United States
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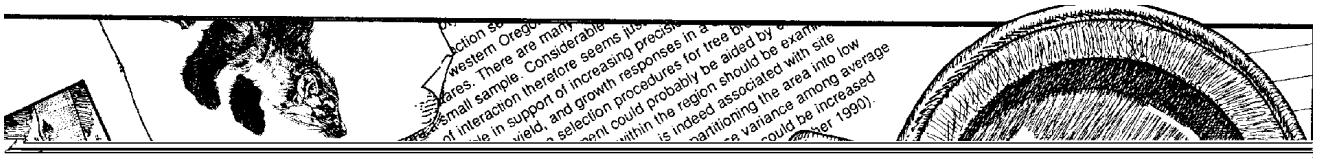
Forest Service

Pacific Northwest
Research Station

Recent Publications of the Pacific Northwest Research Station, Fourth Quarter 1998



A list of recent publications and other products, such as videos and software, of the Pacific Northwest (PNW) Research Station is published four times a year. This list announces completion and availability of scientific and technical publications and products supported by the PNW Research Station.

Publications are arranged in two sections. The first section lists items published by the PNW Research Station and available through our distribution system. The second section lists publications available elsewhere. Within each section, items are grouped by general subject categories and alphabetically by author within categories.

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January 1999

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Our most recent quarterly lists of publications also are available on our web site. Some order forms include email addresses to direct your requests to the appropriate office.

Pacific Northwest Research Station Publications

The following publications may be ordered by using the form on the inside back cover. Circle the code number for the publication.

Economics in Wood Industry

97-105

Lane, Christine L.

1998. Log export and import restrictions of the U.S. Pacific Northwest and British Columbia: past and present. Gen. Tech. Rep. PNW-GTR-436. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 61 p.

Export constraints affecting North American west coast logs have existed intermittently since 1831. Recent developments have tended toward tighter restrictions. National, Provincial, and State rules are described.

Keywords: Log exports, log imports, log embargoes, log trade restrictions, history.

(This publication is available to download in pdf format at http://www.fs.fed.us/pnw/pubs.htm.)

97-235

Weigand, James F.

1998. Composition, volume, and prices for major softwood lumber types in western Oregon and Washington, 1971-2020. Res. Pap. PNW-RP-509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 61 p.

An analysis of lumber prices provided regressions for price trends during the period 1971-95 for composite lumber grades of major timber species found in the Pacific Northwest west of the crest of the Cascade Range. The analysis included data for coastal Douglas-fir and hem-fir lumber; coastal and inland Pacific Northwest ponderosa, sugar, and western white pines; and inland Pacific Northwest and Rocky Mountain lodgepole pine. Future prices of grades by species group are based on these price trends and the latest average regional lumber values established in the Timber Assessment Market Model (TAMM). Land managers can use the price projections in financial analysis of management practices that are designed to affect the quality of timber resources.

Keywords: Douglas-fir, hem-fir, lodgepole pine, lumber prices, ponderosa pine, price trends, sugar pine, Timber Analysis Market Model, western white pine, white woods.

(This publication is available to download in pdf format at http://www.fs.fed.us/pnw/pubs.htm.)

97-234

Weigand, James F.

1998. Management experiments for high-elevation agroforestry systems jointly producing matsutake mushrooms and high-quality timber in the Cascade Range of southern Oregon. Gen. Tech. Rep. PNW-GTR-424. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 42 p.

Experimental prescriptions compare agro-forestry systems designed to increase financial returns from high-elevation stands in the southern Oregon Cascade Range. The pre-scriptions emphasize alternative approaches for joint production of North American matsutake mushrooms (also known as North American pine mushrooms; *Tricholoma magnivelare*) and high-quality timber. Other agroforestry bypro-ducts from the system are

ornamental boughs, pine cones, and Christmas trees. Management practices concentrate on increasing the physiological efficiency and vigor of trees, and on altering leaf area index, tree species composition, and stand age-class structure to increase matsutake production.

Keywords: Tricholoma magnivelare*, agro-forestry systems, nontimber forest products, adaptive management,* Abies magnifica*,* Tsuga mertensiana*,* Pinus contorta*,* Pinus monticola*,* Abies amabilis*, tree pruning.*

(This publication is available to download in pdf format at http://www.fs.fed.us/pnw/pubs.htm.)

Ecosystem Function

97-171

Harrod, Richy J.; Gaines, William L.; Hartl, William E.; Camp, Ann

1998. Estimating historical snag density in dry forests east of the Cascade Range. Gen. Tech. Rep. PNW-GTR-428. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 16 p.

Estimating snag densities in pre-European settlement landscapes (i.e., historical conditions) provides land managers with baseline information for comparing current snag densities. We propose a method for determining historical snag densities in the dry forests east of the Cascade Range. Basal area increase was calculated from tree ring measurements of old ponderosa pine (*Pinus ponderosa* Dougl. ex Laws.) trees. Historical stand structure was assumed to be open and parklike, with low densities favoring larger diameter trees, and it was considered relatively stable at the landscape level.

Keywords: Snag density, ponderosa pine, Pinus ponderosa*, snag recruitment, historical forest structure.*

(This publication is available to download in pdf format at http://www.fs.fed.us/pnw/pubs.htm.)

