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Recent Publications of the Pacific Northwest Research Station, Third Quarter, 2006

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Pacific Northwest Research Station

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Pacific Northwest Research Station Publications

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Aquatic/Riparian Systems

06-294

Thompson, J.

2006. Does wood slow down "sludge dragons?" The interaction between riparian zones and debris flows in mountain landscapes. Science Findings 86. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

Researchers from the PNW Research Station and Oregon State University created a physics-based simulation of debris flow dynamics in a headwater basin within the Oregon Coast Range. They found that the presence of wood fundamentally changes the behavior of debris flows by reducing the momentum and distance that they travel. Because debris flow deposits are primary storage sites for sediment within headwater catchments, a shift toward shorter flows means that more sediment is stored higher up in watersheds. In addition, they found that zones with high densities of wood and sediment are relatively fixed in space and do not migrate downstream. This suggests that management strategies could specifically target achieving habitat objectives within these high accumulation zones.

Keywords: Sludge dragons, riparian zones, debris flows.

06-359

Thompson, J.

2006. Does it work? Monitoring the effectiveness of stream management practices in Alaska. Science Findings 87. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

Researchers at the PNW Research Station laboratories in Juneau, Alaska, and Wenatchee, Washington, have been collaborating with the Tongass National Forest in southeast Alaska to design a stream channel monitoring protocol. Their results indicate that measures of channel geometry, pool frequency, pool size, and potentially streambed surface grain size distribution all are viable indicator variables for effectiveness monitoring. Using these measures, they found high variability in stream channel conditions within pristine watersheds as well as those subject to heavy logging and roading. Nevertheless, well-trained personnel following carefully developed procedures will be able to efficiently collect field data characterizing selected monitoring variables, and will be able to analyze change in channel condition and develop conclusions regarding the relative magnitude of effects of various land use practices on channel condition.

Keywords: Stream management, channel geometry, roading.

06-497

Economics

Warren, D.D.

2006. Production, prices, employment, and trade in Northwest forest industries, all quarters of 2004. Resource Bulletin PNW-RB-250. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 165 p.

Report provides current information on lumber and plywood production and prices; employment in the forest industries; international trade in logs, lumber, and plywood; volume and average prices of stumpage sold by public agencies; and other related items.

Keywords: Forestry business economics, lumber prices, plywood prices, timber volume, stumpage prices, employment (forest products industries), marketing (forest products), imports and exports (forest products).

Forest Management

06-253

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

2006. Effects of vegetation control and organic matter removal on soil water content in a young Douglas-fir plantation. Res. Pap. PNW-RP-568. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 28 p.

We evaluated the effects of vegetation control and organic matter (OM) removal on soil water content (SWC) in a Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) plantation from age 3 through age 5. Treatments were presence versus absence of vegetation control through year 5 and bole-only harvest of the previous stand versus total-tree harvest of the previous stand including removal of all coarse woody residues. In the presence of vegetation control, SWC was approximately 0.02 to 0.04 $m^3 \bullet m^{-3}$ greater between depths of 10 and 60 cm; the effect was greatest from July to September. Soil water content was negatively correlated with percentage cover of competing vegetation and positively correlated with tree diameter growth across all treatments. Soil water content at depths between 10 and 100 cm did not differ between OM removal treatments. Accurate measurement of SWC required a soil-specific instrument calibration. On this highly productive site with high annual precipitation, SWC was greater through plantation age 5 when competing vegetation was controlled.

Keywords: Soil water, vegetation control, organic matter, harvest residue, Douglas-fir, Pseudotsuga menziesii*, Andisol, soil water measurement, instrument calibration.*

Landscape Ecology

06-160

Aitken, M.; Hayes, J.L.

2006. Roads in landscape modeling: a case study of a road data layer and use in the Interior Northwest Landscape Analysis System. Res. Note PNW-RN-552. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 26 p.

