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Pacific Northwest
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Pacific Northwest Research Station

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06-691

Nichols, D.L.; Patterson, S.E.; Uloth, E.

2006. Wood and coal cofiring in interior Alaska: utilizing woody biomass from wildland defensible-space fire treatments and other sources. Res. Note PNW-RN-551. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 13 p.

Cofiring wood and coal at Fairbanks, Alaska, area electrical generation facilities represents an opportunity to use woody biomass from clearings within the borough's wildland-urban interface and from other sources, such as sawmill residues and woody material intended for landfills. Potential benefits of cofiring include air quality improvements, reduced greenhouse gas emissions, market and employment development opportunities, and reduction of municipal wood residues at area landfills. Important issues that must be addressed to enable cofiring include wood chip uniformity and quality, fuel mixing procedures, transportation and wood chip processing costs, infrastructure requirements, and long-term biomass supply. Additional steps in implementing successful cofiring programs could include test burns, an assessment of area biomass supply and treatment needs, and a detailed economic and technical feasibility study. Although Fairbanks North Star Borough is well positioned to use biomass for cofiring at coal burning facilities, long-term cofiring operations would require expansion of biomass sources beyond defensible-space-related clearings alone. Long-term sources could potentially include a range of woody materials including forest harvesting residues, sawmill residues, and municipal wastes.

Keywords: Biomass, energy, wildland-urban interface, coal, Alaska.

05-248

Huff, M.H.; Raphael, M.G.; Miller, S.L.; Nelson, S.K.; Baldwin, J., tech. coords.

2006. Northwest Forest Plan—The first 10 years (1994–2003): status and trends of populations and nesting habitat for the marbled murrelet. Gen. Tech. Rep. PNW-GTR-650. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 149 p.

The Northwest Forest Plan (the Plan) is a large-scale ecosystem management plan for federal land in the Pacific Northwest. Marbled murrelet (*Brachyramphus marmoratus*) populations and habitat were monitored to evaluate effectiveness of the Plan. The chapters in this volume summarize information on marbled murrelet ecology and present the monitoring results for marbled murrelets over the first 10 years of the Plan, 1994 to 2003. The marbled murrelet was federally listed in 1992 as threatened in Washington, Oregon, and California. The Plan identified the marbled murrelet as a major objective in the Plan design and hence the status of the murrelet is a key indicator of the Plan's potential success. Effectiveness monitoring for the marbled murrelet has two facets: (1) assess population trends at sea by using a unified sampling design and standardized survey methods, and (2) establish a credible estimate of baseline nesting-habitat data by modeling habitat relations, and use the baseline to track habitat changes over time. Our primary monitoring objective was to determine the status and trends of marbled murrelet populations and nesting habitat in the Plan area. From 2000 to 2003, the largest population estimate was in Puget Sound and Strait of Juan de Fuca of Washington; the highest densities were along the coast of Oregon and California north of the Humboldt-Mendocino County line, and the smallest population and lowest density were from the Humboldt-Mendocino County line south about 200 mi to San Francisco Bay, California. Marbled murrelet population estimates did not change significantly over 4 years. We estimated that 15 or 9 total years of surveys will be needed to detect a 2 or 5 percent annual decrease, respectively, using a test threshold at 95 percent power. We used three modeling approaches to estimate the amount and distribution of baseline nesting habitat: expert judgment,

ecological niche factor analysis, and logistic regression. Our logistic regression model predicted that murrelet nesting habitat is more likely at sites that are closer to the sea, are on relatively flat terrain, are topographically cooler, have relatively fewer conifers larger than pole size (>10 in diameter at breast height [d.b.h.]), have greater basal area of trees larger than pole size, and have greater basal area of larger diameter trees (>30 in d.b.h.). Estimates of amounts of baseline nesting habitat differed with modeling approaches, but all models showed that over 80 percent of baseline habitat on federally administered land occurred in reserved lands. A high proportion of baseline habitat occurred on nonfederal land; amounts of nonfederal habitat differed among provinces. Fire and harvest have led to losses of nesting habitat since the Plan was implemented, with higher rates of loss on nonfederal land. We estimated that only 13 percent of U.S. Forest Service and Bureau of Land Management land had an even chance or better of being suitable nesting habitat; meaning that, relative odds (odds ratios) were equal to or exceeded that of known occupied nesting habitat. We compare the efficacies of the different model approaches, discuss implications of our results for future monitoring, and propose that a comprehensive evaluation of the potential breeding range of marbled murrelet be done for federal land in the Plan area.

Keywords: Marbled murrelet, monitoring, population, trends, habitat modeling, nesting habitat, Northwest Forest Plan.

05-395

Alden, J.

2006. Field survey of growth and colonization of nonnative trees on mainland Alaska. Gen. Tech. Rep. PNW-GTR-664. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 74 p.

Six of nine nonnative boreal conifers in three genera (*Abies*, *Larix*, and *Pinus*) regenerated in 11 to 31 years after they were introduced to mainland Alaska. Lodgepole pine (*Pinus contorta* var. *latifolia* Engel.) and the Siberian larches (*Larix sibirica* Ledeb. and *L. sukaczewii* N. Dyl.) were the most widely introduced species and will likely be the first nonnative conifers to naturalize. Siberian larch grew up to six times more stem volume than white spruce in the first 40 years on upland sites, but was susceptible to the larch sawfly and a blue stain pathogen carried by bark beetles. On productive sites, lodgepole pine appeared to grow more stem wood than white spruce for about 35 years after planting. Snowshoe hares and moose were the most serious pests of the nonnative conifers. Balsam fir (*Abies balsamea* (L.) Mill.) was the only species to regenerate in an established moss understory. Growth and age relationships were negative for all adequately sampled nonnative conifers and positive for native white spruce (*Picea glauca* (Moench) Voss). Data were insufficient to assess niche availability for commercial use of productive nonnative conifers in mixed stands in Alaska. Survey results indicate that introduction and naturalization of noninvasive tree species may improve the diversity, stability, and productivity of managed forest ecosystems.

Keywords: Alaska, nonnative conifers, adaptation, regeneration, colonization, growth rates, wood yields, animal damage.

05-415

Kruger, L.E.; Mazza, R.L.

2006. Alaska communities and forest environments: a problem analysis and research agenda. Gen. Tech. Rep. PNW-GTR-665. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 58 p.

This problem analysis describes a variety of human-resource interaction issues and identifies related social science research and development needs that serve as the foundation for the Alaska Communities and Forest Environments Team within the Pacific Northwest Research Station. The document lays out a research agenda that focuses on understanding relations between human communities and natural resources. The agenda is divided into four subtopics: (1) communities in transition; (2) collaborative planning and stewardship; (3) sustainable tourism and outdoor recreation; and (4) cultural orientations to and uses and values of natural resources, including traditional knowledge, indigenous property rights, and tenure systems. Research questions are identified within each subtopic. Additional questions are listed in an appendix. The answers to these questions would contribute information important to forest planning and management and could help managers mitigate negative impacts and improve the flow of benefits for communities leading to a better understanding of how to sustain healthy forests and communities.

Keywords: Social science research, Alaska, collaborative planning, communities, tourism and recreation.

06-223

Deal, R.L.; Harrington, C.A., eds.

2006. Red alder—a state of knowledge. Gen. Tech. Rep. PNW-GTR-669. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 150 p.

In March 2005 an international symposium on red alder was held at the University of Washington Center for Urban Horticulture in Seattle, Washington. The symposium was entitled "Red Alder: A State of Knowledge" and brought together regional experts to critically examine the economic, ecological and social values of red alder. The primary goal of the symposium was to discuss new advances in the understanding of red alder biology and silviculture, changing market and nonmarket values, and the current regulatory climate for management of alder. This proceedings includes 14 papers based on oral presentations given at the symposium. These papers highlight some of the key findings from the history, ecology, biology, silviculture and economics sessions presented at the red alder symposium.

Keywords: Red alder, Alnus rubra*, history, biology and ecology, mixed-species stands, silviculture, pruning, plantation establishment, economics, inventory, supply.*

06-018

Pilz, D.; Alexander, S.J.; Smith, J.; Schroeder, R.; Freed, J.

2006. Nontimber forest product opportunities in Alaska. Gen. Tech. Rep. PNW-GTR-671. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 79 p.

Nontimber forest products from southern Alaska (also called special forest products) have been used for millennia as resources vital to the livelihoods and culture of Alaska Natives and, more recently, as subsistence resources for the welfare of all citizens. Many of these products are now being sold, and Alaskans seek additional income opportunities through sustainable harvest and manufacture of such forest resources. We discuss the unique legal, regulatory, land tenure, geographic, vegetation, and climatic context that southern Alaska presents for marketing nontimber forest products; summarize the various species and types of products being harvested; and consider the marketing challenges and opportunities new entrepreneurs will encounter. The information and resources we provide are intended to enhance income opportunities for all Alaskans, while sustaining the organisms harvested, respecting traditional activities, and ensuring equitable access to resources.

Keywords: Nontimber forest products, special forest products, Alaska, marketing opportunities.

05-396

Donoghue, E.M.; Sutton, N.L.

2006. Community socioeconomic information system [CD–ROM]. Gen. Tech. Rep. PNW-GTR-672. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

The Community Socioeconomic Information System (CSIS) is a tool that allows users to retrieve 1990 and 2000 U.S. census data to examine conditions and trends for communities in western Washington, western Oregon, and northern California. The tool includes socioeconomic data for 1,314 communities in the entire region, including incorporated and unincorporated places. The tool delivers socioeconomic data using mapping and database features. In addition to providing data for one community, the tool produces community-level data at a variety of scales, including communities in areas surrounding Forest Service and Bureau of Land Management lands, all communities in the Northwest Forest Plan (NWFP) region, and communities within planning provinces within the NWFP region. One feature allows users to customize community data by creating boundaries and socioeconomic data for group of selected communities. The CSIS tool was designated to increase the usefulness of socioeconomic information at the small scale. Typically community socioeconomic assessments use U.S. census designations called census places. However, census places only represent a portion of the rural population. The CSIS uses a smaller unit of analysis (block groups) that we have aggregated to represent contiguous communities across the landscape, thereby representing the entire population. Applications produce maps that can be printed for specific communities showing community boundaries, water features, roads, metropolitan areas, community population centers, public land ownership, census places, planning provinces, counties, and state boundaries. Or, using the spatial data provided on the CD-ROM, users can produce custom maps.

Keywords: Census, socioeconomic data, communities.

06-141

Liang, J.; Buongiorno, J.; Monserud, R.A.

2006. WestProPlus: a stochastic spreadsheet program for the management of all-aged Douglas-fir–western hemlock forests in the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-674. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 42 p.

WestProPlus is an add-in program developed to work with Microsoft Excel® to simulate the growth and management of all-aged Douglas-fir–western hemlock (*Pseudotsuga menziesii* (Mirb.) Franco–*Tsuga heterophylla* (Raf.) Sarg.) stands in Oregon and Washington. Its built-in growth model was calibrated from 2,706 permanent plots in the Douglas-fir–western hemlock forest type in Oregon and Washington. Stands are described by the number of trees per acre in each of nineteen 2-in diameter classes in four species groups: Douglas-fir, other shade-intolerant species, western hemlock, and other shade-tolerant species. WestProPlus allows managers to predict stand development by year and for many decades from a specific initial state. The simulations can be stochastic or deterministic. The stochastic simulations are based on bootstrapping of the observed errors in models of stand growth, timber prices, and interest rate. When used in stochastic simulations, this bootstrap technique simulates random variables by sampling randomly (with replacement) from actual observations of the variable, rather than from an assumed distribution. Users can choose cutting regimes by specifying the interval between harvests (cutting cycle) and a target distribution of trees remaining after harvest. A target distribution can be a reverse-J-shaped distribution or any other desired distribution. Diameter-limit cuts can also be simulated. Tabulated and graphic results show diameter distributions, basal area, volumes by log grade, income, net present value, and indices of stand diversity by species and size. This manual documents the program installation and activation, provides suggestions for working with Excel, and gives background information on WestProPlus's models. It offers a comprehensive tutorial in the form of two practical examples that explain how to start the program, enter simulation data, execute a simulation, compare simulations, and plot summary statistics.

Keywords: WestProPlus, simulation, growth model, Douglas-fir, western hemlock, management, economics, ecology, diversity, wood quality, risk, stochastic, deterministic.

05-217

Charnley, S., tech. coord.

2006. Northwest Forest Plan—the first 10 years (1994–2003): socioeconomic monitoring results. Gen. Tech. Rep. PNW-GTR-649. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 vol.

The socioeconomic monitoring report addresses two evaluation questions posed in the Northwest Forest Plan (the Plan) record of decision and assesses progress in meeting five Plan socioeconomic goals. Volume I of the report contains key findings. Volume II addresses the question, Are predictable levels of timber and nontimber resources available and being produced? It also evaluates progress in meeting the goal of producing a predictable level of timber sales, special forest products, livestock grazing, minerals, and recreation opportunities. The focus of volume III is the evaluation question, Are local communities and economies experiencing positive or negative changes that may be associated with federal forest management? Two Plan goals are also assessed in volume III: (1) to maintain the stability of local and regional economies on a predictable, long-term basis and, (2) to assist with long-term economic development and diversification to minimize adverse impacts associated with the loss of timber jobs. Progress in meeting another Plan goal—to promote agency-citizen collaboration in forest management—is evaluated in volume IV. Volume V reports on trends in public values regarding forest management in the Pacific Northwest over the past decade, community views of how well the forest values and environmental qualities associated with late-successional, old-growth, and aquatic ecosystems have been protected under the Plan (a fifth Plan goal), and issues and concerns relating to forest management under the Plan expressed by community members. Volume VI provides a history of the Northwest Forest Plan socioeconomic monitoring program and a discussion of potential directions for the program.

Keywords: Northwest Forest Plan, socioeconomic monitoring, timber and nontimber resources, rural communities and economies, collaboration, social values and forest management.

06-232

Thompson, J.

2006. Searing the rhizosphere: belowground impacts of prescribed fires. Science Findings 82. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

A century of fire suppression has resulted in dense fuel loads within the dry pine forests of eastern Oregon. To alleviate the risk of stand-replacing wildfire, forest managers are using prescribed fire and thinning treatments. Until recently, the impact of these fuel treatments on soil productivity has been largely unknown. Such information is essential for making sound management decisions about the successful reintroduction of fire to the ecosystem to retain biodiversity of soil fungi and achieve the desired future condition of large ponderosa pines with low fuel loads. In a recent pair of studies, led by researchers at the PNW Forestry Sciences Laboratory in Corvallis, Oregon, novel molecular techniques were utilized to investigate the response of soil ecosystems to prescribed burning and thinning. The research compared impacts of the season of burn and various combinations of fuel-reducing treatments. Results suggest that overly severe fires can damage soil productivity and that less intense fires can be used to gradually reduce accumulations of fuel. The findings are currently being implemented in decisions about forest management and contribute important new information to the science.

Keywords: Prescribed fire, thinning, soil fungi.

06-210

Thompson, J.

2006. If a tree falls in the forest, who will measure it? DecAID decayed wood advisor. Science Findings 83. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

Decayed wood plays many critical roles in forest ecosystems. Standing dead trees, called snags, provide habitat for a suite of wildlife, including several species of birds, insects, bats, and other mammals. Down wood provides wildlife habitat and performs ecosystem services such as releasing humus, nitrogen, and phosphorus into the forest soil, storing pockets of moisture, and stabilizing soil on slopes. Root wads, tree stumps, hollow trees, and partially dead trees also perform important ecological roles as wildlife habitats and sources of soil organic matter. DecAID Advisor is an on-line decision-aiding system to help managers plan for wood decay elements for biodiversity in forests of Washington and Oregon. DecAID Advisor is a statistical "meta-analysis" and synthesis of a vast amount of wildlife and inventory data. It does not make decisions for managers, but instead, DecAID Advisor advises on size and amount of snags, down wood, and other wood decay elements to meet management objectives and to help set those objectives by forest type and structural condition class. It is the first decision-aiding tool of its kind, given its scope of species, inventory data, and topics provided.

Keywords: DecAID, decayed wood, habitat.

06-252

Thompson, J.

2006. Knock on wood: Is wood production sustainable in the Pacific Northwest? Science Findings 84. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

The Pacific Northwest is one of the world's major timber-producing regions, and its capacity to produce wood on a sustained-yield basis is widely recognized. Nonetheless, there has been increasing public interest in assuring that forests are being sustainably managed, as well as a desire by landowners to demonstrate their commitment to responsible stewardship. Scientists from several universities and the PNW Research Station recently completed an initiative to synthesize existing research on wood production in the region. The initiative was guided by the needs of forest landowners and managers representing forest industry, small private forests, and state forest lands. They concluded that forest fragmentation and land use change, stagnating timber prices, and unfavorable public opinion regarding the scenic quality of intensive forest management were among the largest challenges to sustainable wood production in the region. New technologies and products in wood manufacturing, sustainable harvest levels, niche market opportunities, and underutilized tree species were identified as opportunities for landowners and managers interested in sustainable forestry.

Keywords: Wood production, sustainable harvest, Pacific Northwest.

Publications Available Elsewhere

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Aquatic/Riparian Systems

Bailey, J.D.; Harrington, C.A.

2006. Temperature regulation of bud-burst phenology within and among years in a young Douglas-fir (*Pseudotsuga menziesii*) plantation in western Washington, USA. Tree Physiology. 26: 421–430.

Past greenhouse and growth chamber research has established that terminal buds of Douglas-fir seedlings from many seed sources have a chilling requirement of about 1,200 hours at 0 to 5 °C; once chilled, warm temperatures (>5 °C) force bud burst via accumulation of heat units. We tested this sequential (chilling followed by heat-forcing) bud-burst model with 3 years of field data. This simple model could not predict cooler sites having earlier bud burst nor could it correctly predict the order of bud burst across the 3 years. More complex models of budbreak, which incorporate chilling hours, heat forcing, photoperiod, and the occurrence of freeze events in the spring, may be needed to predict effects of future silvicultural treatments as well to interpret the implications of climate-warming scenarios.

Keywords: Bud burst, budbreak, Douglas-fir seedlings, chilling hours, phenology, climate warming.

(see Olympia order form.)