Fish and Wildlife

97-187

Witmer, Gary W.; Martin, Sandra K.; Sayler, Rodney D.

1998. Forest carnivore conservation and management in the Columbia basin: issues and environmental correlates. Gen. Tech. Rep. PNW-GTR-420. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51 p. (Quigley, Thomas M., ed.; Interior Columbia Basin Ecosystem Management Project: scientific assessment).

This report assesses the status and conservation and management issues of 11 forest carnivore species. The species differ in status: most have declined in numbers and range because of human activities. Efforts to reverse trends include new approaches to reduce conflicts with humans, research to better define habitat needs and monitor populations, formation of expert carnivore working groups, and use of geographic information system models to predict impacts of habitat modification. Long-term preservation of large carnivores in the region is problematic unless conflicts and forest fragmentation are reduced.

Keywords: Coyote, gray wolf, bobcat, lynx, mountain lion, fisher, marten, river otter, wolverine, grizzly bear, black bear, forest management, conservation biology, fragmentation.

(This publication is available to download in pdf format at http://www.fs.fed.us/pnw/pubs.htm.)

General

97-143

Eckhardt, Carol, comp.

1998. The human factor in ecological research: an annotated bibliography. Gen. Tech. Rep. PNW-GTR-429. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 45 p.

As a bibliography of annotated references addressing interdisciplinary environmental research, the collection reviews a broad

spectrum of literature to illustrate the breadth of issues that bear on the role of humankind in environmental context. Categories of culture, environmental law, public policy, environmental valuation strategies, philosophy, interdisciplinary research, landscape theory, design, and management will be useful to interdisciplinary research designers, land use planners and managers, academic faculty and students, environmental stakeholder groups, and anyone with interest in people-and-environment relations.

Keywords: Human ecology, interdisciplinary research methods, ecosystem research, interdisciplinary bibliography, environmental policy, landscape design, landscape management.

(This publication is available to download in pdf format at http://www.fs.fed.us/pnw/pubs.htm.)

General, Nontechnical

98-173

Pacific Northwest Research Station
1998. Recent publications of the Pacific Northwest Research Station, second quarter 1998. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 16 p.

Keywords: Bibliographies (forestry).

(This publication is available to download in pdf format at http://www.fs.fed.us/pnw/pubs.htm.)

98-212

Pacific Northwest Research Station
1998. Recent publications of the Pacific Northwest Research Station, third quarter 1998. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 17 p.

Keywords: Bibliographies (forestry).

(This publication is available to download in pdf format at http://www.fs.fed.us/pnw/pubs.htm.)

97-316

U.S. Department of Agriculture, Forest Service
1998. H.J. Andrews Experimental Forest [Brochure]. Portland, OR: Pacific Northwest Research Station. [Not paged].

The H.J. Andrews Experimental Forest in Blue River, Oregon, and its research programs are described in this brochure for general audiences.

Keywords: Ecosystem research, experimental forests.

Insects

97-323

Cochran, P.H.
1998. Reduction in growth of pole-sized ponderosa pine related to a pandora moth outbreak in central Oregon. Res. Note PNW-RN-526. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 14 p.

Defoliation by pandora moth in a ponderosa pine spacing study in 1992 and 1994 generally increased as spacings increased from 2 to 5.7 meters and then decreased as spacings increased to 8 meters. Defoliation did not increase mortality during the 1990-94 period, but volume growth was reduced. Basal area increments of sample trees were reduced 25 percent the first growing season after defoliation (1992), 30 per-cent the second year after defoliation (1993), and 63 percent after the second defoliation (1994).

Keywords: Ponderosa pine, pandora moth, defoliation, growth loss.

(This publication is available to download in pdf format at http://www.fs.fed.us/pnw/pubs.htm.)

Mycorrhizae

97-184

Amaranthus, Michael P.

1998. The importance and conservation of ectomycorrhizal fungal diverisity in forest ecosystems: lessons from Europe and the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-431. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 15 p.

Ectomycorrhizal fungi (EMF) consist of about 5,000 species and profoundly affect forest ecosystems by mediating nutrient and water uptake, protecting roots from pathogens and environmental extremes, and maintaining soil structure and forest food webs. The diversity of EMF likely aids forest ecosystem resilience in the face of changing environmental factors such as pollution and global climate change. Concerns over decline of EMF have centered on pollution effects, habitat alteration, and effects of overharvest. Strategies for the conservation of EMF include decreasing levels of environmental pollutants and retaining diverse assemblages of native host species, habitats, and structures across a landscape.

Keywords: Conservation, diversity, ectomycorrhizal fungi, forest productivity, forest ecosystem, mushrooms, pollution, truffles.

Science Findings

In 1998 PNW Research Station began publishing a series that presents science findings for people who make and influence decisions about managing lands. These may be ordered by using the order form on the last page of this publication.

98-009

February 1998. Swanson, Fred; Grant, Gordon. Lessons from a flooded landscape.

98-035

March 1998. Burnett, Kelly; Reeves, Gordon. Landslides through the fish-eye lens.

98-089

April 1998. Forsman, Eric; Raphael, Martin. The owl: spotted, listed, barred, or gone?

