environmental Quality, 1996. DEQ's 1994/1996 303(d) List of Water Quality Limited Waterbodies
- Standiford, R.B., Ramacher, S.I., eds., 1981. Proceedings, Edgebrook Conference; 1980 July 2-3, Berkeley, CA. Spec. Pub. 3268. Berkeley, CA; Univ. Calif. Div. Agric. Sci., pp 36-46.
- Robichaud, 1997. Personal communication.
- Tiedemann, A.R., C.E. Conrad, J.H. Dieterich, J.W. Hornbeck, W.F. Megahan, L.A. Viereck, D.D. Wade, 1979. Effects of Fire on Water, A State-of-Knowledge Review. USDA Forest Service General Technical Report WO-10.
- U.S. Department of Agriculture, Forest Service. 1997. Tower Fire Ecosystem Analysis, Unpublished Report. Umatilla National Forest.
- U.S. Department of Agriculture, Forest Service. 1998c. Umatilla National Forest 1998 Monitoring Report, Monitoring Item 8.
- U.S. Dept. of Commerce. 1955. Rainfall Intensity-Duration-Frequency Curves. Technical Paper no. 25, pp53.
- U.S. Geologic Service. 1991. Water Resources Data, Oregon, Water Year 1991. USGS Water-Data Report OR-91-1, p. 118.
- Welch, T.G., and J.O. Klemmedson. 1975. Influence of the biotic factor and parent material on distribution of nitrogen and carbon in ponderosa pine ecosystems. In: *Forest soils and forest land management*, B. Bernier and C.W. Winget, eds., p. 159-178. Les Presses de L'Univ. Laval, Quebec.

## **Wildlife**

- Bull, Evelyn L.; Parks, Catherine G.; Torgersen, Torolf R. 1997. Trees and logs important to wildlife in the interior Columbia River basin. Gen. Tech. Rep. PNW-GTR-391. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 55 p.
- Gobar, Charles F. 1996. Dead standing tree (snag) standards and guidance for fire recovery areas. Pendleton, OR: USDA, Forest Service, Pacific Northwest Region, Umatilla National Forest. 7 p.
- Koehler, Gary M. 1990. Population and habitat characteristics of lynx and showshoe hares in north central Washington. *Can. J. Zool.* 68:845-851.
- Saab, Victoria A.; Dudley, Jonathan G. 1998. Responses of cavity-nesting birds to stand-replacement fire and salvage logging in ponderosa pine/Douglas-fir forests of southwestern Idaho. Res. pap. RMRS-RP-11. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 17 p.
- Knotts, Libby. 1998. Reanalysis of Snag Management Indicator Species. Summit Fire Recovery Project Final Supplement Environmental Impact Statement, Appendix H. Portland, OR: USDA, Forest Service, Pacific Northwest Region. 12 p.
- Powell, David C. 1998. South Tower Upland Forest and Competing Vegetation Analyses Report. U.S. Dept. of Agriculture (USDA), Forest Service.
- U.S. Dept. of Agriculture (USDA), Forest Service. 1990. Land and Resource Management Plan: Umatilla National Forest. Portland, OR: USDA, Forest Service, Pacific Northwest Region. Irregular paging.

## Literature Cited **5**

U.S. Dept. of Agriculture (USDA), Forest Service. 1992. Hexazinone herbicide information profile. Portland, OR: USDA, Forest Service, Pacific Northwest Region. 13 p.

U.S. Dept. of Agriculture (USDA), Forest Service. 1995. Interim Management Direction Establishing Riparian, Ecosystem, and Wildlife Standards for Timber Sales, ("Eastside Screens"), Regional Forester's Forest Plan Amendment #2. Appendix B. Revised Interim Direction: Portland, OR: USDA, Forest Service, Pacific Northwest Region (6). June. 14p.

U.S. Dept. of Agriculture (USDA), Forest Service. 1996a. Unpublished Drafts, Interior Columbia Basin Ecosystem Management Project (ICBEMP). Portland, OR: USDA, Forest Service, Pacific Northwest Region (6). Irregular paging.

