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# Recent Publications of the Pacific Northwest Research Station, Second Quarter, 2005

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**Pacific Northwest Research Station**

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## Aquatic/Riparian Systems

### 04-245

**Stolnack, S.A.; Bryant, M.D.; Wissmar, R.C.**

**2005.** A review of protocols for monitoring streams and juvenile fish in forested regions of the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-625. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 36 p.

This document reviews existing and proposed protocols used to monitor stream ecosystem conditions and responses to land management activities in the Pacific Northwest. Because of recent work aimed at improving the utility of habitat survey and fish abundance assessment methods, this review focuses on current (since 1993) monitoring efforts that assess stream habitat conditions and juvenile fish use. It does not focus on protocols specifically intended to monitor trends in fish populations for salmon recovery efforts, other fish life-history stages (e.g., salmonid smolt monitoring or spawner surveys), or approaches designed to monitor water quality or sources of pollution. We provide an overview of agency monitoring protocols, adaptive management, and types of monitoring, and briefly review the core habitat characteristics thought to be most sensitive to forest management practices. Finally, we summarize a selection of protocols in use in the Pacific Northwest in light of those core habitat characteristics.

***Keywords:*** *Monitoring, aquatic habitat, riparian ecosystems, adaptive management, forest practices.*

## Bibliographies

### 05-030

**Pacific Northwest Research Station.**

**2005.** Recent publications of the Pacific Northwest Research Station, first quarter 2005. Portland, OR: U.S. Department of Agriculture, Forest Service. 22 p.

***Keywords:*** *Bibliographies (forestry).*

## Economics

### 04-329

**Becker, D.R.; Hjerpe, E.E.; Lowell, E.C.**

**2004.** Economic assessment of using a mobile Micromill® for processing small-diameter ponderosa pine. Gen. Tech. Rep. PNW-GTR-623. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 40 p.

An economic assessment of an SLP5000 Diesel Micromill® was conducted to determine the maintenance and operation costs and the logistics of a mobile sawmill used to process small-diameter ponderosa pine. The Micromill® was first introduced in 1997 and has since received considerable attention. In 2003, the USDA Forest Service, Pacific Northwest Research Station conducted a detailed financial analysis of a Micromill® in Escalante, Utah. Productive and nonproductive times were recorded, and the feasibility and logistics of periodically moving the mill closer to the raw material source were assessed in terms of delivered log costs and mobilization costs. Product volume and grade recovery were collected to examine market options. Results of the analysis indicate that cashflow, support equipment, delivered log costs, and product markets significantly affect the financial viability of a mobile Micromill® enterprise.

***Keywords:*** *Small-diameter ponderosa pine utilization (Southwest), economic assessment, small-log mobile processing.*

### 04-268

**Cantrell, R.A.**

**2005.** Assessing the volume of wood products used to build and maintain recreational structures on the Tongass National Forest: potential opportunities for Alaska wood products substitution. Gen. Tech. Rep. PNW-GTR-621. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 20 p.

Although the Tongass National Forest (TNF) possesses abundant stands of redcedar (*Thuja plicata* Donn), yellow-cedar (*Chamaecyparis nootkatensis* (D. Don) Spach), Sitka spruce (*Picea sitchensis* (Bong.) Carr.), and western

hemlock (*Tsuga heterophylla* (Raf.) Sarg), most of its buildings, bridges, and trails are constructed from imported materials. The costs incurred in importing lumber building materials to the TNF seemingly could be offset by manufacturing a slightly more costly product from within the region. To better understand the potential opportunities forgone by southeast Alaska's lumber manufacturers, this study explores the market volume of wood products required to build and maintain the recreational structures (buildings, bridges, and trails) on TNF. Findings suggest that after accounting for the estimated 23 percent of native materials used in train construction, the wood products market potential arisisng from an additional 77-percent Alaska wood species substitution could be, on average, about 1.1 million board feet annually. This volume represents 1.3 percent of the regional output for 2000 and increases overall demand in southeast Alaska by 13.9 percent for this same period. These same figures for 2002 are more dramatic with the TNF potential consumption representing 2.8 percent of the region's output and increasing its overall demand by 57 percent.

***Keywords:*** *Buildings, trails, trailways, pedestrian bridges, utility bridges, structures, infrastructure.*

## 04-330

**Daniels, J.M.**

**2005.** The rise and fall of the Pacific Northwest log export market. Gen. Tech. Rep. PNW-GTR-624. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 80 p.

For decades, softwood log exports were an important component of international wood products trade from the Pacific Northwest (PNW) region of the United States. Log exports to the Pacific Rim began in earnest after the Columbus Day Storm of 1962 generated billions of board feet of salvaged timber. This market was maintained and expanded owing to Japan's demand for high-quality logs for its construction industry. Contentious debate surrounding disproportionate gains and losses to forest product market participants in the PNW (timber owners, mill owners, communities, and consumers) led to government intervention and restriction of volumes available for export. The debate ended and the market declined as a result of three factors: reductions in timber harvesting from PNW forests, changes in Asia's demand, and globalization of wood markets. These changes with implications for trade and timber market participants are discussed.

***Keywords:*** *Log exports, forest products trade, softwood log trade, Japan, globalization, Pacific Northwest trade, spotted owl.*

# Ecosystem Structure and Function

## 04-049

**Mellen, K.; Marcot, B.G.; Ohmann, J. [and others]**

**2004.** DecAID: the decayed wood advisor for managing snags, partially dead trees, and down wood for biodiversity in forests of Washington and Oregon [Brochure]. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. [Irregular pagination]. http://wwwnotes.fs.fed.us:81/pnw/DecAID/DecAID.nsf. (March 4, 2005).

This brochure introduces DecAID Advisor, an Internet-accessible advisory system for managing snags, down wood, and other wood decay elements for biodiversity in forests of Washington and Oregon. The brochure addresses the intent, content, and use of DecAID Advisor and provides its Web site address.

***Keywords:*** *DecAid, down wood, coarse woody debris, expert system, forest management, forest wildlife, forest inventory, forest insects, forest pathogens, forest fungi, soil productivity.*

# Fire

## 04-366

**Peterson, D.L.; Johnson, M.C.; Agee, J.K.; Jain, T.B.; McKenzie, D.; Reinhardt, E.D.**

**2005.** Forest structure and fire hazard in dry forests of the Western United States. Gen. Tech. Rep. PNW-GTR-628. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 30 p.

Fire, in conjunction with landforms and climate, shapes the structure and function of forests throughout the Western United States, where millions of acres of forest lands contain accumulations of flammable fuel that are much higher than historical conditions owing to various forms of fire exclusion. The Healthy Forests Restoration Act mandates that public land managers assertively address this situation through active management of fuel and vegetation. This document synthesizes the relevant scientific knowledge that can assist fuel-treatment projects on national forests and other public lands and contribute to National Environmental Policy Act analyses and other assessments. It is intended to support science-based decisionmaking for fuel management in dry forests of the Western United States at the scale of forest stands (about 1 to 200 acres). It highlights ecological principles that need to be considered when managing forest fuel and vegetation for specific conditions related to forest structure and fire hazard. It also

provides quantitative and qualitative guidelines for planning and implementing fuel treatments through various silvicultural prescriptions and surface-fuel treatments. Effective fuel treatments in forest stands with high fuel accumulations will typically require thinning to increase canopy base height, reduce canopy bulk density, reduce canopy continuity, and require a substantial reduction in surface fuel through prescribed fire or mechanical treatment or both. Long-term maintenance of desired fuel loadings and consideration of broader landscape patterns may improve the effectiveness of fuel treatments.

***Keywords:*** *Crown fire, fire hazard, forest structure, fuel treatments, prescribed burning, silviculture, thinning.*

# Forest Management

## 04-138

**Deal, R.L.; White, S.M., eds.**

**2005.** Understanding key issues of sustainable wood production in the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-626. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 67 p.

Researchers involved with the Pacific Northwest (PNW) Research Station Sustainable Wood Production Initiative have outlined some of the barriers and opportunities for sustainable wood production in the region. Sustainable wood production is defined as the capacity of forests to produce wood, products, and services on a long-term basis and in the context of human activity and use. The collective findings of these papers suggest that in the future, the region's wood supply will primarily come from private land, and the barriers and opportunities related to sustainable wood production will have more to do with future markets, harvest potential, land use changes, and sustainable forestry options than with traditional sustained yield outputs. Private lands in the PNW should be able to sustain recent historical harvest levels over the next 50 years, but regional changes in sawmilling capacity and uncertain market conditions may affect wood production in the region. Public perceptions of forestry, land use changes, and alternative forestry options also are discussed. These papers present preliminary findings and proposals for future work designed to help us understand the key issues related to sustainable wood production.

***Keywords:*** *Pacific Northwest, sustainable forestry, wood production, timber harvest, land use changes, economics.*

## 05-068

**Haynes, R.W.**

**2005.** Economic feasibility of longer management regimes in the Douglas-fir region. Res. Note PNW-RN-547. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 14 p.

The financial returns associated with extended management regimes have been the subject of recurring debate in the Pacific Northwest. Proponents argue that the amount and value of higher quality timber associated with older trees will offset the costs associated with longer management regimes. Land managers and owners express concerns about diminished financial returns depending on the expected costs of holding timber for long periods. The increase in average lumber prices for high-quality timber is insufficient, on average, to offset the costs of longer management regimes. On public land, where ownership continuity is assured and the requirement for positive rates of return is less, longer management regimes may be attractive when they involve the joint production of various public goods such as wildlife habitat and scenery.

***Keywords:*** *Forest management, economic feasibility, management regimes.*

# Mycology

## 05-042

**Wurtz, T.L.; Wiita, A.L.; Weber, N.S.; Pilz, D.**

**2005.** Harvesting morels after wildfire in Alaska. Res. Note PNW-RN-546. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 31 p.

Morels are edible, choice mushrooms that sometimes fruit prolifically in the years immediately after an area has been burned by wildfire. Wildfires are common in interior Alaska; an average of 708,700 acres burned each year in interior Alaska between 1961 and 2000, and in major fire years, over 2 million acres burned. We discuss Alaska's boreal forest environment, describe what is known about the ecology of morels that fruit after fire, and report the morel productivity of three recently burned areas in Alaska. In addition, we describe the results of a series of indepth interviews on the commercial harvest of morels in the Pacific Northwest, western Canada, and Alaska, including information on current harvests, the potential for and constraints to development of an Alaskan morel

industry, and potential resource management and business development implications.