98-097

May 1998. Barbour, Jamie; Fight, Roger. It's not easy being green: the tricky world of small-diameter timber.

98-098

July 1998. Quigley, Thomas M.; Sedell, James R.; Haynes, Richard W. Tackling risks at the broad scale in the interior Columbia basin.

98-161

August 1998. Allen, Stewart. Resiliency of small rural communities in the interior Columbia basin.

98-203

September 1998. McIver, Jim; Bull, Evelyn L. Adaptive management: good business or good buzzwords?

98-340

October 1998. Brooks, David J. Supply and demand for wood: a worldwide perspective.

98-366

November 1998. Carey, Andrew B. Biodiversity and intentional management: a Renaissance pathway.

98-375

December 1998. Kiester, A. Ross. Military maneuvers and biodiversity: strange arrangements in southern California.

Publications Available Elsewhere

The following publications are available through interlibrary loan, by writing to the locations indicated, or by using the form indicated.

Ecosystem Function

Bishop, Gary D.; Church, M. Robbins; Aber, John D. [and others]

1998. A comparison of mapped estimates of long-term runoff in the Northeast United States. Journal of Hydrology. 206: 176-190.

The authors evaluated four methods for developing maps of long-term runoff for part of the Northeast United States. Maps derived from these methods were compared both qualitatively and quantitatively. A visual comparison of the maps showed good agreement as to the general pattern of runoff in the study area. To test the accuracy of estimates of runoff made by interpolation for the four runoff maps, an uncertainty analysis was run by using gauged data withheld from the creation of any of the maps.

Keywords: Hydrology, runoff, modeling, regional.

(See Corvallis order form B.)

Neilson, Ronald P.; Chaney, Jesse

1997. Potential changes in the vegetation distribution in the United States. In: USDA Forest Service global change research program highlights: 1991-95. Gen. Tech. Rep. NE-237. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station: 66-77.

The potential impacts on U.S. vegetation of CO_2-induced global warming were analyzed for sufficient effects, either positive or negative, that might require dramatic shifts in forest management policies. The Mapped Atmosphere-Plant-Soil System was used to simulate vegetation distributions, and the results were compared with other ecological models to explore uncertainties.

Keywords: Global warming, climate change effects, vegetation distribution, MAPPS, model, simulation, forest management.

(See Corvallis order form B.)

Neilson, Ronald P.; Prentice, I. Colin; Kittel, Timothy

1998. Simulated changes in vegetation distribution under global warming. In: Watson, Robert T.; Zinyowera, Marufu C.; Moss, Richard A., eds. The regional impacts of climate change: an assessment of vulnerability. New York: Cambridge University Press: 3-18.

MAPPS and BIOME3 are two biogeography models capable of simulating the potential "climax" vegetation that can exist at any well-drained upland site in the world under an "average" seasonal climate. Results of simulations under alternative future climate scenarios by both models are compared in this paper. Results were qualitatively similar, with or without including a direct, physiological CO_2 effect. However, MAPPS produced consistently stronger drought effects with increasing temperatures. Newer scenarios were less xeric than those from older global vegetation model scenarios and indicate an overall increase in leaf area index when a direct physiological CO_2 effect is included.

Keywords: Climate change, global warming simulation, VEMAP, biogeography, leaf area index.

(See Corvallis order form B.)

Ecosystem Management

Carey, Andrew B.

1998. Dimensions of ecosystem management: a systems approach to policy formulation. In: Calhoun, John M., ed. Forest policy: ready for renaissance. Seattle, WA: University of Washington, College of Forest Resources: 261-274.

For 60 years, ecologists have been arguing about what an ecosystem is, and the debate continues. Ecosystem management, however, is an entirely human process that entails not only manipulating and protecting ecosystems but also making private and public goals operational within a larger social environment of public needs, desires, and laws. Because many of the benefits people wish to derive from ecosystems are incompatible, conflicts over natural resource issues are rampant, especially in the Pacific Northwest. This chapter presents a brief overview of some of the societal and technological sources of conflict while examining three dimensions on which policymakers, in attempting to manage conflict, can evaluate ecosystem management proposals. Those three dimensions are intervention, general sustainability, and intentionality.

Keywords: Ecosystem management, intervention, sustainability, intentionality.

(Available from bookstores and libraries.)

Fire

Alvarado, Ernesto; Sandberg, David V.; Pickford, Stewart G.

1998. Modeling large forest fires as extreme events. Northwest Science. 72: 66-75.

Large fires can have significant impacts on natural, social, and economic systems. Catastrophic wildfires are a major concern in public policy; however, these extreme events are not adequately addressed by standard statistics. This paper presents a modeling approach based on the statistics of extreme events to model large forest fires. Large wildfires can be modeled as those exceeding a high threshold. In the limit of large measurements, the probability structure of extreme fire events will converge to the Frechet-type distribution. In this paper, we offer an analytical approach to model only the large fires that exceed an upper damage threshold. This approach could potentially improve the decisionmaking process in fire management. The statistics of extremes approach can be used to model only those fire events that may be relevant at large ecological spatial scales.

Keywords: Fire, forest fire, fire modeling, extreme events, catastrophic fire.

(See Corvallis order form B.)

Gaines, William L.; Strand, Robert A.; Piper, Susan D.