U.S. Dept. of Agriculture (USDA), Forest Service. 1996b. Triclopyr herbicide information profile. Portland, OR: USDA, Forest Service, Pacific Northwest Region. 14 p.

U.S. Dept. of Agriculture (USDA), Forest Service. 1997. Glyphosate herbicide information profile. Portland, OR: USDA, Forest Service, Pacific Northwest Region. 16 p.

## List of Preparers

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The Forest Service is the only agency responsible for the contents of this document. Consultation to satisfy the terms of the Endangered Species Act was conducted with the Fish and Wildlife Service, and National Marine Fisheries Service.

The Interdisciplinary Team members consisted of the following:

<b>Name/Position</b>	<b>Education</b>	<b>Applicable Experience</b>	<b>Contributions</b>
<b>Janel Lacey</b> - Project leader	B.S. Forest Management/Soils minor	<i>Forest Service</i> - 10 years as a resources planner	project management and writer, visual quality analysis
<b>Tim Davis</b> - Project co-leader	B.S. Forest Management, Silviculture Institute certification	<i>Forest Service</i> - 5 years as NEPA planner, 5 years as a certified silviculturist, 3 years as program manager for recreation /minerals/lands; <i>Bureau of Land Management</i> - 7 years as a forester and 2 years as a road engineer	project management and District point of contact
<b>Lea Baxter</b> – Silviculturist	B.S. Forest Management, Silviculture Institute certification	<i>Forest Service</i> - 5 years as a prescription writer, 5 years as a certified silviculturist	upland vegetation analysis, forest treatments, visual quality analysis
<b>Dave Crabtree</b> - Fisheries Biologist	Ph.D. Marine Biology, M.A. Biology, B.S. Biology/Chemistry minor	<i>Forest Service</i> - 10 years as fish biologist; <i>Antillian College, Puerto Rico</i> - 10 years as Biology Department Chair and professor	steelhead, salmon, and bull trout consultation fisheries analysis, herbicide analysis
<b>Holly Harris</b> - Wildlife Biologist	B.S. Biology, M.S. Wildlife Biology	<i>Forest Service</i> - 10 years as a wildlife biologist	consultation, wildlife analysis
<b>Rick van der Zweep</b> – Hydrologist			sediment modeling, water analysis, water quality restoration plan
<b>Noel Livingston</b> - Fire Management Officer			fuels analysis, air quality analysis

## Additional Forest Service support came from:

Name & Position	Contributions
<b>Craig Smith-Dixon</b> District Ranger	management direction
Craig Busskohl Forest Soil Scientist	advisor regarding Tower Fire Ecosystem Analysis, provided information regarding soils
Karen Kendall Recreation specialist	design and analysis of proposals for developed and dispersed recreation projects
Rick Guglielmi Trails specialist	design and analysis of trail projects
Danny Evans Engineering	design and analysis of transportation and access management
Lowell Smith Assistant Fire Management Officer	Fuel treatments
Dale Douglas Assistant Fire Management Officer	fire suppression access
Elaine Kohrman Tri-forest Economist	economic analysis
Dave Herr Forest NEPA specialist	analysis of effects on Wild and Scenic River, Roadless Area, and Wilderness
Gary Popek Archeologist	GIS support, archeology
Charlie Gobar Forest Wildlife Biologist	advisor regarding Tower Fire Ecosystem Analysis, design of wildlife habitat projects
Caty Clifton Forest Hydrologist	advisor regarding Tower Fire Ecosystem Analysis, amended water resources report to include changes between DEIS and FEIS
Karl Urban Forest Botanist	advisor regarding Tower Fire Ecosystem Analysis
Scott Riley Forest Botanist	design for riparian planting and slope stabilization projects
Dave Powell Forest Silviculturist	advisor regarding Tower Fire Ecosystem Analysis, herbicides reforestation
Tom Thompson Range Conservationist	provided grazing information for cumulative effects analysis
Lindsey Davenport Logging systems specialist	harvest design
Clayton Gudmundson Presale specialist	harvest design
Kristy Groves Fish Biologist	Re-ran WATSED model to incorporate changes between the DEIS and FEIS

