



United States
Department of
Agriculture

Forest Service

Pacific Northwest
Research Station



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July 2003

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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.

Bibliographies

03-149

Pacific Northwest Research Station
2003. Recent publications of the Pacific Northwest Research Station, first quarter 2003. Portland, OR: U.S. Department of Agriculture, Forest Service. 23 p.

Keywords: Bibliographies (forestry).

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

Biometrics

02-151

Hanson, E.J.; Azuma, D.L.; Hiserote, B.A.
2002. Site index equations and mean annual increment equations for Pacific Northwest Research Station forest inventory and analysis inventories, 1985-2001. Res. Note PNW-RN-533. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 24 p.

Site index equations and mean annual increment equations used by the Forest Inventory and Analysis Program, Portland Forestry Sciences Laboratory, Pacific Northwest Research Station, are given. The equations are for 24 tree species in Oregon, Washington, and California.

Keywords: Site index equations, mean annual increment equations.

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

Economics

02-050

Houston, L.L.; Kline, J.D.; Alig, R.J.
2002. Economics research supporting water resource stewardship in the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-550. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72 p.

The use of water increasingly involves complex tradeoffs among biophysical, economic, ecological, and societal values. Knowledge about the value of water to different users and methods with which to evaluate biophysical, economic, ecological, and social tradeoffs associated with allocating limited water resources among competing uses is vital to devising appropriate and effective water resource policies. A review and synthesis of water resource economics research can contribute to a foundation on which to plan and conduct interdisciplinary research evaluating tradeoffs regarding water. It also can assist in setting research priorities for developing analytical processes and tools with which to evaluate tradeoffs, as well as develop water resource management strategies that are ecologically sound, economically efficient, and socially acceptable. Intended primarily for noneconomists, this report reviews existing water resource economics literature concerning the economic value of water in different uses in the Pacific Northwest, the evaluation of tradeoffs among

uses, and the use of economic incentives for water conservation and protection or enhancement of water quality. The synthesis of the water economics literature culminates in the identification of priority research topics relevant to the Pacific Northwest. An annotated bibliography of a sampling of water resource economics research is provided in an appendix.

Keywords: Economic values and tradeoffs, water quality and quantity, riparian species.

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

Forest Management

02-294

Mills, J.R.; Zhou, X.

2003. Projecting national forest inventories for the 2000 RPA timber assessment. Gen. Tech. Rep. PNW-GTR-568. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 58 p.

National forest inventories were projected in a study that was part of the 2000 USDA Forest Service Resources Planning Act (RPA) timber assessment. This paper includes an overview of the status and structure of timber inventory of the National Forest System and presents 50-year projections under several scenarios. To examine a range of possible outcomes, results are shown for five removals scenarios that incorporate assumptions from both current and past studies of wood flows and harvesting on national forests. In addition, two projections were developed to examine the effects of volume reductions associated with large-scale disturbance events, such as fires, insects, and disease. Projections were made by region and forest type by using the aggregated timberland assessment system and plot-level inventory data with methods consistent with procedures followed for private timberlands in the assessment. The results of projected inventory volume differ across regions, but the total inventory of both softwood and hardwood forest types is shown to increase in all scenarios. One result is a shift in area of older age classes. Initially, 15 percent of the timberland is classified as stands older than 150 years; under

the base scenario with disturbance, this area will increase to 32 percent by 2050. This shift means that in the future, a larger share of U.S. timberland is projected to support mature and old-forest conditions.

Keywords: National forests, timber supply, modeling, inventory projection, yield function, seral stage, public policy.

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

Recreation

02-101

Quinn, T.

2002. Public lands and private recreation enterprise: policy issues from a historical perspective. Gen. Tech. Rep. PNW-GTR-556. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 31 p.

This paper highlights a number of the historical events and circumstances influencing the role of recreation enterprises on public lands in the United States. From the earliest debates over national park designations through the current debate on the ethics of recreation fees, the influence of recreation service providers has been pervasive. This history is traced with particular attention to the balance between protecting public interests while offering opportunities for profit to the private sector. It is suggested that the former has frequently been sacrificed owing to political pressures or inadequate agency oversight.

Keywords: National Park Service, USDA Forest Service, concessions, recreation, public lands, public good, public utilities.

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

Regional Assessments

01-406

Crone, L.K.; Reed, P.; Schaefers, J.
2002. Social and economic assessment of the Chugach National Forest area. Gen. Tech. Rep. PNW-GTR-561. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 108 p.

This paper provides an assessment of the social and economic conditions in the Chugach National Forest area as background information for use in forest planning. Current conditions and recent trends in the region are compared and contrasted with state and national conditions and recent trends. Regional employment and income trends in industries that use forest-related resources are detailed with a focus on the relation between forest management and these industries. The industry likely to be the most influenced by forest management policies is the recreation and tourism industry. The social and economic conditions in 14 communities, chosen because of their proximity to the forest, are also described. The results of two mail surveys designed to gain a better understanding of the communities' perceptions of themselves, their views regarding the management of the forest and other public lands, and the role of these lands in their quality of life also are presented and discussed. The survey results indicate that the communities are generally very interested in the management of the forest, and because of the importance of public land to their quality of life, most wish to be equal partners with management agencies in planning for the future of these lands.

Keywords: South-central Alaska, Chugach National Forest, social and economic conditions, communities, community surveys.

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

Resource Inventory

02-045

Azuma, D.L.; Dunham, P.A.; Hiserote, B.A.; Veneklase, C.F.
2002. Timber resource statistics for eastern Oregon, 1999. Resour. Bull. PNW-RB-238. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 42 p.

This report is a summary of timber resource statistics for eastern Oregon, which includes Baker, Crook, Deschutes, Gilliam, Grant, Harney, Jefferson, Klamath, Lake, Malheur, Morrow, Sherman, Umatilla, Union, Wallowa, Wasco, and Wheeler Counties. Data were collected as part of a statewide multiresource inventory. The inventory sampled all private and public lands except those administered by the National Forest System. Area statistics for the National Forest System are provided from regional inventories. Area information for parks and other reserves was obtained directly from the organizations managing these areas. Statistical tables summarize all ownerships and provide estimates of land area, timber volume, growth, mortality, and harvest.

Keywords: Forest surveys, forest inventory, statistics (forest), timber resources, resources (forest), eastern Oregon.

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

Threatened, Endangered, Sensitive Species

02-119

Singleton, P.H.; Gaines, W.L.; Lehmkuhl, J.F. 2002. Landscape permeability for large carnivores in Washington: a geographic information system weighted-distance and least-cost corridor assessment. Res. Pap. PNW-RP-549. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 89 p.