1997. Effects of the Hatchery complex fires on northern spotted owls in the eastern Washington Cascades. In: Greenlee, Jason M., ed. Proceedings: 1st conference on fire effects on rare and endangered species and habitats conference; 1995 November 13-16; Coeur d'Alene, ID. [Place of publication unknown]: International Association of Wildland Fire: 123-129.

During summer 1994, the Hatchery complex fires burned 17 603 hectares on the east slope of the Cascade Range in Washington. These fires affected three habitat reserves and six activity centers for the northern spotted owl (*Strix occidentalis caurina*). The availability of spotted owl habitat within a 2.9-kilometer radius of these activity centers was reduced by the direct effects of the fire (average habitat loss of 31 percent, range loss 8 to 45 percent) but was also significantly reduced by delayed tree mortality and insect-caused mortality (average habitat loss of 55 percent, range loss of 10 to 85 percent). The availability of spotted owl habitat under current and inherent fire regimes was highly dynamic across the east Cascades

landscape. Appropriate management strategies may include strategically located, low-density fuel areas created to protect adjacent spotted owl habitat.

Keywords: Fire, northern spotted owl, Strix occidentalis caurina*, habitat reserves, fire regimes, management strategies.*

(See Wenatchee order form.)

Harrod, Richy J.; Knecht, Dottie E.; Kuhlmann, Ellen E. [and others]

1997. Effects of the Rat and Hatchery Creek fires on four rare plant species. In: Greenlee, Jason M., ed. Proceedings: 1st conference on fire effects on rare and endangered species and habitats conference; 1995 November 13-16; Coeur d'Alene, ID. [Place of publication unknown]: International Association of Wildland Fire: 311-319.

Fire, particularly on the east slope of the Cascade Range, has historically been a significant environmental factor that may have influenced the development of rare species. Past research has suggested that, at the species level, natural selection has favored flammable characteristics, resulting in fire-dependent plant communities. It is possible that fire, in combination with other environmental factors in the Wenatchee Mountains, influenced evolutionary pathways leading to some rare species of the area. At the very least, these rare species, like some other common species, have traits that provide competitive advantages in fire-prone environments.

Keywords: Rare plants, fire, fire effects, Delphinium viridescens, Cypripedium fasciculatum, Silene seelyi, Orobanche pinorum.

(See Wenatchee order form.)

Sallabanks, Rex; McIver, James D.

1998. Response of breeding bird communities to wildfire in the Oregon Blue Mountains: the first three years following the Twin Lakes fire, 1995-1997. In: Fire and wildlife in the Pacific Northwest: research, policy, and management; 1998 April 6-8; Spokane, WA. [Place of publication unknown]: The Wildlife Society, Northwest Section: 85-89.

The Blue Mountains province is a fire-dominated ecosystem in which forest health issues are important areas of study. In 1994, the Twin Lakes fire burned about 22,000 acres of high-elevation conifer forest. This paper reports how the fire influenced the structure and composition of breeding bird communities during the first 3 years after the fire.

Keywords: Blue Mountains, bird communities, breeding, fire, fire ecology.

(See La Grande order form.)

Fish and Wildlife

Boroski, Brian B.; Barrett, Reginald H.; Draper, Susan D.; Kie, John G.

1996. Individual differences in detecting habitat elements in the California wildlife habitat relationships system. Transactions of the Western Section of the Wildlife Society. 32: 62-67.

Users of the California wildlife-habitat relationships system are encouraged to collect information on special habitat elements when evaluating site-specific projects. The authors examined disagreement among 12 pairs of individuals by applying the information for detection of the special habitat elements described. Individual differences should substantially diminish by (1) using standard training procedures within planning units, (2) measuring rather than estimating the size of elements where applicable, (3) specifying a standard rate at which plots are sampled, and (4) sampling at the time of year when the most important elements for species of concern are likely to be present.

Keywords: California wildlife habitat relationships system, habitat, individual differences, wildlife habitat relationship models.

(See La Grande order form.)

Bryant, Mason D.; Frennette, Brian J.; Coghill, Katharine T.

1996. Use of the littoral zone by introduced anadromous salmonids and resident trout, Margaret Lake, southeast Alaska. Alaska Fishery Research Bulletin. 3(2): 112-122.

The littoral zone of lakes is an important habitat for young fish. This study investigated the exploitation of the littoral zone by anadromous salmonids after a fish ladder was installed to provide access to Margaret Lake. Cutthroat trout were the primary resident salmonids using the littoral zone, and juvenile coho and sockeye salmon were abundant. Number of fish captured at each location seemed to be associated with the source of recruitment, such as stream outlets and stocking location. Growth rates greater than 10 millimeter per month were observed for both juvenile coho and sockeye throughout the summer.

Keywords: Salmonids, lakes, littoral zone, sockeye salmon, coho salmon, cutthroat trout.

(See Juneau order form.)

Cooper, Brian A.; Hennon, Paul; Raphael, Martin G.

1997. Use of radar for the study of rare birds. Endangered Species Bulletin. 12(6): 8-9.

A problematic area for wildlife researchers has always been the study of nocturnally active birds, including the many species of seabirds that visit their breeding colonies only after dark and the numerous species of waterfowl, shorebirds, and songbirds that migrate at night. Even the most basic information on distribution, flight behavior, and timing of flights is inadequate for many of these species, including some threatened and endangered birds. Recent advances in radar and night-vision technology have made the job of obtaining this vital information far less difficult.