Roads are important ecological features of forest landscapes, but their cause-and-effect relationships with other ecosystem components are only recently becoming included in integrated landscape analyses. Simulation models can help us to understand how forested landscapes respond over time to disturbance and socioeconomic factors, and potentially to address the important role roads play in these processes. The inclusion of roads as static or as process components of the landscape modeling, however, presents numerous challenges owing to a general lack of adequate road data and threshold effect information. Roads have been included in several recent landscape analysis efforts in the Pacific Northwest, but not as dynamic components. The Interior Northwest Landscape Analysis System (INLAS) developed a framework for simulation modeling of succession, disturbance, and management activities at the subbasin level. Roads were included in the INLAS project as a static landscape feature. We describe the data, analysis, and applications of road data in the INLAS project. Using the INLAS effort as a case study, we examine the challenges of incorporating roads into multidisciplinary landscape-level analyses. With an emphasis on data requirements, we identify practical and logistic barriers to dynamic modeling of road interactions, and propose a strategy for future studies.

Keywords: Road ecology, landscape analysis, simulation modeling, NETDISTANCE, land use.

06-186

Bair, L.S.; Alig, R.J.

2006. Regional cost information for private timberland conversion and management. Gen. Tech. Rep. PNW-GTR-684. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 26 p.

Costs of private timber management practices in the contiguous United States are identified, and their relationship to timber production in general is highlighted. Costs across timber-producing regions and forest types are identified by forest type and timber management practices historically applied in each region. This includes cost estimates for activities such as forest establishment practices such as reforestation and afforestation on crop and pastureland. Establishment costs for reforestation in the Southern United States are less than in other regions, although regional differences in establishment costs are less evident in hardwood than in softwood stands. Also, included in the list of timber management costs are the intermediate management treatments of precommercial thinning, herbicide, and fertilizer application. Intermediate management treatments are less costly in the Southern United States than in other regions. Trends in timber management costs are reported as part of the timber management cost reporting.

Keywords: Timberland, costs, production, timber management, intermediate treatment.

Monitoring

06-180

Pilz, D.; Ballard, H.L.; Jones, E.T.

2006. Broadening participation in biological monitoring: handbook for scientists and managers. Gen. Tech. Rep. PNW-GTR-680. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 131 p.

Participatory (collaborative, multiparty, citizen, volunteer) monitoring reflects the understanding that natural resource decisions are more effective and less controversial when stakeholders who have an interest in the results are involved in the process. An adequate number of such projects have now been organized, tried, and evaluated to recommend a comprehensive approach to implementing such processes. This handbook was written for managers and scientists in the United States who are contemplating a participatory approach to monitoring biological resources, especially biodiversity. It is designed as a how-to manual with discussions of relevant topics, checklists of important considerations to address, and resources for further information. Worksheets for developing, implementing, and evaluating a monitoring plan are posted on a companion Web site. The subject matter is divided into three stages of a monitoring project encompassing a total of 22 topical modules. These modules can be used in any sequence on an ongoing basis. Stages and modules include (1) planning—documentation, goals, indicators, collaboration, decisions, context, organization, participants, communication, incentives, design, and resources; (2) implementation—training, safety, fieldwork, sampling, data, and quality; and (3) followthrough—analysis, reporting, evaluation, and celebrations.

Keywords: Participatory inventory, participatory monitoring, participatory research, biodiversity, collaborative monitoring, multiparty monitoring, monitoring plan, forest managers, scientists.

Natural Resource Policy

06-085

Stankey, G.H.; Clark, R.N.; Bormann, B.T., eds.

2006. Learning to manage a complex ecosystem: adaptive management and the Northwest Forest Plan. Res. Pap. PNW-RP-567. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 194 p.

The Northwest Forest Plan (the Plan) identifies adaptive management as a central strategy for effective implementation. Despite this, there has been a lack of any systematic evaluation of its performance. This study is based on an extensive literature review, 50 interviews with resource managers and scientists involved with the Plan's implementation, and a survey of over 400 citizens in Oregon and Washington who participated in public involvement programs related to the adaptive management elements of the Plan. The study documents experiences with adaptive approaches, identifies key facilitators of, and barriers to, implementation of such approaches, and suggests needed changes to enhance implementation. Major problems confront efforts to undertake adaptive approaches, and these derive from a complex set of factors including a risk-averse organizational culture; a restrictive legal-political environment; and inadequate training, staffing, and financial resources.

Keywords: Adaptive management, decisionmaking, complexity, risk and uncertainty, social learning, precautionary principle.