We conducted a regional-scale evaluation of landscape permeability for large carnivore movements in Washington and adjacent portions of British Columbia and Idaho. We developed geographic information system-based landscape permeability models for wolves (*Canis lupus*), wolverine (*Gulo gulo*), lynx (*Lynx canadensis*), and grizzly bear (*Ursus arctos*). We also developed a general large carnivore model to provide a single generalization of the predominant landscape patterns for the four focal species. The models evaluated land cover type, road density, human population density, elevation, and slope to provide an estimate of landscape permeability.

We identified five concentrations of large carnivore habitat between which we evaluated landscape permeability. We evaluated landscape permeability in fracture zones between those areas. We identified the portions of the Washington State highway system that passed through habitat links between the habitat concentration areas and areas accessible to the focal species. This analysis provides a consistent measure of estimated landscape permeability across the analysis area that can be used to develop conservation strategies, to contribute to future field survey efforts, and to help identify management priorities for the focal species.

Keywords: Washington, corridors, fragmentation, habitat connectivity, landscape permeability, endangered species, reserve design.

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

Publications Available Elsewhere

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

Aquatic and Riparian Systems

Gove, N.E.; Edwards, R.T.; Conquest, L.L.
2001. Effects of scale on land use and water quality relationships: a longitudinal basin-wide perspective. *Journal of the American Water Resources Association*. 37(6): 1721-1734.

Human land use is the major source of change in most catchments in developing areas. Informed land use planning and ecosystem restoration require estimates of how changes in land use will affect ecosystem processes across multiple scales of space and time. The complexity of biogeochemical and hydrologic interactions within a basin makes it difficult to scale up from process-based studies of individual reaches to watershed scales over multiple decades. Empirical models relating land use and land cover (LULC) to water quality can be useful in long-term planning but require an understanding of the effects of scale on apparent land use-water quality relations. We empirically determined how apparent relations between water quality LULC data change at different scales by using land use land cover data from the Willapa Bay watershed and water quality data collected along the Willapa and North Rivers in Washington. Spatial scales examined ranged from the local riparian scale to that of total upstream catchment. We found that models vary significantly depending on the size and shape of the portion of the watershed used to characterize surrounding land use. The implication is that managers need to consider the effects of land use at multiple scales for successful land use planning or restoration activities.

Keywords: Water quality, scale, land use, watershed management, Willapa River, North River.

(See Juneau order form.)

Atmosphere

Rorig, M.L.; Ferguson, S.A.
2002. The 2000 fire season: lightning-caused fires. *Journal of Applied Meteorology*. 41: 786-791.

A large number of lightning-caused fires burned across the Western United States during the summer of 2000. In a previous study, we determined a simple index of low-level moisture (85 kPa dewpoint depression) and instability (85 kPa to 50 kPa temperature difference) from the Spokane, Washington, upper-air soundings that was very useful for indicating the likelihood of "dry" lightning in the Pacific Northwest. This same method was applied to the summer 2000 fire season in the Pacific Northwest and northern Rocky Mountains. The mean 85 kPa dewpoint depression at Spokane from May through September was 17.7 °C on days when lightning-caused fires occurred and 12.3 °C on days with no lightning-caused fires. Likewise, the mean temperature difference between 85 kPa and 50 kPa was 31.3 °C on lightning-fire days, compared with 28.9 °C on nonlightning-fire days. Both measures, dewpoint depression and temperature difference, were found to be significantly different for days with and without lightning-caused fires. By using these two variables as discriminators, 51 of 59 days on which lightning fires started were correctly identified as having a high probability of "dry" lightning.

Keywords: Lightning-caused fire, 2000 fire season, dry lightning.

(See Seattle order form.)

Economics

Alexander, S.

2001. Property taxes too high? Make certain of your land's tax designation. Northwest Woodlands. Fall: 26-27.

The author recounts the story of re-establishing tax-deferred status for her family tree farm in Oregon.

Keywords: Property taxes, tax deferral, forest land.

(See Corvallis order form 1.)

Alexander, S.J.; Pilz, D.; Weber, N.S. [and others]

2002. Mushrooms, trees, and money: value estimates of commercial mushrooms and timber in the Pacific Northwest. *Environmental Management*. 30(1): 129-141.

Wild edible mushrooms are harvested in the forests of the Pacific Northwest, where trees and mushrooms have both been produced over the same landscape. Although there has been some discussion about the value of trees and mushrooms, the joint production of and value for these two forest resources have not been described in detail. By using four case studies, the information needed to determine production and value for three wild mushroom species in different forests of the Pacific Northwest is described, and present values for several forest management scenarios are presented. The values for timber and for mushrooms are site and species specific. The field of production economics is concerned with choices regarding how much and what to produce with what resources. The choices are influenced by changes in technical and economic circumstances. We analyzed the definitions and

assumptions necessary to assess value in joint production of timber and wild mushrooms, and we found that values are sensitive to assumptions about changes in forest management, yields for mushrooms and trees, and costs.

Keywords: Joint production, resource value, economics, mushrooms, nontimber forest products.

(See Corvallis order form 1.)

Cohen, W.B.; Spies, T.A.; Alig, R.J. [and others] 2002. Characterizing 23 years (1972-95) of stand replacement disturbance in western Oregon forests with Landsat imagery. *Ecosystems*. 5: 122-137.

In western Oregon, forest ecosystem processes are greatly affected by patterns of stand-replacement disturbance. A spatially explicit characterization of clearcut logging and wildfire is a prerequisite to understanding the causes and consequences of disturbance in this region. We analyzed stand-replacement disturbance over 4.6 million forested hectares of three major provinces in western Oregon between 1972 and 1995, contrasting the relative amounts of wildfire and harvest in each province and comparing harvest statistics among the dominant land ownership categories. Comparing the managed disturbance regimes with historical wild disturbance regimes can help us to understand the relative impact of management regimes on ecosystems.

Keywords: Forest disturbance, Landsat, forest management, remote sensing, change detection, province ownership.

(See Corvallis order form 1.)

Haynes, R.W.

2002. Forest management in the 21st century: changing numbers, changing context. *Journal of Forestry*. March: 38-43.

Results from the fifth Resources Planning Act timber assessment suggest that we face a future nearly the reverse of that anticipated in the Forest Service's first post-World War II assessment completed 50 years ago, with a growing abundance of softwoods but a regionally restricted supply of hardwoods. Both the bulk of the softwood harvest expansion and the set of limitations in hardwoods supply are in the United States South. Assessment results also provide insights on trends in some measures of sustainable forest management, timber supply complexities in western forest health issues on public lands, the impacts of forest fragmentation, and the preeminence of private lands in national timber supply.