***Keywords:*** *Morel,* Morchella*, Alaska, wildfire, mushrooms, commercial harvest, nontimber forest products, special forest products.*

# Resource Inventory

## 04-509

**Waddell, K.L.; Barrett, T.M.**

**2005.** Oak woodlands and other hardwood forests of California, 1990s. Resour. Bull. PNW-RB-245. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 94 p.

This report provides a multiownership assessment of oak woodlands and other hardwood forests in California, excluding only reserved lands outside of national forests. Because sampling intensity on woodlands was doubled from the previous 1981–84 inventory, and because national forests were inventoried, this is the most complete assessment to date for California hardwoods. Tables provide estimates for hardwood forest type area, hardwood volume, biomass, numbers of trees, change in forest area, growth, harvest, and mortality. The dates of the inventories used in the assessment, 1991–94 for unreserved lands outside national forests and 1994–2000 for national forests, also allowed an assessment of pre-epidemic conditions for susceptible tree species and forests in a 12-county area affected by sudden oak death.

***Keywords:*** Quercus*, oaks, forest monitoring, rangelands, oak woodlands, forest inventory, hardwoods.*

# Social Science

## 04-492

**Haynes, R.W.**

**2005.** Developing an agenda to guide forest social science, economics, and utilization research. Gen. Tech. Rep. PNW-GTR-627. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 53 p.

The USDA Forest Service has had a longstanding presence in utilization, economics, and social science research and development activities. The magnitude and diversity of these activities have changed as the questions and who is asking them have changed over the past century. These changes challenge the social science and utilization research community to develop this collective vision for utilization, economics, and social science research and development activities conducted by the Forest Service. It deals with the need to balance knowledge creation with the constantly changing demands for information that guide various land management decisions and shape policymaker perceptions in various environmental debates. The vision is built around six common thematic lines that will help us create a larger pool of experience from which we can form judgments relative to outcomes and develop tools that can be used to solve a variety of different problems. It assumes that the worth of utilization, economics, and social sciences research and development activities will be judged by our ability to create lasting solutions that alter outcomes. Finally, creating and implementing such a vision depends on leaders who can advocate for problem selection that recognizes the full integrated nature of contemporary questions, who can synchronize research oriented toward major questions with knowledge creation, and who can serve as defenders of social science research against ideological attacks by emphasizing the true nature of questions and the importance of taking integrative approaches.

***Keywords:*** *Research direction, program formulation, research leadership.*

# Wildlife

## 05-054

**Bull, E.L.; Clark, A.A.; Shepherd, J.F.**

**2005.** Short-term effects of fuel reduction on pileated woodpeckers in northeastern Oregon—a pilot study. Res. Pap. PNW-RP-564. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 17 p.

To determine the short-term effects (1 to 3 years post-treatment) of fuel reduction on pileated woodpeckers (*Dryocopus pileatus*) in northeastern Oregon, we compared measures of abundance of logs, snags, stumps, and of woodpecker foraging in mixed-conifer stands that had undergone the following treatments: prescribed burning after mechanical fuel reduction, mechanical fuel reduction without prescribed burning, or no treatment. Pileated woodpecker foraging was significantly more abundant in the stands that were not treated or had mechanical fuel reduction only. Ants, the primary prey of pileated woodpeckers, were also significantly more abundant in these stands.

***Keywords:*** *Fuel reduction, prescribed burns, pileated woodpecker, northeastern Oregon, ants, snags, logs.*

## 05-026

**Bull, E.L.; Heater, T.W.; Clark, A.A. [and others]**

**2005.** Influence of precommercial thinning on snowshoe hares. Res. Pap. PNW-RP-562. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 16 p.

Relative abundance, survival, home range, and habitat use of snowshoe hares (*Lepus americanus*) were evaluated in five precommercial thinning treatments in lodgepole pine (*Pinus contorta* Dougl. ex Loud.) stands in northeastern Oregon between June 2000 and July 2003. A combination of track surveys, trapping grids, and radiocollared hares was used to evaluate these characteristics. Relative abundance of snowshoe hare tracks was highest in unthinned control stands and lowest in the recently thinned stands. The highest abundance of snowshoe hares in trapping grids occurred in patch cuts (10-m-wide cuts interspersed with unthinned patches 10 to 30 m wide). Hare home ranges were smallest in the patch cuts. Habitat use changed seasonally, with hares using denser stands during summer and more open stands in winter. In the short term, the patch cut appeared to provide the best hare habitat of the treatments investigated.

***Keywords:*** *Fuel reduction,* Lepus americanus*, northeastern Oregon, snowshoe hare, thinning.*

# Wood Utilization

## 04-050

**Hovgaard, A.; Hansen, E.; Roos, J.**

**2005.** Innovation in the forest products industry: an analysis of companies in Alaska and Oregon. Gen. Tech. Rep. PNW-GTR-629. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 53 p.

The objectives of this study were to understand the process and definition of innovation in the forest products industry, identify the constraints on innovative activities, identify resources that would improve innovation in forest products companies, compare the innovation environments in Alaska and Oregon, and provide a benchmark study for innovation in the forest products industry.

This study revealed that there are several aspects of innovation in the forest products industry. In addition, the innovation process is a combination of semiformal development stages, trial and error, intuition, and luck. A variety of factors constrained companies from being more innovative, including government regulations, shipping and labor costs, lack of cash flow, raw material characteristics, marketing expertise, and raw material supply. There do not appear to be any resources that would be helpful to forest products companies, at least none that the interviewed companies could recommend. Offering companies the chance to exchange ideas and network is the most valuable resource available.

The innovation environments in Alaska and Oregon are somewhat similar yet different in the marketing tactics employed and the techniques used to obtain market information. Furthermore, the type of innovation projects that each region focuses on differs, as does the actual process used to develop innovations. Future research should focus on completing a quantitative component to this study, developing short courses or 1-day seminars, identifying factors that contribute to innovation success and failure, investigating why the forest products industry is not innovative by nature, and exploring the external acquisition of innovation in the forest products industry.

***Keywords:*** *Innovation, forest products, marketing, lumber, forest products marketing.*

## 05-060

**Nicholls, D.L., comp.**

**2005.** Proceedings: linking healthy forests and communities—successful strategies and future directions. Gen. Tech. Rep. PNW-GTR-631. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51 p.

The Linking Healthy Forests and Communities conference brought together a diverse group representing government agencies, traditional forest users, landholders, scientists, and small enterprises and other businesses related to nontimber forest products. The purpose was to exchange information, encourage cooperation, and raise awareness of environmentally and economically viable wood-products-related opportunities in Alaska. These proceedings include extended summaries of presentations by speakers and panelists at the conference. Summaries were compiled and edited by the USDA Forest Service, Alaska Wood Utilization Research and Development Center.

***Keywords:*** *Forest products industry, value-added wood products, nontimber forest products, manufacturing, marketing, Alaska.*

# Publications Available Elsewhere

The following publications are available through interlibrary loan, by writing to the locations indicated, or by using the form indicated. Many journal articles are available on our Web site at http://www.fs.fed.us/pnw/publications/nonstation.shtml.

## Aquatic and Riparian Systems

**Johnson, S.L.**

**2004.** Factors influencing stream temperatures in small streams: substrate effects and a shading experiment. Canadian Journal of Fisheries and Aquatic Sciences. 61: 913–923.

Stream temperature is an important control of many biotic processes, especially in streams. Confusion and controversy exist concerning the role of shade on stream temperature, especially for forest harvest or water quality discussions. In this paper, I examine the response of a second-order stream to experimental shading and model the findings into a stream heat budget. In addition, I show the influence of type of substrate on stream temperature, where the bedrock reach has wide diurnal fluctuations and the downstream reach with hyporheic flows dampens those extremes. These findings are unique within the literature and highlight important processes that exist within most streams but are often masked by interactions with other processes.

***Keywords:*** *Aquatic ecosystems, microclimate, solar radiation, air temperature, energy budget, water quality, water temperature.*

(See Corvallis order form.)

**Reeves, G.H.; Burnett, K.M.; McGarry, E.V.**

**2003.** Sources of large wood in the main stem of a fourth-order watershed in coastal Oregon. Canadian Journal of Forest Research. 33: 1363–1370.

We compared the contribution of large wood from different sources and wood distributions among channel zones of influence in a relatively pristine 4$^{th}$-order watershed in the central Coast Range of Oregon. Our results suggested that previous studies examining only streamside sources of wood might have limited applications when designing and evaluating riparian management approaches in landslide-prone areas. The results also suggest a possible reason for the decline of large wood in streams in the Pacific Northwest.

***Keywords:*** *Large wood, riparian ecosystems, landslides.*

(See Corvallis order form.)

**Webster, J.R.; Mulholland, P.J.; Tank, J.L. [and others].**

**2003.** Factors affecting ammonium uptake in streams—an inter-biome perspective. Freshwater Biology. 48: 1329–1352.

The Lotic Intersite Nitrogen eXperiment (LINX) was a coordinated study of the relations between North American biomes and factors governing ammonium uptake in streams. Our objective was to relate inter-biome variability of ammonium uptake to physical, chemical, and biological processes. Data were collected from 11 streams ranging from arctic to tropical and from desert to rainforest. Measurements at each site included physical, hydraulic, and chemical characteristics, biological parameters, whole-stream metabolism, and ammonium uptake. Ammonium uptake was measured by injection of 15N-ammonium and downstream measurements of 15-N ammonium concentration. We found no general, statistically significant relations that explained the variability in ammonium uptake among sites. This approach, however, ignores the complexity of multiple mechanisms of ammonium uptake in streams. As an alternative approach, we estimated biological demand for inorganic nitrogen based on our measurements of instream metabolism. Results showed good correspondence between calculated nitrogen demand and measured assimilative nitrogen uptake. The relative constancy of nitrogen uptake reflects the metabolic balance among streams in a variety of distinctly different biomes (autotrophic production is high where allochthonous inputs are relatively low and vice versa) and reinforces the close ties between streams and their riparian vegetation.

***Keywords:*** *Aquatic ecosystems, nitrogen cycling, water chemistry.*

(See Corvallis order form.)

# Bibliographies

**Olson, D.**

**2003.** Literature cited 101. The Murreletter. 11(3): 2–4.

Scientific writing practices are not well documented or taught. Ten topics are described that represent commonly observed errors in the citations of scientific literature.

***Keywords:*** *Referencing, literature cited, citations.*

(See Corvallis order form.)

# Biometrics

**McGaughey, R.J.; Carson, W.W.**

Fusing LIDAR data, photographs, and other data using 2D and 3D visualization techniques. In: Proceedings: terrain data—applications and visualization—making the connection [CD]. [Bethesda, MD]: American Society for Photogrammetry and Remote Sensing.