Silviculture

06-240

Thompson, J.

2006. Seeing the bigger picture: landscape silviculture may offer compatible solutions to conflicting objectives. Science Findings 85. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

A case study of the Gotchen Reserve in Washington suggests that the potential for compatibility between fire and habitat objectives could be increased through landscape silviculture. Taking their cue from historical disturbance dynamics, researchers developed prescriptions for individual units but evaluated them collectively according to management objectives for the entire reserve. The places where treatments contributed most to accomplishing both objectives were identified by using simulation modeling. Solutions included sets of treatments that, when evaluated in aggregate for the entire reserve, could reduce the threat of high-severity fire, maintain older forest structure, and break even in costs and proceeds from timber harvest over the next 30 years. In this scenario, trees removed were mainly in the 7- to-16-inch size classes of grand fir, a shade-tolerant conifer.

Keywords: Fire, habitat, disturbance dynamics, high-severity fire, timber harvest.

Social Sciences

06-022

McLain, R.J.; Tobe, L.; Charnley, S.; Donoghue, E.M.; Moseley, C.

2006. Northwest Forest Plan—the first 10 years (1994–2003): socioeconomic monitoring of Coos Bay District and three local communities. Gen. Tech. Rep. PNW-GTR-675. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 144 p.

This case study examines the socioeconomic changes that took place between 1990 and 2000 in and around lands managed by the Bureau of Land Management (BLM) Coos Bay District in southwestern Oregon to assess the effects of the Northwest Forest Plan (the Plan) on rural economies and communities in the Coos Bay region. The case study included an analysis of changes in the district's programs, as well as socioeconomic changes within the communities of Coos Bay, Myrtle Point, and Reedsport. The study indicates that by the time the Plan was initiated, the Coos Bay region's timber sector had already lost a substantial portion of wood products processing capacity, and employment opportunities. Additionally, socioeconomic changes of the 1990s—an outflow of younger workers, inmigration of older workers and retirees, school closures, increased levels of educational attainment, declines in manufacturing sectors, and expansion of the services sector—took place during the same period in rural communities across much of the Western United States. It is thus likely that the overall socioeconomic changes observed in the Coos Bay region between 1990 and 2004 would have occurred with or without the Plan. Owing to legal challenges, the Coos Bay District was unable to provide a steady and predictable supply of timber from 1994 onward. District foresters shifted toward developing thinning techniques for density management of stands fewer than 80 years old. Sales from these younger stands will enable the district to provide a predictable supply of smaller diameter timber in future years. The Coos Bay District also significantly expanded its capacity to carry out multiple-use land management, playing a key role in community-based watershed restoration and recreation and tourism development. Key factors in the success of community-district partnerships included support from upper-level leadership, a stable district budget, and relatively stable staffing (in contrast to the downsizing that occurred in neighboring national forests).

Keywords: Social assessment, economic assessment, regional planning, rural development, Coos Bay.

06-045

Buttolph, L.P.; Kay, W.; Charnley, S.; Moseley, C.; Donoghue, E.M.

2006. Northwest Forest Plan—the first 10 years: socioeconomic monitoring of the Olympic National Forest and three local communities. Gen. Tech. Rep. PNW-GTR-679. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 84 p.

This report examines socioeconomic changes that occurred between 1990 and 2000 associated with implementation of the Northwest Forest Plan (the Plan) in the Olympic National Forest in western Washington. We used a combination of data from the U.S. census and the Forest Service, historical documents, and interviews from Forest Service employees and members of three case study communities—Quilcene, the Lake Quinault area, and the Quinault Indian Nation. We explore how the Plan affected the flow of socioeconomic benefits associated with the Olympic National Forest, such as the production of forest commodities and recreation, agency jobs, procurement contract work, grants for community economic assistance, payments to county governments, and opportunities for collaborative forest management. The greatest change was the curtailment of timber harvest activities, which affected timber industry jobs in local communities and resulted in declining agency budgets. We also examine socioeconomic changes and the influence of forest management policy on these changes. Between 1990 and 2000 all three communities showed a decrease in population, an increase in median age, a decline in timber industry–related employment, and an increase in service-industry and government jobs. Quilcene's proximity to the larger urban centers has attracted professional and service industry workers who commute to the larger hubs. Lake Quinault area residents are increasingly turning to tourism, while its growing Latino population works in the cedar shake and floral greens industries. For the Quinault Indian Nation, employment in tribal government and its casino has helped offset job losses in the fishing and timber industries. Many changes were a result of the prior restructuring of the forest products industry, national economic trends, and demographic shifts. However, for Quilcene and Lake Quinault, which were highly dependent on the national forest for timber and served as Forest Service district headquarters, the loss of timber industry and Forest Service jobs associated with the Plan led to substantial job losses and crises in the economic and social capital of these communities.