Keywords: Timber assessments, timber supply, timber demand.

(See Portland order form.)

Haynes, R.W.; Skog, K.E.

2002. The fifth Resources Planning Act timber assessment. *Journal of Forestry*. March: 8-12

The United States has a century-long history of developing national assessments of supply and demand trends for timber that have helped shape perceptions of future commodity consumption and needs for forest policies. Trends and projections since 1952 have consistently shown rising forest products consumption and changing sources of timber supplies. The current assessment envisions forest products consumption rising 42 percent by 2050 and marked shifts in the extent and location of domestic and import supplies. Prospective shifts include a temporary near-term decline in United States roundwood harvest and an increase in net imports in the near and long term.

Keywords: Assessments, timber supply, timber demand.

(See Portland order form.)

Ecosystem Structure and Function

Gray, A.N.; Spies, T.A.; Easter, M.J.

2002. Microclimatic and soil moisture responses to gap formation in coastal Douglas-fir forests. *Canadian Journal of Forest Research*. 32: 332-343.

The effects of gap formation on solar radiation, soil and air temperature, and soil moisture were studied in mature coniferous forests of the Pacific Northwest. Measurements were taken over a 6-year period in closed-canopy areas and recently created gaps in four stands of mature (90-140 year) and old-growth (>400 years) Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) forest on the west side of the Cascade Range of central Oregon and southern Washington. Gap sizes ranged from 40 to 2000 square meters. Summer solar radiation levels and soil temperatures differed significantly among gap sizes and positions within gaps and were driven primarily by patterns of direct radiation. Nevertheless, effects on air temperature were minimal, indicating buffering by the surrounding forest. Soil moisture was more abundant in gaps than in controls, was most abundant in intermediate-size gaps, and tended to decline during the growing season in single-tree gaps and on the north edges of large gaps. Moisture in gaps declined over multiple years, likely caused by encroachment of vegetation within and around gaps. Low light levels probably limit filling of natural gaps in these forests, but the variety of microenvironments in large gaps may facilitate diverse plant communities.

Keywords: Treefall gaps, microclimate, soil moisture, solar radiation, temperature, disturbance.

(See Corvallis order form 1.)

Joyce, L.; Aber, J.; McNulty, S. [and others] 2001. Potential consequences of climate variability and change for the forests of the United States. In: Climate change impacts on the United States: the potential consequences of climate variability and change—report for the US Global Change Research Program. Cambridge, United Kingdom: Cambridge University Press: 489-521. Chapter 17.

Carbon storage in forests of the United States is currently estimated to increase from 0.1 to 0.3 petagrams per year, and analyses suggest that carbon dioxide fertilization and land use have influenced this current storage. Within the next 50 years, forest productivity is likely to increase with the fertilizing effect of atmospheric carbon dioxide. Economic analyses when driven by several different climate scenarios indicate an overall increase in forest productivity in the United States that is very likely to increase timber inventory, subject to other external forces. With more potential forest inventory to harvest, the costs of wood and paper products to consumers are likely to decrease, as are the returns to owners of timberland. Over the next century, changes in the severity, frequency, and extent of natural disturbances are possible under future climate change. Analyses of results from climate and ecological models suggest that the seasonal severity of fire hazard is likely to increase by 10 percent over much of the United States, with possibly larger increases in the Southeastern United States and Alaska and actual decreases in the Northern Great Plains. Analyses of the results of ecological models when driven by several different climate scenarios indicate changes in the location and area of potential habitats for many tree species and plant communities. Outdoor recreation opportunities are also likely affected by climate change.

Keywords: Climate variability, climate change, forests, forest processes, disturbance, biodiversity, socioeconomic impacts, forest management.

(Available in libraries and bookstores.)

Mclver, J.; Starr, L. 2001. Restoration of degraded lands in the interior Columbia River basin: passive vs. active approaches. *Forest Ecology and Management*. 153: 15-28.

Evidence for success of passive and active restoration is presented for interior coniferous forest, sagebrush steppe, and riparian ecosystems, with a focus on the Columbia River basin. Passive restoration, defined as removal of the stresses that cause degradation, may be most appropriate for higher elevation forests, low-order riparian ecosystems, and for sagebrush steppe communities that are only slightly impaired. More active approaches, in which management techniques such as planting, weeding, burning, and thinning are applied, have been more successful in forests with excessive fuels and in some riparian systems and may be necessary in highly degraded sagebrush steppe communities. There is general agreement that true restoration requires not only reestablishment of more desirable structure or composition, but of the processes needed to sustain these for the long term. The challenge for the restorationist is to find a way to restore more desirable conditions within the context of social constraints that limit how processes are allowed to operate and economic constraints that determine how much effort will be invested in restoration.

Keywords: Disturbance, process, degradation, resiliency, state-transition, riparian, sagebrush, interior forest, restoration management.

(See La Grande order form.)

Tietje, W.D.; Waddell, K.L.; Vreeland, J.K.; Bolsinger, C.L.

2002. Coarse woody debris in oak woodlands in California. *Western Journal of Applied Forestry*. 17(3): 139-146.

An extensive forest inventory was conducted to estimate the amount and distribution of coarse woody debris (CWD) in the oak (*Quercus* spp.) woodland system of California. Only land outside of national forests and reserve areas was sampled. Estimates of volume, log density, and linear feet per acre are presented by species, forest type, and geographic location. Almost 3

million acres of woodland (52 percent of the sampled woodland area) were estimated to have no CWD. Overall, blue oak (*Q. douglasii*) was the most abundant species of CWD, and gray pine (*Pinus sabiniana*) produced the most volume. Most logs were in the advanced stages of decay, but there was no distinct pattern of decay among CWD species or diameter classes.

Keywords: Coarse woody debris, oak woodland, Quercus spp., blue oak, Quercus douglasii, gray pine, Pinus sabiniana, habitat structure, forest inventory.

(See Portland order form.)

Waddell, K.L.

2002. Sampling coarse woody debris for multiple attributes in extensive resource inventories. *Ecological Indicators*. 1: 139-153.