The forestry program at Fort Lewis, Washington, requires measurement of shrubs, understory, and overstory canopy cover to monitor vegetation response to various management approaches. At present, these measurements are acquired through field-based procedures. Direct, three-dimensional measurements of forest canopy structure and underlying terrain surface can be provided by LIDAR. Cover measurements based on LIDAR data can be related to forest vegetation cover. This study was carried out to determine the utility of small-footprint, discrete-return LIDAR for estimation of forest canopy cover at Fort Lewis. Structural measures based on LIDAR were compared to spatially explicit field measurements acquired from inventory plots.

***Keywords:*** *LIDAR, airborne laser scanning, remote sensing, forest structure.*

(See PFWSL order form.)

**McGaughey, R.J.; Carson, W.W.; Reutebuch, S.E.; Anderson, H.-E.**

**2004.** Direct measurement of individual tree characteristics from LIDAR data. In: ASPRS annual conference proceedings [CD]. [Bethesda, MD]: American Society for Photogrammetry and Remote Sensing.

This paper provides an overview of approaches and software used for forest stand and landscape visual simulations. The Stand Visualization System (SVS) and EnVision landscape visualization system are described. Examples of SVS and EnVision visual simulation results for stand and landscape silvicultural treatments are presented.

***Keywords:*** *Landscape visualization, stand visualization, silvicultural options.*

(See PWFSL order form.)

**Melson, S.; Azuma, D.; Fried, J.S.**

**2003.** A first look at measurement error on FIA plots using blind plots in the Pacific Northwest. In: McRoberts, R.E.; Reams, G.A.; Van Deusen, P.C.; Moser, J.W., eds. Proceedings of the 3rd annual Forest Inventory and Analysis symposium. Gen. Tech. Rep. NC-230. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station: 11–20.

Measurement error in the Pacific Northwest Forest Inventory and Analysis inventory was estimated with a recently implemented blind plot measurement protocol. A small subset of plots was revisited by a crew having limited knowledge of the first crew's measurements. This preliminary analysis of the first 18 months' blind plot data indicates that ranges of variation can be quite large. When blind plot results were summarized to facilitate comparisons with established tolerance standards, we found that diameters for trees greater than 20 in diameter at breast height (d.b.h.), heights for trees less than 60 ft tall, and counts of down wood pieces do not meet standards in over 10 percent of the cases. However, azimuths for condition class boundaries, diameters for trees less than 20 in d.b.h., heights for trees over 60 ft tall, and understory vegetation cover estimates by life form were within tolerance at least 90 percent of the time.

***Keywords:*** *Repeatability, forest inventory, quality control and assurance, precision and accuracy standards.*

(See Portland order form. The complete general technical report is available at http://www.treesearch.fs.fed.us.)

**Yang, Y.; Monserud, R.A.; Huang, S.**

**2004.** An evaluation of diagnostic tests and their roles in validating forest biometric models. Canadian Journal of Forest Research. 34: 619–629.

Model validation is an important part of model development. It is performed to increase the credibility and to gain sufficient confidence about a model. This paper evaluated the usefulness of 10 statistical tests, 5 parametric and 5 nonparametric, in validating forest biometric models. The five parametric tests are the paired *t* test, the $X^2$ test, the separate *t* test, the simultaneous *F* test, and the novel test. The five nonparametric tests are the Brown-Mood test, the

Kolmogorov-Smirnov test, the modified Kolmogorov-Smirnov test, the sign test, and the Wilcoxon signed-rank test. Nine benchmark data sets were selected to evaluate the behavior of these tests in model validation; three were collected from Alberta and six were published elsewhere. It was shown that the usefulness of statistical tests in model validation is very limited. None of the tests seems to be generic enough to work well across a wide range of models and data. Each model passed one or more tests, but not all of them. Because of this, caution should be exercised when choosing a statistical test or several tests together to try to validate a model. It is important to reduce and remove any potential personal bias in selecting a favorite test, which can influence the outcome of the results.

***Keywords:*** *Forest biometric models.*

(See Portland order form.)

## Economics

**Fight, R.D.; Pinjuv, G.L.; Daugherty, P.J.**
**2004.** Small-diameter wood processing in the southwestern United States: an economic case study and decision analysis tool. Forest Products Journal. 54(5): 85–89.

A materials balance flow diagram was created for a producer of small roundwood products that showed the products and byproducts that resulted when a log was allocated to production of a final product. This was converted into a spreadsheet model that included the product yields, processing rates, processing costs, and sales revenue. This model was used to evaluate the allocation of ponderosa pine logs with different characteristics to various final products to determine the highest value use of different types of logs and the relative value of different products in the product line.

***Keywords:*** *Roundwood, manufacturing, ponderosa pine, decision analysis.*

(See Portland order form.)

**Haynes, R.**
**2003.** Economic analysis in support of broad scale land management strategies. Forest Policy and Economics. 5: 361–371.

The United States has a century of experience with the development of forest policies that have benefited from or been influenced by economic research activities in the forest sector. At the same time, increasing rigor in policy debates stimulated economics research. During the past four decades, economic research has evolved to include increased understanding of consumer demands, producer behavior, landowner behavior, and timber resource conditions. Bioeconomic models have evolved that combine economic and resource models; these have been used in the United States to provide the basis for forecasting resource and market trends and to shape public perceptions. Economics research has also contributed frameworks for policy analysis by using approaches like scenario planning to help decisionmakers gauge uncertainty.

***Keywords:*** *Forest policy history, forest sector modeling, policy analysis, supply, demand.*

(See Portland order form.)

## Economics in Forest Management

**Hesseln, H.; Loomis, J.B.; González-Cabán, A.; Alexander, S.**
**2003.** Wildfire effects on hiking and biking demand in New Mexico: a travel cost study. Journal of Environmental Management. 69: 359–368.

Travel cost surveys on 10 sites within the national forests in New Mexico were conducted to determine the effects of fire on recreation demand and benefits for people engaging in hiking and mountain biking activities. The average travel distance to each site was 228 miles, and the average gas cost per person was $28. By using a count-data individual-observation travel cost demand model, the net economic benefit (e.g., consumer surplus) was estimated to be $93 per trip for both hikers and mountain bikers. Hikers averaged 2.6 trips per year, whereas mountain bikers took an average of 6.2 trips. The presence of crown fires significantly reduced the number of trips taken, but not the consumer surplus. Older crown fires increased the demand for recreation in the area. Fire age of light or prescribed fires had no significant effect on demand or consumer surplus. Reducing the risk of crown fires by using prescribed burning would seem to be a benefit change in forest management from the recreation standpoint.

***Keywords:*** *Recreation demand, travel cost method, wildfire, prescribed fire.*

(See Station Headquarters order form.)

# Ecosystem Structure and Function

**Lenihan, J.M.; Drapek, R.; Bachelet, D.; Neilson, R.P.**
**2003.** Climate change effects on vegetation distribution, carbon, and fire in California. Ecological Applications. 13(6): 1667–1681.

The objective of this study was to dynamically simulate the response of vegetation distribution, carbon, and fire to historical climate and to two contrasting scenarios of climate change in California. The results of the simulations for the historical climate compared favorably to independent estimates and observations, but validation was complicated by lack of land use effects in the model. The response to increasing temperatures was a shift in dominance from needle-leaved to broad-leaved life forms. Simulated responses to precipitation were complex. Because of the potentially large impact on climate change on California ecosystems, there is a need for further use and development of dynamic vegetation models that use various ensembles of climate-change scenarios.

***Keywords:*** *Climate change, California, simulation, vegetation distribution, carbon, fire.*

(See Corvallis order form.)

**Moore, G.W.; Bond, B.J.; Jones, J.A. [and others]**
**2004.** Structural and compositional controls on transpiration in 40- and 450-year-old riparian forests in western Oregon, USA. Tree Physiology. 24: 481–491.

This study examined the effects on transpiration of structural and compositional differences between young (about 40 years since disturbance) and old (about 450 years since disturbance) forests at the H.J. Andrews Experimental Forest on the west side of the Cascade Range in Oregon. Sap flow measurements were used to evaluate the degree to which differences in age and species composition affect water use. We estimated that transpiration per hectare was 3.27 times greater in the young stand during the growing season. Age had the greatest effect on stand differences, followed by differences in sapwood basal area, and finally species composition.

***Keywords:*** Pseudotsuga menziesii, Tsuga heterophylla, Alnus rubra, *xylem sap flow, riparian vegetation.*

(See Corvallis order form.)

**Turner, D.P.; Ritts, W.D.; Cohen, W.B. [and others]**
**2003.** Scaling gross primary production (GPP) over boreal and deciduous forest landscapes in support of MODIS GPP product validation. Remote Sensing of Environment. 88: 256–270.

Global estimates of 8-day mean daily gross primary production (GPP) at the 1-km spatial resolution are now operationally produced by the MODIS land science team for the global terrestrial surface by using a production efficiency approach. In this study, the 2001 MODIS GPP product was compared with scaled GPP estimates based on ground measurements at two forested sites. At the hardwood forest site, the MODIS GPP phenology started earlier than was indicated by the scaled GPP, and the summertime GPP from MODIS was generally lower than the scaled GPP values. The fall-off in production at the end of the growing season was similar to the validation data. At the boreal forest site, the GPP phenology also tended to anticipate the actual spring initiation of GPP. The midsummer MODIS GPP was generally higher than the ground-based GPP. The differences between the MODIS GPP products and the ground-based GPPs were driven predominantly by differences in the timing of FPAR (fraction of photosynthetically active radiation absorbed by vegetation) and the magnitude of light use efficiency rather than from differences in other inputs ot the MODIS GPP algorithm—daily incident PAR (photosynthetically active radiation, minimum temperature, and vapor pressure deficit.

***Keywords:*** *Carbon cycling.*

(See Corvallis order form.)

**Tyler, M.W.; Peterson, D.L.**
**2004.** Effects of forest policy on landscape pattern of late-seral forest of the Western Olympic Peninsula, Washington. Agriculture, Ecosystems and Environment. 101: 289–306.

Forest harvest policies and regulations in the Pacific Northwest region of the United States have changed considerably across all land ownerships over the last 25 years, primarily in response to threatened and endangered species. Before adopting new forest practice rules, Washington state considered three alternatives and their contributions to riparian habitat. This paper projected the effects of the three alternatives on private lands 200 years into the future and compared the resulting distribution of late-seral forest across the western Olympic Peninsula. Our

analysis framework will be useful for evaluating the effects of alternative management scenarios on landscape pattern across broad geographic areas with complex ownership.