Gooseff, M.N.; Anderson, J.K.; Wondzell, S.M.; LaNier, J.; Haggerty, R.

2005. A modelling study of hyporheic exchange pattern and the sequence, size, and spacing of stream bedforms in mountain stream networks, Oregon, USA. Hydrological Processes. 19: 2915–2929.

Studies of the hyporheic zone have identified the physical features of channels that control exchange flow at the reach scale, namely changes in subsurface head distributions and longitudinal streambed gradient associated with bedforms such as pool-step or pool-riffle sequences. We showed that spatial channel unit characteristics increased (step size, pool length, etc.) with increasing stream order and that the size of hyporheic upwelling and downwelling zones increased to match the spacing of channel units. Further, our results suggest that the geomorphologic patterns that influence the hyporheic exchange change systematically along the river continuum.

Keywords: Hyporheic zone, geomorphology, MODFLOW, groundwater flow modelling, spatial scaling.

(see Olympia order form.)

Hood, E.; Gooseff, M.N.; Johnson, S.L.

2006. Changes in the character of stream water dissolved organic carbon during flushing in three small watersheds. Oregon. Journal of Geophysical Research. 3(111): GO1007, DOI:10.1029/2005JG000082.

The purpose of this study was to provide a descriptive characterization of dissolved organic carbon (DOC) export in small watersheds by using spectroscopic and chemical analyses to identify how the quality of DOC changes during storm events. These techniques should allow us to discern whether the type, and therefore source and potentially the flowpath, of DOC are changing through the course of the storm event. Additionally, these measures of DOC quality provide insight into the variability in the chemical character of DOC among different sources of DOC within the catchments.

Keywords: Water chemistry, dissolved organic carbon, hydrology, storms, experimental watershed studies.

(see Corvallis order form.)

Reeves, G.H.; WIlliams, J.E.; Gallo, K.; Burnett, K.M.

2006. The Aquatic Conservation Strategy of the Northwest Forest Plan. Conservation Biology. 20(2): 319–329.

The Aquatic Conservation Strategy (ACS) of the Northwest Forest Plan (NWFP) was designed to restore and maintain ecological processes for aquatic and riparian area conservation on federal lands in the western portion of the Pacific Northwest. The primary objective of this paper is to identify the expectations for the ACS in the first 10 years of implementation and to assess how well the ACS has met the initial expectations. This is accomplished through a combination of summary of recently completed analyses on the NWFP and ACS, and quantitative and qualitative assessments of available data and information.

Keywords: Decision-support models, ecosystem management, public lands, riparian management.

(see Corvallis order form.)

Richardson, J.S.; Naiman, R.J.; Swanson, F.J.; Hibbs, D.E.

2005. Riparian communities associated with Pacific Northwest headwater streams: assemblages, processes, and uniqueness. Journal of the American Water Resources Association. 41(4): 935–947.

Riparian areas of large streams provide important habitat to many species and control many instream processes—but is the same true for the margins of small streams? This review considers riparian areas alongside small streams in forested, mountainous areas of the Pacific Northwest and asks if there are fundamental ecological differences from larger streams and from other regions and if there are consequences for management from any differences.

Keywords: Riparian zone, vegetation, stream ecology, microclimate.

(see Corvallis order form.)

Atmosphere

Case, M.J.; Peterson, D.L.

2005. Fine-scale variability in growth-climate relationships of Douglas-fir, North Cascade Range, Washington. Canadian Journal of Forest Research. 35: 2743–2755.

Information about the sensitivity to climate of Douglas-fir is valuable because it will allow forest managers to maximize growth, better understand how carbon sequestration may change over time, and better model and predict future ecosystem responses to climatic change. Projected increases in summer temperatures will likely cause greater soil moisture stress in many forested ecosystems. The potential of extended summer drought periods over decades may significantly alter spatial patterns of productivity, thus impacting carbon storage. It is likely that the productivity of Douglas-fir in the Cascade Range will decrease at sites with shallow, excessively drained soils, south- and west-facing aspects, and steep slopes and will increase at high-elevation sites.

Keywords: Tree growth, carbon sequestration, climate change, Douglas-fir, North Cascade Range.

(see Seattle order form.)

Wiedinmyer, C.; Tie, X.; Guenther, A.; Neilson, R.; Granier, C.

2006. Future changes in biogenic isoprene emissions: how might they affect regional and global atmospheric chemistry? Earth Interactions. 10(3): 1–19.

Isoprene is emitted from vegetation to atmosphere in significant quantities and it plays an important role in the reactions that control tropospheric oxidant concentrations. This paper presents a study of the change in biogenic isoprene emissions that would result from both anthropogenic land cover and climate-driven changes. The Model for Ozone and Related Tracers (MOZART-2) was run with different isoprene emission scenarios to simulate the potential changes in global atmospheric chemical composition. The results were used to evaluate changes in ozone production chemistry under different emission scenarios. The impacts of changing isoprene emissions are regionally dependent with large changes in China, the Amazon, the U.S. and Europe.

Keywords: Isoprene emissions, climate change, land cover change, simulation.

(see Corvallis order form.)

Economics

Mazza, R.

2006. New currency for conservation. American Forests. 3: 43–45.

This article discusses developments in market-based conservation: emerging markets for ecosystem services and other innovative methods to conserve traditionally nonmarketable natural resources while encouraging economic growth.

Keywords: Ecosystem services, market-based conservation.

(see Portland order form.)

Ecosystem Structure and Function

Bachelet, D.; Lenihan, J.; Neilson, R.; Drapek, R.; Kittel, T.

2005. Simulating the response of natural ecosystems and their fire regimes to climatic variability in Alaska. Canadian Journal of Forest Research. 35: 2244–2257.

The dynamic global vegetation model MCI was used to examine climate, fire, and ecosystems interactions in Alaska under historical (1922–96) and future (1997–2100) climate conditions. Projections show that by the end of the 21st century, 75 to 90 percent of the area simulated as tundra in 1922 is replaced by boreal and temperate forest. Under future climate change scenarios, fire emissions

increase to 11 to 12 g C • m^{-2} • $year^{-1}$ and the area burned increases to 411 000 to 481 000 ha • $year^{-1}$. Despite increases in fire losses, the model simulates an increase in carbon gains during the 21st century until its last decade, when, under both climate change scenarios, Alaska becomes a net carbon source.

Keywords: Simulation, climate variability, fire and ecosystem interactions, carbon.

(see Corvallis order form.)

Burkett, V.R.; Wilcox, D.A.; Stottlemyer, R.; Barrow, W.; Fagre, D.; Baron, J.; Price, J.; Nielsen, J.L.; Allen, C.D.; Peterson, D.L.; Ruggerone, G.; Doyle, T.

2005. Nonlinear dynamics in ecosystem response to climatic change: case studies and policy implications. Ecological Complexity. 2: 357–394.

Many biological, hydrological, and geological processes are interactively linked in ecosystems. Rapid, nonlinear changes to markedly different conditions can be triggered by even small differences if threshold values are exceeded. Intrinsic and extrinsic ecological thresholds can lead to effects that cascade among systems, precluding accurate modeling and prediction of system response to climate change. Ten case studies from North America illustrate how changes in climate can lead to rapid, threshold-type responses within ecological communities; the case studies also highlight the role of human activities that alter the rate or direction of system response to climate change. Understanding and anticipating nonlinear dynamics are important aspects of adaptation planning because responses of biological resources to changes in the physical climate system are not necessarily proportional.

Keywords: Nonlinear dynamics, thresholds, ecosystems, climate change, natural resource management.

(see Seattle order form.)

McIver, J.; Starr, L.

2001. Restoration of degraded lands in the interior Columbia River basin: passive vs. active approaches. Forest Ecology and Management. 153: 15–28.

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

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

(see La Grande order form.)

Neilson, R.P.; Pitelka, L.P.; Solomon, A.M.; Nathan, R.; Midgley, G.F.; Fragoso, J.M.V.; Lischke, H.; Thompson, K.

2005. Forecasting regional to global plant migration in response to climate change. BioScience. 55(9): 749–759.

The rate of future climate change is likely to exceed the migration rates of most plant species. The replacement of dominant species by locally rare species may require decades, and extinctions may occur when plant species cannot migrate fast enough to escape the consequences of climate change. To assess global change, simulation of plant migration and local vegetation change by dynamic global vegetation models (DGVMs) is critical, yet fraught with challenges. DVGMs cannot simulate all species, necessitating their aggregation into plant functional types (PFTs). Yet most PFTs encompass the full spectrum of migration rates. Theories about climate change and migration are limited by inadequate data for key processes at both short and long space and time scales and must be enhanced to incorporate species-level migration and succession processes into a more comprehensive definition of PFTs.

Keywords: Climate change, dispersal, migration, simulation, ecosystem function, dynamic global vegetation models.

(see Corvallis order form.)

Peterson, D.L.; Littell, J.

2006. Biological change in the global greenhouse [Book Review]. Conservation Biology. 20(1): 255.

Review of the book *Climate Change and Biodiversity* (Lovejoy, T.E.; Hannah, L., eds. New Haven, CT: Yale University Press. 440 p.)

Keywords: Biodiversity, climate change, global change.

(see Seattle order form.)

Fire

Calkin, D.E.; Gebert, K.M.; Jones, J.G.; Neilson, R.P.

2005. Forest Service large fire area burned and suppression expenditure trends, 1970–2002. Journal of Forestry. 103(4): 179–183.

Extreme fire seasons in recent years and associated high suppression expenditures have brought about a chorus of calls for reform of federal firefighting structure and policy. Given the political nature of the topic, a critical review of past trends in area burned, size of fires, and suppression expenditures is warranted. We examined data relating to emergency wildland fire suppression expenditures, number of fires, and acres burned and developed statistical models to estimate area burned using drought indices for the USDA Forest Service from 1970 to 2002.

Keywords: Wildland fire, Forest Service suppression expenditure trends, Palmer Drought Severity Index.

(see Corvallis order form.)

Chapin, F.S., III; McGuire, D.; Ruess, R.W.; Walker, M.W.; Boone, R.D.; Edwards, M.E.; Finney, B.P.; Hinzman, L.D.; Jones, J.B.; Juday, G.P.; Kasischke, E.S.; Kielland, K.; Lloyd, A.H.; Oswood, M.W.; Ping, C.-L.; Rexstad, E.; Romanovsky, V.E.; Schimel, J.P.; Sparrow, E.B.; Sveinbjörnsson, B.; Valentine, D.W.; van Cleve, K.; Verbyla, D.L.; Viereck, L.A.; Werner, R.A.; Wurtz, T.L.; Yarie, J.

2006. Summary and synthesis: past and future changes in the Alaskan boreal forest. In: Chapin, F.S., III; Oswood, M.W.; van Cleve, K.; Viereck, L.A.; Verbyla, D.L., eds. Alaska's changing boreal forest. New York: Oxford University Press: 333–338. Chapter 21.

Summary chapter that discusses the findings described in earlier chapters...

Keywords: Boreal forest, white spruce, interior Alaska.

(see Fairbanks order form.)

Hammer, R.B.; Radeloff, V.C.; Fried, J.S.; Stewart, S.I.

2005. The wildland-urban interface in the United States. Ecological Applications. 15(3): 799–805.

We examined wildland-urban interface (WUI) growth in California, Oregon, and Washington, combining housing density information from the 1990 and 2000 U.S. censuses with land cover information from the 1992/93 National Land Cover Dataset and via overlay with coarse-scale fire regime condition class to evaluate implications for wildland fire management. During the 1990s, WUI area in the three-state region increased by 5,218 km^2 to nearly 53,000 km^2, and housing units in the WUI increased to 6.9 million by 2000 (43 percent of all housing in the region). More than a million new homes were constructed in the WUI, comprising 61 percent of the new homes constructed in the region. By 2000, there was far more intermix WUI than interface.

Keywords: Fragmentation, housing growth, urban sprawl, urbanization, wildfire, wildland fire, wildland-urban interface.

(see Portland order form.)

Johnson, M.C.; Peterson, D.L.

2005. Forest fuel treatments in western North America: merging silviculture and fire management. The Forestry Chronicle. 81(3): 366–368.

Scientific and management tools were linked to develop an analytical approach that allows resource managers to quantify and evaluate the effectiveness of alternative fuel treatments in dry interior forests of western North America. The principal tools are (1) the Fire and Fuels Extension of the Forest Vegetation Simulator (FFE-FVS) for characterizing fuel succession and fire behavior and (2) the EnVision system for visualizing surface fuels. This combination of tools provides a user-friendly framework that facilitates rapid evaluation of thinning and surface fuel treatments intended to reduce crown fire potential and fireline intensity. This approach quantifies fire hazard at multiple spatial scales, assists with treatment priorities and schedules, and generates stand and landscape visualizations that aid decisionmaking about appropriate fuel treatments.

Keywords: Fire behavior, fire hazard, fuel treatments, silviculture.

(see Seattle order form.)

Potter, B.E.; Charney, J.J.; Fusina, L.A.

2006. Atmospheric moisture's influence on fire behavior: surface moisture and plume dynamics. In: Viegas, D.X., ed. Proceedings, 5th international conference on forest fire research. Coimbra, Portugal: [Publisher unknown].

Nine measures of atmospheric surface moisture are tested for statistical relationships with fire size and number of fires using data from the Great Lakes region of the United States. The measures include relative humidity, water vapor mixing ratio, mixing ratio deficit, vapor pressure, vapor pressure deficit, dew point temperature, dew point depression, wet bulb temperature and wet bulb depression. Two moisture-related measures of the vertical stability of the atmosphere (convective available potential energy and a modified version of the same quantity) are also tested for the same fire data. Results suggest that measures that indicate the difference between equilibrium moisture content of the atmosphere and actual moisture content correlate more strongly with fire number in a region than do measures of actual moisture content. None of the moisture measures, including stability measures, appear to correlate with individual fire size.

Keywords: Weather, humidity, fire danger.

(see Seattle order form.)

Raymond, C.L.; Peterson, D.L.

2005. Fuel treatments alter the effects of wildfire in a mixed-evergreen forest, Oregon, USA. Canadian Journal of Forest Research. 35: 2981–2995.

This study quantified the relationship between fuels and fire severity using prefire surface and canopy fuel data and fire severity data after a wildfire. The study area is a mixed-evergreen forest of southwestern Oregon with a mixed-severity fire regime. Modeled fire behavior showed that thinning reduced canopy fuels, thereby decreasing the potential for crown fire spread. Thinning followed by underburning reduced canopy, ladder, and surface fuels, thereby decreasing surface fire intensity and crown fire potential. Mortality was most severe in thinned treatments, moderate in untreated stands, and least severe in the thinned and underburned treatment. Thinned treatments had higher fine-fuel loading and more extensive crown scorch, suggesting that greater consumption of fine fuels contributed to higher tree mortality. Fuel treatments intended to minimize tree mortality will be most effective if both ladder and surface fuels are treated.

Keywords: Fire effects, Biscuit fire, fuel treatment, forest thinning.

(see Seattle order form.)

Thies, W.G.; Westlind, D.J.; Loewen, M.; Brenner, G.

2006. Prediction of delayed mortality of fire-damaged ponderosa pine following prescribed fires in eastern Oregon, USA. International Journal of Wildland Fire. 15: 19–29.

Delayed mortality of ponderosa pine following prescribed burn was studied in six previously thinned stands in the south end of the Blue Mountains near Burns, Oregon. A fall burn, spring burn, and unburned control were applied to 12-ha experimental units within each stand. Burns were representative of operational burns given weather and fuel conditions. Trees were observed for four growing seasons postburning. Nine morphological variables and measures of fire damage from 3,415 trees were evaluated by logistic regression. Mortality was found to be more a function of tree damage from fire than a tree's seasonal physiological state. A five-factor full model and a two-factor reduced model are presented for projecting probability of mortality.

Keywords: Fire, modeling, Blue Mountains, ponderosa pine.

(see Corvallis order form.)

Fish

Bisson, P.A.; Lichatowich, J.A.; Liss, W.J.; Goodman, D.; Coutant, C.C.; McDonald, L.; Lettenmaier, D.; Loudenslager, E.J.; Williams, R.N.

2006. Federal and state approaches to salmon recovery at the millennium [Book chapter]. In: Williams, R.N., ed. Return to the river: restoring salmon to the Columbia River. Burlington, MA: Elsevier Academic Press. Chapter 12.

This chapter reviews approaches to salmon recovery put forward in four recent documents: (1) the Governors' Plan (Recommendations of the Governors of Idaho, Montana, Oregon and Washington for Protecting and Restoring Columbia River Fish and Wildlife and Preserving the Benefits of the Columbia River Power System, July 2000; recently updated in June 2003), (2) the Northwest Power Planning Council's Plan (2000 Columbia River Basin Fish and Wildlife Program, November 30, 2000), (3) the National Marine Fisheries Service's Biological Opinion (Final 2000 Federal Columbia River Power System Biological Opinion, December 21, 2000), and (4) the Federal Caucus Plan (Conservation of Columbia Basin Fish, December 21, 2000, here termed the Basinwide Recovery Strategy or All-H Paper).

Keywords: Pacific salmon, Columbia River, salmon recovery plans.

(see Corvallis order form.)

Fried, J.S.; Gilless, J.K.; Spero, J.

2006. Analysing initial attack on wildland fires using stochastic simulation. Journal of Wildland Fire. 15: 137–146.

Stochastic simulation models of initial attack on wildland fire can be designed to reflect the complexity of a wildland fire protection agency's environmental, administrative, and institutional context. Such complexity comes at the cost of a considerable investment in data acquisition and management, but allows for analysis of a wider spectrum of operational problems in wildland fire protection planning. One such simulation system, the California Fire Economics Simulator version 2, facilitates quantitative analysis of the potential effects of changes in almost any component of the wildland fire system, including availability and stationing of resources, dispatch rules, criteria for setting fire dispatch level, staff schedules, and deployment and line-building tactics. The model can also be used to support strategic planning with respect to vegetation management programs, development at the wildland-urban interface, reallocation of responsibilities among fire protection agencies, and climate change. These capacities are illustrated by examples showing impacts on the effectiveness of initial attack of (1) multiple fire starts, (2) diversion of firefighting resources to structure protection, (3) alternate stationing of firefighting resources, and (4) multiagency cooperation.