This paper describes a sampling method, measurement protocols, and estimation procedures to collect and compile data on coarse woody debris (CWD) attributes within inventory. The line intersect method was used to sample CWD inside the boundaries of the standard inventory field plot. Previously published equations were customized to allow for easy calculation of per-unit-area values for each plot, such as biomass and carbon per hectare, log density per hectare, or volume per hectare. These estimates are associated with all other information recorded or calculated for the inventory plot. This allows for indepth analysis of CWD data in relation to stand characteristics. These data can be used to address current, relevant issues such as criteria outlined in the 1994 Montreal Process and the 1995 Santiago Declaration, which assess the contribution of forests to the global carbon cycle by measuring indicators such as CWD, live plant biomass, and soil carbon.

Keywords: Coarse woody debris, down wood, dead wood, logging residue, line intersect sampling, line transects, resource inventory.

(See Portland order form.)

Forest Management

McIver, J.; Weatherspoon, P.; Edminster, C.
2001. Alternative ponderosa pine restoration treatments in the Western United States. In: Vance, R.K.; Edminster, C.B.; Covington, W.W.; Blake, J.A., comps. *Ponderosa pine ecosystems: restoration and conservation: steps toward stewardship: Proceedings*. RMRS-P-22. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 104-109.

Compared to presettlement times, many ponderosa pine forests of the United States are now denser and have greater quantities of fuels. Widespread treatments are needed in these forests to restore ecological integrity and to reduce the risk of uncharacteristically severe fires. Resource managers need better information on the effects of alternative practices such as fire and mechanical or manual "fire surrogates." This study assesses a wide range of ecological and economic consequences of four alternative restoration treatments: (1) cuttings and mechanical fuel treatments alone; (2) prescribed fire alone; (3) a combination of cuttings, mechanical fuel treatments, and prescribed fire; and (4) untreated controls. A comprehensive set of core variables will be measured at each site, including aspects of fire behavior and fuels, vegetation, wildlife, entomology, pathology, soils, and economics. The core design will allow interdisciplinary analysis at both the site and multisite scales.

Keywords: Forest fuel treatments, prescribed burning, silviculture, long-term interdisciplinary research.

(See La Grande order form. To order a copy of the complete proceedings, email Richard Schneider at rschneider@fs.fed.us or write to Richard Schneider, Rocky Mountain Research Station, 240 W Prospect Road, Fort Collins, CO 80526.)

Niwa, C.G.; Peck, R.W.; Torgersen, T.R.
2001. Soil, litter, and coarse woody debris habitats for arthropods in eastern Oregon and Washington. Northwest Science. 75(Spec. issue): 141-148.

Arthropods in soil, litter, and coarse woody debris play vital roles in maintaining soil fertility, health, and productivity. Arthropods shred plant material, help mineralize nutrients for plants, act as predators, and serve as food for other wildlife. Some species or groups of species are potentially valuable for monitoring forest health. Natural and human-caused disturbance may immediately kill many arthropods, but changes to habitat structure are likely to cause long-term effects on their community compositions. Fire effects on arthropods may be minimized if refugia of litter and coarse woody debris are retained. Possible effects of timber harvesting on arthropods include mechanical effects on soil and litter, microclimate changes, and the addition of organic matter to the forest floor. Soil compaction reduces pore size, which may result in loss of habitat and decreased nutrient retention, and changes the microbial and nematode communities, which can affect nutrient cycling and food resources for microarthropods. Thresholds required for healthy ecosystem function, and predictive and decision-support tools that include these components in relation to disturbances are not available.

Keywords: Soil, litter, coarse woody debris, soil arthropods, forest health and productivity, disturbance processes, forest management.

(See Corvallis order form 2.)

Genetics

Johnson, R.; St. Clair, B.; Lipow, S.
2001. Genetic conservation in applied tree breeding programs. In: Thielges, B.A.; Sastrapradja, S.D.; Rimbawanto, A., eds. Proceedings of the international conference on ex situ and in situ conservation of commercial tropical trees. Yogyakarta, Indonesia: Gadjah Mada University, Faculty of Forestry: 215-230.

This paper reviews how population size and structure affect the maintenance of genetic variation in breeding and gene resource populations. We discuss appropriate population sizes for low-frequency alleles and point out some examples of low-frequency alleles in the literature. Development of appropriate breeding populations and gene resource populations are discussed.

Keywords: Genetic conservation, breeding program, gene frequency.

(See Corvallis order form 2.)

Temel, F.; Johnson, R.
2000. Early testing of Douglas-fir for Swiss needle cast tolerance. In: Filip, G., ed. Swiss needle cast research cooperative annual report 2000. Corvallis, OR: Oregon State University, College of Forestry: 36-40.

Foliage health traits, growth, and measures of Swiss needle cast (SNC) infection were examined in families of Douglas-fir at juvenile (2 years) and mature (10 and 12 years) ages. There was significant genetic variation in most traits representing SNC symptoms; breeding for improved foliage health, therefore, is possible. Early selection at age 2 was 25 to 100 percent as efficient as waiting until age 10 or 12. Because there was no difference among families for SNC infections (percentage of SNC fungus in needles or percentage of occluded stomata), it appears that we are breeding for tolerance to SNC, not resistance per se. The better families had a tendency to shed heavily infected needles before the poorer families.

Keywords: Breeding, early selection, Swiss needle cast, Douglas-fir.

(See Corvallis order form 2.)

Geomorphology and Hydrology

Grant, G.

2001. Dam removal: Panacea or Pandora for rivers? *Hydrological Processes*. 15: 1531-1532.

Dam removal is emerging as a viable strategy for restoring rivers. In many cases, however, little is known about the geomorphic and ecological consequences of dam removal. A national science program to evaluate how rivers respond to dam removal could improve our ability to identify which dams should be removed and which should remain.

Keywords: Channel geomorphology, sediment routing, watershed analysis, cumulative watershed effects, public values.

(See Corvallis order form 1.)

Gurnell, A.M.; Piégay, H.; Swanson, F.J.; Gregory, S.V.

2002. Large wood and fluvial processes. *Freshwater Biology*. 47: 601-619.

We consider the role of wood as an important component of the load transported by rivers as well as a control on their morphology. We review the characteristics of wood that govern its potential dynamics and the characteristics of rivers that indicate the way in which wood is mobilized, transported, and retained. In particular, we consider the relation between large wood and fluvial processes within rivers of different sizes.

Keywords: Large woody debris, fluvial processes, stream geomorphology.

(See Corvallis order form 1.)

Haggerty, R.; Wondzell, S.M.; Johnson, M.A.

2002. Power-law residence time distribution in the hyporheic zone of a 2nd-order mountain stream. *Geophysical Research Letters*. 29(13): 18-1 to 18-4.