***Keywords:*** *Forest practices, forest rules, endangered species, late-seral forest, Olympic Peninsula, Washington state.*

(See PWFSL order form.)

## Fire

**Hessl, A.E.; McKenzie, D.; Schellhaas, R.**
**2004.** Drought and Pacific Decadal Oscillation linked to fire occurrence in the inland Pacific Northwest. Ecological Applications. 14(2): 425–442.

We investigated relations between composite fire histories and Palmer Drought Severity Index, Pacific Decadal Oscillation (PDO), and El Niño/Southern Oscillation (ENSO) in dry forest ecosystems of the inland Pacific Northwest. Fires tended to occur during dry summers and during the positive phase of the PDO. Cross-spectral analysis indicates that percentage of trees scarred by fire and the PDO are spectrally coherent at 47 years, the approximate cycle of the PDO. Similarly, the percentage scarred and ENSO are spectrally coherent at 6 years, the approximate cycle of the ENSO. Other results, however, suggest that ENSO was only a weak driver of fire occurrence in the past three centuries. We suggest that long-term fire planning with the PDO may be possible in the Pacific Northwest, allowing decadal-scale management of fire and vegetation.

***Keywords:*** *Drought, climate change, dendrochronology, Columbia River, Pacific Decadal Oscillation.*

(See PWFSL order form.)

**Huang, S.; Monserud, R.A.; Braun, T.; Lougheed, H.; Bakowsky, O.**
**2004.** Comparing site productivity of mature fire-origin and post-harvest juvenile lodgepole pine stands in Alberta. Canadian Journal of Forest Research. 34(6): 1181–1191.

Twenty-two paired-plot sample locations of the 1987 Udell-Dempster study were revisited to re-examine the site indices of fire-origin and adjacent naturally regenerated lodgepole pine (*Pinus contorta* var. *latifolia* Engelm.) stands occurring on the same physiographic sites. The naturally regenerated stands followed harvesting and drag scarification, whereas the fire-origin stands received no stand treatment. Results showed that the site index of naturally regenerated stands was 27 percent to 35 percent higher than that of the fire-origin stands. Calculation of the rate of change in site index indicated that the site index estimates of regenerated stands were stable after 5 years breast-height age was reached. This suggests that the increase in site index in regenerated stands is not a short-term artifact but a sustained gain that will be maintained over time. Simulations of regenerated yield based on the Alberta growth-and-yield projection system for lodgepole pine suggested that the increase in regenerated site index will likely result in substantial gains in the mean annual increment and total yield of regenerated stands in the study area. The results of this study indicate that regenerated lodgepole pine stands are growing significantly faster than their fire-origin counterparts on equivalent sites.

***Keywords:*** *Regeneration, lodgepole pine,* Pinus contorta.

(See Portland order form.)

**Keane, R.E.; Cary, G.J.; Davies, I.D. [and others]**
**2004.** A classification of landscape fire succession models: spatial simulations of fire and vegetation dynamics. Ecological Modelling. 179: 3–27.

A classification of spatial simulation models of fire and vegetation dynamics is presented. The classification was developed to provide a foundation for comparing models and to help identify the appropriate fire and vegetation processes and their simulation to include in coarse-scale DGVMs. Other uses include a decision tool for research and management applications and a vehicle to interpret differences between landscape fire succession models (LFSMs). The classification is based on the four primary processes that influence fire and vegetation dynamics: fire ignition, fire spread, fire effects, and vegetation succession. Forty-four LFSMs are rated by the authors and classified by using various ordination and clustering techniques.

***Keywords:*** *Fire, vegetation dynamics, spatial simulations, classification, management.*

(See Corvallis order form.)

**Long, C.J.**

**2003.** Holocene fire and vegetation history of the Oregon Coast Range, USA. Eugene, OR: University of Oregon. 131 p. Ph.D. dissertation.

High-resolution charcoal and pollen analyses of lake sediments were undertaken at three lakes to reconstruct the fire and vegetation history of the Oregon Coast Range for the last 9,000 years. Fire episodes were more frequent or near present rates during the early Holocene (ca 9,000 to 65,000 calendar years B.P.) as a result of warmer, drier summer conditions than at present. As conditions become cooler and wetter in the late Holocene (ca 6,500 calendar years B.P. to present), fire-return intervals lengthened and fire-sensitive taxa, such as *Tsuga heterophylla*, *Thuja plicata*, and *Picea sitchensis* increased in abundance. The paleoecological records suggest that fire has been an important disturbance in seasonal rain forests and variations in fire activity respond to changes in climate on multiple time scales.

***Keywords:*** *Fire history, vegetation history, Coast Range, landscape dynamics.*

(Only available through library or interlibrary loan.)

**McKenzie, D.; Prichard, S.; Hessl, A.E.; Peterson, D.L.**

**2004.** Empirical approaches to modeling wildland fire in the Pacific Northwest region of the United States. In: Perera, A.H.; Buse, L.J.; Weber, M.G., eds. Emulating natural forest landscape disturbances: concepts and applications. New York: Columbia University Press: 85–97. Chapter 7.

Spatially explicit models of fire and succession that are applied at landscape scales require large amounts of empirical data as inputs, but existing data are rarely adequate. Differing accuracies, resolutions, extents, and spatial patterns often limit the effectiveness of simple aggregations of raw data. Statistical models of the associations between one or more potential input layers can provide a more rigorous method for providing useful input data for simulation models. By using four existing studies conducted at different spatial and temporal scales, we illustrate a range of techniques for linking empirical research to landscape modeling by capturing the spatial and temporal variation in parameters defining associations among climate, fire regimes, and fuels and vegetation. Parameters are obtained by qualitative, semiqualitative, or fully quantitative methods, depending on the extent and resolution of the application or simulation model, and the quality of raw data. Linking empirical studies with process-based models takes advantage of the strengths of both approaches for a better understanding of fire disturbance on heterogeneous landscapes.

***Keywords:*** *Empirical models, landscape modeling, fire, succession, rule-based models.*

(Available from bookstores and libraries.)

**Ottmar, R.D.; Sandberg, D.V.**

**2003.** Predicting forest floor consumption from wildland fire in boreal forests of Alaska—preliminary results. In: Galley, K.E.M.; Klinger, R.C.; Sugihara, N.G., eds. Proceedings of Fire Conference 2000: the first national congress on fire ecology, prevention, and management. Misc. Publ. 13. Tallahassee, FL: Tall Timbers Research Station: 218–224.

Forest floor reduction was measured on 14 black spruce, white spruce, and birch-aspen prescribed burns in Alaska between 1990 and 1999. Three of the sites were part of the large international FrostFire project near Fairbanks. Several empirically derived predictive equations have been developed, one of which is presented in this report. The double parameter equation uses upper forest floor fuel moisture content and preburn forest floor depth as independent variables. The fuel moisture content of the upper forest floor can be obtained by collecting forest floor samples, oven drying, and weighing to determine a gravimetric fuel moisture content. The preburn forest floor depths require the onsite collection of measurements.

***Keywords:*** *Forest floor consumption, forest floor reduction, wildland fire, boreal forest.*

(See PWFSL order form.)

**Reinhardt, T.E.; Ottmar, R.D.**

**2004.** Baseline measurements of smoke exposure among wildland firefighters. Journal of Occupational and Environmental Hygiene. 1: 593–606.

Extensive measurements of smoke exposure among wildland firefighters are summarized, showing that firefighters can be exposed to significant levels of carbon monoxide and respiratory irritants, including formaldehyde, acrolein, and respirable particulates. Firefighters were exposed to higher levels of smoke at prescribed burns than at wildfires, and shift-average smoke exposures were lowest among firefighters who performed initial attack of wildfires

in the early stages of the fires. Smoke exposure reaches its highest levels among firefighters maintaining fire within designated firelines and performing direct attack of spot fires that cross fires. The pollutants measured in smoke were reasonably well correlated with each other.

***Keywords:*** *Smoke, firefighters, hazard, wildfire, health, carbon monoxide.*

(See PWFSL order form.)

**Wright, C.S.; Agee, J.K.**
**2004.** Fire and vegetation history in the eastern Cascade Mountains, Washington. Ecological Applications. 14(2): 443–459.

Dendrochronological techniques were used to reconstruct a 433-year fire history and to characterize the historical fire regime (frequency, size, season, severity) of the approximately 30 000-ha Teanaway River drainage on the east side of the Cascade Range in Washington. In addition, General Land Office survey data were used to reconstruct the late 19$^{th}$-century structure and composition of the forests in the study area. Systematic fire-scar surveys revealed that fire frequency was quite variable at different locations in the study area. Fire size also varied widely; the majority of fires were relatively small (<1000 ha), although several large fires (>4000 ha) were detected. Mean and median fire sizes were 1795 ha and 988 ha, respectively. Large fires occurred every 27 years over the entire length of the record and coincided with periods of annual and seasonal drought. Intervals as long as 37 years and as short as 1 year occurred between 4000+ ha fires. Sampling locations in dry forest types yielded fire-scarred cross sections with many fire scars, leading us to infer that most historical fires were of low intensity, leaving the overstory structure intact. This inference is corroborated by the composition and structure of the historical forest, which was characterized by a preponderance of very large ponderosa pines. Mesic forest types (dominated by grand fir and Douglas-fir) exhibited a wider range of fire severities.

***Keywords:*** *Dendrochronology, Douglas-fir, ENSO, fire ecology, fire history, fire regime, grand fir, PDSI, ponderosa pine, Washington.*

(See PWFSL order form.)

## Fish

**Bisson, P.A.; Reeves, G.H.; Gregory, S.V.; Wondzell, S.**
**2003.** Trends in using wood to restore aquatic habitats and fish communities in western North American rivers. American Fisheries Society Symposium. 37: 391–406.

Advances in understanding wood dynamics in rivers of western North America have led to several important management trends. First, there is a trend away from using "hard" engineering approaches to anchoring wood in streams to using "soft" placement techninques that allow some wood movement. Second, wood is being placed in locations where channel form and hydraulics favor stability and where wood is likely to accumulate. Third, there is an increased emphasis on passive recruitment of wood from natural source areas (instead of active placement) where the likelihood that it will enter streams through channel migration, windthrow, and landslides is high. Fourth, restoration targets for wood loads are incorporating landscape-scale objectives; thus, managing wood to emulate the spatial and temporal variability produced by natural disturbances is replacing fixed prescriptions for wood in individual reaches. Predicting the effects of wood restoration on individual fish populations in western North America is problematic because local biophysical conditions generate so much experimental noise that it is rarely possible to partition the effects of wood restoration from other sources of variation. Development of appropriate monitoring techniques, combined with a regional network of experimental catchments that include restored and unrestored streams, would help track changes in population status and gauge the effectiveness of wood restoration efforts.