## **Distribution List**

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The North Fork John Day Ranger District received 10 letters in response to the scoping done for the Tower Fire Recovery Projects EIS. Scoping letters were mailed to 159 groups and individuals who had previously shown interest in District projects. The 114 letters and phone calls received in response to scoping of previous proposed projects within the fire area (Big Tower EA, South Tower EA, Cable EA Tower Salvage EA, and Hairy Hazard Tree Removal CE) were also reviewed and incorporated into this EIS. In all, correspondence was received from the Confederated Tribes of the Warm Springs Reservation of Oregon, Confederated Tribes of the Umatilla Indian Reservation, Oregon Department of Fish and Wildlife, various local government agencies, several environmental organizations, timber companies, and the public.

### **Agencies**

Advisory Council on Historic Preservation  
Federal Aviation Administration, Northwest Region  
Federal Energy Regulatory Commission, Environmental Compliance Branch  
Federal Highway Administration, Region 10, Regional Administrator  
General Services Administration, Office of Planning & Analysis  
Northwest Power Planning Council  
Office of Transportation and Regulatory Affairs, Federal Railroad Administration,  
Environmental Division, P-14  
Oregon Department of Environmental Quality, Air  
Oregon Department of Environmental Quality, Water  
Oregon Department of Fish and Wildlife, Habitat Conservation Division  
Oregon Department of Geology and Mineral Industries  
Oregon Department of Land Conservation and Development  
Oregon Division of State Lands  
Oregon Executive Department, State Economist  
Oregon Forestry Department  
Oregon Governor's Forest Advisor  
Oregon Parks and Recreation Department, Planning & Development Section  
Oregon Rural Development Section  
Oregon Water Resources Department  
Surface Transportation Board, Chief, Energy and Environment  
U.S. Dept. of Agriculture, Animal & Plant Health Inspection Service, Deputy Director  
BBEP, EAD, (unit 149)  
U.S. Dept. of Agriculture, Forest Service, Pacific Northwest Region, Environmental  
Coordination  
U.S. Dept. of Agriculture, Office of Equal Opportunity  
U.S. Dept. of Agriculture, OPA Publication Stockroom  
U.S. Dept. of Commerce, Director, Ecology and Conservation Office  
U.S. Dept. of Commerce, National Marine Fisheries Service, Northwest Region  
U.S. Dept. of Defense, U.S. Army Engineers Division, North Pacific Unit, COE  
U.S. Dept. of Housing & Urban Development  
U.S. Dept. of Interior, Bureau of Indian Affairs  
U.S. Dept. of Interior, Director, Office of Environmental Policy and Compliance  
U.S. Department of Transportation, Assistant Secretary for Policy, Environmental Div. (P-14)  
U.S. Environmental Protection Agency

### **Confederated Tribes**

Umatilla Indian Reservation  
Warm Springs Reservation

Yakima Indian Reservation

**Organizations**

Associated Oregon Loggers, Inc.  
Blue Mountain Native Forest Alliance  
Columbia Helicopters, Inc.  
Forest Guardians  
Oregon Natural Resources Council  
Lehman Development Corporation  
Lehman Hot Springs  
Malheur Lumber Company  
Malheur Timber Operators, Inc.  
National Environmental Defense Council  
National Wildlife Federation  
Northwest Trailriders Association  
Trout Unlimited, Blue Mountain Chapter  
Western Fire Ecology Center

**Public Officials**

Grant County Commissioners

**Individuals**

Norvel Arbogast  
Sandra Bowman  
Albert Eisele  
Brent Foster  
Drew Hempel  
Scott Horngren  
Jackie McClur  
Lyle R Neptun  
David T. Rainey  
Herb Rudolph  
Mark Simmons  
Jim Steward

# Distribution List 5