Keywords: Socioeconomic, monitoring, Northwest Forest Plan, Olympic National Forest, Quilcene, Lake Quinault, Quinault Indian Nation.

06-185

Clark, R.N.; Stankey, G.H.

2006. Integrated research in natural resources: the key role of problem framing. Gen. Tech. Rep. PNW-GTR-678. Portland, OR. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 63 p.

Integrated research is about achieving holistic understanding of complex biophysical and social issues and problems. It is driven by the need to improve understanding about such systems and to improve resource management by using the results of integrated research processes. Traditional research tends to fragment complex problems, focusing more on the pieces of problems rather than the whole that comprises multiple interrelationships and interactions. The outcome is that a lot is known about the parts (e.g., recreation, fish, and wildlife) but relatively little about how they are interrelated. There seems to be general agreement that integrated questions must drive the search for integrated understanding, but tradition, inertia, institutional culture, budgets, training, and lack of effective leadership foster reductionism (at worst) or minimal degrees of integration (at best) rather than any substantial, sustainable effort toward integrated research. In this paper, a phased approach to framing integrated research questions and addressing the substantial barriers that impede integrated efforts are discussed. A key conclusion is that to make any significant progress toward comprehensive integrated research will require more than rhetoric. Progress must begin with more effective leadership throughout various levels of research organizations.

Keywords: Research, integration, resource management, leadership, problem framing.

Wood Utilization

06-198

Brackley, A.M.; Rojas, T.D.; Haynes, R.W.

2006. Timber products output and timber harvests in Alaska: projections for 2005–25. Gen. Tech. Rep. PNW-GTR-677. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 33 p.

Projections of Alaska timber products output, the derived demand for logs and chips, and timber harvest by owner are developed by using a trend-based analysis. These are revised projections of those made in 1990, 1994, and 1997, and reflect the consequences of recent changes in the Alaska forest sector and trends in markets for Alaska products. With the cancellation of the long-term contracts and the closure of the two southeast Alaska pulp mills, demand for Alaska national forest timber now depends on markets for sawn wood and the ability to export manufacturing residues and lower grade logs. Four scenarios are presented that display a range of possible future demands. The range in annual demand for timber from Alaska national forests is 48 to 370 million board feet of logs annually. Areas of uncertainty include the prospect of continuing changes in markets and competition, and the rates of investment and innovation in manufacturing in Alaska.

Keywords: National forest (Alaska), forest sector models, lumber.

06-199

Pavia, K.J.

2006. A review of double-diffusion wood preservation suitable for Alaska. Gen. Tech. Rep. PNW-GTR-676. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 23 p.

Currently, all treated lumber used in Alaska is imported from the 48 contiguous states and Canada because there are no wood-treating facilities in Alaska. This report explores conventional and alternative wood-treating methods and reviews previous studies and laboratory tests on treated wood. In investigating wood treatment as a possible processing option for Alaska forest products manufacturers, the double-diffusion method of using sodium fluoride followed by copper sulfate appeared to be the most advantageous approach. This method of treating wood was identified because it can be used to treat freshly cut or green wood. This was an important factor to consider, owing to the limited drying capacity in Alaska. Little information was available as to the chemical retention after treating and its resistance to leaching.

Keywords: Wood preservation, double-diffusion, Alaska, nonpressured treatment, lumber, copper sulfate.

06-200

Brackley, A.M.; Parrent, D.J.; Rojas, T.D.

2006. Estimating sawmill processing capacity for Tongass timber: 2003 and 2004 update. Res. Note PNW-RN-553. Portland, OR. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 15 p.