Keywords: Fire protection planning, forest fire, wildfire.

(see Portland order form.)

Lang, D.W.; Reeves, G.H.; Hall, J.D.; Wipfli, M.S.

2006. The influence of fall-spawning coho salmon (*Oncorhynchus kisutch*) on growth and production of juvenile coho salmon rearing in beaver ponds on the Copper River Delta, Alaska. Canadian Journal of Fisheries and Aquatic Sciences. 63: 917–930.

This study examined the influence of fall-spawning coho salmon on the density, growth rate, body condition, and survival to outmigration of juvenile coho salmon on the Copper River Delta, Alaska. The response to spawning salmon was variable. In some ponds, fall-spawning salmon increased growth rates and improved the condition of juvenile coho salmon. The enrichment with salmon carcasses and eggs significantly increased growth rates of fish in nonspawning ponds. However, there was little evidence that the short-term growth benefits observed in the fall led to greater overwinter growth or survival to outmigration when compared with fish from the nonspawning ponds. One potential reason for this result may be that nutrients from spawning salmon are widely distributed across the delta because of hydrologic connectivity and hyporheic flows.

Keywords: Coho salmon, beaver ponds, growth and production, salmon spawning.

(see Corvallis order form.)

Forest Management

Ager, A.A.; Hayes, J.L.; Barbour, R.J.

2005. Simulating fuel reduction scenarios on a wildland-urban interface in northeastern Oregon. In: Bevers, M.; Barrett, T.M., comps. Systems analysis in forest resources: proceedings of the 2003 Symposium. Gen. Tech. Rep. PNW-GTR-656. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 215–227.

We analyzed the long-term effects of fuels reduction treatments around a wildland-urban interface located in the Blue Mountains near La Grande, Oregon. The study area is targeted for wide-scale fuels reduction treatments on both private and federal lands as a means to reduce the risk of severe wildfire and associated damage to property and homes. We modeled a number of hypothetical fuel treatment scenarios that varied management intensity, and examined the resulting changes in fuel characteristics, fire potential, and stand structure over time.

Keywords: Fuels management, wildland-urban interface, FVS, FFE, northeastern Oregon.

(see La Grande order form.)

Devine, W.D.; Harrington, C.A.; Terry, T.A.

2005. Volumetric soil water content in a 4-year-old and a 50-year-old Douglas-fir stand. In: Harrington, C.A.; Schoenholtz, S.H., eds. Productivity of Western forests: a forest products focus. Gen. Tech. Rep. PNW-GTR-642. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 161–164.

We compared growing-season soil water content in a young Douglas-fir (*Pseudotsuga menziesi* (Mirb.) Franco) plantation (established in 2000 with no vegetation control) to that of an adjacent 50-year-old conifer stand on a highly productive site in southwestern Washington. Soil water content in the older stand was slightly greater than that of the younger stand at soil depths of 10 and 30 cm during the 2003 and 2004 growing seasons. At 100 cm, soil water content was similar between stands. During the 2003 growing season, when precipitation was below average, soil water content declined by a similar amount in both stands.

Keywords: Soil water, Douglas-fir, regeneration, evaporation, transpiration.

(see Olympia order form.)

Devine, W.D.; Harrington, C.A.

2005. Root system morphology of Oregon white oak on a glacial outwash soil. Northwest Science. 79(2–3): 179–188.

In the Puget Trough of western Washington, Oregon white oak grows in coarse-textured glacial outwash soils on lowland sites. Our objective was to quantify the gross root system morphology of Oregon white oak, thereby improving our understanding of its belowground resource acquisition on these sites. Root systems of 27 oak trees (age 3 to 95 years) were excavated and measured. Root systems of seedlings and small trees had prominent taproots, but root systems of larger trees were structurally dominated by shallow lateral roots. The predominance of shallow roots suggests that management of understory vegetation or overstory conifers, which both have a similar rooting zone, will likely influence growth and survival of oak.

Keywords: Quercus garryana*, Oregon white oak, roots, soil.*

(see Olympia order form.)

Erickson, H.; Harrington, C.A.

2006. Conifer-*Ceanothus* interactions influence tree growth before and after shrub removal in a forest plantation in the western Cascade Mountains, USA. Forest Ecology and Management. 229: 183–194.

Ceanothus velutinous is often considered to be an aggressive competitor with young conifers in the Western United States. Using a conifer (noble fir, Pacific silver fir, Douglas-fir, and western hemlock) plantation in western Washington where *Ceanothus* had become established, we assessed how conifer-shrub crown interactions affected individual tree growth before and after cutting *Ceanothus* from around individual trees. For all conifer species, trees surrounded by but with leaders above *Ceanothus* were 18 to 70 percent taller than open-grown trees, and trees with leaders below *Ceanothus* were 22 to 50 percent shorter than open-grown trees, suggesting that *Ceanothus* had both positive and negative effects on tree growth. The benefits of growing with or being released from encroachment by *Ceanothus* will vary with conifer species and the degree of conifer-shrub interaction and may persist for many years.

Keywords: Conifer growth, shrub competition, Ceanothus*, noble fir, Pacific silver fir, Douglas-fir, western hemlock.*

(see Olympia order form.)

Fried, J.S.; Christensen, G.; Weyermann, D.; Barbour, R.J.; Fight, R.; Hiserote, B.; Pinjuv, G.

2005. Modeling opportunities and feasibility of siting wood-fired electrical generating facilities to facilitate landscape-scale fuel treatment with FIA BioSum. In: Bevers, M.; Barrett, T.M., comps. Systems analysis in forest resources: proceedings of the 2003 symposium. Gen. Tech. Rep. PNW-GTR-656. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 207–216.

The FIA BioSum modeling framework, which incorporates Forest Inventory and Analysis (FIA) plot data, a transportation cost model, a treatment cost accounting module, a log valuation model, and a crown fire hazard evaluator was applied to a 28 million acre study area containing 6,200 FIA plots spanning in western Oregon and northern California. Several fuel treatment prescriptions with a high likelihood of producing a substantial reduction in crown fire hazard were simulated for each plot, and 221 potential biomass processing sites were considered. With four 50 megawatt biomass-fueled power plants strategically distributed over the study area, up to 5.3 million acres could be effectively treated with net revenue of $2.6 billion, a merchantable yield of 9.5 billion cubic feet, and a biomass yield of 79 million green tons, if net-revenue maximizing fuel treatments are selected.

Keywords: Thinning, biomass assessment, fire hazard reduction.

(see Portland order form.)

Nonaka, E.; Spies, T.A.

2005. Historical range of variability in landscape structure: a simulation study in Oregon, USA. Ecological Applications. 15(5): 1727–1746.

The main objective of this study was to evaluate the use of the historical range of variability (HRV) approach for assessing the effects of forest management in a large, province-scale landscape. We studied the Oregon Coast Range because we had a good foundation of ecological studies and simulation models upon which to advance our knowledge of HRV and its relevance to forest management. The specific objectives of this study were to (1) establish the HRV of landscape structure using a wide array of age classes and landscape metrics, (2) compare the current landscape condition with the HRV, and (3) evaluate the similarity of alternative future landscapes to HRV.

Keywords: Disturbance, fire, historical range of variability, landscape dynamics, landscape metrics.

(see Corvallis order form.)

Thies, W.G.; Kelsey, R.G.; Westlind, D.J.; Madsen, J.
2006. Potassium fertilizer applied immediately after planting has no impact on Douglas-fir seedling mortality caused by laminated root rot. Forest Ecology and Management. 229: 195–201.

Increasing tree vigor and resistance to pathogens through application of K fertilizer is a suggested disease management strategy. Plots were established with Douglas-fir seedlings planted densely (12,000 seedlings • ha^{-1}) around stumps of LRR-killed trees. Treatments, randomly assigned to plots, included 224 kg K • ha^{-1}, 448 kg K • ha^{-1}, 224 kg K + 224 kg N • ha^{-1}, or a no-fertilizer control, with 11 replicates. Roots of seedlings receiving the K + N treatment showed the only increase in phenol/sugar ratios after one growing season, suggesting their resistance might be enhanced, however, their mortality rate due to laminated root rot 7 years posttreatment was similar to that on the no-fertilizer plots.

Keywords: Potassium fertilizer, defensive chemicals, root disease, plant nutrients, laminated root rot.

(see Corvallis order form.)

Wurtz, T.L.; Ott, R.; Maisch, J.C.
2006. Timber harvest in interior Alaska. In: Chapin, F.S., III; Oswood, M.W.; van Cleve, K.; Viereck, L.A.; Verbyla, D.L., eds. Alaska's changing boreal forest. New York: Oxford University Press: 302–308. Chapter 18.

Interior Alaska has more than 600 000 ha of productive mixed white spruce/hardwood and pur white spruce forest on state lands classified for forestry purposes. Yet during the last 20 years fewer than 500 ha have been harvested per year. We review the reasons behind the small amount of timber harvested, including access to merchantable stands, distance to markets, and the low quality of material. The bases of the Bonanza Creek Long-Term Ecological Research Program's interest in timber harvest in interior Alaska are discussed.

Keywords: Timber harvest, interior Alaska.

(see Fairbanks order form.)

General Science

Lugo, A.E.; Swanson, F.J.; Gonzalez, O.R.; Adams, M.B.; Palik, B.; Thill, R.E.; Brockway, D.G.; Kern, C.; Woodsmith, R.; Musselman, R.
2006. Long-term research at the USDA Forest Service's experimental forests and ranges. BioScience. 56(1): 39–47.

The network of experimental forests and ranges administered by the USDA Forest Service consists of 77 properties that are representative of most forest cover types and many ecological regions in the Nation. Established as early as 1908, these sites maintain exceptional, long-term databases on environmental dynamics and biotic responses. Over time, many of the properties have evolved into a functional network of ecological observatories through common large-scale, long-term experiments. Collaboration with other institutions and research programs fosters intersite research and common procedures for managing and sharing data. Much current research in this network focuses on global change and interdisciplinary ecosystem studies at local to global scales. With this experience in developing networks and compiling records of environmental history, the experimental forests and ranges network can contribute greatly to formation of new networks of environmental observatories.

Keywords: Experimental forests, experimental rangelands, research networks, global change science, silviculture.

(see Corvallis order form.)

Genetics

Howe, G.T.; Jayawickrama, K.; Cherry, M.; Johnson, G.R.; Wheeler, N.C.
2006. Breeding Douglas-fir. In: Plant breeding reviews. Hoboken, NJ: John Wiley & Sons: 245–353. Chapter 6.

This chapter in *Plant Breeding Reviews*, Volume 27, provides a comprehensive summary of the state of Douglas-fir breeding. It describes the theory and procedures of Douglas-fir breeding programs.

Keywords: Douglas-fir, tree breeding, genetics, biotechnology.

(see Corvallis order form.)

St. Clair, J.B.; Lipow, S.; Johnson, R.G.
2005. Enfoques a la conservación de recursos genéticos forestales. In: Vera, C.G.; Vargas, J.J.; Dorantes, L., eds. Memorias del simposium Uso y conservación de recursos genéticos forestales. Jalapa, Veracruz, México. Comisión Nacional Forestal: 63–77. [In Spanish.]

Conservation of genetic resources is an important requirement of sustainable forest management. This paper reviews methods and concerns of forest tree gene conservation, and presents an example of a regional program of gene conservation in the Pacific Northwest.

Keywords: Gene conservation gap analysis, conifers.

(see Corvallis order form.)

St. Clair, J.B.; Mandel, N.L.; Vance-Borland, K.W.

2005. Genecology of Douglas-fir in western Oregon and Washington. Annals of Botany. 96: 1199–1214.

Adaptive traits were measured in seedlings of 1,338 parents from 1,048 locations grown in a common garden. Populations differed considerably in bud phenology, growth, emergence, and partitioning. Cold temperatures are of overriding importance to the adaptation of Douglas-fir to Pacific Northwest environments. Also, important, but to a smaller degree, are environmental variables associated with summer drought. Maps generated using canonical correlation analysis and geographic information systems allow easy visualization of a complex array of traits as related to a complex array of environments. Populations from the east side of the Washington Cascades were less vigorous, and are hypothesized to be of the interior variety.

Keywords: Pseudotsuga menziesii*, genecology, geographic variation, adaptation, phenology.*

(see Corvallis order form.)

Geomorphology and Hydrology

Hassan, M.A.; Church, M.; Lisle, T.E.; Brardinoni, F.; Benda, L.; Grant, G.E.

2005. Sediment transport and channel morphology of small, forested streams. Journal of the American Water Resources Association. 41(4): 853–876.

This paper reviews sediment transport and channel morphology in small, forested streams in the Pacific Northwest region of North America to assess current knowledge of channel stability and morphology relevant to riparian management practices around small streams. Small channels are ones in which morphology and hydraulics may be significantly influenced by individual clasts or wood materials in the channel. Such channels are headwater channels in close proximity to sediment sources, so they reflect a mix of hillslope and channel processes. Sediment inputs are derived directly from adjacent hillslopes and from the channel banks. Morphologically significant sediments move mainly as bed load, mainly at low intensity, and there is no standard method for measurement. The larger clastic and woody elements in the channel form persistent structures that trap significant volumes of sediment, reducing sediment transport in the short term and substantially increasing channel stability.

Keywords: Streams, sediment transport, fluvial processes, geomorphology.

(see Corvallis order form.)

O'Connor, J.E.; Grant, G.E., eds.

2003. A peculiar river: geology, geomorphology, and hydrology of the Deschutes River, Oregon. Water Science and Application Series Volume 7. Washington, DC: American Geophysical Union. 219 p.

This monograph links together several separate studies from a variety of disciplines into an integrated view of the geology, hydrology, and ecology of the Deschutes River. The research was initially prompted by the question "What effect has flow regulation and reduced sediment input had on the Deschutes River downstream of the Pelton-Round Butte dam complex?" Contrary to our expectations, there is little evidence of change in channel bed texture and morphology since dam construction. The broader geologic setting and history has limited the effectiveness of modern processes, such as meteorological floods and dam operations, in shaping the present channel and valley bottom of the Deschutes River.

Keywords: Channel geomorphology, floods, mass movement, fish, groundwater processes.

(see Corvallis order form.)

Samuels, W.B.; Bahadur, R.; Monteith, M.C.; Amstutz, D.E.; Pickus, J.M.; Parker, K.; Ryan, D.

2006. NHD, RiverSpill, and the development of the incident command tool for drinking water protection. Water Resources Impact. 8(2): 15–18.

This project involved developing an information tool that gives incident commanders critical information they need to make decisions regarding the consequences of threats to public drinking water intakes. Making data on the location and concentration of contaminants and other key information quickly available to incident commanders will better enable them to evaluate the risks posed to the public and to direct actions of first responders to effectively reduce those risks. This tool provides secure, Web-based access for local incident commanders and to centralized regional and national command centers. IC Water provides the capability of tracking and predicting the movement of human pathogens, toxic substances, and radioactive contaminants that could pose significant threats to public safety if they are introduced into surface water as a result of deliberate contamination attacks or accidental spills.

Keywords: Toxic chemicals, radioactive contaminants, biological contaminants, human pathogens, public drinking water, incident command tool.

(see Olympia order form.)

Invasive Plants and Animals

Naylor, B.J.; Endress, B.A.; Parks, C.G.

2005. Multiscale detection of sulfur cinquefoil using aerial photography. Rangeland Ecology and Management. 58: 447–451.

We evaluated the effectiveness of natural color aerial photography as a tool to improve detection, monitoring, and mapping of sulfur cinquefoil (*Potentilla recta* L.), an exotic perennial plant. We visually analyzed the photographs for sulfur cinquefoil presence at 80 sample points, which were then located in the field by using a global positioning system. Field data collected at each point included sulfur cinquefoil presence, percentage cover, and stem density; and total vegetation composition and percent cover by life form. Sulfur cinquefoil presence was correctly identified in 76.9, 67.9, and 59.1 percent of the sitesat the 1:3,000, 1:6,000, and 1:12,000 scales, respectively. Low-density infestations (<1 percent cover) were detected at all scales. Accuracy of percentage cover estimates ranged from 33.8 to 38.0 percent across scales. Our results indicate that aerial photography can be used to detect sulfur cinquefoil infestations in open forests and rangelands in the intermountain West.

Keywords: Remote sensing, Potentilla recta*, image analysis, invasive plants, noxious weeds, exotic species, Oregon*.

(see La Grande order form).

Parks, C.G.; Radosevich, S.R.; Anzinger, D.; Endress, B.A.; Rew, L.J.; Maxwell, B.D.; Dwire, K.A.; Naylor, B.J.

2005. Natural and land-use history of the Northwest mountain ecoregions (USA) in relation to patterns of plant invasions. Perspectives in Plant Ecology, Evolution and Systematics. 7: 137–158.

Land managers are concerned about nonindigenous invasive plant expansion into Northwest mountains. We highlight key human-induced environmental changes that have occurred over the last two centuries of Northwest settlement. Land use that causes land cover changes account for many of the deteriorated environments that invite and stabilize plant invasions in the region's mountains. Our analysis found altered riparian systems to be especially vulnerable to nonindigenous plant invasion. Conversely, alpine areas are still relatively uninvaded. We offer some options and approaches that may be useful to address current and emerging issues in invasive plant management of Northwest mountain ecosystems.

Keywords: Exotic plants, invasive plant management, landscape change, mountain ecosystems, Pacific Northwest, settlement history

(see La Grande order form.)

Perkins, D.L.; Parks, C.G.; Dwire, K.A.; Endress, B.A.; Johnson, K.

2006. Age structure and age-related performance of sulfur cinquefoil (*Potentilla recta*). Weed Science. 54: 87–93.

Age distributions of sulfur cinquefoil populations were determined on sites that were historically grazed, cultivated, and mechanically disturbed. From 12 sites, a total of 279 reproductively active plants were collected and aged by using herbchronology (counting rings in the secondary root xylem of the root crown) to (1) estimate the age structure of the populations, (2) relate plant size and flower production to plant age, and (3) examine the relation of population age structure to environmental variables and disturbance history. Results indicated that the mean age for all sampled plants was 3.5 (±1.74 SD) years and ranged from 1 to 10 years. We conclude that sulfur cinquefoil plants sampled in northeast Oregon are able to colonize, establish, and reproduce at disturbed sites rapidly.