***Keywords:*** *Aquatic habitats, fish communities, aquatic restoration.*

(See Olympia order form.)

**Muir, M.J.**
**2003.** Evaluation of restoration projects and channel changes in the Little Naches basin, with a comparison to the American River basin, WA. Seattle, WA: University of Washington. 191 p. M.S. thesis.

The overall purpose of this study was to evaluate instream, riparian, and road restoration projects, habitat variability, and channel changes in the Little Naches watershed in light of changing land management practices and active restoration work in the basin over the same timeframes. The Little Naches watershed has been a high priority for restoration because of the depressed state of salmonid populations and degraded habitat conditions. The American River, immediately to the south, was used as a reference of natural conditions and processes that existed historically in the area. Results indicated that habitat conditions are improving in the Little Naches River but are not equivalent to those of the American River reference reaches.

***Keywords:*** *Stream restoration, fish habitat, salmon, Yakima River watershed.*

(Available only through library or interlibrary loan.)

**Trebitz, A.S.; Hill, B.H.; McCormick, F.H.**
**2003.** Sensitivity of indices of biotic integrity to simulated fish assemblage changes. Environmental Management. 32(4): 499–515.

Indices of biotic integrity (IBI) are used to assess condition of fish assemblages, but their ability to monitor temporal trends is unknown. We assessed the trend detection ability of IBI and community similarity and diversity indices by using simulations that progressively altered the fish assemblages of 39 streams. We assessed the statistical responses of fish community metrics to simulated variability in fish abundances and found that IBIs were insensitive to changes that affected all species proportionally. Indices of biotic integrity and other community indices more readily detected changes that differentially affected fish species, either according to life history traits or by increasing dominance of already common species.

***Keywords:*** *Index of biotic integrity, fish assemblages, streams, trend monitoring, EMAP.*

(See Olympia order form.)

# Forest Management

**Bormann, B.T.; Kiester, A.R.**
**2004.** Options forestry: acting on uncertainty. Journal of Forestry. 102: 22–27.

An increased appreciation of how scientific and societal uncertainty enters management decisions suggests a new approach to forest management-options forestry. We contend that unflinching assessments of uncertainty can often find an array of alternatives that cannot be distinguished with sufficient confidence to permit the choice of one "best practice." Options forestry respond to uncertainty by diversifying management, emphasizing learning, and integrating research and management. A Siuslaw National Forest project in Oregon demonstrates options forestry as an approach to act on uncertainty to society's advantage.

***Keywords:*** *Communications, decision science, education.*

(See Corvallis order form.)

**Higgins, S.; Blatner, K.; Kerns, B.K.; Worthington, A.**
**2004.** Relationship between *Xerophyllum tenax* and canopy density in the southern Cascades of Washington. Western Journal of Applied Forestry. 19(2): 82–87.

Large-scale commercial harvest of beargrass (*Xerophyllum tenax*) has been taking place in the Cascades of Washington and Oregon for the past 15 to 20 years. The long, slender leaves are either used fresh or dried and dyed for use in the floral industry in the United States and Europe. We examined differences in beargrass production for different overstory canopy conditions on 10 sites in two plant associations. Results suggest that overstory canopy and plant association are related to beargrass commercial characteristics. Evaluation of the sustainability of beargrass as a nontimber forest product will require long-term study of the relations among environmental variables, beargrass productivity, and population dynamics.

***Keywords:*** *Beargrass, nontimber forest products.*

(See Corvallis order form.)

**Reynolds, K.M.; Johnson, K.N.; Gordon, S.N.**
**2003.** The science/policy interface in logic-based evaluation of forest ecosystem sustainability. Forest Policy and Economics. 5: 433–446.

Numerous efforts around the world are underway to apply the Montreal Process criteria and indicators to assess the sustainability of temperate and boreal forests. In this paper we describe a logic-based system for evaluating the sustainability of forests at regional and national levels. We believe that such a system can make evaluation of sustainability more consistent and transparent. This effort also makes two points abundantly clear: (1) a systematic way to organize expert judgment about ecological, economic, social, and institutional relations (here, by using "fuzzy logic") is crucial to building such a system, and (2) the structure of this logic-based system reflects a policy framework and a series of decisions about values and what is meant by "sustainability."

***Keywords:*** *Logic, model, sustainability, Montreal Process, criteria, indicators.*

(See Corvallis order form. Also available at http://www.sciencedirect.com.)

## Genetics

**Johnson, R.; Jayawickrama, K.**
**2003.** Forwards vs. backwards selection for seed orchards and cooperative second-generation breeding in the US Pacific Northwest. In: Jayawickrama, K. Northwest Tree Improvement Cooperative annual report. Corvallis, OR: Oregon State University, Department of Forest Science: 17–23.

Gains from various orchard strategies were modeled with computer simulation. The results showed that a 1.5-generation seed orchard (recruited from many first-generation open-pollinated testing programs with lots of parents from which to choose) with parental selections would give gain superior to all-progeny orchards and is essentially equal to the gain from selecting both progeny and parents. The situation, however, was changed in the second cycle; in many cases selecting progeny will give the highest expected gain.

***Keywords:*** *Progeny testing, seed orchards, gain.*

(See Corvallis order form.)

**Lipow, S.R.; Johnson, G.R.; St. Clair, J.B.; Jayawickrama, K.J.**
**2003.** The role of tree improvement programs for *ex situ* gene conservation of coastal Douglas-fir in the Pacific Northwest. Forest Genetics. 10(2): 111–120.

We enumerate the ex situ genetic resources for coastal Douglas-fir in breeding populations and genetic tests and evaluate how they contribute to gene conservation of the species. The first-generation tree improvement programs for coastal Douglas-fir include over 4 million progeny from about 39,000 selections planted on 1,000 test sites. More than 2,000 of the selections tested in the first generation have been incorporated into second-generation programs. These genetic tests are more than adequate to meet the objective most frequently associated with ex situ conservation—namely maintenance of sufficient variation in breeding programs to allow for continued gain in subsequent generations. They also serve as repositories for low-frequency alleles of potential future import and for variation in quantitative traits not presently under selection. Much of this genetic variation also resides in the many large in situ populations of Douglas-fir, but it can be more easily detected in genetic tests and may be more rapidly integrated into tree improvement programs with the least loss of genetic gain. Second-generation programs alone are probably too small to effectively offer the many advantages of ex situ gene conservation, and maintenance of completed first-generation tests or establishment of new gene resource populations is therefore of potential value.

***Keywords:*** *Genetic resources, gene conservation, genetic tests, tree improvement,* Pseudotsuga menziesii.

(See Corvallis order form.)

**Lipow, S.R.; Vance-Borland, K.; St. Clair, J.B. [and others]**
**2004.** Gap analysis of conserved genetic resources for forest trees. Conservation Biology. 18(2): 412–423.

A gap analysis was developed to evaluate whether the genetic resources conserved in situ are adequate for conifers in the Pacific Northwest. Results of the analyses for noble fir and Douglas-fir are presented. The method involved intersecting three types of data layers by means of geographic information system (GIS). The first layer showed the location of protected areas. The second displayed the distribution of each tree species across the landscape as inferred from available GIS coverages and grids showing modeled potential and actual vegetation. The third layer presented a scheme for stratifying the

distribution of each species into genetically meaningful units for analysis, in this case seed zones and ecoregions. The results show that in much of the study area, the genetic resources of both species are well protected in in situ reserves. Additional gene conservation of noble fir, however, may be warranted for Willapa Hills populations in southwestern Washington. An in situ genetic resource gap arguably occurs for Douglas-fir in the Southern Puget Lowlands, but this gap is filled by extensive ex situ genetic resources from the same region.

***Keywords:*** *Genetic resources, gene conservation, gap analysis.*

(See Corvallis order form.)

## Geomorphology and Hydrology

**Hassan, M.A.; Woodsmith, R.D.**

**2004.** Bed load transport in an obstruction-formed pool in a forest, gravelbed stream. Geomorphology. 58: 203–221.

We examined channel dynamics and bedload transport relations through an obstruction-forced pool in a forest, gravel-bed stream by comparing flow conditions, sediment mobility, and bed morphology among transects at the pool head, center, and tail. Despite a large flood, significant scour was observed at only three distinct locations, all related to large woody debris. Bed material texture showed little change in size distribution of either surface or subsurface material, suggesting a lack of disruption of the preflood bed, and fractions larger than the median size of the bed surface material were rarely mobile. Sediment rating relations were similar, although temporal variation within and among stations was relatively high. Relations between bedload size distribution and discharge were complex, showing coarsening with increasing discharge followed by fining as more sand was mobilized at high flow. Lack of scour combined with bedload fining and net fill by relatively fine material implied that the dominant sources of mobile sediment were upstream storage sites and local bank collapse. Patterns of flow, channel dynamics, and sediment mobility were strongly affected by a flow obstruction of large woody debris in the pool center that created turbulent effects, thereby enhancing entrainment and transport in a manner similar to scour at bridge piers.

***Keywords:*** *Bedload transport, channel dynamics, forest stream geomorphology.*

(See Wenatchee order form.)

**Swanson, F.J.**

**2003.** Wood in rivers: a landscape perspective. American Fisheries Society Symposium 37. In: Gregory, S.V.; Boyer, K.L.; Gurnell, A.M., eds. The ecology and management of wood in world rivers. Bethesda, MD: American Fisheries Society: 299–313.

A conceptual model is put forth to account for the roles of spatial patterns of wood input and redistribution processes in river networks.

***Keywords:*** *Wood in rivers, geomorphology-rivers.*

(See Corvallis order form.)

## Invertebrates

**Overhulser, D.; Niwa, C.**

**2003.** Insects and Willamette Valley ponderosas. In: Establishing and managing ponderosa pine in the Willamette Valley. EM 8805. Corvallis, OR: Oregon State University Extension Service: 17–21. Chapter 5.

The primary insect pests currently found on Willamette Valley ponderosa pine are discussed. Host records, damage potential, damage symptoms, and insect stages are described for the red turpentine beetle, California fivespined ips, ponderosa pine cone beetle, and sequoia pitch moth. Recommendations for managing and treating insect pests are given.

***Keywords:*** *Ponderosa pine, Willamette Valley, insects, protection, management.*

(See Corvallis order form.)

**Willhite, E.A.; Overhulser, D.L.; Niwa, C.G.**

**2004.** Using Douglas-fir cone gall midge pheremone traps to time insecticide applications. FHP-WSC-04-01. Sandy, OR: U.S. Department of Agriculture, Forest Service, Forest Health Protection, Westside Service Center. 2 p.