In spring 2004 and 2005, sawmill capacity and wood utilization information was collected for selected mills in southeast Alaska. The collected information is required to prepare information for compliance with Section 705(a) of the Tongass Timber Reform Act. The total capacity in the region (active and inactive mills) was 370,350 thousand board feet (mbf) Scribner log scale during both calendar years (CYs) 2003 and 2004. The capacity of active mills for the same periods was 255,350 mbf. This is a 7.4-percent increase in active capacity from CY 2002 (237,850 mbf) to CY 2004. The actual volume of material processed during CY 2004 was 31,027 mbf Scribner log scale. This is a 21.9-percent reduction over CY 2002 (39,702 mbf Scribner log scale).

Keywords: Alaska sawmills, mill capacity, timber usage.

06-222

Brandt, J.P.; Morgan, T.A.; Dillon, T.; Lettman, G.J.; Keegan, C.E.; Azuma, D.L.

2006. Oregon's forest products industry and timber harvest, 2003. Gen. Tech. Rep. PNW-GTR-681. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 53 p.

This report traces the flow of Oregon's 2003 timber harvest through the primary timber-processing industry and describes its structure, operations, and condition. Pulp and board, lumber, and plywood and veneer sectors accounted for 96 percent of total industry sales of $6.7 billion. Oregon's 2003 timber harvest of just over 4 billion board feet was 95 percent softwood species; 65 percent of the total was Douglas-fir. As a result of improved technology, lumber overrun increased 32 percent since 1988 to 2.07 board feet lumber tally per board foot Scribner of timber input. Despite decreases in amount of timber harvested, the industry has remained important to Oregon's workforce: average earnings for a worker in Oregon forest products industry was about $50,200; Oregon's average for all industries was $32,400.

Keywords: Employment, lumber overrun, mill residue, timber-processing capacity, wood products.

06-250

Nicholls, D.L.; Brackley, A.M.; Rojas, T.D.

2006. Alaska's lumber-drying industry—impacts from a federal grant program. Gen. Tech. Rep. PNW-GTR-683. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 23 p.

A survey determined that installed dry kiln capacity in Alaska more than doubled to an estimated 220 thousand board feet (mbf) within 4 years (2000–2004). This increased ability to produce dry lumber and value-added products resulted from industry efforts to obtain federal funding to support a dry kiln grant program. This report reviews grantees' progress in implementing grant-supported projects and their impact on the production capabilities of the Alaska lumber drying industry. Data were collected in early 2005 by using a standard set of questions asked of 19 dry kiln owners. Much of the growth in drying and value-added processing capacity has been concentrated in southeast Alaska where there has been the greatest dry kiln investment. During 2004, the estimated volume of lumber dried in Alaska was 813 mbf, whereas potential annual capacity was estimated to be almost 6,600 mbf. This indicates that Alaska producers are drying just over 12 percent of their potential capacity. Factors that will increase the future production of value-added forest products in Alaska include a continuing supply of economically priced timber, the ability of the industry to support a reasonably priced grading service, and the ability of producers to move value-added products to domestic and export markets.

Keywords: Wood products, economics, dry kiln, dehumidification, lumber, employment, Alaska.

06-296

Brackley, A.M.; Rojas, T.D.; Stiefel, M.C.

2006. Alaska Wood Tides No. 5. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 4 p.

Issue No. 5 of the newsletter of the Wood Utilization Center in Sitka features an article by Thomas Rojas on National Forest economic clusters. This issue also provides research updates, an events calendar, and lists of current and upcoming publications.

Keywords: Micro-economic environments, rural communities, cluster.

Publications Available Elsewhere

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

Aquatic/Riparian Systems

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

2005. Patterns in stream longitudinal profiles and implications for hyporheic exchange flow. Hydrological Processes. 19: 2931–2949.

This paper identifies characteristics of stream channel morphology that are readily measurable, vary predictably throughout stream networks, and influence patterns of hyporheic exchange flow in mountain streams. We characterize stream longitudinal profiles and demonstrate that (1) the spacing between zones of upwelling and downwelling in the beds of mountainous streams are closely related to the spacing of slope breaks, (2) the magnitude of the vertical hydaulic gradients driving hyporheic exchange flow increase with increasing water surface concavity, and (3) both channel unit spacing and concavity vary predictably with drainage basin area, making them useful metrics for characterizing patterns in hyporheic.