Keywords: Age determination, age distribution, demography, herbaceous perennials, population biology.

(see La Grande order form.)

Invertebrates

Progar, R.A.

2005. Five-year operational trial of verbenone to deter mountain pine beetle (*Dendroctonus ponderosae*; Coleoptera: Scolytidae) attack of lodgepole pine (*Pinus contorta*). Environmental Entomology. 34(6): 1402–1407.

The antiaggregation pheromone verbenone was operationally tested for 5 years to deter mass attack by the mountain pine beetle on lodgepole pine in campgrounds and administrative areas surrounding Redfish and Little Redfish Lakes at the Sawtooth National Recreation Area in central Idaho. Mountain pine beetles had killed a median of 87 percent of the lodgepole pine trees >13 cm in diameter in untreated plots and 67 percent in plots containing verbenone pouches. It is hypothesized that as preferred resources became scarce and population levels rose, the response of mountain pine beetles to the antiaggregant signal sharply declined. The 2-year delay in catastrophic loss of large pines caused by verbenone would have given land managers time to institute other management tactics in the areas.

Keywords: Pheromone, verbenone, mountain pine beetle, lodgepole pine.

(see Corvallis order form.)

Schowalter, T.D.; Zhang, Y.; Prograr, R.A.

2005. Canopy arthropod response to density and distribution of green trees retained after partial harvest. Ecological Applications. 15(5): 1594–1603.

We measured canopy arthropod responses to six contrasting green-tree retention treatments in western Oregon and Washington as part of the Demonstration of Ecosystem Management Options study. Treatments were 100 percent retention (uncut), 75 percent retention with three 1-ha harvested gaps, 40 percent dispersed retention, 40 percent aggregated retention with five 1-ha uncut aggregates, 15 percent dispersed retention, and 15 percent aggregated retention with two 1-ha uncut aggregates. Arthropods showed little evidence of treatment response, but the abundance of arthropods on both plant species showed significant variation among blocks, reflecting responses to environmental gradients at a regional scale. Our results suggest that disturbance at this intensity or scale has little influence on canopy arthropods in the short term.

Keyword: Acer circinatum*, Douglas-fir, green-tree retention, insect, mite,* Pseudotsuga menziesii*, spider, timber harvest.*

(see Corvallis order form.)

Landscape Ecology

Cary, G.J.; Keane, R.E.; Gardner, R.H.; Lavorel, S.; Flannigan, M.D.; Davies, I.D., Li, C.; Lenihan, J.M.; Rupp, T.S.; Mouillot, F.

2006. Comparison of the sensitivity of landscape-fire-succession models to variation in terrain, climate and weather. Landscape Ecology. 21: 121–137.

The purpose of this study was to compare the sensitivity of modelled area burned to environmental factors across a range of independently developed landscape-fire-succession models. The sensitivity of area burned to variation in four factors, terrain, fuel pattern, climate, and weather was determined for four existing landscape-fire-succession models (EMBYR, FIRESCAPE, LANDSUM, and SEMLAND) and a new model implemented in the LAMOS modelling shell (LAMOS(DS)). Sensitivity was measured as the variance in area burned explained by each of the four factors, and all of the interactions among them, in a standard generalized linear modelling analysis. Modelled area burned was most sensitive to variation in climate and weather as compared with terrain complexity and fuel pattern, although the sensitivity to these latter factors in a small number of models demonstrates the importance of representing key processes. The models that represented fire ignition and spread in a relatively complex fashion were more sensitive to changes in all four factors because they explicitly simulate the processes that link these factors to area burned.

Keywords: Fire models, model sensitivity, climate, weather.

(see Corvallis order form.)

Hargrove, W.W.; Hoffman, F.M.; Hessburg, P.F.

2006. Mapcurves: a quantitative method for comparing categorical maps. Journal of Geographical Systems. DOI 10.1007/s 10109-006-0025-x.

We present Mapcurves, a quantitative goodness-of-fit (GOF) method that unambiguously shows the degree of spatial concordance between two or more categorical maps. Mapcurves graphically and quantitatively evaluate the degree of fit among any number of maps and quantify a GOF for each polygon, as well as the entire map. The Mapcurve method indicates a perfect fit even if all polygons in one map are comprised of unique sets of the polygons in another map, if the coincidence among map categories is absolute. It is not necessary to interpret (or even know) legend descriptors for the categories in the maps to be compared, since the degree of fit in the spatial overlay alone forms the basis for the comparison. This feature makes Mapcurves ideal for comparing maps derived from remotely sensed images. A translation table is provided for the categories in each map as an output. Because the comparison is category-based rather than cell-based, the GOF is resolution-independent. Mapcurves can be applied either to entire map categories or to individual raster patches or vector polygons. Mapcurves also have applications for quantifying the spatial uncertainty of particular map features.

Keywords: Ecoregion, goodness-of-fit, kappa statistic, landcover, model validation, overlap, spatial concordance, spatial uncertainty, vegetation.

(see Wenatchee order form.)

McKenzie, D.; Hessl, A.E.; Kellogg, L.-K.B.

2006. Using neutral models to identify constraints on low-severity fire regimes. Landscape Ecology. 21: 139–152.

Climate, topography, fuel loadings, and human activities all affect spatial and temporal pattern of fire occurrence. We generated random landscapes of fire-scarred trees and compared "neutral" fire regimes to those from five watersheds in eastern Washington that have experienced low-severity fire. Composite fire intervals at multiple spatial scales displayed similar monotonic decreases with increasing sample area in neutral vs. real landscapes. In contrast, predicted temporal trends in fire hazard exhibited different forms of scale dependence in real vs. simulated data. Neutral models show promise for investigating low-severity fire regimes to identify the effects of climate, fuel loadings, topography, and management.

Keywords: Neutral models, fire regimes, low-severity fire, ponderosa pine, Weibull, WMPI, hazard function.

(see Seattle order form.)

Pierce, K.B., Jr.; Lookingbill, T.R.; Urban, D.

2005. A simple method for estimating potential relative radiation (PRR) for landscape-scale vegetation analysis. Landscape Ecology. 20: 137–147.

We developed a widely applicable method for estimating potential relative radiation (PRR) using digital elevation data and Arc/Info, a widely used geographic information system (GIS). We found significant differences among four increasingly comprehensive radiation proxies. Our GIS-based proxy compared well with estimates from more data-intensive and computationally rigorous radiation models. We note that several recent studies have not found strong correlations between vegetation pattern and landscape-scale differences in radiation. We suggest that these findings may be due to the use of proxies that were not accurately capturing variability in radiation, and we recommend PRR or similar measures for use in future vegetation analyses.

Keywords: Aspect, DEM, GIS, solar insolation, species-environment interactions, topographic effects, vegetation distribution.

(see Corvallis order form.)

Spies, T.A.

2005. Scaling up from stands to landscapes. In: Peterson, C.E.; Maguire, D.A., eds. Balancing ecosystem values: innovative experiments for sustainable forestry. Gen. Tech. Rep. PNW-GTR-635. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 187–190.

Stand-level experiments are critical to understanding the effects of innovative silvicultural practices on biological diversity. In this paper, I examine some lessons learned from landscape-scale modeling studies that incorporate stand-level information. In particular, I focus on what we have learned from the Coastal Landscape Analysis and Modeling Study as it pertains to estimating the effects of different forest management practices on biological diversity and timber production across landscapes.

Keywords: Forest biodiversity, multiownership landscapes, spatial simulation models, Pacific Northwest.

(see Corvallis order form.)

Land Use

Alig, R.J.; Lewis, D.J.; Swenson, J.J.

2005. Changes in land use, forest fragmentaion, and policy responses. In: Emerging issues along urban/rural interfaces: linking science and society. Proceedings of a conference. Atlanta, GA: School of Forestry and Wildlife Sciences, Auburn University: 81–84.

Land use conversion is a primary determinant of environmental change in terrestrial ecosystems. Projections are for more than 50 million acres of U.S. forest to be converted to developed uses (e.g., parking lots) over the next 50 years, as the population grows by more than 120 million people. Land use change can lead to forest fragmentation—the transformation of a contiguous patch of forest into disjunct patches. Forest fragmentation is considered to be a primary threat to terrestrial biodiversity. We examine research about the underlying behavioral factors affecting landowner decisions, to provide insights into the effects of land use policies on forest fragmentation. Although more attention to date has been focused on biophysical aspects of forest fragmentation, more attention to socioeconomic and policy factors can aid in exploring the efficiency of options for addressing effects of land use conversion and allowing society sufficient lead time to implement land conservation measures. A central aim of this effort is better understanding socioeconomic determinants of land use conversion leading to forest fragmentation and the importance of land use decisions.

Keywords: Land quality, socioeconomic drivers, land use decisions.

(see Corvallis order form.)

Alig, R.J.; Lewis, D.J.; Swenson, J.J.

2005. Is forest fragmentation driven by the spatial configuration of land quality? The case of western Oregon. Forest Ecology and Management. 217: 266–274.

We investigated spatial configuration of economic returns to enhance models of forest fragmentation for western Oregon and western Washington. Economic drivers of forest fragmentation at the landscape level include land quality comprised of attributes such as soil fertility or the distance of urban plots to amenities. We included the spatial configuration of land quality as independent variables in regressions for western Oregon. Results indicate that land quality fragmentation is a significant determinant of forest fragmentation. This holds both for composite and component models: percentage of nonforest, percentage of edge, and interspersion. Including land quality fragmentation as an explanatory variable increases the fit of the regressions by more when the dependent variable represents spatial pattern (e.g., percentage of edge) rather than aggregate land use (e.g., percentage of nonforest). Variables capturing the spatial configuration of soil quality improve the fit of all specifications. Improved understanding of key determinants will aid in designing land conservation policies that provide a mechanism for aligning private incentives with broader public goals.

Keywords: Fragmentation, land quality, land rent, spatial configuration.

(see Corvallis order form.)

Theobald, D.M.; Spies, T.A.; Kline, J.; Maxwell, B.; Hobbs, N.T.; Dale, V.H.

2005. Ecological support for rural land use planning. Ecological Applications. 15(6): 1906–1914.

How can ecological science be more effective in supporting rural land use planning and policy? Our goal in this paper is to offer guidelines about how ecological science can be more effectively applied to support rural land use panning and policymaking. Rather than attempting a comprehensive review of a nascent field, we offer a list of typical rural land use issues, describe a generalized decisionmaking framework that forms the context for incorporating ecological information, and identify gaps in ecological research and practical application.

Keywords: Landscape analysis, forest planning, adaptive management.

(see Corvallis order form.)

Land Use Economics

Alig, R.J.

2005. Methods for projecting large-scale area changes for U.S. land uses and land covers: the past and the future. In: Bevers, M.; Barrett, T.M., comps. Systems analysis in forest resources: proceedings of the 2003 symposium. Gen. Tech. Rep. PNW-GTR-656. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 15–25.

Over the past 25 years, renewable resource assessments have addressed demand, supply, and inventory of various renewable resources in increasingly sophisticated fashion, including simulation and optimization analyses of area changes in land uses (e.g., urbanization) and land covers (e.g., plantations vs. naturally regenerated forests). This synthesis reviews related research over the more than two decades since area projection modeling systems replaced expert opinion approaches in the national Resources Planning Act assessments, as part of state-of-the-art approaches for regional and national resources assessments. Such models reflect that key land base changes such as afforestation and deforestation are driven by different socioeconomic factors. Projections of area changes are important for a wide range of natural resource analyses, including those for wildlife habitat, timber supply, global climate change, water, recreation, and others. The demand for applications in global change analyses has increased recently, and the synthesis addresses information needs in such macro assessments. Significant challenges in the research area in general include systematic integration of approaches and therefore findings across resource areas to support sustainability analyses.

Keywords: Parcelization, land use conversions, population growth.

(see Corvallis order form.)

Brunjes, K.J.; Miller, K.V.; Ford, W.M.; Harrington, T.B.; Edwards, M.B.

2004. Effects of thinning and herbicide application on vertebrate communities in longleaf pine plantations. Proceedings of the Annual Conference of Southeastern Fish and Wildlife Agencies. 57: 252–267.

To ascertain the effects of various silvicultural management techniques on vertebrate communities, we surveyed small-mammal, herpetofaunal, and avian communities in six 10- to 13-year-old longleaf pine plantations subjected to various thinning and herbicide regimes. Areas within each plantation were randomly assigned one of four treatments: thinning, herbicide spraying, thinning and herbicide, and an untreated control. For all vertebrate groups, abundance and species diversity tended to be less in control areas than in treated areas. Birds and small mammals were most abundant and diverse in thinned treatments versus spray only and control. Silvicultural treatments that reduce hardwood stem density and pine basal area can enhance habitat conditions for numerous vertebrate species.

Keywords: Avian communities, herpetofauna, longleaf pine, silvicultural treatment, small mammals.

(see Olympia order form.)

Monitoring

Barrett, T.M.; Gatziolis, D.; Fried, J.S.; Waddell, K.L.

2006. Sudden oak death in California: What is the potential? Journal of Forestry. March 2006.

Sudden oak death, a disease associated with the pathogen *Phtophtora ramorum*, has a large number of shrub and tree host species. Three of the tree species most susceptible to mortality from the disease, California black oak (*Quecus kelloggii*), coast live oak (*Quercus agrifolia*), and tanoak (*Lithocarpus densiflorus*), are estimated to predominate by basal area on 1.52 (±0.10) million acres in 12 counties that currently are under quarantine for the disease. The variety, prevalence, and importance of host species to wildlife indicate a high potential for impact on forest ecosystems in California.

Keywords: Forest monitoring, forest health, ramorum *dieback,* ramorum *leafblight.*

(See Portland order form).

Turner, D.P.; Cohen, W.B.; Running, S.W.; Gower, S.T.

2004. Monitoring global net primary production. In: Sessa, R., ed. GTOS Biennial Report 2002–2003. Rome, Italy: Food and Agriculture Organization of the United Nations.

Beginning with 2001, data from the MODIS sensor has been used by National Aeronautics and Space Administration scientists to produce 8-day estimates of Gross Primary Production (GPP) and annual estimates of Net Primary Production (NPP) for each 1-km^2 cell of the Earth's terrestrial surface. These data have great potential utility for monitoring the NPP component of the global carbon cycle and for assessing regional responses to climate variation, including effects on agriculture and forestry. The assessment and validation of these products will require a network of sites focused on validation, and the goal of the Global Terrestrial Observing System NPP Demonstration Project is to coordinate that validation activity.

Keywords: Carbon cycling, remote sensing.

(see Corvallis order form.)

Mount St. Helens

Bishop, J.G.; Fagan, W.F.; Schade, J.D.; Crisafulli, C.M.

2005. Causes and consequences of herbivory on prairie lupine (*Lupinus lepidus*) in early succession. In: Dale, V.H.; Swanson, F.J.; Crisafulli, C.M., eds. Ecological responses to the 1980 eruption of Mount St. Helens. New York: Springer Science and Business Media: 151–161. Chapter 11.

Prairie lupine is a nitrogen-fixing legume characteristic of alpine and subalpine pumice communities in Oregon and Washington. It was the first plant to colonize areas in which all biota was wiped clean by the 1980 eruptions of Mount St. Helens. As nitrogen fixers and as the only plant to initially establish on pyroclastic flow surface, lupines were expected to drive the pace and pattern of early succession; primarily through facilitation. A diverse group of lepidopteran herbivores have strongly affected population dynamics of the lupine, slowing its spread. However, the herbivores have not prevented the lupine population from growing and becoming the dominant plant on the landscape. Lupine has faciliated the colonization of numerous wind-dispersed plant species, accelerating productivity and increasing biodiversity of the pyroclastic flow area.

Keywords: Mount St. Helens, primary succession, prairie lupine, herbivory, lepidopteran.

(see Olympia order form.)

Dale, V.H.; Campbell, D.R.; Adams, W.M.; Crisafulli, C.M.; Dains, V.I.; Frenzen, P.M.; Holland, R.F.

2005. Plant succession on the Mount St. Helens debris-avalanche deposit. In: Dale, V.H.; Swanson, F.J.; Crisafulli, C.M., eds. Ecological responses to the 1980 eruption of Mount St. Helens. New York: Springer Science and Business Media: 59–73. Chapter 5.

The largest debris avalanche in recorded history occurred at Mount St. Helens on May 18, 1980. This chapter presents an overview of factors affecting plant establishment on the Mount St. Helens debris-avalanche deposit during the initial 20 years after the 1980 eruption. We summarize the initial physical and biological conditions on the debris-avalanche-deposit surface. We describe a set of permanent plots, large-animal exclosures, and other measured to document patterns, rates, and mechanisms of community development. We detail the observations made and experiments performed to evaluate the role of these factors in determining patterns of planting establishment. We discuss changes during the 25 years since the last eruption and implications for the future.

Keywords: Mount St. Helens, plant succession, debris, avalanche.

(see Olympia order form.)

Mycology

Claridge, A.W.; Trappe, J.M.

2004. Managing habitat for mycophagous (fungus-feeding) mammals: A burning issue? In: Lunney, D., ed. Conservation of Australia's forest fauna. 2nd ed. Mosman, NSW, Australia: Royal Zoological Society of New South Wales: 936–946.

The phenomenon of mycophagy—in general the eating of fungi, but for purposes herein restricted to the eating of fungal sporocarps—has been observed for centuries. Sporocarp mycophagy has been shown to be widespread among a diversity of invertebrates and vertebrates. This review chapter (1) provides a synopsis of the degree to which different animals, particularly mammals, consume fungal sporocarps, (2) reviews the nutritional characteristics of fungi compared to other foodstuffs, and (3) describes how different in the digestive anatomy and physiology of mammal species might help explain the degree to which such foods are utilized in nature.

Keywords: Mycorrhizae, food webs.

(see Corvallis order form.)

Colgan, W.; Trappe, J.M.

2004. NATS truffle and truffle-like fungi 10: *Pachyphloeus thysellli* sp. nov. (*Pezizaceae*, Pezizomycotina). Mycotaxon. 90(2): 281–284.