Biogeochemical processes that occur in the hyporheic zone modify water chemistry so that exchange flows filter upstream signals of watershed processes. The volume and residence time distribution of the hyporheic zone determine the nature of this filter. We measured the hyporheic residence time distribution in a second-order mountain stream at H.J. Andrews Experimental Forest, Oregon, and found it to exhibit fractal scaling over at least 1.5 orders of magnitude in time (1.5 hours to 3.5 days). Thus, the hyporheic zone may store significant quantities of water and solutes over time scales very much longer than the mean advection time within the stream channel and contribute to fractal scaling in time series of solute concentrations observed in small-watershed studies.

Keywords: Hyporheic zone, residence time distribution, fractal scaling.

(See Olympia order form.)

Lancaster, S.T.; Hayes, S.K.; Grant, G.E.

2001. Modeling sediment and wood storage and dynamics in small mountainous watersheds. In: Dorava, J.M.; Montgomery, D.R.; Palcsak, B.B.; Fitzpatrick, F.A., eds. *Geomorphic processes and riverine habitat*. Washington, DC: American Geophysical Union: 85-102.

A new landscape dynamic model simulates mass movements and channel evolution in response to forest growth and disturbance. The model predicts accumulation and erosion at discrete locations within the channel network.

Keywords: Geology, geomorphology, landslides, alluvial deposits, sediment routing, hillslope and stream interactions, channel geomorphology.

(Available in bookstores and libraries.)

O'Connor, J.E.; Grant, G.E.; Costa, J.E.
2002. The geology and geography of floods.
In: House, P.K.; Webb, R.H.; Baker, V.R.;
Levish, D.R., eds. Ancient floods, modern
hazards: principles and applications of
paleoflood hydrology. Water Science and
Application 5. Washington, DC: American
Geophysical Union: 359-385.

In this paper, some of the primary factors that influence the magnitude of floods and how these factors vary temporally and spatially over geologic time and space scales are outlined.

Keywords: Hydrologic processes, flood processes, peak flows, hydrocycle, channel geomorphology.

(See Corvallis order form 2.)

Invertebrates

Boughton, D.A.

2001. The dispersal system of a butterfly: a test of source-sink theory suggests the intermediate-scale hypothesis. *The American Naturalist*. 156(2): 131-144.

The dispersal system of the butterfly *Euphydryas editha* at a site where it has source-sink dynamics is examined. The goal of the study was to experimentally determine the dispersal system of the butterfly.

Keywords: Source sink, dispersal, Euphydryas editha, habitat diffusion, ideal free distribution, population modeling.

(See Corvallis order form 1.)

Torgersen, T.; Duncan, S.

2002. When the trees die. In: *The World and I*. Washington, DC: The Washington Tribune: 140-148.

This article describes the interconnections among forest defoliators (budworms), their predators (ants, birds, and bears), and predator

habitat (snags and down logs). Methods of studying these components and their interactions and the importance to healthy ecosystems are discussed.

Keywords: Cavity nesters, decay fungi, dwarf mistletoe, forest management, hollow trees, logs, snags, wildlife management, wood decay.

(See La Grande order form.)

Zúñiga, G.; Salinas-Moreno, Y.; Hayes, J.L.
[and others]

2002. Chromosome number in *Dendroctonus micans* and karyological divergence within the genus *Dendroctonus* (Coleoptera: Scolytidae). *The Canadian Entomologist*. 134: 503-510.

The meioformula of *Dendroctonus micans* (Kugelann), the European spruce beetle, is 10 II + Xyp in males and 10 II + XX in females. This meioformula is different from that of its conspecific *Dendroctonus punctatus* LeConte (14 II + Xyp), which confirms the taxonomic validity of both species. Additionally, the chromosome number found in *D. micans*, added to karyological data from the rest of the *Dendroctonus* species, suggests that the karyological diversification of this genus occurred in two ways: one toward more southerly latitudes in North America, and the other toward Europe and Asia.

Keywords: Dendroctonus spp.

(See La Grande order form.)

Land Use

Alig, R.; Mills, J.; Butler, B.

2002. Private timberlands: growing demands, shrinking land base. *Journal of Forestry*. March: 32-37.

By 2050, U.S. timberland area is projected to be about 3 percent smaller than today owing to increasing demands for urban and related land uses from another 126 million people. An increasing area of southern planted pine is accompanied by a reduction in the area of upland hardwoods. Hardwoods will continue to dominate the South's forested landscape. Plantation growth rates will increase by 38 percent, and plantation fiber output will increase 289 percent to reach 61 percent of private softwood removals volume.

Keywords: Timberland area, forest cover, forest investment.

(See Corvallis order form 1.)

Irland, L.C.; Adams, D.; Alig, R. [and others]
2001. Assessing socioeconomic impacts of climate change on U.S. forests, wood-product markets, and forest recreation. *BioScience*. 51(9): 753-764.

As part of a national global climate change assessment, our socioeconomic team assembled existing data to examine how climate change might impact forests, wood-product markets, and forest recreation. Over century-long timespans, national and regional populations, incomes, and demand for wood products will change, with a wide range of uncertainty. Based on existing projections, climate-change effects on wood-product markets and forest recreation over the next 100 years seem likely to be small by comparison. Effects on forest recreation may involve positive and negative aspects, and adaptive mechanisms may aid in responding to climate-change impacts if they occur at a relatively slow pace.

Keywords: Timber supply, forest sector, forest resource assessment, plantation area.

(See Corvallis order form 1.)

Mycology

Dreisbach, T.A.; Smith, J.E.; Molina, R.

2002. Challenges of modeling fungal habitat: When and where do you find chanterelles? In: Scott, J.M.; Heglund, P.J.; Morrison, M.L. [and others], eds. *Predicting species occurrences: issues of accuracy and scale: Proceedings of a conference*. Washington, DC: Island Press: 475-481. Chapter 41.

We are developing habitat models to predict occurrence for nine species of cantharelloid fungi ranging from "weedy" to "rare." Our goal is to produce spatially based habitat models for use across multiple scales by land managers. Time and scale create challenges in the development of these models. We present a two-tiered modeling approach, incorporating seasonal and stochastic elements, for predicting chanterelle species occurrence at multiple scales.

Keywords: Fungi, chanterelles, habitat factors, habitat suitability models.

(Available in bookstores and libraries.)

Peintner, U.; Bougher, N.L.; Castellano, M.A. [and others]

2001. Multiple origins of sequestrate fungi related to *Cortinarius* (Cortinariaceae). *American Journal of Botany*. 88(12): 2168-2179.