Keywords: Hyporheic zone, stream-reach morphology, concavity, channel unit spacing, river continuum.

(see Olympia Laboratory order form.)

Balian, E.V.; Naiman, R.J.

2005. Abundance and production of riparian trees in the lowland floodplain of the Queets River, Washington. Ecosystems. 8: 841–861.

Riparian trees grow quickly in the floodplain of the Queets River valley. Older riparian forests on mature terraces are the main contributors to stem production at the plot and floodplain scales for at least 350 years after stand initiation. This suggests that, in combination with the rapid lateral migrations of many alluvial rivers, the older riparian forests on those terraces are important and sustained sources of organic matter (especially large woody debris) that, over decades to centuries, shape the character of coastal rivers in the Pacific Northwest.

Keywords: Riparian zones, floodplains, large woody debris.

(see Olympia Laboratory order form.)

Bisson, P.A.; Montgomery, D.R.; Buffington, J.M.

2006. Valley Segments, Stream Reaches and Channel Units. In: Hauer, R.F. ed. Methods in stream ecology. Academic Press: 23–49. Chapter 2.

This is chapter 2 of a textbook on methods used to study stream ecosystems. It describes a classification system for valley segments, stream reaches, and individual channel units ("habitat types"), and discusses protocols for field surveys. A laboratory and field exercise for students of stream ecology is provided.

Keywords: Stream channels, stream classification, stream habitat inventory.

(see Olympia Laboratory order form.)

Claeson, S.M.; Li, J.L.; Compton, J.E.; Bisson, P.A.

2006. Response of nutrients, biofilm, and benthic insects to salmon carcass addition. Canadian Journal of Fisheries and Aquatic Sciences. 63: 1230–1241.

This study examined stream nutrients, epilithic biofilm, leaf-litter decomposition, and aquatic invertebrate responses to carcass addition in three streams of SW Washington State. We used stable isotopes (^{13}C and ^{15}N) to trace incorporation of salmon-derived (SD) nutrients into stream food webs. The SD nutrients were assimilated by biofilm, benthic insects, and age-1 steelhead. The SD nutrients peaked 2 weeks after carcass addition for insects and fish feeding on carcasses, but indirect uptake of SD nutrients by biofilm and insects was delayed by about 2 months. A strong stable isotope signal did not always correspond with measurable biological change. Carcass additions can have a transient effect on primary and secondary trophic levels, but responses may be limited to specific taxa near carcass locations.

Keywords: Marine-derived nutrients, salmon carcasses, biofilm, invertebrates, stable isotopes.

(see Olympia Laboratory order form.)

Cissel, J.H.; Anderson, P.D.; Olson, D.H.; Puettmann, K.; Berryman, S.; Chan, S.S.; Thompson, C.

2006. BLM Density Management and Riparian Buffer Study: establishment report and study plan. Corvallis, OR. U.S. Geological Survey Scientific Investigations Report. 2006–5087. 144 p.

The establishment report and study plan of the density management and riparian buffer study provides a comprehensive history of our western Oregon research project that examines a variety of response parameters to alternative thinning regimes and riparian buffer widths. Three main projects are highlighted: (1) a study of the upland vegetation response to the various thinning treatments, (2) a study of the microclimate and microsite responses from streams through intact riparian buffers into thinned uplands, and (3) a study of the stream habitats and stream and stream bank vertebrates and their responses to different riparian buffer widths with upslope thinning. Plans for a second phase of thinning treatments and monitoring are outlined.

Keywords: Riparian reserves, stream habitats, riparian vertebrates, arthropods, density management, forest vegetation.

(see Corvallis Laboratory order form.)

Botany

Cline, M.; Yoders, M.; Dipti, D.; Harrington, C.; Carlson, W.

2006. Hormonal control of second flushing in Douglas-fir shoots. Tree Physiology. 26: 1369–1375.

Spring-flushing, over-wintered buds of Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) produce new buds that may follow various developmental pathways. These include second flushing in early summer or dormancy before flushing during the following spring. Second flushing usually entails an initial release of apical dominance as some of the current-season upper lateral buds grow out. We tested four hypotheses in a series of experiments and conclude that auxin and cytokinin play important repressive and promotive roles, respectively, in the control of second flushing in the terminal spring-flushing Douglas-fir shoot.