Keywords: Radar, nocturnal, rare birds.

(See Olympia order form.)

Jones, Lawrence L.C.; Raphael, Martin G.

1998. *Ascaphus truei* (tailed frog) predation. Herpetological Review. 29(1): 39.

Metamorphosing tailed frogs (*Ascaphus truei)* were documented being preyed upon by a hellgrammite (Megaloptera: dobsonfly larva) and Cope's giant salamander (*Dicamptodon copei*) in a headwater stream of Matheny Creek, Jefferson County, in the Olympic Mountains of Washington.

Keywords: Tailed frog, Ascaphus truei*, predation, hellgrammite, Cope's giant salamander,* Dicamptodon copei*.*

(See Olympia order form.)

Quinlan-Murphy, Lonnie J.

1998. Influence of age, condition, nutrition, and season on Rocky Mountain elk serum and urine chemistry. Corvallis, OR: Oregon State University. 165 p. M.S. thesis.

Research objectives of this thesis were to establish reliable data for elk serum and urine chemistry and to evaluate the influences of age, photoperiod, condition, and nutrition. An existing radioimmunoassay was validated, and a pilot study on insulinlike growth factor-1 response to nutritional restriction in elk calves was conducted.

Keywords: Elk, nutrition, condition, serum chemistry, urine chemistry, thermal cover.

(Available only through library or interlibrary loan.)

Raphael, Martin G.; Marcot, Bruce G.; Holthausen, Richard S.; Wisdom, Michael J.

1998. Terrestrial species and habitats. Journal of Forestry. October: 22-27.

This terrestrial assessment within the interior Columbia River basin had three phases. First, it described and compared prehistoric, historic, and current terrestrial environments and plant and animal communities. The second phase developed a detailed understanding of the changes in source habitats for a broad array of species for which there was ongoing concern

about population or habitat status. The third phase evaluated the implications of future distributions of forest cover and other habitat elements on the viability of plant and animal populations.

Keywords: Terrestrial species, habitat, Columbia basin.

(See Olympia order form.)

Raphael, Martin G.; McKelvey, Kevin S.; Galleher, Beth M.
1998. Using geographic information systems and spatially explicit population models for avian conservation: a case study. In: Marzluff, John M.; Sallabanks, Rex, eds. Avian conservation research and management. Washington, DC: Island Press: 65-75. Chapter 5.

Spatially explicit population models can provide valuable information about the response of bird populations to variation in the amount and pattern of habitat. The authors illustrate the use of such models with a case study of the response of the northern spotted owl to alternative land management plans in the Pacific Northwest. A model was linked to a map of suitable habitat by using a geographic information system. A dynamic map was created by simulating rates of harvest and growth of habitat over time as influenced by the extent of land available for timber harvest under each of three alternatives. The model was a very useful tool in evaluating the impact of future management plans.

Keywords: Northern spotted owl, geographic information systems, population models, habitat.

(Available from bookstores and libraries.)

Reeves, Gordon H.; Hohler, David B.; Hansen, Bruce E. [P.] [and others]
1997. Fish habitat restoration in the Pacific Northwest: Fish Creek of Oregon. In: Williams, Jack E.; Wood, Christopher A.; Dombeck, Michael P., eds. Watershed restoration: principles and practices. Bethesda, MD: American Fisheries Society: 335-359. Chapter 20.

Intensive habitat restoration in Fish Creek, Oregon, resulted in the amount of pool habitat increasing to the desired levels. Biologically, the response to the restoration effort differed with species. Steelhead trout numbers (smolts and 1+ years) increased relative to the prerestoration period. Numbers of coho salmon juveniles declined. None of these differences was statistically significant.

Keywords: Anadromous salmonids, habitat, habitat restoration.

(Available from bookstores and libraries.)

Thysell, David R.; Villa, Lisa J.; Carey, Andrew B.
1997. Observations of northern flying squirrel feeding behavior: use of non-truffle food items. Northwestern Naturalist. 78: 87-92.

The northern flying squirrel is the preferred prey of the northern spotted owl and, in the Pacific Northwest, subsists primarily on sporocarps of truffles. West of the Cascade Range, truffles are present year-round, albeit with seasonal fluctuations in abundance. Flying squirrels have also been observed eating epigeous fungi, maple seeds, and fruits, which are not easily identifiable by fecal pellet analysis. These foods are often found in microhabitats that are rare in managed Douglas-fir forests. By availing themselves of other food sources, flying squirrels may persist in otherwise marginal habitats.

Keywords: Glaucomys sabrinus*, northern flying squirrel, mycophagy, small mammal diet, truffles, mushrooms, forest management, Pacific Northwest, Washington, dispersal.*

(See Olympia order form.)

General

McIver, James D.
1998. Economics and environmental effects of fuel reduction at Limber Jim. Tech. Note BMNRI-TN-10. La Grande, OR: Blue Mountains Natural Resources Institute. 9 p.