This study investigated the phylogeny and evolution of sequestrate fungi in relation to their gilled relatives from the Cortinariaceae (Basidiomycetes). Phylogenetic analyses of 151 ITS sequences from 77 gilled species and 37 sequestrate taxa were performed with PAUP* 4.0d64 by using maximum parsimony and maximum likelihood methods. Sequestrate fruit-body forms occur in all three major ectomy-corrhizal lineages: the clades *Cortinarius*, *Hebeloma/Hymenogaster/Naucoria*, and *Descolea*, but not within the saprophytic out-group *Gymnopilus*, thus indicating multiple origins of sequestrate forms from ectomy-corrhizal ancestors.

Keywords: Mycology, sequestrate fungi, truffles.

(See Corvallis order form 2.)

Smith, J.E.; Lebel, T.

2001. A comparison of taxonomic keys to species within the genus *Russula*. *Mcllvainea*. 15(1): 9-22.

More than 700 dried collections of *Russula* from a large-scale study conducted on the west side of the Cascade Range in Oregon were examined and identified with the aid of several recently published species descriptions and keys to species within the genus. Few regional taxonomic references to this genus were available at the time of the study. The strengths and limitations of the keys to this and other situations are described. A comparison of each key's species or species groupings for the species we encountered is provided. Suggestions for identifying *Russula* species in large-scale ecological studies are discussed.

Keywords: *Russula*, *sporocarps*, *Cascade Range*, *H.J. Andrews Experimental Forest*, *western hemlock zone*, *taxonomy*.

(See Corvallis order form 2.)

Plant Ecology

James, S.A.; Clearwater, M.J.; Meinzer, F.C.; Goldstein, G.

2002. Heat dissipation sensors of variable length for the measurement of sap flow in trees with deep sapwood. *Tree Physiology*. 22: 277-283.

Robust thermal dissipation sensors of variable length (3 to 30 centimeters) were developed to overcome limitations to the measurement of radial profiles of sap flow in large-diameter tropical trees with deep sapwood. The effective measuring length of the custom-made sensors was reduced to 10 millimeters at the tip of a thermally nonconducting shaft, thereby minimizing the influence of nonuniform sap flux density profiles across the sapwood. Sap flow was measured at different depths and circumferential positions in the trunks of four tree species at the Parque Nacional Metropolitan canopy crane site, Panama. Sap flow was detected at a depth of 24 centimeters in the trunk of a 1-meter-diameter *Anacardium excelsum* tree and a 0.65-meter-diameter *Ficus insipida* tree, to a depth of 7 centimeters in a 0.34-meter-diameter *Cordia*

alliodora trunk, and 17 cm in a 0.47-meter-diameter *Schefflera morototoni* trunk. Sap flux density was maximal in the outermost 4 centimeters of sapwood and declined with increasing sapwood depth. Considerable variation in sap flux density profiles was observed both within and among trees. In *S. morototoni*, radial variation in sap flux density was associated with radial variation in wood properties, particularly vessel lumen area and distribution. High variability in radial and circumferential sap flux density resulted in large errors when measurements of sap flow at a single depth or a single radial profile were used to estimate whole-plant water use.

Keywords: *Anacardium excelsum*, *conducting xylem*, *Cordia alliodora*, *Ficus insipida*, *radial profile*, *sap flux density*, *Schefflera morototoni*, *tree water use*.

(See Corvallis order form 1.)

Walker, M.D.; Walker, D.A.; Theodose, T.A.; Webber, P.J.

2001. The vegetation: hierarchical species-environment relationships. In: Bowman, W.D.; Seastedt, T.R., eds. *Structure and function of an alpine ecosystem: Niwot Ridge, Colorado*. New York: Oxford University Press: 99-127. Chapter 6.

The vegetation of Niwot Ridge, Colorado, has a rich history of study, beginning with phytosociological studies directly on the ridge and in the surrounding mountains and incorporating more experimental and dynamic approaches in later years. This chapter provides an overview of the spatial patterns of Niwot Ridge plants and plant communities relative to the primary controlling environmental gradients at scales from the individual to the landscape.

Keywords: *Niwot Ridge*, *Colorado*, *plant communities*, *environmental gradients*.

(Available in bookstores and libraries.)

Plant Pathology

Johnson, R.; Gartner, B.; Kanaskie, A.; Maguire, D.

2000. Influence of Bravo fungicide applications on wood properties of Douglas-fir. In: Filip, G., ed. Swiss needle cast research cooperative annual report 2000. Corvallis, OR: Oregon State University, College of Forestry: 96-98.

The moisture content of sapwood in trees sprayed for 5 years with Bravo was significantly higher than in unsprayed trees. We hypothesize that this is a function of the trees not having a sufficient photosynthate supply that could be used to overcome air embolisms in the tracheids. The reduction in moisture content will result in green logs from the unsprayed plots weighing less than those from the sprayed plots even though the dry weight of the loads would not differ. The Bravo also resulted in increased growth, decreased latewood proportion and decreased wood density.

Keywords: Swiss needle cast, wood density, Douglas-fir, moisture content.

(See Corvallis order form 2.)

Thies, W.G.

2001. Root diseases in eastern Oregon and Washington. Northwest Science. 75(Spec. issue): 38-45.

Root diseases influence stand structure, density, composition, function, and yield. The root diseases of greatest concern in eastern Oregon and Washington are annosus root disease, Armillaria root disease, laminated root rot, and black stain root disease. For these, some information is available on root disease ecology, population dynamics, biology of the pathogens, and the natural processes that regulate them. Less is known about disease effects at the watershed or landscape level or how diseases interact with other disturbances and how they respond to management. Decision support, such as the western root disease model, is being developed. In response to a shift in forest species and structure following a century of fire suppression and partial cutting, root diseases

are believed to have spread causing more inoculum on more sites. Stand management to restore historical vegetation conditions may intensify disease; in cases where diseased stands are converted to seral species, however, incidence and severity of root diseases will likely decline. Treatments that retain high stocking of host species, or allow host regeneration, will likely result in increased levels of root diseases because inoculum remains on the site. Spore infections may increase with partial cutting where stumps are not chemically treated. Disturbance increases activity of some insects that may act as vectors of root disease pathogens.

Keywords: Root disease, disturbance processes, forest health and productivity, forest management.

(See Corvallis order form 2.)

Remote Sensing

Lefsky, M.A.; Cohen, W.B.; Spies, T.A.

2001. An evaluation of alternate remote sensing products for forest inventory, monitoring, and mapping of Douglas-fir forests in western Oregon. Canadian Journal of Forest Research. 31: 78-87.