Keywords: Apical dominace, auxin, branching, cytokinin, defoliation, lateral and terminal bud outgrowth, spring flushing.

(see Olympia Laboratory order form.)

Gartner, B.L.; Johnson, G.R.

2006. Is long primary growth associated with stem sinuosity in Douglas-fir? Canadian Journal of Forest Research. 36: 2351–2356.

Stem sinuosity is a highly visible stem form trait in the leaders of fast-growing Douglas-fir (*Pseudotsuga menziesii*) trees, and yet its cause is unknown. We tested the hypotheses that sinuous stems have longer expanses of primary growth than non-sinuous stems and higher leader angle using 4 to 5 year old saplings in raised beds. As hypothesized, sinuous stems had longer expanses of primary growth than did nonsinuous stems (13.5 vs. 12.3 cm, respectively). However, for the dates for which growth differed significantly among sinuosity class, sinuosity class only explained 15 to 21 percent of the variation in growth rate. There were no significant differences in leader angle for saplings of the three sinuosity classes.

Keywords: Sinuosity, primary growth, stem form.

(see Corvallis Laboratory order form.)

Ecosystem Structure and Function

Acker, S.A.; Franklin, J.F.; Greene, S.E.; Thomas, T.B.; Van Pelt, R.; Bible, K.J.

2006. Two decades of stability and change in old-growth forest at Mount Rainer National Park. Northwest Science. 80(1): 65–72.

Patterns of forest dynamics were observed in lower elevation and higher elevation old-growth forests in the Pacific Northwest. Tree recruitment, growth, and mortality were compared over 10 years. Little change occurred in stand structure and composition; recruitment occurred without substantial mortality in the upper canopy. Habitat characteristics associated with old-growth forests changed little except in a mature noble fir stand that experienced mortality owing to drought and pathogens. Plots in the old-growth forests on the coldest and wettest sites had low similarity to the published definitions of upper-slope old-growth forests.

Keywords: Old-growth forests, forest composition, forest structure, pathogens.

(see Corvallis Laboratory order form.)

Chapin, F.S., III; Oswood, M.W.; Van Cleve, K.; Viereck, L.A.; Verbyla, D.L.

2006. Alaska's changing boreal forest. New York: Oxford University Press. 354 p.

Research conducted through the Long-Term Ecological Research program at the Bonanza Creek Experimental Forest near Fairbanks, Alaska, during nearly 20 years is reviewed, integrated with other knowledge of boreal forest ecology, and synthesized. The central organizing theme is the role of climate change in changing the ecological structure and function of boreal ecosystems in interior Alaska. Major ecological processes, dynamics, interactions, and their effects are identified and explained. This book is an excellent state-of-knowledge summary of Alaskan boreal ecosystems and will be of interest to scientists, land managers, students, and interested general public alike.

Keywords: Boreal forest, Alaska, climate change, ecosystem processes, Bonanza Creek Long-Term Ecological Research.

(printed copies not available through PNW.)

Homann, P.S.; Harmon, M.; Remillard, S.; Smithwick, E.A.H.

2005. What the soil reveals: potential total ecosystem C stores of the Pacific Northwest Region, USA. Forest Ecology and Management. 220: 270–283. http://www.sciencedirect.com. [Date accessed unknown].

This study synthesized the spatial distribution of soil properties derived from the state soils geographic database with empirical measurements of old-growth forest ecosystem carbon (C) to yield a distribution of potential maximum total-ecosystem organic C stores. The region under consideration is 179,000 square kilometers extending from the southern Oregon border to the northern Washington border and from the Pacific Ocean to the east side of the Cascade Mountains.

Keywords: Old-growth forests, biomass (soils), carbon cycling, permanent plot reference stands, soil organic matter.

(see Corvallis Laboratory order form.)

Law, B.E.; Turner, D.; Lefsky, M.; Campbell, J.; Guzy, M.; Sun, O.; Van Tuyl, S.; Cohen, W.B.