Fuel reduction by mechanical thinning and removal was studied in mixed-conifer stands at Limber Jim ridge, La Grande District, Wallow-Whitman National Forest, between 1995 and 1997. A single-grip harvester was coupled with either a skyline yarder or a forwarder, and fuel reduction, soil disturbance, and operational economics were measured in three replicate stands. The two retrieval systems achieved nearly identical patterns of fuel and standing stem reduction. The pattern of soil disturbance was different for the two systems, with the forwarder causing significantly more compaction than the skyline yarder. Overall, the project was a narrow economic success. Results are discussed in the context of adaptive management.

Keywords: Economics, forest management, harvesting, soil compaction, fuel loads, adaptive management.

(See La Grande order form.)

General, Nontechnical

Cascade Center for Ecosystem Management
1997. Cascade center research and management news: no. 4. Corvallis, OR: Oregon State University; [U.S. Department of Agriculture, Forest Service], Pacific Northwest Research Station; Blue River, OR: [U.S. Department of Agriculture, Forest Service], Willamette National Forest, Blue River Ranger District. 4 p.

This issue of a newsletter includes a summary of the H.J. Andrews Experimental Forest's "Nature Talks!" presentations; discusses the northern spotted owl central Cascades demography study; provides information concerning the web page connection to the "Young Stand Thinning and Diversity Study"; and talks about a video on enhancing lichens and bryophytes in young forests.

Keywords: Cascade Center for Ecosystem Management, technology transfer, newsletter, vertebrates, birds.

(See Corvallis order form A.)

Genetics

Krutovskii, K.V.; Vollmer, S.S.; Sorensen, F.C. [and others]
1998. RAPD genome maps of Douglas-fir. The American Genetic Association. 89: 197-205.

Linkage maps and estimated genome length are given for two hybrid individuals of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco). The hybrids were produced by crosses between the coastal (var. *menziesii*) and interior (var. *glauca*) varieties. The maps are among the largest reported for conifers, a possible consequence of its 13 chromosomes.

Keywords: Douglas-fir, genome map.

(See Corvallis order form B.)

Johnson, G.R.
1998. Parental GCA testing: how many crosses per parent? Canadian Journal of Forest Research. 28: 540-545.

The impact of increasing the number of crosses per parent on the efficiency of backwards selection (reselection of parents) was examined by using Monte-Carlo simulation. Efficiencies were examined in light of advanced-generation Douglas-fir tree improvement programs where information is available from previous generations, seed orchards have reduced genetic variation as a result of selection, and dominance variation is small compared to additive variation. Both the efficiency of reselection and its associated variance leveled after two to

three crosses per parent. The information from previous generations did not significantly increase reselection efficiency.

Keywords: Forest genetics, GCA testing, backwards selection, breeding.

(See Corvallis order form B.)

Mycorrhizae

Amaranthus, M.P.; Luoma, D.L.
1997. Diversity of ectomycorrhizal fungi in forest ecosystems: importance and conservation. In: Martins, Maria Therezinha; Sato, Maria Inês Zanoli; Tiedje, James [and others], eds. Progress in microbial ecology: Proceedings of the 7th international symposium on microbial ecology; 1995 August 27-September 1; São Paolo, Brazil. [Place of publication unknown]: Brazilian Society for Microbiology: 99-105.

Ectomycorrhizal fungi (EMF) profoundly affect forest ecosystems by mediating nutrient and water uptake, protecting roots from pathogens and environmental extremes, and maintaining soil structure and forest food webs. Also, EMF diversity likely influences forest health and resilience in the face of environmental challenge such as pollution and global climate change. Concerns over decline of EMF have centered on pollution effects, habitat alteration, and effects of overharvest. Strategies for the conservation of EMF include retaining diverse assemblages of host species, habitats, and structures across a landscape.

Keywords: Conservation, diversity, ectomycorrhizal fungi, forest productivity, pollution.

(Available only through library or interlibrary loan.)

Amaranthus, Michael P.; Weigand, James F.; Abbott, Rick
1998. Managing high-elevation forests to produce American matsutake (*Tricholoma magnivelare*), high-quality timber, and nontimber forest products. Western Journal of Applied Forestry. 13(4): 1-9.

In the Pacific Northwest, nontimber forest products account for more than $200 million in annual revenue, yet there is little intentional management to promote the dozens of these harvested species. In the southern Cascade Range in Oregon, management experiments are being installed to develop and refine silvicultural practices that increase financial returns from high-elevation stands. Pretreatment measurements are complete and harvest treatments began in 1998. Management practices will be designed to opportunistically manage and harvest nontimber forest products. A comprehensive monitoring program will track ecosystem and economic variables at different temporal scales. This paper presents management scenarios that emphasize forest function and biological diversity while providing an even flow of commercially valuable timber and nontimber forest products.

Keywords: Nontimber forest products, silviculture, forest management, American matsutake, Tricholoma magnivelare*.*

(See Seattle order form.)

Chang, Tun Tschu; Li, Ching Y.
1998. Weathering of limestone, marble, and calcium phosphate by ecotomycorrhizal fungi and associated microorganisms. Taiwan Journal of Forest Science. 13(2): 85-90.

Ectomycorrhizal fungi associated with Douglas-fir or Scots pine were able to weather limestone, marble, and calcium phosphate, thereby releasing calcium for uptake by plants. The

microorganisms, isolated from the mycorrhizal fungi, can also solubilize these rocks and release significant amounts of calcium available for plants.