An undescribed truffle found on the Fort Lewis Military Reservation near Olympia, Washington, is described as *Pachyphloeus thysellii*. This new species, associated with *Pseudotsuga menziesii*, closely resembles *Pachyphloeus prieguensis* from southern Europe. It differs from the latter in having yellow veins and patches showing among the minute, brown warts on the peridial surface, smaller asci, and a different mycorrhizal host.

Keywords: Mycorrhizae, mycophagy, small mammals, food web.

(see Corvallis order form.)

Ferdman, Y.; Aviram, S.; Roth-Bejerano, N.; Trappe, J.M.; Kagan-Zur, V.

2005. Phylogenetic studies of *Terfezia pfeilii* and *Choiromyces echinulatus* (*Pezizales*) support new genera for southern African truffles: *Kalaharituber* and *Eremiomyces*. Mycological Research. 109(2): 237–245.

The ITS region including the 5.8S rRNA gene as well as the 5′ end of the 28S rRNA gene of hypogeous *Pezizaceae* and *Tuberaceae* were studied to clarify the generic placement of two southern African desert truffles, *Terfezia pfeilii* and *Choiromyces echinulatus*. The results show that neither species belongs in the genus to which it has been assigned on the basis of morphological characters. As expected, two *Choiromyces* spp. grouped close to the representative of the Tuberaceae (*Tuber melanosporum*). However, *C. echinulatus* diverged from the other *Choiromyces* species and emerged near members of the genus *Terfezia*, being even closer to that genus than *Terfezia pfeilii*. Two new genera and new species combinations, *Kalaharituber* gen. nov. with *K. pfeilii* (syn. *T. pfeilii*) comb. nov. and *Eremiomyces* gen. nov. with *E. echinulatus* (syn. C. *echinulatus*) comb. nov. are therefore introduced to accommodate these taxa. Both genera are closely related to *Terfezia*, and thus are placed in the *Pezizaceae*.

Keywords: Mycorrhizae, desert truffles, taxonomy.

(see Corvallis order form.)

Gomez, D.M.; Anthony, R.G.; Trappe, J.M.

2003. The influence of thinning on production of hypogeous fungus sporocarps in Douglas-fir forests in the northern Oregon Coast Range. Northwest Science. 77(4): 308–319.

Effects of thinning second-growth (35- to 45-year-old) Douglas-fir forests on production of hypogeous sporocarps were investigated to test the hypothesis that in the short term thinning would reduce their production and species diversity. We compared sporocarp production among unthinned, moderately thinned, and heavily thinned stands in four locations in the Oregon Coast Range, 1996 and 1997. The genera *Alpova*, *Barssia*, *Elaphomyces*, *Truncocolumella*, and *Tuber* appeared to decrease in response to thinning. Thinning significantly reduced total sporocarp frequency among treatments. Sporocarp distributions were clumped at the plot and grid station levels, and total sporocarp abundance was associated with abundance of coarse woody debris (CWD). These results indicated that commercial thinning influenced hypogeous sporocarp production and sporocarp species diversity at 2 to 3 years after cutting and that CWD was an important variable for predicting hypogeous sporocarp production. Retention of CWD in commercially thinned sites seems important for sporocarp production of certain hypogeous species and thus to habitat maintenance for many small mammal mycophagists.

Keywords: Small mammals, mycophagy, mycorrhizae.

(see Corvallis order form.)

Grubisha, L.C.; Trappe, J.M.; Burns, T.D.

2005. Preliminary record of ectomycorrhizal fungi on two California channel islands. In: Garcelon, D.K.; Schwemm, C.A., eds. Proceedings of the 6th California islands symposium. National Park Service Tech. Pub. CHIS-05-01. Arcata, CA: Institute for Wildlife Studies: 171–183.

Santa Cruz and Santa Rosa Islands of the northern Channel Islands contain unique floral communities comprised of many California and island endemics. This study reports initial findings on the fleshy fungi of these islands. Our primary work involved collecting samples of *Rhizopogon* species from pine communities for an ongoing population genetics study, but we also collected, identified, and vouchered other fleshy fungi from multiple locations. We found a high diversity of species, including representatives from the three major fungal phyla that participate in ectomycorrhizal symbioses. We found both epigeous (aboveground) and hypogeous (belowground) species, as well as species previously undescribed.

Keywords: Ascomycetes, Basidiomycetes, conservation, diversity.

(see Corvallis order form.)

Grubisha, L.C.; Trappe, J.M.; Beyerle, A.R.; Wheeler, D.

2005. NATS truffle and truffle-like fungi 12: *Rhizopogon ater* sp. nov. and *R. brunsii* sp. nov. (*Rhizopogonaceae*, Basidiomycota). Mycotaxon. 93: 345-353.

Two new species of *Rhizopogon* are described as *R. ater* from western Oregon and southwestern Washington and *R. brunsii* from southern California. *R. ater* is placed in *Rhizopogon* subgenus *Villosuli* and associates with *Pseudotsuga menziesii*, whereas *R. brunsii* belongs to *Rhizopogon* subgenus *Amylopogon* and associates with two- to five-needle pines in southern California.

Keywords: Hypogeous, Boletales*, ectomycorrhizal fungi, taxonomy.*

(see Corvallis order form.)

Hobbie, E.A.; Jumpponen, A.; Trappe, J.M.

2005. Foliar and fungal ^{15}N:^{14}N ratios reflect development of mycorrhizae and nitrogen supply during primary succession. Oecologia. 146: 258–268.

Nitrogen isotopes are used as markers to delineate whether plants are using the mycorrhizal symbioses to attain their nitrogen from soil processes. This study confirms that nitrogen isotopes are powerful tools for probing nitrogen dynamics between mycorrizhal fungi and associated plants.

Keywords: Nitrogen concentration, isotope ratios, mycorrhizal, nitrogen cycling, primary succession.

(see Corvallis order form.)

Jumpponen, A.; Claridge, A.W.; Trappe, J.M.; Lebel, T.; Claridge, D.L.

2004. Ecological relationships among hypogeous fungi and trees: inferences from association analysis integrated. with habitat modeling. Mycologia. 96(3): 510–525.

Association analyses by contingency tables and generalized linear modeling were compared to infer relationships among hypogeous ectomycorrhizal fungi and potential host tree species from 136 study plots in forested habitats in southeastern mainland Australia. Some species of fungi increased significantly in the presence of particular host tree species, suggesting fungal host preference or shared habitat preferences. These results provide a starting point for selection of compatible host-fungus combinations that could be used for forest nursery and restoration applications.

Keywords: Truffles, mycorrhizae, southeastern Australia.

(see Corvallis order form.)

Nouhra, E.R.; Dominguez, L.S.; Becerra, A.G.; Trappe, J.M.

2005. Morphological, molecular and ecological aspects of the South American hypogeous fungus *Alpova austroalnicola* sp. nov. Mycologia. 97(3): 598–604.

Field studies in Argentina's Yunga District revealed *Alpova austroalnicola* sp. nov., a hypogeous fungus associated with *Alnus acuminata* ssp. *acuminata*. Morphological and molecular studies based on amplification and sequencing of the nuclear LSU rDNA gene showed its unique identity within *Alpova*. Related genera included in the analyses were *Boletus edulis*, *Rhizopogon* spp., *Suillus luteus*, and *Truncocolumella citrina*. Additional observations of animal diggings around the sites and microscopic examination of fecal pellets of the nine-banded armadillo (*Dasypus novemcinctus novemcinctus*) indicate *A. austroalnicola* is consumed and its spores dispersed by animals.

Keywords: Alnus acuminata*, Boletales, Dasypus, molecular systematics, mycophagy, phylogeny*

(see Corvallis order form.)

Smith, M.E.; Trappe, J.M.; Rizzo, D.M.; Miller, S.L.

2006. *Gymnomyces xerophilus* sp. nov. (sequestrate Russulaceae), an ectomycorrizhal associate of *Quercus* in California. Mycological Research. 110: 575–582.

Gymnomyces xerophilus sp. nov. is characterized and described as a new species from *Quercus*-dominated woodlands in California.

Keywords: Basidiomycota, molecular phylogeny.

(see Corvallis order form.)

Trappe, J.M.

2004. Habitat and host associations of *Craterellus tubaeformis* in northwestern Oregon. Mycologia. 96(3): 498–509.

The Survey and Manage Program of the Northwest Forest Plan listed *Craterellus tubaeformis* as a rare species of concern. This study examines habitat and host association to better understand how best to manage this fungus. Molecular analyses of mycorrhizal root tips formed by this fungus found that stand age and well-decayed, coarse, woody-debris were related significantly to the probability of *C. tubaeformis* occurrence but not to standing crop biomass. *C. tubaeformis* can form mycorrhizae with Douglas-fir and Sitka spruce. Implications on species conservation are discussed.

Keywords: Hemlock, Tsuga*, winter chanterelle, survey and manage.*

(see Corvallis order form.)

Trappe, J.M.; Claridge, A.W.

2005. Hypogeous fungi: evolution of reproductive and dispersal strategies through interactions with animals and mycorrhizal plants. In: Dighton, J.; White, J.F.; Oudemans, P., eds. In the fungal community: its organization and role in the ecosystem. London, United Kingdom: CRC Press: 613–623.

Mycophagy of fungal sporocarps by a great diversity of animals is documented for all continents except Antarctica and entails a range of behaviors and nutritional modes. This paper discusses the selection pressures for evolution of the hypogeous habit among mycorrhizal fungi and its relation to mycophagy of sporocarps as the primary mode of spore dispersal. The importance of this food web dynamic is discussed in relation to forest ecosystem processes and health.

Keywords: Mycophagy, micorrhiza, forest food webs.

(see Corvallis order form.)

Trappe, J.M.; Claridge, A.W.

2005. Australasian sequestrate fungi 17: the genus *Hydnoplicata* (Ascomycota, Pezizaceae) resurrected. Australasian Mycologist. 25: 33–36.

The history of the genus *Hydnoplicata* is reviewed and resurrected to aid in the identification of fungi in Australia.

Keywords: truffle, hypogeous fungi, fungal taxonomy.

(see Corvallis order form.)

Plant Ecology

Brooks, J.R.; Meinzer, F.C.; Warren, J.M.; Domec, J.-C.; Coulombe, R.

2006. Hydraulic redistribution in a Douglas-fir forest: lessons from system manipulations. Plant, Cell and Environment. 29: 138–150.

The objectives of this study were to quantify seasonal variation in hydraulic redistribution (HR) and its driving force, and to manipulate the soil-root system to elucidate biophysical components controlling HR and the utilization of redistributed water. By late summer, HR replenished approximately 40 percent of the water depleted from the upper soil on a daily basis. Separating roots from the transpiring tree increased HR above naturally occurring control levels. Irrigating with deuterated water demonstrated that redistributed water was taken up by small understory plants as far as 5 m from the watering source, and potentially further. Taken together, our results indicate that the rate and magnitude of HR were strongly governed by the development of water potential gradients within the soil, and the demand for water by the above ground portion of the tree.

Keywords: Pseudotsuga menziesii*, deuterium labelling, hydraulic lift, seasonal variation, soil water utilization, soil water potential, trenching, water transport.*

(see Corvallis order form.)

Domec, J.-C.; Meinzer, F.C.; Garner, B.L.; Woodruff, D.

2006. Transpiration-induced axial and radial tension gradients in trunks of Douglas-fir trees. Tree Physiology. 26: 275–284.

Axial specific conductivity (k_s) and sap flux density (J_s) were measured at four consecutive depths at the same heights within the sapwood of young Douglas-fir trees in order to estimate longitudinal and radial tension gradients. Longitudinal and radial tension gradients were nonuniform from inner to outer sapwood. Radial tension gradients were in the range of 0.15 to 0.25 MPa/m. Transpiration-induced axial tension gradients were in the range of 0.007 to 0.01 MPa/m and were 50 percent higher in the outer sapwood than in the inner sapwood. The calculated radial Js based on radial tension gradients and measured radial ks was about two orders of magnitude smaller than the axial J_s. These data clarified the role played by xylem k_s in determining in situ patterns of J_s.

Keywords: Sap flux density, specific conductivity, xylem anatomy, xylem embolism.

(see Corvallis order form.)

Domec, J.-C.; Scholz, F.G.; Bucci, S.J.; Meinzer, F.C.; Goldstein, G.; Villalobos-Vega, R.

2006. Diurnal and seasonal variation in root xylem embolism in neotropical savanna woody species: impact on stomatal control of plant water status. Plant, Cell and Environment. 29: 26–35.

Vulnerability to water-stress-induced embolism and variation in the degree of native embolism were measured in lateral roots of four co-occurring Neotropical savanna tree species. Root embolism varied diurnally and seasonally. Daily variation in root water potential decreased, and root xylem vulnerability and capacitance increased with rooting depth. However, all species experienced seasonal minimum root water potential close to complete hydraulic failure independent of their rooting depth or resistance to embolism. Daily embolism and refilling in roots is a common occurrence and thus may be an inherent component of a hydraulic signaling mechanism enabling stomata to maintain the integrity of the hydraulic pipeline in long-lived structures such as stems.

Keywords: Cavitation, capacitance, hydraulic conductivity, water relations, xylem vulnerability.

(see Corvallis order form.)

Hoffmann, W.A.; da Silva, E.R., Jr.; Machado, G.C.; Bucci, S.J.; Scholz, F.G.; Goldstein, G.; Meinzer, F.C.

2005. Seasonal leaf dynamics across a tree density gradient in a Brazilian savanna. Oecologia. 145: 307–316.

We measured leaf area index (LAI) of the ground layer and shrub and tree layer in the Brazilian cerrado over a range of tree densities from open shrub savanna to closed woodland through the annual cycle. During the dry season, soil water potential was strongly and positively correlated with grass LAI, and less strongly with tree and shrub LAI. By the end of the dry season, LAI of grasses, groundlayer dicots and trees declined to 28, 60, and 68 percent of mean wet-season values, respectively. When compared with remotely sensed vegetation indices, the field measurements were more strongly correlated to the enhanced vegetation index (EVI, $r = 0.71$) than to the normalized difference vegetation index (NDVI, $r^2 = 0.49$). Although the NDVI has been more widely used in quantifying leaf dynamics of tropical savannas, EVI appears better suited for this purpose.

Keywords: Cerrado, leaf area index, phenology, tropical forest, water potential.

(see Corvallis order form.)

Kelsey, R.G.; Hennon, P.E.; Huso, M.; Karchesy, J.J.
2005. Changes in heartwood chemistry of dead yellow-cedar trees that remain standing for 80 years or more in southeast Alaska. Journal of Chemical Ecology. 31(11): 2653–2670.

At four locations in southeast Alaska, we measured the concentrations of extractable bioactive compounds in the heartwood of live yellow-cedar (*Chamaecyparis nootkatensis*) trees and five classes of standing snags to determine how the concentrations changed in the slowly deteriorating snags. Concentrations of carvacrol, nootkatene, nootkatol, nootkatone, nootkatin, and a total extractives were analyzed for an inner, middle, and surface segment of each core. Concentrations of all compounds, except nootkatene, decreased between snag class 2 and 5, resulting in heartwood of class 5 snags having the lowest quantities. A similar response pattern can be expected at all sites in southeast Alaska. The loss of nootkatin and carvacrol is probably responsible for the lower decay resistance of heartwood from class 5 snags compared with heartwood from live trees.

Keywords: Chamaecyparis nootkatensis*, snags, decay resistance, chemical defense, carvacrol, nootkatin, antifungal compounds.*

(see Corvallis order form.)

Meinzer, F.C.; Brooks, J.R.; Domec, J.-C.; Gartner, B.L.; Warren, J.M.; Woodruff, D.R.; Bible, K.; Shaw, D.C.
2006. Dynamics of water transport and storage in conifers studied with deuterium and heat tracing techniques. Plant, Cell and Environment. 29: 105–114.

We used heat and deuterated water (D_20) as tracers to characterize whole-tree water transport and storage properties in Douglas-fir and western hemlock trees spanning a broad range of height and diameter. Sap flow was monitored continuously with heat dissipation probes near the base of the trunk prior to, during, and following injection of D_20. Transit times for D_20 transport from the base of the trunk to the upper crown ranged from 2.5 to 21 days and residence times ranged from 36 to 79 days. Tracer residence time and half-life increased as tree diameter increased linearly with tree diameter independent of species. Species-independent scaling of tracer velocity with sapwood-specific conductivity and hydraulic capacitance was also observed. Sapwood capacitance is an intrinsic tissue-level property that appears to govern whole-tree water transport in a similar manner among both tracheid- and vesselbearing species.

Keywords: Pseudotsuga menziesii*,* Tsuga heterophylla*, sap velocity, stable isotopes.*

(see Corvallis order form.)

Sheridan, C.D.; Spies, T.A.
Vegetation-environment relationships in zero-order basins in coastal Oregon. Canadian Journal of Forest Research. 35: 340–355.

Zero-order basins, where hillslope topography converges to form drainages, are common in steep, forested landscapes but we know little about their ecological structure. This study provides baseline information on the vascular-plant composition of unmanaged zero-order basins. We sought specifically to (1) characterize geomorphology, overstory tree, and shrub composition; (2) identify and describe the dominant gradients in plant species composition in terms of physical environment; and (3) identify groups of plants associated with different geomorphic features and environmental conditions.

Keywords: Riparian vegetation, community structure, forest composition.

(see Corvallis order form.)

Range Management

Vavra, M., Ager, A.A.; Johnson, B.; Wisdom, M.J.; Hemstrom, M.A.; Riggs, R.
2004. Modeling the effects of large herbivores. In: Hayes, J.L.; Ager, A.A.; Barbour, R.J., eds. Methods for integrated modeling of landscape change: interior Northwest landscape analysis system. Gen. Tech. Rep. PNW-GTR-610. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 82–103. Chapter 7.

Knowledge about the effects of ungulates on forest and range vegetation is reviewed, and future research needs are identified. We plan to develope the framework of a conceptual model of herbivory effects on succession.

Keywords: Herbivory, succession, disturbance, modeling, ungulates.

(see La Grande order form.)

Regional Assessments

Molina, R.; Marcot, B.G.; Lesher, R.
2006. Protecting rare, old-growth, forest-associated species under the Survey and Manage Program guidelines of the Northwest Forest Plan. Conservation Biology. 20(2): 306–318.