Douglas-fir cone gall midge (DFCGM), *Contarinia oregonensis* Foote, is considered the most significant pest of Douglas-fir seed orchards. The timing of spray is critical so the residual life of the insecticide overlaps with the short period when DFCGM are active. Insecticide treatments should be timed to just precede or coincide with peak emergence of adult midges in spring. This also corresponds to the brief period when female flowers are upright and receptive to pollen. The recent identification of a sex pheremone for the DFCGM means that detecting emerging male

midges can be done quickly and simply by using pheremone-baited traps. This publication describes how to time insecticide applications by using pheremone-baited traps, including equipment needs, procedures for trap installation and monitoring, and identification of adult male midge.

***Keywords:*** *Douglas-fir cone gall midge, Douglas-fir, seed orchard, pheremone trapping, insecticide application.*

(See Corvallis order form.)

**Yi, H.**

**2002.** Response of arthropods to different intensities of thinning in Oregon. Corvallis, OR: Oregon State University. 102 p. Ph.D. dissertation.

Study sites were 40- to 50-year-old, young stands of typical plantation Douglas-fir forests in the Willamette National Forest, Oregon. Shrub-, ground-, and litter-dwelling arthropods decreased with the thinning intensity for deciduous foliage but did not show any response for conifer foliage. Abundance and diversity of ground-dwelling arthropods were higher in heavy-thin and light-thin-with-gap treatments than the control and light-thin treatments.

***Keywords:*** *Entomology, thinning effects, arthropods.*

(Available only through library or interlibrary loan.)

## Mycology

**Hoff, J.A.; Klopfenstein, N.B.; McDonald, G.I. [and others]**

**2004.** Fungal endophytes in woody roots of Douglas-fir (*Pseudotsuga menziesii*) and ponderosa pine **(***Pinus ponderosa*). Forest Pathology. 34: 255–271.

The fungal community inhabiting large woody roots of healthy appearing conifers is not well documented. To provide more information, a survey was conducted by using increment cores from the woody roots of symptomless Douglas-fir and ponderosa pine growing in dry forests on the eastern slope of the Cascade Mountains in Washington state. Fungi were cultured on standard media and identified by using a combination of molecular and morphological methods. Twenty-seven fungal genera were identified. Two groups predominated: *Byssochlamys nivea* and *Umbelopsis* species. This is the first report of these fungi within large woody roots of conifers. Both taxa have been previously identified as potential biological control agents.

***Keywords:*** *Fungal endophytes,* Byssochlamys nivea*,* Umbelopsis*.*

(See Wenatchee order form.)

## Natural Resources Policy

**McCool, S.F.; Stankey, G.H.**

**2004.** Indicators of sustainability: challenges and opportunities at the interface of science and policy. Environmental Management. 33(3): 294–305.

Rising global interest in sustainability has triggered attention in indicators as a means of achieving a more sustainable world. Although the search for indicators has led to the development of criteria for good indicators, it has also been dominated by scientific elites. The consequences of such dominance leads to significant social and policy implications, particularly with regard to how the search for sustainability has become defined primarily as a technical and scientific exploration when it is actually a moral and ethical issue. Our discussion about sustainability and appropriate indicators centers on what constitutes the public interest, a question that requires inclusiveness and centers on the interface of science and policy. The paper reviews the rationale for selecting indicators, the functions they serve, and the implications and consequences involved when one sector—science—dominates the debate. The paper concludes with suggestions about appropriate roles of science and policy in the indicator selection process.

***Keywords:*** *Sustainability, indicators, policy, sustainable development criteria.*

(See Corvallis order form.)

**Swanson, F.J.**

**2004.** Roles of scientists in forestry policy and management: views from the Pacific Northwest. In: Arabas, K.; Bowersox, J., eds. Forest futures: science, politics, and policy for the next century. Lanham, MD: Rowman and Littlefield Publishers, Inc.: 112–126. Chapter 7.

Scientists have played many roles in forest management and policy formulation in the Pacific Northwest. Science was used both to support and to undermine the timber management paradigm of the 1950s to 1980s; science engaged heavily in formulation of the Northwest Forest Plan; and science was to play an important, now faltering, role in continued refinement and modification of the plan through adaptive management. Recent social science studies reveal the extent to which surveyed scientists, managers, members

of interest groups, and public differ in their opinions concerning appropriate roles of scientists in management positions.

***Keywords:*** *Adaptive management, roles of scientists, FEMAT, forest policy.*

(See Corvallis order form.)

## Plant Ecology

**Helm, D.J.; Mead, B.R.**
**2003.** Reproducibility of vegetation cover estimates in south-central Alaska forests. Journal of Vegetation Science. 14: 33–40.

Five methods of evaluating understory composition were appraised for reproducibility among six observers in two forest types in south-central Alaska: overall community estimates, ocular estimates in quadrats, horizontal-vertical profiles, rooted frequency, and points. Two general methods of evaluating reproducibility were considered: standard deviations and components of variance. Standard deviations and coefficients of variation (standard deviation relative to mean) were evaluated to determine the precision among observers. Components of variance were analyzed to determine the percentage of total variance attributable to observers. Most techniques had an observer effect over half of the time when analyzed with standard deviations and factorial variance components and almost all the time when viewed with hierarchical components of variance.

***Keywords:*** *Vegetation sampling, reproducibility, inventory, monitoring, Alaska.*

(See Anchorage order form.)

**Meinzer, F.C.; Brooks, J.R.; Bucci, S. [and others]**
**2004.** Converging patterns of uptake and hydraulic redistribution of soil water in contrasting woody vegetation types. Tree Physiology. 24: 919–928.

We assessed the effects of soil water potential on uptake and hydraulic redistribution (HR) of soil water by roots in six sites characterized by different types and amounts of woody vegetation. The sites included a semiarid old-growth ponderosa pine forest, moist old-growth and 24-year-old Douglas-fir forests, and three Brazilian savanna sites differing in tree density. Similarities in relations between soil water potential and HR, and between soil water use and relative rhizosphere conductance among the six sites suggested that despite probable differences in maximum rooting depth and density among them, there was a certain degree of convergence in biophysical controls on soil water use and redistribution in the upper soil layers where the density of finer roots is greatest.

***Keywords:*** Pinus ponderosa, Pseudotsuga menziesii, *rhizosphere, roots, soil water potential.*

(See Corvallis order form.)

**Meinzer, F.C.; James, S.A.; Goldstein, G.**
**2004.** Dynamics of transpiration, sap flow and use of stored water in tropical forest canopy trees. Tree Physiology. 24: 901–909.

We measured time courses of sap flow, hydraulic resistance, plant water potential, and stomatal resistance in co-occurring tropical forest canopy trees to determine how total daily water use and daily reliance on stored water scaled with size, and to examine the effects of scale and tree hydraulic properties on apparent time constants for changes in transpiration and waterflow in response to fluctuations in environmental driving variables. Total daily water use and reliance on stored water were strongly correlated with trunk diameter, independent of species. Stomatal control limited use of stored water to a nearly constant fractions (10 percent) of total daily water use. Time constants for changes in transpiration were similar among individuals.

***Keywords:*** *Allometric relationships, hydraulic architecture, hydraulic capacitance, hydraulic resistance, scaling.*

(See Corvallis order form.)

**Woodruff, D.R.; Bond, B.J.; Meinzer, F.C.**
**2004.** Does turgor limit growth in tall trees? Plant, Cell and Environment. 27: 229–236.

We characterized height-dependent variation in leaf tissue water relations and morphological characteristics in Douglas-fir trees to determine the extent to which growth limitations with increasing height may be linked to the influence of the gravitational water potential gradient on leaf turgor. Turgor decreased with increasing height, particularly during the late spring when vegetative buds began to swell. In tall trees, the gravitational component of water potential is superimposed on phenologically driven changes in leaf water relation characteristics, imposing potential constraints on turgor that may be indistinguishable from those associated with drought.

***Keywords:*** *Douglas-fir, height growth, osmotic adjustment,* Pseudotsuga menziesii, *turgor maintenance.*

(See Corvallis order form.)

# Plant Pathology

**Johnson, G.R.; Gartner, B.L.; Maguire, D.; Kanaskie, A.**
**2003.** Influence of Bravo fungicide applications on wood density and moisture content of Swiss needle cast affected Douglas-fir trees. Forest Ecology and Management. 186: 339–348.

Wood properties were examined in trees from plots that were sprayed for 5 years with chlorothalonil (Bravo) fungicide to reduce the impact of Swiss needle cast and from trees in adjacent unsprayed plots. The unsprayed (more heavily diseased) trees had significantly narrower sapwood, narrower growth rings, lower sapwood moisture content, higher latewood proportion, higher overall wood density, and narrower tracheid cell wall thickness than did the sprayed (less heavily diseased) trees. Spraying also altered earlywood density—earlywood width ratios. The decreased moisture content in the unsprayed trees probably resulted from insufficient energy (photosynthate) to reverse sapwood embolisms.

***Keywords:*** *Wood quality, Swiss needle cast, moisture content.*

(See Corvallis order form.)

**Kelsey, R.G.; Manter, D.K.**
**2004.** Effect of Swiss needle cast on Douglas-fir stem ethanol and monoterpene concentrations, oleoresin flow, and host selection by the Douglas-fir beetle. Forest Ecology and Management. 190: 241–253.

We explored the influence of Swiss needle cast (SNC) on Douglas-fir beetle, *Dendroctonus pseudotsugae*, activity and some of the host tree's physiological parameters. Woody tissue ethanol concentrations, wound-induced resin flow, and beetle attraction were reduced as disease severity increased. Beetle galleries were longer and penetrated to the sapwood tissues more frequently in diseased trees than in healthier trees. Trees stressed by SNC are at no greater risk of attack by Douglas-fir beetles than healthy trees when beetle numbers are low. The beetle's inability to recognize stressed trees could result from the trees limited production of ethanol. The trees diseased with SNC do have a weakened oleoresin defense system that might exacerbate the potential for an outbreak if beetle numbers increase owing to some other catastrophic event.

***Keywords:*** *Bark beetles, physiological stress, kairomones, disturbance, host selection.*

(See Corvallis order form.)

**Meinzer, F.C.; Woodruff, D.R.; Shaw, D.C.**
**2004.** Integrated responses of hydraulic architecture, water and carbon relations of western hemlock to dwarf mistletoe infection. Plant, Cell and Environment. 27: 937–946.