Keywords: Microbial weathering, biodegradation, mycorrhizal fungi.

(See Corvallis order form B.)

Molina, Randy; Smith, Jane E.; McKay, Donaraye; Melville, L.H.

1997. Biology of the ectomycorrhizal genus, *Rhizopogon*. New Phytologist. 137: 519-528.

Mycorrhizal plants and fungi differ in the degree of specificity shown in their associations. This study examined differences between conifers and hardwoods for mycorrhizal association with the truffle genus *Rhizopogon*, and effect of neighboring plants on mycorrhiza development. The results are discussed in terms of forest community dynamics.

Keywords: Douglas-fir, ponderosa pine, Pacific madrone, bearberry, mycorrhiza, forest ecology.

(See Corvallis order form B.)

Simard, Suzanne W.; Molina, Randy; Smith, Jane E. [and others]

1997. Shared compatibility of ectomycorrhizae on *Pseudotsuga menziesii* and *Betula papyrifera* seedlings grown in mixture of soils from southern British Columbia. Canadian Journal of Forest Research. 27: 331-342.

Seedlings of *Pseudotsuga menziesii* (Mirb.) Franco and *Betula papyrifera* Marsh. were grown in the greenhouse in monoculture and dual culture in soils collected from a young mixed-species plantation in the southern interior of British Columbia. The objectives were to (1) evaluate the ability of *Pseudotsuga menziesii* (Mirb.) Franco and *Betula papyrifera* Marsh. to share compatible ectomycorrhizal fungi in order to assess their potential for hyphal linkages, and (2) study the influence of neighboring seedlings on ectomycorrhiza occurrence. Eleven ectomycorrhizal morphotypes were recognized, seven of which *P. menziesii* and *B. papyrifera* seedlings shared in common over 90 percent of their root tips. The importance of mycorrhizae in mediating plant succession is discussed.

Keywords: Mycorrhizae, fungi, plant succession, Douglas-fir, birch.

(See Corvallis order form B.)

Simard, Suzanne W.; Jones, Melanie D.; Durall, Daniel M. [and others]

1997. Reciprocal transfer of carbon isotopes between *ectomycorrhizal Betula papyrifera* and *Pseudotsuga menziesii*. New Phytologist. 137: 529-542.

Interspecific carbon transfer was studied in laboratory microcosms containing pairs of 6-month-old *Betula papyrifera* and *Pseudotsuga menziesii* seedlings growing in individual, root-restrictive pouches filled with field soil. Interspecific transfer was examined by reciprocal labeling of seedlings with $^{13}CO_{2\ (gas)}$ and $^{14}CO_{2(gas)}$. Carbon transferred through ectomycorrhizal connections was distinguished from that through soil pathways by comparing microcosms where interconnecting hyphae were left intact and those where they were severed immediately before labeling. Transfer was bidirectional and represented 5 percent of total isotope uptake by both *B. papyrifera* and *P. menziesii* together. *Pseudotsuga menziesii* received on average 59 percent more ^{14}C and 66 percent more ^{13}C from paper birch than vice versa; however, differences between species were not statistically significant. Results are discussed in regard to the relevance of the movement of carbon between tree species that are connected by a common mycorrhizal fungal network.

Keywords: Mycorrhizae, carbon transfer, carbon isotope, Douglas-fir, paper birch.

(See Corvallis order form B.)

Plant Pathology

Filip, Gregory

1998. Effects of insects and diseases on short-term and long-term tree yields. Tech. Note BMNRI-TN-11. La Grande, OR: Blue Mountains Natural Resources Institute. 4 p.

Short- and long-term forest yields are affected by various insects and diseases. Short-term yield losses are a result of catastrophic mortality caused by native pests such as bark beetles or by introduced pests such as white pine blister rust. Long-term yield losses are caused by most pest groups. There are many "environmentally friendly" techniques that can be used to reduce the adverse effects of forest pests such as thinning dense stands and maintaining mixtures of tree species. Besides reducing forest yields, however, insects and disease pathogens have beneficial roles in forested ecosystems.

Keywords: Pathogens, insect damage, disease, forest yields.

(See La Grande order form.)

Range Management

Dickard, Marni L.

1998. Management strategies for improved cattle distribution and subsequent riparian health. Moscow, ID: University of Idaho. 110 p. M.S. thesis.

This study was designed to quantify the effect of offstream water and trace mineralized salt on cattle distribution relative to riparian areas. Cow and calf pairs were allotted to pastures with one of three treatments: (1) stream access and access to offstream water and trace mineralized salt, (2) stream access and no access to offstream water and trace mineral salt, and (3) ungrazed control. Response of cattle to access to offstream water and salt was measured through visual observation of cattle distribution, grazing activity and travel distance, cow and calf performance, vegetation usage patterns, water quality, and fecal deposit distribution. Distribution and cow and calf performance were influenced by the presence of offstream water and trace mineral salt; however, treatment responses to grazing activity, travel distance, and water quality were either unclear or not observed.

Keywords: Grazing behavior, trace mineralized salt, utilization, riparian areas.