This case study describes the implementation history, survey strategies, key results, and controversies surrounding the Survey and Manage program. It emphasizes science considerations of combing coarse and fine filter approaches to conserve rare, little-known species at regional scales, and addresses how aspects of the program can be used as a model elsewhere.

Keywords: Conservation biology, species viability, species persistence.

(see Portland order form.)

Remote Sensing

Lefsky, M.A.; Hudak, A.T.; Cohen, W.B.; Acker, S.A.
2005. Geographic variability in lidar projections of forest stand structure in the Pacific Northwest. Remote Sensing of Environment. 95: 532–548.

Estimation of the amount of carbon stored in forests is a key challenge for understanding the global carbon cycle, one which remote sensing is expected to help address. However, carbon storage in moderate to high biomass forests is difficult to estimate with conventional optical or radar sensors. Light detection and ranging (LIDAR) instruments measure the vertical structure of forests and thus hold great promise for remotely sensing the quantity and spatial organization of forest biomass. In this study, we compare the relationships between LIDAR-measured canopy structure and coincident field measurements of forest stand structure at five locations in the Pacific Northwest of the United States with contrasting composition.

Keywords: LIDAR, forest structure.

(see Corvallis order form.)

Lefsky, M.A.; Hudak, A.T.; Cohen, W.B.; Acker, S.A.
2005. Patterns of covariance between forest stand and canopy structure in the Pacific Northwest. Remote Sensing of Environment. 95: 517–531.

The goal of this study is to document the statistical relationship between two multivariate data sets containing coincident lidar measurements of canopy structure and field measurements of stand structure. We expect that with such a quantitification of these relationships, these two alternative perspectives on forest structure can be reconciled, and the main effects ranked.

Keywords: Remote sensing. forest structure.

(see Corvallis order form.)

Macander, M.J.; Harris, N.R.; Wurtz, T.L.
2006. Studying white sweet clover with blimp-mounted cameras. Proceedings, 11th biennial USDA Forest Service remote sensing applications conference. Salt Lake City, UT: U.S. Department of Agriculture, Forest Service, Remote Sensing Applications Center.

White sweet clover (*Melilotus alba*) is a biennial invasive plant that has become established on roadsides and river valleys in Alaska. Low-cost digital and film cameras mounted on a tethered blimp were used to acquire imagery over the Matanuska River flood plain during the 2004 and 2005 growing seasons. The objectives were to acquire image time series, acquire images at different resolutions (altitudes), orthorectify and mosaic images, extract *Melilotus* patches by using spectral analysis, and document the spread of this plant over 2 years. *Melilotus* patches had a somewhat distinct spectral signature using natural color imagery late in the growing season. Sparse patches could not be reliably detected, however, and the patches were not spectrally distinct at other times during the growing season.

Keywords: Blimp, imagery, Melilotus.

(see Fairbanks order form.)

McGaughey, R.J.; Andersen, H.-E.; Reutebuch, S.E.
2006. Considerations for planning, acquiring, and processing LIDAR data for forestry applications. Proceedings, 11th biennial USDA Forest Service remote sensing applications conference. Salt Lake City, UT: U.S. Department of Agriculture, Forest Service, Remote Sensing Applications Center. [Pagination unknown].

This paper discusses the requirements for airborne laser scanning data used for topographic surveys and vegetation measurement and highlights deliverables, specific to forestry applications. We describe the types of data products obtained from an airborne laser scanning mission and the amount of data that must be managed and stored. We present an overview of the current state-of-the-art in data visualization and processing, with emphasis on the analytical methods currently employed to characterize vegetation structure using airborne laser scanning data. Finally, five simple, easily understood data products are identified that would help ensure that forestry needs are considered when multiresource airborne laser scanning missions are flown.

Keywords: LIDAR, active remote sensing, forest mensuration, software, data processing.

(see Seattle order form.)

Potter, C.; Tan, P.-N.; Kuman, V.; Kucharik, C.; Klooster, S.; Genovese, V.; Cohen, W.; Healey, S.
2005. Recent history of large-scale ecosystem disturbances in North America derived from the AVHRR satellite record. Ecosystems. 8: 808–824.

Ecosystem structure and function are strongly affected by disturbance events, many of which in North America are associated with seasonal temperature extremes, wildfires, and tropical storms. This study was conducted to evaluate patterns in a 19-year record of global satellite observations of vegetation phenology from the advanced very high resolution radiometer (AVHRR) as a means to characterize major ecosystem disturbance events and regimes. We can find verifiable evidence of numerous disturbance types across North America, including major regional patterns of cold and heat waves, forest fires, tropical storms, and large-scale forest logging. Summed over 19 years, areas potentially influenced by major ecosystem disturbances total more than 766 000 km^2. Based on this analysis, an historical picture is emerging of periodic droughts and heat waves, possibly coupled with herbivorous insect outbreaks, as among the most important causes of ecosystem disturbance in North America.

Keywords: Ecosystem disturbance, remote sensing, fire, drought, forests.

(see Corvallis order form.)

Reutebuch, S.E.; Andersen, H.-E.; McGaughey, R.J.
2005. Light detection and ranging (LIDAR): an emerging tool for multiple resource inventory. Journal of Forestry. 103(6): 286–292.

Airborne laser scanning (LIDAR) of forests has been shown to provide accurate terrain models, and at the same time, estimates of multiple resource vegetation inventory variables through active sensing of three-dimensional forest vegetation. However, there is a need for standards and specifications for LIDAR missions to ensure maximum utility for vegetation measurement and monitoring, rather than simply terrain mapping. Once standards are developed, there is an opportunity to maximize the value of permanent ground plot remeasurements by also collecting LIDAR data over a limited number of plots each year.

Keywords: LIDAR forest inventory, airborne laser scanning, biometrics.

(see Seattle order form.)

Turner, D.P.; Ritts, W.D.; Cohen, W.B. [and others].
2005. Site-level evaluation of satellite-based global terrestrial gross primary production and net primary production monitoring. Global Change Biology. 11: 666–684.

Regular monitoring of global terrestrial net primary production (NPP) and gross primary production (GPP) is needed for the purposes of evaluating trends in biospheric behavior, understanding the role of the biosphere in the global carbon cycle, and investigating large-scale patterns in food and fiber production. In this paper, we describe an approach to producing NPP/GPP validation data layers at the site level and report comparisons to Moderate Resolution Imaging Spectroradiometer products at six sites differing widely in vegetation physiognomy, phenology, and productivity.

Keywords: Ecosystem function, remote sensing, ecosystem monitoring, carbon cycling.

(see Corvallis order form.)

Yang, Z.; Cohen, W.B.; Harmon, M.E.

2005. Modeling early forest succession folllowing clear-cutting in western Oregon. Canadian Journal for Forest Research. 35: 1889–1900.

In the Pacific Northwest, the pattern of conifer development after stand-replacement disturbance has important implications for many forest processes (e.g., carbon storage, nutrient cycling, and biodiversity). This paper examines conifer development in the Coast Ranges Province and the Western Cascades Province of Oregon by using historic aerial photographs by examining the canopy cover change of different life forms: shrubs, hardwood trees, and conifer trees.

Keywords: Succession, airborne imagery.

(see Corvallis order form.)

Silviculture

Ares, A.; Terry, T.A.; Miller, R.E.; Anderson, H.W.

2005. Ground-based forest harvesting effects on soil physical properties and Douglas-fir growth. Soil Science Society of America Journal. 69: 1822–1832.

Soil properties and forest productivity can be affected by heavy equipment used for harvest and site preparation, but these impacts vary greatly with site conditions and operational practices. We assessed the effects of ground-based logging on soil physical properties and subsequent Douglas-fir [*Pseudotsuga menziesii* (Mirb) Franco] growth on a highly productive site receiving vegetation control in coastal Washington. We also tested the effectiveness of tillage in maintaining or enhancing site productivity. The study revealed no detrimental effects on tree height and diameter from soil compaction at age 4. At stand age 3, a tree volume index was actually greater for trees planted on traffic lanes than for those on nondisturbed soil.

Keywords: Soil compaction, bulk density, Douglas-fir, growth.

(see Olympia order form.)

Constantine, N.L.; Campbell, T.A.; Baughman, W.M.; Harrington, T.B.; Chapman, B.R.; Miller, K.V.

2004. Effects of clearcutting with corridor retention on abundance, coastal plain of South Carolina, USA. Forest Ecology and Management. 202: 293–300.

We studied six pine plantations in coastal South Carolina to determine the influence of clearcutting with corridor retention on small mammal abundance, richness, and diversity. Rodent abundance, richness, and diversity indices were greater in harvested stands with corridors than in nonharvested pine stands. The early successional habitat created by clearcutting was used by many small mammal species, including cotton rats and marsh rice rats. Species composition of small mammals within the corridor habitats was similar to that in the nonharvested pine stands. The inclusion of corridors in pine plantation management enhances habitat diversity and ecosystem maintenance and contributes to local diversity of the small mammal community.

Keywords: Clearcutting, corridors, pine plantations, Pinus*, small mammals.*

(see Olympia order form.)

Constantine, N.L.; Campbell, T.A.; Baughman, W.M.; Harrington, T.B.; Chapman, B.R.; Miller, K.V.

2005. Small mammal distributions relative to corridor edges within intensively managed Southern pine plantations. Southern Journal of Applied Forestry. 29(3): 148–151.

We characterized small mammal communities in three loblolly pine (*Pinus taeda*) stands in the lower coastal plain of South Carolina during June 1998–August 2000 to investigate influence of corridor edges on small mammal distribution. Rodent captures were greatest in harvested stands, declined near the edge of mature pine corridors, and were lowest within corridors. Shrew captures were generally greatest in mature pine corridors and least in the interior of harvested stands. Retention of mature pine corridors of only 100 m may maintain some small mammals (i.e., shrews) that would not occur if stands were completely harvested.

Keywords: Corridor, ecosystem-based forestry, intensive management, loblolly pine, Pinus taeda*, rodents.*

(see Olympia order form.)

Curran, M.P.; Miller, R.E.; Howes, S.W.; Maynard, D.G.; Terry, T.A.; Heninger, R.L.; Niemann, T.; van Rees, K.; Powers, R.F.; Schoenholtz, S.H.

2005. Progress towards more uniform assessment and reporting of soil disturbance for operations, research, and sustainability protocols. Forest Ecology and Management. 220: 17–30.

International protocols, such as those of the Montréal Process, specify desired outcomes without specifying the process and components required to attain those outcomes. We suggest that the process and its components are critical to achieve desired outcomes. We discuss recent progress in northwestern North America, on three topics that will facilitate development of and reporting in sustainability protocols: (1) common terms and comparable guidelines for soil disturbance, (2) cost-effective techniques for monitoring and assessing soil disturbance, and (3) improved methods to rate soils for risk of detrimental soil disturbance. Uniform terms for soil disturbance will facilitate reporting and exchange of information. Reliable monitoring techniques and tracking the consequences of soil disturbance for forest growth and hydrology are paramount for improving understanding and predictions of the practical consequences of forest practices.

Keywords: Soil compaction, rutting, monitoring, adaptive management, criteria and indicators, Montréal process.

(see Olympia order form.)

Curtis, R.

2006. Volume growth trends in a Douglas-fir levels-of-growing-stock study. Western Journal of Applied Forestry. 21(2): 79–86.

Mean curves of increment and yield in gross total cubic volume and net merchantable cubic volume were derived from seven installations of the regional cooperative Levels-of-Growing-Stock Study (LOGS) in Douglas-fir. The technique used reduces the data to a single set of readily interpretable curves. To a top height of 100 ft and corresponding average age of 45 years, growth and yield in both total volume and net merchantable volume were strongly related to stocking. Current annual increment was still far greater than mean annual increment. Thinning has accelerated diameter growth of the 40 largest trees per acre as well as of the stand average.

Keywords: Thinning, stocking, growth, yield, Pseudotsuga menziesii.

(see Olympia order form.)

Deal, R.L.

2006. Red alder stand development and dynamics. In: Deal, R.L.; Harrington, C.A., eds. Red alder—a state of knowledge. Gen. Tech. Rep, PNW-GTR-669. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 45–54.

This paper synthesizes information on the development of natural pure red alder stands and dynamics of mixed alder-conifer stands. Early research on red alder growth and yield focused on developing stand volume and normal yield tables for alder in the Pacific Northwest. Recent site-index-estimation and height-growth curves were developed on a 20-year site base age. These height-growth and site-index curves were a significant improvement over earlier work and are widely used today. Red alder exhibits rapid early height growth with much more rapid height growth than for conifer associates. On good sites, trees may be 9 m at age 5, 16 m at age 10, and 24 m at age 20. Height growth then quickly declines, and by age 15 alder will reach more than half its total height and nearly all of its mature height by the age of 40. Long-term successional sequences of red alder stands are not well understood. Red alder frequently occurs in mixed stands with conifer associates including Douglas-fir, western hemlock, Sitka spruce, and western redcedar. Mixed species dynamics are more complex and variable than for pure stands and depend on a number of factors including forest composition, establishment and survival of understory conifers, timing of alder mortality, abundance and composition of shrubs, and geographic location.

Keywords: Alnus rubra*, red alder, stand development, stand dynamics, mixed alder-conifer stands, forest succession.*

(see Portland order form.)

DeBell, D.S.; Harrington, C.A.; Gartner, B.L.; Singleton, R.L.

2006. Time and distance to clear wood in pruned red alder settings. In: Deal, R.L.; Harrington, C.A., eds. Red alder—a state of knowledge. Gen. Tech. Rep. PNW-GTR-669. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 103–113.

Pruning trials in young alder stands were sampled to evaluate the effects of pruning (1) live branches on different dates and (2) dead branches with or without damaging the branch collar on trees pruned at plantation age 6. Based on assessment 6 years after treatment, pruning during the growing season, and, to a lesser extent, late in the growing season when leaf abscission was beginning, resulted in

shorter times and distances to formation of clear wood than did pruning in the dormant season or just prior to the beginning of the growing season. Cutting the branch collar on dead branches led to shorter times and distances to clear wood than did intentionally avoiding such wounding.

Keywords: Alnus rubra*, red alder, clear wood.*

(see Olympia order form.)

Harrington, C.A.

2006. Biology and ecology of alder. In: Deal, R.L.; Harrington, C.A., eds. Red alder—a state of knowledge. Gen. Tech. Rep. PNW-GTR-669. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 21–43.

Red alder is the most common hardwood in the Pacific Northwest with a range stretching from coastal southeast Alaska to southern California and east to isolated populations in Idaho. Soil moisture during the growing season influences where it grows; it can tolerate poor drainage but not droughty, hot sites. Owing to its tolerance of wet soil conditions, alder is common in riparian areas. Management experience with the species is limited to a fairly narrow range at sites and management scenarios; thus, information of ecology of the species should help guide managers.

Keywords: Biology, ecology, damaging agents, growth, regeneration.

(see Olympia order form.)

Harrington, T.B.

2006. Plant competition, facilitation, and other overstory-understory interactions in longleaf pine ecosystems. In: Jose, S.; Jokela, E.J.; Miller, D.L., eds. The longleaf pine ecosystem: ecology, silviculture, and restoration. New York: Springer-Verlag: 135–156. Chapter 5.

Overstory trees in forest stands affect understory vegetation by modifying growing conditions, either directly or indirectly. In a similar way, understory vegetation can influence the growing conditions of overstory trees. This book chapter will focus on two common interactions in forest communities, competition and facilitation, with emphasis on longleaf pine (*Pinus palustris*). Included will be basic concepts of plant interactions, a review of previous research and two case studies from sandhill sites on the Savannah River site, and a discussion of silvicultural implications to restoration and maintenance of longleaf pine communities.

Keywords: Plant interactions, competition, facilitation, longleaf pine, wiregrass.

(see Olympia order form.)

Harrington, T.B.; Madsen, J.

2005. Silvicultural technology and applications for forest plantation establishment west of the Cascade crest. In: Harrington, C.A.; Schoenholtz, S.H., tech. eds. Productivity of Western forests: a forest products focus. Gen. Tech. Rep. PNW-GTR-642. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 27–37.

Research and operational trials have identified methods of forest plantation establishment that promote high rates of survival and early growth of tree seedlings in the Pacific Northwest. Primary reasons for this success are the intensive control of competing vegetation provided by herbicide treatments and the planting of high-quality seedlings. This paper discusses the current state of the art in forest plantation establishment in Oregon and Washington west of the crest of the Cascade Range. It considers technologies developed in the last two decades that currently have widespread application on lands managed primarily for wood products. The focus of this review is on even-aged silviculture of conifer seedlings, especially coastal Douglas-fir, but other species, silvicultural systems, and regions are considered where appropriate.

Keywords: Vegetation management, nursery technology, tree planting, Douglas-fir.

(see Olympia order form.)

Harrington, C.A.; Terry, T.; Harrison, R.B.

2005. Fall River long-term site productivity study. In: Harrington, C.A.; Schoenholtz, S.H., tech. eds. Productivity of Western forests: a forest products focus. Gen. Tech. Rep. PNW-GTR-642. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 169–172.

The Fall River Long-Term Site Productivity study is a cooperative project designed to examine factors influencing short- and long-term productivity and how management practices affect both tree growth and soil characteristics. The study was established after the existing Douglas-fir/western hemlock stand was harvested in 1999, and several levels of biomass retention were created as major treatments in the study. The study also includes fertilization, vegetation control, compaction, and tillage. Douglas-fir seedlings were planted in spring 2000, and several tree and soil assessments have been made since then. Early results indicate that biomass removals and compaction/tillage affected physical and chemical soil properties but vegetation control was the primary factor affecting tree growth.

Keywords: Douglas-fir, site productivity, seedling growth, vegetation management, woody debris retention, biomass removal, compaction, soil tillage, nitrogen cycling.

(see Olympia order form.)

Holman, M.L.; Peterson, D.L.

2006. Spatial and temporal variability in forest growth in the Olympic Mountains, Washington: sensitivity to climatic variability. Canadian Journal of Forest Research. 36: 92–104.