Water and carbon relations were characterized over a range of scale from leaf to whole tree in large western hemlock trees that were either heavily infected or uninfected with hemlock dwarf mistletoe. Maximum whole-tree water use was substantially lower in infected trees than in uninfected trees because reduced numbers of live branches in infected trees reduced whole-tree leaf area in relation to sapwood area. These adjustments in hydraulic architecture of infected trees contributed to homeostasis of water transport efficiency and transpiration on a leaf area basis, whereas both carbon accumulation and photosynthetic water-use efficiency were sharply reduced at both the leaf and whole-tree scales.

***Keywords:*** Arceuthobium *spp., carbon isotope ratio, photosynthesis, stomata,* Tsuga heterophylla.

(See Corvallis order form.)

**Moreira, M.Z.; Scholz, F.G.; Bucci, S.J. [and others]**
**2003.** Hydraulic life in a neotropical savanna. Functional Ecology. 17: 573–581.

We report our findings on hydraulic lift in the savanna vegetation of central Brazil (Cerrado). We used both heat pulse and isotopic labeling techniques to determine whether hydraulic lift occurred in two common species, and whether neighboring small shrubs and trees were using this water. Both techniques showed uptake of water by tap roots and reverse flow of water in lateral roots. Roots transferred hydraulically lifted water to the soil, and small shrubs and trees neighboring the labeled individuals were labeled by deuterated water. Isotopic mass balance equations and sap flow measurements, however, showed that water taken up by the central tap root in each individual measured here constituted only a small percentage of total flux of water through the treated plants. Mass balance equations also indicated that small shrubs and trees neighboring the treated plant only used a few thousandths of a percent of the label. Hydraulic lift through the taproot of the studied species, therefore, seems to be of little consequence to water relations of neighboring small shrubs and trees.

***Keywords:*** *Cerrado, deuterium labeling, heat pulse, sap flow, soil water redistribution.*

(See Corvallis order form.)

**Temel, F.; Stone, J.K.; Johnson, G.R.**
**2003.** First report of Swiss needle cast caused by *Phaeocryptopus gaeumannii* on Douglas-fir in Turkey. Plant Disease. 87(12): 1536.

The occurrence of Swiss needle cast in Turkey is reported.

***Keywords:*** Phaeocryptopus gaeumannii*, Swiss needle cast, Douglas-fir, Turkey.*

(See Corvallis order form.)

## Remote Sensing

**Cihlar, J.; Heimann, M.; Olson, R., eds.**
**2002.** Terrestrial carbon observation: the Frascati report on *in situ* carbon data and information. Rome, Italy: Food and Agriculture Organization of the United Nations. 120 p. http://www.fao.org/gtos/doc/pub31.pdf. (February 10, 2005).

Because the acquisition and use of global in situ data are inherently complex, a workshop was organized to examine this aspect in more detail. The main objectives of the workshop were to assess the readiness of in situ components, to identify gaps between requirements and the existing situation and discuss possible approaches to filling these, and to examine the ways of using existing data for terrestrial carbon observations.

***Keywords:*** *Carbon, remote sensing, monitoring.*

(Only available online.)

**Hudak, A.T.; Lefsky, M.A.; Cohen, W.B.; Berterretche, M.**
**2002.** Integration of lidar and Landsat ETM+ data for estimating and mapping forest canopy height. Remote Sensing of Environment. 82: 397–416.

We tested five aspatial and spatial methods for predicting canopy height by using an airborne LIDAR system (Aeroscan) and Landsat ETM+ data: regression, kriging, cokriging, and kriging and cokriging of regression residuals. We sampled a spatially continuous LIDAR coverage in eight systematic patterns to determine which LIDAR sampling strategy would optimize LIDAR-Landsat integration in western Oregon forests: transects sampled at 2000-, 1000-, 500-, and 250-m frequencies and points sampled at these same spatial frequencies. We concluded that an integrated modeling strategy is most suitable for estimating and mapping canopy height at locations unsampled by LIDAR, and that a 250-m discrete point sampling strategy most efficiently samples an intensively managed forest landscape in western Oregon.

***Keywords:*** *Remote sensing, spatial strategies.*

(See Corvallis order form.)

**Kaartinen, A.T.; Fried, J.S.; Dunham, P.A.**
**2003.** Efficiency and precision for estimating timber and non-timber attributes using Landsat-based stratification methods in two-phase sampling in northwest California. In: McRoberts, R.E.; Reams, G.A.; Van Deusen, P.C.; Moser, J.W., eds. Proceedings of the 3rd annual forest inventory and analysis symposium. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station: 69–79.

Three Landsat TM-based GIS layers were evaluated as alternatives to conventional, photointerpretation-based stratification of Forest Inventory and Analysis (FIA) field plots. Estimates for timberland area, timber volume, and volume of down wood were calculated for California's north coast survey unit of 2.5 million hectares. The estimates were compared on the basis of standard errors, conformance to FIA accuracy standards, and the gain in precision achieved by stratification relative to simple random sampling and to conventional photointerpretation. Some satellite imagery-based approaches were found to be far less costly than conventional methods, with very little sacrifice in precision.

***Keywords:*** *Satellite image analysis, two-phase sampling, stratified forest inventory.*

(See Portland order form.)

**Kennedy, R.E.; Cohen, W.B.**
**2003.** Automated designation of tie-points for image-to-image coregistration. International Journal of Remote Sensing. 24(17): 3467–3490.

Image-to-image registration requires identification of common points in both images (image tie-points, ITPs). We describe software implementing an automated, area-based technique for identifying ITPs. We tested the software under several confounding conditions, representing image distortions, inaccurate user input, and changes between images. The software was robust to additive noise, moderate change between images, low levels of image geometric distortion, undocumented rotation, and inaccurate pixel size designation.

***Keywords:*** *Remote sensing.*

(See Corvallis order form.)

**Lee, K.-S.; Cohen, W.B.; Kennedy, R.E. [and others]**
**2004.** Hyperspectral versus multispectral data for estimating leaf area index in four different biomes. Remote Sensing of Environment. 91: 508–520.

Motivated by the increasing importance of hyperspectral remote sensing data, this study sought to determine whether current generation, narrow-band hyperspectral remote sensing data could better track vegetative leaf area index (LAI) than traditional broad-band multispectral data. Biome types sampled include row-crop agriculture, tall-grass prairie, mixed hardwood-conifer forest, and boreal conifer forest. The effects of bandwidth, band placement, and number of bands were isolated from radiometric quality by comparing regression models derived from individual AVIRIS channels with those derived from simulated ETM+ and MODIS channels by using the AVIRIS data. There was little difference in the strength of models except when the number of individual AVIRIS bands was permitted to exceed the number of bands in the simulated datasets. Moreover, models based on actual ETM+ data were generally stronger than those based on simulated ETM+ data, suggesting that, for predicting LAI, ETM+ data suffer no penalty for having lower radiometric quality than AVIRIS data. Spectral channels in the red-edge and shortwave-infrared regions were generally more important than those in the near-infrared for predicting LAI.

***Keywords:*** *Remote sensing.*

(See Corvallis order form.)

**Morisette, J.T.; Nickeson, J.E.; Davis, P. [and others]**
**2003.** High spatial resolution satellite observations for validation of MODIS land products: IKONOS observations acquired under the NASA scientific data purchase. Remote Sensing of Environment. 88: 100–110.

Phase II of the Scientific Data Purchase has provided NASA investigators access to data from four different satellite and airborne data sources. The Moderate Resolution Imaging Spectrometer (MODIS) land discipline team (MODLAND) sought to use these data in support of land product validation activities with a focus on the EOS Land Validation Core Sites. This paper provides an overview of the MODIS Land Team's validation strategy to incorporate high-resolution imagery and presents three case studies as examples of the use of IKONOS data for MODIS land validation activities.

***Keywords:*** *Accuracy assessment, MODIS, IKONOS.*

(See Corvallis order form. Also available online at http://www.sciencedirect.com.)

## Silviculture

**Hummel, S.; Hummel, R.**
**2004.** Five-year thinning response of an overgrown Douglas-fir Christmas tree plantation. Western Journal of Applied Forestry. 19(3): 171–174.

A 15-year-old Douglas-fir Christmas tree plantation in western Oregon was thinned in 1996 to spacing suitable for developing sawtimber according to regional conversion guidelines. In two strata, 5 ft by 5 ft (area 1) and 10 ft by 10 ft (area 2), every other row of trees was removed plus every other tree in the rows that were retained. Untreated control units were kept in both areas. After 5 years, the quadratic mean diameter (QMD) in area 1 (thinned) was 6.4 in versus 5.2 in for area 1 (unthinned), whereas in area 2 (thinned) the QMD was 11.4 in compared to 9.3 in for area 2 (unthinned). Over the same period, the volume per acre in area 1 (thinned) was nearly twice that of area 1 (unthinned). In contrast, the volume per acre in area 2 (thinned) was almost half that of area 2 (unthinned). These results suggest that although thinning was timely for area 1, the treatment could have been delayed for area 2. By plantation age 30, estimated yields for the treated units in areas 1 and 2 are 9.6 and 11.6 thousand board feet, respectively, with no additional thinning. Given 2002 average prices for No. 3 sawmill grade logs, gross return per acre at age 30 would range between $5,000 and $6,000.

***Keywords:*** *Quadratic mean diameter, volume per acre, log grades, western Oregon.*

(See Portland order form.)

**Murphy, M.S.; Harrington, T.B.**
**2004.** Stem sinuosity of loblolly pine seedlings as influenced by taproot shape. In: Connor, K.F., ed. Proceedings of the 12th biennial Southern silvicultural research conference. Gen. Tech. Rep. SRS-71. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 465–468.

Sinuous stem growth in loblolly pine (*Pinus taeda* L.) results in diminished potential for the use of wood products in loblolly pines as these stems are difficult to mill and contain a higher percentage of compression wood. In this study, 90 full-sibling loblolly pine seedlings (30 seedlings from each of three families) were planted with five taproot configurations: straight taproot, straight taproot with underground obstruction, taproot planted with "J" shape, straight taproot planted at a 45-degree angle, and a straight taproot with the stem guy-wired to a 45-degree angle. Seedlings were irrigated and fertilized to maintain high

growth rates, and insect control treatments were applied to minimize injury from the Nantucket pine shoot tip moth (*Rhyacionia frustrana* (Comstock). Growth and form data were collected after the first growing season. Statistical analyses were conducted to determine if seedling growth rate and stem eccentricity differed significantly according to family, taproot treatment, or their interaction.

***Keywords:*** *Bent taproots, stem malformation.*

(See Olympia order form.)