This research evaluates the utility of several remote sensing data types for the purpose of mapping forest structure and related attributes at a regional scale. The objective was to evaluate, as directly as possible, the relative ability of five remote sensing data products to predict structural attributes of closed-canopy coniferous forest, by using methods appropriate for regional-scale mapping. The results of this evaluation will assist us in determining which remote sensing products deserve additional consideration in our ongoing work.

Keywords: Remote sensing.

(See Corvallis order form 2.)

Silviculture

Busing, R.T.; Garman, S.L.

2002. Promoting old-growth characteristics and long-term wood production in Douglas-fir forests. *Forest Ecology and Management*. 160: 161-175.

This study uses long-term simulations to explore the consequences of several silvicultural regimes for wood production, wood quality, and ecological attributes of forest stands. The regimes differ by length of time between harvests (rotation length), timing and type of thinning treatments, and the cover of canopy trees retained at harvest. Comparison of wood yields and quantitative ecological indicators over multiple centuries is accomplished with projections from an ecological model of forest dynamics that tracks live and dead trees. Key issues include how various regimes affect (1) the quantity and quality of harvested wood and (2) the development of late-successional ecological attributes of forest stands. Ultimately we attempt to identify regimes that produce wood of high quality as well as late-successional stand attributes. We also characterize tradeoffs among wood quantity, wood quality, and ecological attributes.

Keywords: Silviculture, old-growth forests, vegetation modeling, thinning.

(See Corvallis order form 1.)

Hummel, S.

2002. Size-density relations in tropical forests: a role for research. *Journal of Tropical Forest Science*. 14(2): 277-281.

A matrix is presented that can be a framework for organizing and integrating the results of research on size-density relations. Much is known about the response of individual tree growth to variable levels of tree density in even-aged stands of temperate forest trees. A task now is to use this information to design experiments that investigate how the general response differs at different latitudes and in mixed-species forests. One place to start is with essentially even-aged single-species stands of tropical trees that fit the assumptions of temperate mensurational methods. The results generated from decades of studies in temperate forests may

be used as hypotheses for studies in tropical and boreal forests. The implications of extending size-density theory to, for example, tropical trees, encompass more than species-specific management.

Keywords: Tropical forests, size-density relations, silvicultural theory.

(See Portland order form.)

Threatened, Endangered, and Sensitive Species

Bull, E.L.; Wales, B.C.

2001. Effects of disturbance on birds of conservation concern in eastern Oregon and Washington. *Northwest Science*. 75(Spec. issue): 166-173.

The effects on birds of forest insects, tree diseases, wildfire, and management strategies designed to improve forest health (e.g., thinning, prescribed burns, road removal, and spraying with pesticides or biological microbial agents) are discussed. Those bird species of concern that occur in forested habitats in eastern Oregon and Washington include the bald eagle, peregrine falcon, harlequin duck, upland sandpiper, northern goshawk, ferruginous hawk, black rosy finch, and seven species of woodpeckers and nuthatches. Forest disturbances that create dead trees and logs are critical to cavity-nesting birds for nesting and roosting habitat. The insects associated with outbreaks or tree mortality provide prey for the woodpeckers and nuthatches. The loss of nest or roost trees could be detrimental to bald eagles, goshawks, or ferruginous hawks, whereas the loss of canopy cover could be detrimental to harlequin ducks and goshawks or to prey of some of the raptors. The more open canopies created by thinning may be more beneficial to a species like the black rosy finch, yet detrimental to some woodpeckers owing to a decrease in cover. Prescribed burning may be beneficial to those

woodpeckers primarily associated with ponderosa pine stands and detrimental to other woodpeckers because of the loss of coarse woody debris. Removal of roads is likely to benefit most of these species because of the decrease in human activity. Recovery plans for bald eagles and peregrine falcons are available.

Keywords: Birds, species of concern, disturbance processes, forest management, bald eagle, peregrine falcon, harlequin duck, upland sandpiper, northern goshawk, ferruginous hawk, black rosy finch.

(See La Grande order form.)

Wildlife

Blaustein, A.R.; Belden, L.K.; Olson, D.H. [and others]

2001. Amphibian breeding and climate change. *Conservation Biology*. 15(6): 1804-1809.

The effects of current trends in climate on breeding phenology were examined in four North American anurans for which long-term data sets were available. Results suggest that climate change has not affected the timing of breeding; population-specific trends were noted for both earlier and later breeding, however, as were associations between breeding times and temperatures.

Keywords: Anuran, breeding time, temperature, climate trends.

(See Corvallis order form 1.)

Kie, J.G.; Bowyer, R.T.; Nicholson, M.C. [and others]

2002. Landscape heterogeneity at differing scales: effects on spatial distribution of mule deer. *Ecology*. 83(2): 530-544.

We quantified relations between a group of landscape metrics measured at different spatial scales and sizes of home ranges for female mule deer (*Odocoileus hemionus*) to test whether spatial heterogeneity played a major role in determining the distribution of deer. We collected data on mule deer and their habitats at five diverse study sites that spanned the length of California. We placed circles of varying radii

(250, 500, 1000, and 2000 m) at the centroid of the home range of each deer and measured landscape metrics within those circles. We explicitly tested the role of spatial heterogeneity in determining home-range size in mule deer by using a multiple-regression model at the 2000-m scale that included patch richness density, mean nearest neighbor, mean shape index, and mean edge contrast index. That model explained 57 percent of the variation in home-range size of mule deer. Models at successively smaller spatial scales explained progressively less of the variation in the sizes of deer home ranges.

Keywords: Mule deer, Odocoileus hemionus, home range, California, habitat, spatial heterogeneity.

(See La Grande order form.)

Preisler, H.K.; Brillinger, D.R.; Ager, A.A. [and others]

2001. Stochastic differential equations: a tool for studying animal movement. In: Proceedings: IUFRO 4.11 conference, session on forest biometry, modeling, and information systems. <http://cms1.gre.ac.uk/conferences/iufro/proceedings/preisler4.pdf>. (12 March 2002).

Stochastic differential equations (SDE) have been used to analyze data from such areas as quantum physics, economics, control engineering, and epidemiology. In this presentation, we discuss the use of SDEs to characterize direction and speed of an animal's movements and to study the effects of explanatory variables (e.g., habitat characteristics) on movement patterns. Analyses of animal movements demand the use of complex models and computationally intense techniques. The use of these techniques is demonstrated by two

examples. In the first example, the tracks of female bark beetles are studied as they orient and move toward a point source emitting male pheromones. In the second example, the trajectories of radio-collared elk and deer are studied as they forage in a 9000-hectare experimental forest in Oregon.