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Remote Sensing

Sachs, Donald L.; Sollins, Phillip; Cohen, Warren B.

1998. Detecting landscape changes in the interior of British Columbia from 1975 to 1992 using satellite imagery. Canadian Journal of Forest Research. 28: 23-36.

Changes in landscape pattern from 1975 to 1992 were examined by calculating indices that describe overall landscape pattern and patterns of conifer and harvested patches in each biogeoclimatic zone. Harvesting affected 8.4 percent of the forest area outside provincial parks during the 17 years. Harvested areas were consistently much smaller than conifer patches in all biogeoclimatic zones and had a lower percentage of interior area and perimeter-area ratio. Complexity of the conifer patch shape differed among zones; harvested patches had simpler shapes and were similar in all zones. Results indicate that this landscape is in only the early stages of fragmentation, but a similar harvest pattern has been imposed on differing ecological zones.

Keywords: Deforestation, change detector, Landsat TM, Landsat MSS.

(See Corvallis order form A.)

Timber Management

Curtis, Robert O.
1998. Harvest options for production forests. In: The Newsletter of Stand Management Cooperative. Seattle, WA: University of Washington, College of Forest Resources: 6-9.

A long-term comparison of alternative silvicultural systems is being installed in the Capitol Forest near Olympia, WA. This is a cooperative project of the USDA Forest Service, Pacific Northwest Research Station, and the Washington Department of Natural Resources. The Universities of Washington and Idaho also are involved. This study will provide comparisons of timber yields, harvest and management costs, visual appearances, and public reactions.

Keywords: Silviculture, landscape management, harvesting costs, public response, multiple use.

(See Olympia order form.)

Curtis, Robert O.
1998. "Selective cutting" in Douglas-fir: history revisited. Journal of Forestry. 96(7): 40-46.

This article reviews the selective cutting controversy of the 1930s and the conclusions that were drawn. This episode was more complex than suggested by brief references in current texts. Although the effort was generally viewed as a failure, it contains lessons that remain pertinent to current problems.

Keywords: Silviculture, uneven-aged management, forest history, Pseudotsuga menziesii*.*

(See Olympia order form.)

Watershed Management

Duan, Jinfan; Selker, John; Grant, Gordon E.
1998. Evaluation of probability density functions in precipitation models for the Pacific Northwest. Journal of the American Water Resources Association. 34(3): 617-627.

Watershed, climate, and ecosystem models often require precipitation data; this paper evaluates different mathematical models for generating these data. When compared with actual precipitation data from 99 sites in the Western United States, the single-parameter Weibull distribution performed significantly better than other single-parameter models and as well as the widely used but cumbersome two-parameter gamma model. Advantages of the single-parameter Weibull include that it requires only the mean wet day precipitation for calibration (readily available for most sites), is invertable for simulation purposes, and is easily manipulated analytically.

Keywords: Watershed analysis, precipitation models, Pacific Northwest.

(See Corvallis order form A.)

Grant, Gordon
1997. Dynamics and geomorphology of mountain rivers [Book review]. Journal of the North American Benthological Society. 16: 719-720.

This is a book review of *Dynamics and Geomorphology of Mountain Rivers*, edited by P. Ergenzinger and K. Schmidt, a compendium of papers describing physical processes and structure of mountain streams. The book emphasizes new technologies for studying mountain river dynamics but is weak in considering river assessments or restoration.

Keywords: Geomorphology, channel geomorphology, experimental structures.

(See Corvallis order form A.)

Swanson, Frederick J.; Johnson, Sherri L.; Gregory, Stanley V.; Acker, Steven A.

1998. Flood disturbance in a forested mountain landscape. BioScience. 48(9): 681-689.

A recent major flood in forested, mountain landscapes of the Pacific Northwest produced patchy disturbance, leaving numerous refuges. High rates of water, sediment, and wood movement altered channels and riparian zones. Mobile and widespread aquatic species survived better than less mobile, bottom-dwelling species.

Keywords: Disturbance, floods, storms, fish habitat, debris slides, debris flows, cumulative watershed effects.

(See Corvallis order form A.)

Wood Utilization

Willits, Susan A.; Lowell, Eini C.; Christensen, Glenn A.

1997. Lumber and veneer yields from small-diameter trees. In: Barbour, R. James; Skog, Kenneth E., eds. Role of wood production in ecosystem management: Proceedings of the sustainable forestry working group at the IUFRO all division 5 conference; 1997 July; Pullman, WA. Gen. Tech. Rep. FPL-GTR-100. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory: 73-79.

Forest management activities since the start of the 20th century have created vast acreages of densely stocked small-diameter stands throughout the Intermountain West. One of the economic benefits of active management of these stands is to use the material being removed from the forest to produce wood products. To efficiently use the small-diameter material, information about the volume and quality of products that can be produced is necessary. A recent series of mill recovery studies was conducted on small-diameter Douglas-fir, western larch, lodgepole pine, ponderosa pine, and white fir trees from eastern Washington, northern Idaho, and southwestern Oregon. Results of the lumber study showed that the volume recovery is as high or higher than previously experienced from timber of this size.

Keywords: Densely-stocked small-diameter stands, Douglas-fir, ponderosa pine, lodgepole pine, larch, lumber recovery, veneer recovery.

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