**Perry, D.A.; Jing, H.; Youngblood, A.; Oetter, D.R.**
**2004.** Forest structure and fire susceptibility in volcanic landscapes of the eastern High Cascades, Oregon. Conservation Biology. 18(4): 913–926.

We report the size, species, and age class distribution of trees in forests on lava-rich sites on the eastern slopes of the Cascades in Oregon, and we model current susceptibility to crown fires after calculating crown bulk density for stands with multiple canopy layers. Current stand density and multiple canopy layers contribute to a high risk of crown fire. Various thinning regimes were then simulated to alter the risk of crown fires. Models predict that thinning trees less than 20 cm in diameter, coupled with understory burning to reduce logging slash, would prevent torching and initiation of crown fire even under extreme fire conditions.

***Keywords:*** *Crown bulk density, ponderosa pine, crown fire susceptibility, fuel reduction.*

(See La Grande order form.)

## Soil

**Rich, J.J.**
**2003.** Community composition and activities of denitrifying bacteria in soils. Corvallis, OR: Oregon State University. 102 p. Ph.D. dissertation.

I investigated communities of denitrifying bacteria from adjacent meadow and forest soils in the Cascade Range of Oregon. I examined denitrifying bacteria from three adjacent habitats in Oregon: agricultural soil that received nitrogen fertilizer inputs, naturally vegetated riparian soil, and creek sediment. Both studies indicated that denitrifying community composition differed among adjacent habitats.

***Keywords:*** *Soil, bacteria, nitrogen cycling, biodiversity.*

(Available only through library or interlibrary loan.)

**Yano, Y.**
**2002.** Characteristics of dissolved organic matter (DOM) and its stabilization in a forest soil. Corvallis, OR: Oregon State University. 85 p. Ph.D. dissertation.

I conducted a parallel laboratory and field study to examine (1) the effect of litter quality on dissolved organic matter (DOM) chemistry and (2) the effects of DOM chemistry on immobilization in the mineral soil. In the lab study, degree of litter decomposition strongly influenced the chemical composition of the water extracts. Contrary to the laboratory results, no difference was found in composition of the O-horizon leachate among double litter, double wood, and control treatments after 4 years of litter manipulation, in spite of significant differences in total carbon (C), total nitrogen (N), and C:N ratios of the O-horizon material.

***Keywords:*** *Soil carbon, DIRT experiment, litter decomposition, dissolved organic matter.*

(Available only through library or interlibrary loan.)

## Special Forest Products

**Pilz, D.; Weber, N.S.; Carter, M.C. [and others]**
**2004.** Productivity and diversity of morel mushrooms in healthy, burned, and insect-damaged forests of northeastern Oregon. Forest Ecology and Management. 198: 367–386.

Our limited understanding of morel mushroom productivity, diversity, and ecology hinders their management in the Western United States. We used morphological, genetic, and ecological data to identify and characterize five putative species found in northeastern Oregon forests. Three of these putative species fruited only on burned soils the first spring season following a wildfire. The other two putative species fruited on nonburned substrates or the second year following fire on burned soils. Unbiased landscape-level estimates of genus-level morel productivity ranged from 80 to 4,350 morels per hectare and from 0.550 to 9.080 km per hectare. Productivity followed the general trend of wildfire-burned forests > insect-damaged forests > healthy forests.

***Keywords:*** *Morel, wildfire, productivity, genetics, taxonomy, nontimber forest products.*

(See Corvallis order form.)

## Threatened, Endangered, Sensitive Species

**Wisely, S.M.; Buskirk, S.W.; Russell, G.A. [and others]**
**2004.** Genetic diversity and structure of the fisher (*Martes pennanti*) in a peninsular and peripheral metapopulation. Journal of Mammalogy. 85(4): 640–648.

Population genetic structure in a one-dimensional metapopulation should be higher than in a similar two-dimensional metapopulation. By using microsatellite genotypes, we show that because of the linear nature of their distribution, fisher (*Martes pennanti*) populations in the Pacific States exhibit high genetic structure and an isolation-by-distance pattern of differentiation. Genetic variability decreases from north to south. Distributional effects on measures of genetic diversity were probably exacerbated by human-caused changes to the environment. The low genetic diversity and high genetic structure of fisher populations in the southern Sierra Nevada suggest that they are highly prone to extirpation.

***Keywords:*** *Fisher,* Martes pennanti*, microsatellite DNA, genetic structure, heterozygosity, dispersal.*

(See Olympia order form.)

## Wildlife

**Herman, A.E.**
**2003.** Aspects of the ecology of the Shasta salamander, *Hydromantes shastae*, near Samwell Cave, Shasta County, California. Arcata, CA: Humboldt State University. 56 p. M.A. thesis.

The Shasta salamander is endemic to the Shasta Lake region of northern California and is patchily distributed, varying between being locally abundant to very rare within its known range. It currently is listed as threatened under the California Endangered Species Act. Most aspects of the basic ecology are unknown, and additional knowledge of its natural history is needed for conservation effects to be successful. To examine size class structure, movements, seasonal activity, and habitat availability and occupancy patterns, 49 surveys were conducted between 2000 and 2002 near Samwell Cave, California. During the study 399 Shasta salamanders were captured, 306 were marked, and 77 were recaptured at least once, yielding a 25-percent recapture rate. The farthest distance traveled was 104 m, by a male. Reproductive patterns observed in recaptured females suggest biennial reproduction. Three size classes were described based on size frequency distribution of snout-vent lengths. Observations indicated that competition and territoriality are not factors in habitat use. Relations were all nonlinear between physical environmental variables and number of salamanders captured. The baseline information from this study may likely be exemplary of other local populations owing to the similarity in basic habitat characteristics if neighboring populations are found.

***Keywords:*** *Amphibians, Shasta salamanders.*

(Available only through library or interlibrary loan.)

**Kelly, E.G.; Forsman, E.D.**
**2004.** Recent records of hybridization between barred owls **(***Strix varia*) and northern spotted owls (*S. occidentalis caurina***)**. The Auk. 121(3): 806–810.

We summarized all records of hybridization between barred owls (*Strix varia*) and northern spotted owls (*Strix occidentalis caurina*) in Washington and Oregon through 1999. A total of 47 hybrids were observed, including 17 F1s that were first detected as adult, 4 F1s that were first detected as juveniles and subsequently recaptured as adults, 10 F1 juveniles that were banded and never seen again, and 16 F2 juveniles that were banded and never seen again. All confirmed cases of hybridization between barred and spotted owls involved male spotted owls paired with female barred owls. Hybrids that backcrossed with barred owls produced more young than hybrids that backcrossed with spotted owls. These differences may indicate that some combinations of sex and species are more compatible or more fertile than others, but this needs more documentation. Because F2 hybrids and subsequent generations are difficult to distinguish from barred owls or spotted owls in the field, genetic comparisons of blood or tissue samples may be needed to identify hybrids beyond the first generation. The small number of F1 hybrids detected during many years of extensive banding studies of spotted owls suggests that the isolating mechanisms that separate barred owls and spotted owls are normally sufficient to avoid hybridization between them. Direct competition between the two species for food and space is probably a much more serious threat to the spotted owl than is hybridization.

***Keywords:*** *Spotted owl, barred owl, hybridization.*

(See Corvallis order form or http://www.bioone.org/pdfserv/i0004-8038-121-03-0806.pdf.)

**Rowland, M.**

**2004.** Effects of management practices on grassland birds: greater sage-grouse. Jamestown, ND: U.S. Geological Survey, Northern Prairie Wildlife Research Center. http://www.npwrc.usgs.gov/resource/literatr/grasbird/grsf/grsg.htm. (February 18, 2005).

Information on the habitat requirements and effects of habitat management on greater sage-grouse was summarized from more than 800 published and unpublished papers. A range map is provided to indicate the current range. Sections included in the account are (1) breeding range; (2) suitable habitat, including breeding and micro-habitat characteristics; (3) area requirements; (4) breeding-season phenology and site fidelity; (5) species response to management; (6) management recommendations; and (7) literature cited. A table complements the section on suitable habitat and lists specific habitat characteristics for the species by individual study.

***Keywords:*** Centrocerus urophasianus*, greater sage-grouse, habitat characteristics, management practices.*

(Available online only.)

## Wood Utilization

**Kumar, S.; Barbour, R.J.; Gustafson, R.R.**

**2004.** Kraft pulping response and paper properties of wood from densely stocked small-diameter stands. Forest Products Journal. 54(5): 50–56.

The kraft pulping characteristics, fiber properties, and handsheet properties of small-diameter trees and tops from three eastern Washington wood species—lodgepole pine, Douglas-fir, and western larch—were determined. Similar studies were done on submerchantable sawlogs from these three wood species and two commercially available sawmill residue pulp chip sources; a lodgepole pine and a western larch-Douglas-fir blend currently is used in kraft pulp mills. It was found that chips from small-diameter trees and tops had a pulping response similar to those from submerchantable sawlogs and the commercial sawmill residue pulp chip sources, with the exception of Douglas-fir from submerchantable saw logs, which pulped slower than the other woods.

***Keywords:*** *Kraft pulping, paper properties of wood.*

(See Portland order form.)

# Anchorage Lab Order Form

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___ **Kelly, E.G.; Forsman, E.D.**
Recent records of hybridization between barred owls (*Strix varia*) and northern spotted owls **(***S. occidentalis caurina*).

___ **Kelsey, R.G.; Manter, D.K.**
Effect of Swiss needle cast on Douglas-fir stem ethanol and monoterpene concentrations, oleoresin flow, and host selection by the Douglas-fir beetle.

___ **Kennedy, R.E.; Cohen, W.B.**
Automated designation of tie-points for image-to-image coregistration.

___ **Lee, K.-S.; Cohen, W.B.; Kennedy, R.E. [and others].**
Hyperspectral versus multispectral data for estimating leaf area index in four different biomes.

___ **Lenihan, J.M.; Drapek, R.; Bachelet, D.; Neilson, R.P.**
Climate change effects on vegetation distribution, carbon, and fire in California.

___ **Lipow, S.R.; Johnson, G.R.; St. Clair, J.B.; Jayawickrama, K.J.**
The role of tree improvement programs for ex situ gene conservation of coastal Douglas-fir in the Pacific Northwest.

___ **Lipow, S.R.; Vance-Borland, K.; St. Clair, J.B. [and others].**
Gap analysis of conserved genetic resources for forest trees.

___ **McCool, S.F.; Stankey, G.H.**
Indicators of sustainability: challenges and opportunities at the interface of science and policy.

___ **Meinzer, F.C.; Brooks, J.R.; Bucci, S. [and others].**
Converging patterns of uptake and hydraulic redistribution of soil water in contrasting woody vegetation types.

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