Keywords: Bark beetle trajectories, diffusion models, elk tracks, nonparametric regression, pheromone, vector fields.

(See La Grande order form.)

Stewart, K.M.; Bowyer, R.T.; Kie, J.G.
[and others]

2002. Temporospatial distributions of elk, mule deer, and cattle: resource partitioning and competitive displacement. *Journal of Mammalogy*. 83(1): 229-244.

Elk (*Cervus elaphus nelsoni*), mule deer (*Odocoileus hemionus hemionus*), and cattle frequently co-occur on montane landscapes in the Pacific Northwest. We hypothesized that niche overlap would be greatest between introduced cattle with either of the two native herbivores because co-evolution between native elk and mule deer should have resulted in strong patterns of resource partitioning. Our analyses indicated strong differences among species in use of space, and that these three species strongly partitioned use of habitats, particularly elevation, steepness of slope, and use of logged forests. We used near-instantaneous sampling and a temporal window of the previous 7 days that included other herbivores within a spatial window surrounding the location of each animal to examine distribution of cattle, elk, and mule deer. We evaluated relative effects of resource partitioning and competitive interactions by using multiple regressions, which indicated strong avoidance over a 6-hour period among these three large herbivores. The effect was weaker for the previous 7 days.

Keywords: Elk, Cervus elaphus nelsoni, mule deer, Odocoileus hemionus hemionus, competition, competitive exclusion, free-ranging cattle, niche partitioning, Oregon.

(See La Grande order form.)

Scott, J.M.; Heglund, P.J.; Morrison, M.L.
[and others]

2002. Predicting species occurrences: issues of accuracy and scale. Washington, DC: Island Press. 868 p.

This book resulted from a conference held to discuss the status of our ability to model species distributions with regard to concerns about pattern and scale and is a compendium of research that defines the current state of our knowledge. This book is a continuation of the major effort conducted in 1984 that culminated in "Wildlife 2000: Modeling Habitat Relationships for Terrestrial Vertebrates"—an assessment of the state of our knowledge 15 years ago. This current volume evaluates the progress we have made since the publication of "Wildlife 2000." In it, the authors reiterate the need for continued support of basic and applied ecological studies of pattern and scale. Beyond that, the authors emphasize the need for measures of model accuracy when policy and management decisions are involved.

Keywords: Wildlife habitat relationships, models, population dynamics, demographics, population ecology.

(Available in bookstores and libraries.)

Tiedemann, A.R.

2000. Wildlife. In: Dissmeyer, G.E., ed. Drinking water from forests and grasslands. Gen. Tech. Rep. SRS-39. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 158-163. Chapter 15.

Wild herbivores have the potential to influence microbiological quality of wildland surface water and to render it unsafe for drinking. Free-ranging large wild herbivores may be vectors for transmission of disease organisms such as *Escherichia coli* 0157:H7 and *Giardia* complex; effects depend on physical and vegetal landscape

characteristics, hydrologic parameters (discharge, pH, temperature), type of contaminating organism, type and number of animals, use patterns of animals, mixing of domestic and wild herbivores, length of time since animals were present, and land treatment measures. Land management activities that expose surface waters may aggravate water quality problems associated with wild herbivores. It seems appropriate to examine management strategies from the perspective of maintaining the integrity of streams.

Keywords: Wildland surface water, Giardia, Escherichia coli, disease vectors.

(See La Grande order form.)

Wales, B.C.

2001. The management of insects, diseases, fire, and grazing and implications for terrestrial vertebrates using riparian habitats in eastern Oregon and Washington. *Northwest Science*. 75(Spec. issue): 119-127.

Riparian habitats in eastern Oregon and Washington make up a small percentage of the landscape, and yet these habitats are essential for many vertebrate species. Riparian areas are sensitive to disturbance agents that can pose formidable challenges to effective management of these habitats. Moreover, few studies have documented the effects of disturbance agents on riparian habitats and associated fauna. In general, disturbances from insects and disease likely have strong effects on cavity nesters and insect feeders, and use of *Bacillus thuringiensis* to control insect pests decreases the food supply for insectivores. Most fire effects on terrestrial vertebrates are through changes in habitat, food, and competitors, and responses to fire are variable and species specific. Salvage logging likely has negative effects for species

that use dead and dying trees. Livestock grazing in riparian areas can eliminate nesting substrates, alter habitat structure and composition, compact soil, trample banks, encourage cowbird range expansion, and increase exotic plants. The magnitude of these effects depends on the timing and intensity of grazing. There are almost no studies on how landscape-level vegetation patterns (including riparian corridors) contribute to the viability of wildlife populations. Managers have chosen to buffer riparian areas from harvest, spraying, and prescribed fire, but there are no decision-support tools or guidelines for management of riparian habitat for terrestrial vertebrates.

Keywords: Riparian habitat, forest health and productivity, disturbance processes, forest management.

(See La Grande order form.)

Wood Utilization

Christensen, G.A.; Julin, K.R.; Ross, R.J.; Willits, S.

2002. Volume recovery, grade yield, and properties of lumber from young-growth Sitka spruce and western hemlock in southeast Alaska. *Forest Products Journal*. 52(5): 81-87.

Wood volume recovery, lumber grade yield, and mechanical properties of young-growth Sitka spruce (*Picea sitchensis* (Bong.) Carr.) and western hemlock (*Tsuga heterophylla* (Raf.) Sarg.) were examined. The sample included trees from commercially thinned and unthinned

stands and fluted western hemlock logs obtained from a sort yard. Mean cubic recovery of lumber volume from all sawn logs was 44.9 percent. More than 90 percent of the lumber was graded as No. 2 or better; about 5 percent was Clear and about 10 percent was Select Structural. No differences in volume recovery or grade yield caused by thinning were noted for Sitka spruce logs. For western hemlock, more volume was recovered from trees in unthinned stands; more Select Structural and No. 1 lumber and less No. 2 lumber were produced from thinned stands. No differences in volume recovery or grade yield were noted between fluted and unthinned western hemlock. Bending properties were found to be excellent for this resource. All grades for both species exceeded or matched published bending modulus of elasticity values for these species. No differences in modulus of elasticity were noted between thinned and unthinned lumber from both species. Slightly higher modulus of elasticity values were noted in fluted western hemlock for the No. 1 and No. 2 lumber grades. Lumber from this young-growth resource appears best suited for structural light framing or molding and mill work based on visual grading rules grades and mechanical properties observed.

Keywords: Volume recovery, lumber properties, fluting, young growth, Sitka spruce, Picea sitchensis, western hemlock, Tsuga heterophylla.

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