This study quantified variation in tree growth in the Olympic Mountains over the past 54 years, a period of significant temperature increase in the Pacific Northwest, and assessed the sensitivity of Olympic forests to climatic variability and change. Growth patterns were analyzed at multiple scales to determine the scale at which growth-limiting factors such as climate assert their strongest influence. Growth patterns were compared between the two most recent phases of the Pacific Decadal Oscillation. Results suggest that there is a common overarching growth-limiting factor, such as climate, that affects tree growth over large areas. Low-elevation coniferous forests are relatively sensitive to change in growth limiting factors, in contrast to the traditional view, and may play an important role in storing carbon in a warmer climate.

Keywords: Growth-climate relationship, Olympic Mountains, climate change, carbon storage, adaptive management.

(see Seattle order form.)

Nakawatase, J.M.; Peterson, D.L

2006. Spatial variability in forest growth-climate relationships in the Olympic Mountains, Washington. Canadian Journal of Forest Research. 36: 77–91.

Information on spatial and temporal variability in tree growth-climate relationships is needed to predict how forests will respond to climate change. We studied the effects of climatic variability on tree growth at 74 plots in the western and northeastern Olympic Mountains. Tree growth in the Olympic Mountains responds to climatic variability as a function of mean climate and elevation. In the warmer greenhouse climate predicted for the Olympic Mountains, productivity at high elevations of the western Olympics will likely increase, whereas productivity at high elevations in the northeastern region and potentially in low elevations of the western region will likely decrease. This information can be used to develop adaptive management strategies to prepare for the effects of future climate on these forests.

Keywords: Growth-climate relationships, Olympic Mountains, climate change, carbon storage, adaptive management.

(see Seattle order form.)

Van Lear, D.H.; Wurtz, T.L.

2005. Cultural practices for restoring and maintaining ecosystem function. In: Stanturf, J.A.; Madsen, P., eds. Restoration of boreal and temperate forests. Boca Raton, FL: CRC Press: 173–192. Chapter 11.

Cultural practices needed to restore and maintain. ecosystems should approximate the disturbance regimes that created those ecosystems in the past. Historically, fire shaped most ecosystems in both temperate and boreal forests. A policy of fire exclusion has been in effect throughout much of the developed world for most of the past century and fire-maintained ecosystems have dramatically declined, especially in the temperate forests of North America and the boreal forests of Europe. Now, in efforts to restore or maintain these ecosystems, appropriate use of prescribed fire must be included in management strategies wherever possible.

Keywords: Forest restoration.

(see Fairbanks order form.)

Welch, J.R.; Miller, K.V.; Palmer, W.E.; Harrington, T.B.

2004. Response of understory vegetation important to the northern bobwhite following imazapyr and mechanical treatments. Wildlife Society Bulletin. 32(4): 1071–1076.

In southern pine (*Pinus* spp.) stands, managers have used a variety of treatments to control hardwood encroachment and improve habitat conditions for northern bobwhites (*Colinus virginianus*). We compared use of the herbicide Arsenal® (imazapyr) and traditional mechanical treatments, with and without fire, to control hardwood encroachment on study sites near Tallahassee, Florida. A single application of imazapyr, with or without prescribed fire, can control hardwood encroachment and stimulate herbaceous species growth. Following treatment, vegetative communities likely can be maintained for prolonged periods by using traditional methods such as prescribed fire.

Keywords: Colinus virginianus*, habitat, herbicide, imazapyr, northern bobwhite, vegetation.*

(see Olympia order form.)

Social Sciences

Bilek, E.M.; Skog, K.E.; Fried, J.; Christensen, G.

2005. Fuel to burn: economics of converting forest thinnings to energy using BioMax in southern Oregon. Gen. Tech. Rep. FPL-GTR-157. Madison, WI: U.S. Department of Agricuture, Forest Service, Forest Products Laboratory. 27 p.

We assessed the feasibility of using portable biomass plants to generate electricity from forest thinnings. At current electricity prices in Oregon, and assuming a 23-percent pre-tax nominal return on invested capital, it would not be economical to operate either a 100-kW or 1000-kW gasification plant at a forest landing without a subsidy or tax credit, even if fuel were delivered at no cost. Electricity rates of 7.3 cents per KW-hour are sufficient to achieve break-even for the small (100-kW plant) if fuels are delivered at no cost; rates of 3.5 cents/kW-hour would allow a 1000-kW plant to achieve break-even. For both plant sizes, for every half-cent increase in electricity prices, the amount available to pay for biomass increased by $3.58 per bone-dry ton.

Keywords: Biomass assessment. fire hazard reduction.

(see Portland order form.)

Stankey, G.H.; Shindler, B.

2006. Formation of social acceptability judgments and their implications for management of rare and little-known species. Conservation Biology. 20(1): 28–37.

Effective policies for management of rare and little-known species (RLK) must not only be scientifically valid and cost-effective, but also consistent with prevailing social norms, beliefs, and values. However, limited public awareness of such species or their ecological significance constrains efforts to build understanding and support. In the absence of support, resistance to such policies is likely, particularly when they affect important public uses and values. The challenge lies in understanding how public judgments are formed, sustained, and altered. Although the lack of support often is attributed to inadequate understanding of the scientific bases for policies, research indicates that judgments evolve from a suite of factors, including contextual issues, trust, aesthetic concerns, and personal history. This paper outlines possible responses to foster the understanding necessary for effective RLK management. These include (1) clearly describe the rationale for, and impacts of, policies on the species; (2) clarify the contextual setting; (3) outline the specific actions to be taken; and (4) identify when and where policies will be employed. Without improved efforts to foster public understanding and support, RLK management will continue to be dominated by political conflict and narrow economic interests, resulting in a further loss of species and values to society.

Keywords: Decisionmaking, policy processes, public involvement.

(see Corvallis order form.)

Swanson, F.

2005. Long-term ecological reflections. LTER Network News. 18(1): 4. http://www.1ternet.edu/news/Article4.html.

A collaboration of the H.J. Andrews Experimental Forest Ecosystem Research Program and the creative writing community is bringing humanists, including philosophers and poets, into the forest to reflect and write on long-term ecological change and our evolving relationship with ecosystems.

Keywords: Long-term ecological reflections, H.J. Andrews Experimental Forest.

(see Corvallis order form.)

Swanson, F.

2005. Research. In: Anderson, R., ed. We had an objective in mind: The U.S. Forest Service in the Pacific Northwest 1905–2005. Portland, OR: The Pacific Northwest Forest Service Association: 544–548. http://oldsmokeys.org.

This is a book of accounts about the Forest Service in the Pacific Northwest—an area that includes the Pacific Northwest Region (Region 6) and the Pacific Northwest Research Station. The stories are full of tales about the hardships and difficulties of starting a new venture. Each of the six chapters covers a unique period in Forest Service history.

Keywords: Technology transfer, experimental forests, flood processes.

(see Corvallis order form.)

Vogt, C.; Winter, G.; Fried, J.S.

2004. Predicting homeowners' approval of fuel management at the wildland-urban interface using the theory of reasoned action. Society and Natural Resources. 18: 337–354.

The Theory of Reasoned Action, a social science model now widely applied to natural resource problems, provided a framework for studying homeowners' beliefs, attitudes, and intent to support prescribed burning, mechanical fuel reduction, and defensible space ordinances. Besides the a priori factors prescribed by the theory, the influence of three additional variables was assessed—personal importance, trust, and past experience. Despite significant differences in the ratings of these explanatory variables among study sites, personal importance of a fuel management approach was related to attitude toward that approach, and trust in an agency's implementation of that approach was related to intent to approve the use of that approach.

Keywords: Public acceptance, prescribed burning, mechanical fuel treatment, defensible space, wildland fire experience.

(see Portland order form.)

Wildlife

Bull, E.L.; Heater, T.W.; Shepherd, J.F.

2005. Habitat selection by the American marten in northeastern Oregon. Northwest Science. 79(1): 36–42.

Habitat used by 20 adult radiocollared American martens (*Martes americana*) was investigated in northeastern Oregon between 1993 and 1997 to provide land managers with information on habitat management for this species. Martens showed a strong preference for old-structure, unlogged stands in subalpine fir and spruce forests with canopy closures ≥50 percent, a high density of dead trees and logs, and in close proximity to water. Martens avoided harvested stands, dry forest types, early structural classes, and areas with low densities of dead trees. Factors such as disturbance patterns, tree diseases, forest structure, prey base, and predators are important considerations in a management plan for martens.

Keywords: Marten, Martes americana*, habitat management.*

(see La Grande order form.)

Hanley, T.A.; Deal, R.L.; Orlikowska, E.H.

2006. Relations between red alder composition and understory vegetation in young mixed forests of southeast Alaska. Canadian Journal of Forest Research. 36: 738–748.

We studied understory vegetation in nine even-aged, young-growth stands (38 to 42 years old) comprising a gradient of red alder–conifer overstory composition, with red alder ranging from 0 to 86 percent of stand basal area. Conifers were Sitka spruce, western hemlock, and western redcedar. We measured understory biomass and net production (current annual growth) in each stand by species and plant part and estimated carrying capacity for black-tailed deer with a food-based habitat model. We used linear regression to determine relations between the proportion of red alder basal area and (1) understory biomass, and (2) carrying capacity for deer. Highly significant correlations ($P < 0.002$) were found between red alder basal area and all of the following: total understory biomass ($r^2 = 0.743$), net production of shrubs ($r^2 = 0.758$) and herbs ($r^2 = 0.855$), and summer carrying capacity for deer ($r^2 = 0.846$). The high correlation between red alder and herbaceous production is important because herbs are least abundant and most difficult to maintain in young-growth conifer forests of this region. Red alder offers prospects for increasing biodiversity, wildlife habitat value, and diversified wood products when included as a hardwood overstory species in mixed hardwood-conifer young-growth forests.

Keywords: Red alder, Alnus rubra*, understory vegetation, overstory-understory relations, wildlife habitat, black-tailed deer.*

(see Juneau order form.)

Jones, L.L.C.; Leonard, W.P.; Olson, D.H., eds.

2006. Amphibians of the Pacific Northwest. Seattle, WA: Seattle Audubon Society. 227 p.

This field guide provides updated species information for amphibians in northwestern North America. The geographic scope of this book has not been attempted previously. Several new species are included here that were not recognized in earlier field guides. Introductory chapters provide background information not usually presented in a field guide, of interest to new herpetologists and the public.

Keywords: Amphibians, frogs, toads, salamanders, Pacific Northwest.

(see Corvallis order form.)

Lehmkuhl, J.F.

2005. Wildlife habitat fragmentation. Western Forester. November/December: 8–9.

There are several key things to remember about habitat fragmentation. Forest practices that alter forest composition and structure can be good, bad, or neutral for wildlife. Some species might gain and some might lose habitat, with corresponding short- and long-term effects on population size and persistence. Impacts depend on the specific species, their habitat requirements, population structure, and life history, and the landscape context. Landscape-level issues of habitat distribution and connectivity across ownerships usually need to be addressed through collaboration among private and government land managers, especially for wideranging wildlife.

Keywords: Fragmentation, wildlife, forest practices.

(see Wenatchee order form.)

Luoma, D.L.; Trappe, J.M.; Claridge, A.W.; Jacobs, K.M.; Cázares, E.

2003. Relationships among fungi and small mammals in forested ecosystems. In: Zabel, C.J.; Anthony, R.G., eds. Mammal community dynamics: management and conservation in the coniferous forests of western North America. New York: Cambridge University Press: 343–373. Chapter 10.

This book chapter presents information about relationships between small mammals and an important food source, fruitbodies of (predominantly) ectomycorrhizal fungi. After providing some background on the function and diversity of the fungi involved, it examines historical interest in mycophagy and current questions. The main focus is on mycophagy (fungi consumption) and potential effects of disturbance on the interrelationships among trees, truffles, and mammals. The discussion is not limited to western North America because much relevant research has occurred in Australia.

Keywords: Small mammals, mycophagy, truffles.

(see Corvallis order form).

Marcot, B.G.

2005. Two turtles from Western Democratic Republic of the Congo: *Pelusios chapini* and *Kinixys erosa*. Newsletter of the World Chelonian Trust. 2(4): 1–2, 8.

During an expedition in August–September 2004 to Democratic Republic of the Congo, two species of poorly known turtles were encountered: Central African Mud Turtle (*Pelusios chapini*) and Forest Hingeback (*Kinixys erosa*) along riparian forests on the Ubange River. Photographs of *Pelusios chapini* are apparently among the first ever taken of this species in its native environment. *Kinixys erosa* was found in a village market being sold as bushmeat. Population status of both species is unknown and needs study.

Keywords: Africa, Congo, tropical turtles.

(see Portland order form.)

Miller, M.P.; Bellinger, M.R.; Forsman, E.D.; Haig, S.M

2006. Effects of historical climate change, habitat connectivity, and vicariance on genetic structure and diversity across the range of the red tree vole (*Phenacomys longicaudus*) in the Pacific Northwestern United States. Molecular Ecology. 15: 145–159.

We examined phylogeographical patterns of red tree voles in western Oregon by analysing mitochondrial control region sequences for 169 individuals from 18 areas across the species' range. Spatial genetic analyses of control region sequences demonstrated a primary north-south genetic discontinuity separating northern and southern sampling areas. The north/south discontinuity probably corresponds to a region of secondary contact between lineages rather than to an overt barrier. A less distinct genetic discontinuity was detected between the Cascade Range and Coast Range of northern Oregon.

Keywords: Red tree vole, Phenacomys longicaudus*,* Arborimus*, genetics, populations structure.*

(see Corvallis order form.)

Naylor, B.J.

2005. Spatial distributions of elk and deer at the Starkey Experimental Forest and Range in Oregon.[Poster]. San Diego, CA: Environmental Systems Research Institute International User Conference.

Density maps were created using the telemetry point locations of deer and elk within the Starkey Experimental Forest and Range. A merger of 30-m-resolution satellite imagery and 1-m-resolution digital orthophoto quadrangles was used to display the habitat types within the study area.

Keywords: Animal telemetry, LORAN-C, DOQ, image merge, Starkey Experimental Forest and Range.

(see La Grande order form.)

Nicholson, M.C.; Bowyer, T.; Kie, J.G.

2006. Forage selection by mule deer: does niche breadth increase with population density? Journal of Zoology. 269: 39–49.

Effects of population density of mule deer (*Odocoileus hemionus)* on forage selection were investigated by comparing diet characteristics of two subpopulations of deer in southern California that differed in population density during winter. Quality of diet for deer was higher at the low-density site than at the high-density site in winter, when deer densities were different. Quality of diet was similar in summer when both areas had comparable densities of deer. During winter, niche breadth along the dietary axis in the low-density area was twice that of the high-density site. Generalist herbivores feeding primarily on low-quality browse at high population density in winter would be expected to increase their dietary breadth by feeding on additional species of plants as they depleted their food supply. Mule deer in our study, however, decreased the breadth of their dietary niche as population density increased. We hypothesize that by rapidly eliminating high-quality forages from an area by heavy grazing, deer at higher population densities narrowed their dietary niche.

Keywords: Mule deer, Odocoileus hemionus*, density dependence, dietary niche dynamics.*

(see La Grande order form.)

Olson, D.H.

2005. Cascades frog, *Rana cascadae* Slater. In: Jones, L.L.C.; Leonard, W.P.; Olson, D.H., eds. Amphibians of the Pacific Northwest. Seattle, WA: Seattle Audubon Society.

This field guide species account of the Cascades frog provides key features for identification, life history and habitat descriptions, and notable research findings. Current status and genetic biodiversity results are summarized.

Keywords: Cascades frog, Rana cascadae*, field guide.*

(see Corvallis order form.)

Olson, D.H.

2005. Overview of frogs and toads. In: Jones, L.L.C.; Leonard, W.P.; Olson, D.H., eds. Amphibians of the Pacific Northwest. Seattle, WA: Seattle Audubon Society.

This overview provides a general introduction to anuran amphibians of northwestern North America. Topics covered include key characteristics of frogs and toad, predator-prey relations, breeding biology, habitat, and status. Distinct features of northwest regional species are highlighted.

Keywords: Frogs and toad, anura, northwest North America.

(see Corvallis order form.)

Olson, D.H.

2005. Shasta salamander, *Hydromantes shastae* Gorman and Camp. In: Jones, L.L.C.; Leonard, W.P.; Olson, D.H., eds. Amphibians of the Pacific Northwest. Seattle, WA: Seattle Audubon Society.

This field guide account of the Shasta salamander updates ecological information for the species and provides key characteristics for identification.

Keywords: Shasta salamander, Hydromantes shastae*, field guide.*

(see Corvallis order form.)

Olson, D.H.

2005. Western toad, *Bufo boreas* Baird and Girard. In: Jones, L.L.C.; Leonard, W.P.; Olson, D.H., eds. Amphibians of the Pacific Northwest. Seattle, WA: Seattle Audubon Society.

This field guide species account of the Western toad provides key characteristics for identification, a basic ecology description, and notable research findings. Its current status is summarized.

Keywords: Western toad, Bufo boreas*, field guide.*

(see Corvallis order form.)

Preisler, H.K.; Ager, A.A.; Wisdom, M.J.

2006. Statistical methods for analysing responses of wildlife to human disturbance. Journal of Applied Ecology. 43: 164–172.

We have developed methods for studying wildlife responses to off-road recreation with the use of new technologies that allow frequent and accurate monitoring of human-wildlife interactions. To illustrate these methods, we studied the response of Rocky Mountain elk (*Cervus elaphus* L.) to all-terrain vehicles (ATVs), one of the most prominent forms of summer recreation in North America. Elk locations before and during the human disturbances were monitored using an automated telemetry system. We developed a statistical method that accounted for daily circadian rhythms in movement behavior of elk, and related the probability of flight to distance to the disturbance and a number of environmental covariates. We also present methods for estimating spatially and temporally explicit movement vectors as a way of detecting and visualizing landscape-level movement patterns. Using these methods, we observed that elk appeared to respond at relatively long distances (>1000 m) to ATVs, and that the estimated probability of flight appeared to be higher when elk were closer to the ATV routes, even when the distance to an ATV was large.

Keywords: Nonparametric regression, off-road recreation, stochastic movement models, telemetry data, vector field.

(see La Grande order form.)

Rich, T.D.; Wisdom, M.J.; Saab, V.A.

2005. Conservation of priority birds in sagebrush ecosystems. In: Ralph, C.J.; Rich, R.D., eds. Bird conservation implementation and integration in the Americas: proceedings of the third international partners in flight conference. Gen. Tech. Rep. PSW-GTR-191. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 589–606.

We examined the hypothesis that greater sage-grouse may serve as an umbrella species for other species of birds in sagebrush ecosystem. Numbers and densities of shrub-associated species, total bird abundance, and total species richness were higher in better sage-grouse habitat, but grass-associated species showed no significant relationships. Thus, several components of the bird community apparently were covered by the sage-grouse umbrella, but others were not. We describe conditions where sage-grouse function serve as an effective surrogate for management of other sagebrush-associated species.

Keywords: Sage-grouse, umbrella species, sagebrush, sagebrush ecosystem, wildlife.

(see La Grande order form.)

Rowland, M.M.; Wisdom, M.J.

2005. The Great Basin at risk. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 83–93. Chapter 2.

The Great Basin Ecoregion of Nevada, Utah, and California is faced with a variety of pervasive threats to its shrubland communities. We describe the environmental conditions of the ecoregion and the associated major threats to its shrubland communities.

Keywords: Great Basin, Nevada, sagebrush ecosystem, species of conservation concern, shrublands, threat.

(see La Grande order form.)

Rowland, M.M.; Wisdom, M.J.; Meinke, C.W.; Suring, L.H.

2006. Greater sage-grouse as an umbrella species for sagebrush-associated vertebrates. Biological Conservation. 129: 322–335.

Widespread degradation of sagebrush (*Artemisia* spp.) has prompted managers to consider myriad approaches to conserve habitats for sagebrush-associated species. One approach involves the use of greater sage-grouse as an umbrella species. The efficacy of this approach, however, has not been evaluated. We tested that concept by comparing overlap between ranges and habitats of sage-grouse and 39 other vertebrate species of conservation concern in the Great Basin. Our results indicated that management focused on sage-grouse habitats may offer substantial conservation coverage for sagebrush obligates, but only limited coverage for other vertebrate species in sagebrush ecosystems.

Keywords: Centrocercus urophasianus*, Great Basin, greater sage-grouse, umbrella species, sagebrush.*

(see La Grande order form.)

Rowland, M.M.; Suring, L.H.; Wisdom, M.J.; Meinke, C.W.; Schueck, L.

2005. Habitats for vertebrate species of conservation concern. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 163–204. Chapter 6.

Regional assessment of habitats for species of conservation concern must effectively address the information demands posed by the inclusion of a diverse suite of species in such evaluations. In this chapter, we describe habitat conditions for the 40 sagebrush-associated species of conservation concern selected for our assessment. Our objectives were

to (1) identify land cover types (cover types) that function as habitat for the species; (2) quantify the amount of habitat (i.e., habitat area) for each species at two spatial extents—the Great Basin Ecoregion (Great Basin) and Nevada; and (3) quantify habitats at risk of displacement by cheatgrass or pinyon juniper woodlands for each species of concern in the Great Basin and Nevada.

Keywords: Sagebrush, sagebrush ecosystem, species of conservation concern, shrublands, threat.

(see La Grande order form.)

Scheibe, J.S.; Smith, W.P.; Bassham, J.; Magness, D.
2006. Locomotor performance and cost of transport in the northern flying squirrel *Glaucomys sabrinus*. Acta Theoriologica. 51(2): 169–178.

We assessed locomotor performance by northern flying squirrels (*Glaucomys sabrinus griseifrons),* measuring 168 glides by 82 squirrels in Alaska. Mean glide distances varied from 12.46 m to 14.39 m, with a maximum observed glide distance of 65 m. We used models of transport cost to provide an initial assessment of the hypothesis that gliding locomotion is energetically less expensive than quadrupedal locomotion. Our results suggest that gliding is less expensive than quadrupedal locomotion after a distance of 10 m or more. Because average glide length was 14.2 m, the hypothesis that gliding is less expensive than quadrupedal locomotion is supported.

Keywords: Energetics, gliding, northern flying squirrel, old-growth forest, southeastern Alaska.

(see Juneau order form.)

Smith, W.P.; Gende, S.M.; Nichols, J.V.
2005. Correlates of microhabitat use and density of *Clethrionomys gapperi* and *Peromyscus keeni* in temperate rain forests of southeast Alaska. Acta Zoologica Sinica. 51(6): 8973–8988.

We studied the Wrangell Island vole (*Clethrionomys gapperi wrangeli*) and Keen's mouse (*Peromyscus keeni macrorhinus*) in rain forest of the Alexander Archipelago during 1998–2000 to obtain the first quantitative estimates of habitat relations in southeastern Alaska. We trapped 1-ha grids and assessment lines with live traps during spring and autumn to compare population density and microhabitat use among gap-phase old growth, multi-cohort old growth, precommercially thinned young growth, and peatland mixed-conifer forests. For both species, populations in 1998 were higher than in 1999–2000 and we analyzed microhabitat use in those periods separately. Habitat distribution and microhabitat use varied with density. Our results support earlier studies that concluded that *P. keeni* populations in southeastern Alaska flourish in a variety of habitats, but departed from the view that *C. gapperi* achieves its highest density in late-seral coniferous forests. Voles in southeastern Alaska may be able to persist in habitats where the canopy has been removed. Peatland mixed-conifer forest contributed little to breeding populations of *C. gapperi* or *P. keeni*, thus is unlikely to mitigate any impacts of broad-scale clearcut logging of more productive old-growth forests.

Keywords: Clethrionomys gapperi wrangeli*, endemic taxa, habitat relations, Keen's mouse, logistic regression, microhabitat use,* Peromyscus keeni macrorhinus*, temperate rain forest.*

(see Juneau order form.)

Suring, L.H.; Rowland, M.M.; Wisdom, M.J.
2005. Identifying species of conservation concern. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 150–162. Chapter 5.

We identified 207 species of conservation concern that were associated with sagebrush habitats in the Great Basin. Habitats for plant and invertebrate species, as well as many vertebrates, could not be evaluated as part of our regional assessment, and instead require local assessment. We identified 40 vertebrate species of conservation concern (1 amphibian, 9 reptiles, 17 birds, and 13 mammals) that were appropriate for regional assessment of the Great Basin, and these species were the focus of our assessment.

Keywords: Sagebrush, sagebrush ecosystem, species of conservation concern, shrublands, threat.

(see La Grande order form.)

Suring, L.H.; Rowland, M.M.; Wisdom, M.J.; Schueck, L.; Meinke, C.W.

2005. Vegetation communities. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 94–113. Chapter 3.

Sagebrush, salt desert shrub, and pinyon juniper cover types dominate the state of Nevada and the Great Basin. The number, size, and total area burned across the Great Basin and state of Nevada have increased dramatically in the last 20 years; these trends appear to be accelerating, in association with extensive establishment of cheatgrass. Large portions of the areas burned since the early 1990s previously supported sagebrush or salt desert shrub communities; many of these cover types were not adapted to frequent, high-intensity fires and have converted to cheatgrass.

Keywords: Sagebrush, sagebrush ecosystem, species of conservation concern, shrublands, threat.

(see La Grande order form.)

Suring, L.H.; Wisdom, M.J.; Tausch, R.J.; Miller, R.F.; Rowland, M.M.; Schueck, L.; Meinke, C.W.

2005. Modeling threats to sagebrush and other shrubland communities. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 114–149. Chapter 4.

Approximately 80 percent of the land area in the Great Basin and Nevada is susceptible to displacement by cheatgrass. Wyoming-basin big sagebrush and salt desert scrub cover types occupy >40 percent of the Great Basin and Nevada and are the cover types most at risk to displacement by cheatgrass. Mountain big sagebrush is generally at lower risk, and more area of this cover type is found in Nevada compared to the Great Basin. Management efforts may be most productive when applied to areas with low and moderate risk to ensure they do not become high-risk areas. Cover types estimated to be at high risk may have already crossed the threshold to conversion to cheatgrass, and this level of risk may be difficult to mitigate.

Keywords: Sagebrush, sagebrush ecosystem, species of conservation concern, shrublands, threat.

(see La Grande order form.)

Wisdom, M.J.; Rowland, M.M.; Hemstrom, M.A.; Wales, B.C.

2005. Landscape restoration for greater sage-grouse: implications for multiscale planning and monitoring. In: Shaw, N.L.; Pellant, M.; Monsen, S.B., comps. Sage-grouse habitat restoration symposium proceedings. Proceedings RMRS-P-38. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 62–69.

Habitats and populations of greater sage-grouse (*Centrocercus urophasianus*) have declined throughout western North America in response to a myriad of detrimental land uses. Successful restoration of this species' habitat, therefore, is of keen interest to federal land agencies who oversee management of most remaining habitat. To illustrate the challenges and potential for landscape restoration, we summarized recent findings of restoration modeling for sage-grouse in the interior Northwest. Changes in amount and quality of habitat were evaluated under proposed federal management and under two restoration scenarios. Under the two scenarios, the rate of habitat loss was reduced and the quality of habitat was substantially improved compared to proposed management. These results have direct implications for restoration planning and monitoring. First, a strategic, multiscale approach is needed that links the scale of the stand with scales of the seasonal, year-round, and multipopulation ranges of sage-grouse. Second, consideration of connectivity across scales is essential. Third, extensive and sustained use of a holistic suite of passive and active restoration treatments is needed. Finally, monitoring of both habitat and population responses across scales is critical.

Keywords: Artemisia*, conservation, greater sage-grouse, habitat restoration, interior Columbia Basin, sagebrush.*

(see La Grande order form.)

Wisdom, M.J.; Rowland, M.M.; Suring, L.H.

2005. Assumptions and limitations for appropriate use. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 250–263. Chapter 9.

In this chapter, we identify key assumptions and limitations appropriate to management use of results from our regional assessment of habitats in the Great Basin and Nevada. Our summary of these assumptions and limitations is intended to meet two purposes: (1) to help managers understand current limits of inference for decisionmaking; and (2) to identify the important knowledge gaps that we believe are

best addressed through management-based experiments, such as can be achieved through adaptive management and validation research.

Keywords: Great Basin, Nevada, sagebrush ecosystem, species of conservation concern, threats.

(see La Grande order form.)

Wisdom, M.J.; Rowland, M.M.; Suring, L.H.
2005. Glossary of terms. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 273–287. Appendix 1.

This appendix provides a comprehensive glossary of terms for the book.

Keywords: Great Basin, Nevada, sagebrush ecosystem, species of conservation concern, threat.

(see La Grande order form.)

Wisdom, M.J.; Rowland, M.M.; Suring, L.H.
2005. Identifying species of conservation concern in the sagebrush ecosystem. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 288. Appendix 2.

This appendix provides a detailed description of the methods by which species of concern were identified in the sagebrush ecosystem, and provides the resulting list of species. http://www.fs.fed.us/pnw/pubs/sagebrush-appendices/.

Keywords: Great Basin, Nevada, sagebrush ecosystem, species of conservation concern, threat.

(see La Grande order form.)

Wisdom, M.J.; Rowland, M.M.; Suring, L.H.
2005. Short-cut approaches to multi-species assessment. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 289. Appendix 3. http://www.fs.fed.us/pnw/pubs/sagebrush-appendices/.

This appendix provides a detailed description of the various methods by which assessment of a large collection of single species can be indexed by other, more efficient methods that are correlated with, or representative of, the larger set of individual species.

Keywords: Great Basin, Nevada, sagebrush ecosystem, species of conservation concern, threat.

(see La Grande order form.)

Wisdom, M.J.; Rowland, M.M.; Suring, L.H.
2005. Plant and animal species mentioned in text, excluding species of conservation concern. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 290–291. Appendix 4.

This appendix lists the common and scientific names of plant and animal species mentioned throughout the book except for species of conservation concern, which are listed in appendix 5.

Keywords: Great Basin, Nevada, sagebrush ecosystem, species of conservation concern, threat.

(see La Grande order form.)

Wisdom, M.J.; Rowland, M.M.; Suring, L.H.
2005. Species of conservation concern in the Great Basin. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 292–299. Appendix 5.

This appendix lists the common and scientific names of all plant and animal species identified as species of concern in the Great Basin.

Keywords: Great Basin, Nevada, sagebrush ecosystem, species of conservation concern, threat.

(see La Grande order form.)

Wisdom, M.J.; Rowland, M.M.; Suring, L.H.
2005. Habitat and associated risks for species of concern in the Great Basin and Nevada. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 300. Appendix 6. http://www.fs.fed.us/pnw/pubs/sagebrush-appendices/.

This appendix provides detailed information on habitat abundance and habitat at risk from cheatgrass displacement for 40 vertebrate species of concern in the Great Basin Ecoregion and Nevada.

Keywords: Great Basin, Nevada, sagebrush ecosystem, species of conservation concern, threats.

(see La Grande order form.)

Wisdom, M.J.; Rowland, M.M.; Suring, L.H.

2005. Summary results for BLM field offices in Nevada. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 301. Appendix 7. http://www.fs.fed.us/pnw/pubs/sagebrush-appendices/.

This appendix provides a summary of assessment results for Bureau of Land Management field offices in Nevada.

Keywords: Great Basin, Nevada, sagebrush ecosystem, species of conservation concern, threat.

(see La Grande order form.)

Wisdom, M.J.; Rowland, M.M.; Suring, L.H.; Schueck, L.; Meinke, C.W.; Knick, S.T.

2005. Evaluating species of conservation concern at regional scales. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 5–74. Chapter 1.

We developed regional assessment procedures to evaluate pervasive threats to habitats for species of conservation concern in arid shrubland ecosystems of the Western United States. Our methods and example applications illustrate the management utility of assessing regional threats to habitats for species of concern.

Keywords: Great Basin, Nevada, sagebrush ecosystem, species of conservation concern, threat.

(see La Grande order form.)

Wisdom, M.J.; Suring, L.H.; Rowland, M.M.

2005. Conclusions and implications for management. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 264–272. Chapter 10.

In this chapter, we summarize the major conclusions from our assessment and describe the associated management implications. Conclusions and implications follow the order of chapters 2–9, and thus are not arranged by priority. Instead, we consider all conclusions and implications described below to be equally relevant to managers of native habitats for species of conservation concern in Nevada and the Great Basin Ecoregion. Consequently, our summary is intended to be comprehensive. Literature and findings in support of our conclusions and implications can be found in chapters 2–9.

Keywords: Great Basin, Nevada, sagebrush ecosystem, species of conservation concern, threat.

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Wisdom, M.J.; Suring, L.H.; Rowland, M.M.; Meinke, C.W.; Schueck, L.; Knick, S.T.; Wales, B.C.

2005. Habitats for groups of species. In: Wisdom, M.J.; Rowland, M.M.; Suring, L.H., eds. Habitat threats in the sagebrush ecosystem: methods of regional assessment and applications in the Great Basin. Lawrence, KS: Alliance Communications Group: 205–231. Chapter 7.

Regional assessments can include hundreds or even thousands of species. For land managers, individual attention to large numbers of species can be impractical. Consequently, in this chapter we describe the use of 5 groups of species to generalize the habitat patterns represented by the 40 species of conservation concern in watersheds of the Great Basin Ecoregion (Great Basin) and state of Nevada. Our objectives were to (1) place species in groups by similarity among habitat associations and amounts of these habitats, as a means of generalizing the habitat patterns of the 40 species; and (2) characterize habitat conditions in watersheds for each group of species, for use in land management planning.

Keywords: Great Basin, Nevada, sagebrush ecosystem, species of conservation concern, threat.

(see La Grande order form.)

Wood Utilization

Green, D.W.; Lowell, E.C.; Hernandez, R.
2005. Structural lumber from dense stands of small-diameter Douglas-fir trees. Forest Products Journal. 55(7/8): 43–50.

Small-diameter trees growing in overstocked dense stands are often targeted for thinning to reduce fire hazard and improve forest health and ecosystem diversity. In the Pacific Northwest and intermountain regions, Douglas-fir can be a predominant species in such stands. In this study, mechanical properties and grade yield of structural products were estimated for 2 by 4 lumber cut from logs of small-diameter Douglas-fir trees from a stand in northern California. The results indicate that 70- to 90-year-old suppressed Douglas-fir has excellent potential for the production of all structural lumber products. Grade recovery was determined by using five grading systems. When graded as Structural Light Framing, 68 percent of the lumber made Select Structural as Light Framing, 74 percent made Construction grade, 89 percent made STUD grade, 90 percent made 2400Fb2.0E under machine stress rating rules, and 46 percent would qualify as stock for glue laminated beams. Care must be taken in kiln-drying to avoid the commonly observed problem of twist.

Keywords: Small-diameter, Douglas-fir, suppressed stands, mechanical properties.

(see Portland order form.)

Nicholls, D.L.; Zerbe, J.I.; Bergman, R.D.; Crimp, P.M.
2004. Use of wood energy for lumber drying and community heating in southeast Alaska. Gen. Tech. Rep. FPL-GTR-152. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 14 p.

The potential use of sawmill residues to supply wood energy systems for community heating and lumber drying in Hoonah, Alaska, was considered. The proposed community heating system would be a direct combustion system, burning approximately 1,450 green tons of wood fuel per year to heat seven buildings in central Hoonah. Additional sawmill residues would be used in a second system to provide process heat for a proposed 25,000 board foot lumber drying kiln. Use of wood fuel for community heating would save an estimated 65,000 gallons of heating oil per year. Wood residue from the sawmill is assumed to be available at no cost other than for transportation.

Keywords: Biomass, wood energy, lumber drying, wood residues, sawmill, Alaska.

(see Sitka order form.)

Thomas, J.; Hansen, E.; Brackley, A.M.
2005. An assessment of educational needs in the Alaskan forest products industry. Forest Products Journal. 55(9): 19–23.

Major changes in federal forest policy in Alaska have resulted in a dramatic downsizing of the state's forest industry. These changes have driven efforts for economic restructuring and improved support for Alaskan communities. The University of Alaska Sitka Forest Products program at the University of Alaska Southeast is one example of efforts to better support the Alaskan forest industry. To best target educational programs, an industry needs assessment was conducted. Despite the fact that the Alaskan forest industry is different in many ways from the industry in the lower 48 States, educational needs are quite similar to those previously identified in Oregon and Virginia. Generally, marketing and business topics were higher educational needs than traditional processing topics.

Keywords: Alaska, forest products industry, education.

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