2006. Carbon fluxes across regions: observational constraints at multiple scales. In: Wu, J.; Jones, K.B.; Li, H.; Loucks, O.L., eds. Scaling and Uncertainty analysis in ecology. Netherlands: Springer: 167–190. Chapter 9.

Terrestrial carbon cycle science is directed toward understanding the role of terrestrial vegetation in the global carbon cycle. Advances in satellite remote sensing and computer-based modeling of forest ecosystems now make it feasible to simulate the carbon cycle over large spatial domains. In coniferous forest of the Pacific Northwest region, application of a carbon flux scaling logic built on remote sensing and ecological modeling, and implementation of these evaluation approaches, has permitted a comprehensive evaluation of the major controls on terrestrial carbon flux.

Keywords: Carbon cycling, modeling, remote sensing.

(see Corvallis Laboratory order form.)

Law, B.E.; Turner, D.; Sun, O.J.; Guzy, M.; Campbell, J.; Lefsky, M.; Van Tuyl, S.; Ritts, W.D.; Cohen, W.B.

2004. Disturbance and climate effects on carbon stocks and fluxes across western Oregon USA. Global Change Biology. 10: 1429–1444.

The objectives of this paper are to use a spatially nested hierarchy of observations to initialize, test, and apply a biogeochemistry model, Biome-BGC across the forested region of Oregon, and to determine the relative influence of ecoregional differences in climate and disturbance regime on carbon stocks and fluxes of these forests.

Keywords: Disturbance ecology, ecosystem dynamics, remote sensing, carbon cycling.

(see Corvallis Laboratory order form.)

Fish and Wildlife

Bull, L.E.; 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 radio-collared American martens 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 close 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: American marten, Martes americana*, home range, diet, demography, habitat use, northeastern Oregon.*

(see La Grande Laboratory Order form.)

Fire

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, fuel pattern, 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. 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.

Keywords: EMBYR, firescape, LAMOS, landsum, model comparison, SEM-LAND, simulation modeling.

(see Corvallis Laboratory order form.)

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

2006. Analyzing initial attack on wildland fires using stochastic simulation. International 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 the 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 the 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 concerning the impact 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 planners.

(see Portland Laboratory order form.)

Guild, L.S.; Kauffman, B.J.; Cohen, W.B.

2004. Modeling biomass burning emissions for Amazon forest and pastures in Rondonia, Brazil. Ecological Applications. 14(4): S232–S246.

Biomass burning emissions associated with deforestation in the Amazon are globally significant. The objective of this research was to quantify biomass burning emissions at a local scale. Using results from ground-based measurements combined with landsat Thematic Mapper (TM) data, we estimated carbon emissions from three sources: fires associated with (1) primary forest slash, (2) regenerating forest slash, and (3) pastures. The major findings of this work are the identification of considerable carbon emissions from pasture burning and procedures for integrating fine-scale ground data with local-scale remote sensing data and land use modeling to improve biomass burning emissions flux with implications to regional and global emissions estimation.

Keywords: Fire, carbon, remote sensing.

(see Corvallis Laboratory order form.)

Kerns, B.K.; Thies, W.G.; Niwa, C.G.

2006. Season and severity of prescribed burn in ponderosa pine forests: implications for understory native and exotic plants. Ecoscience. 13(1): 44–55.

Management use of prescribed fire has the potential for both positive and negative impacts on native and exotic flora. To assess these impacts, we investigated herbaceous richness and cover in relation to season and severity of burn and a suite of other variables five growing seasons after prescribed fires in six stands. Stands were located in the southern Blue Mountains of Oregon and consisted of three randomly assigned treatments: fall burn, spring burn, and control. Fall burn treatments had significantly greater exotic species richness and cover compared to spring and control. Important CART model explanatory variables were related to fire severity, stand structure, and location. We suggest that fire intensity and resulting ecosystem effects, rather than phenological interactions with season of burn, are responsible for observed patterns.

Keywords: CART, cheatgrass, fire, Blue Mountains.

(see Corvallis Laboratory order form.)

Forest Management

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

2006. Examination of long-term fuels management scenarios at a wildland-urban interface in northeastern Oregon. In: Bevers, M.; Barrett, T.M., tech. comps. 2005. Proceedings of the 2003 symposium of system analysis in forest resources. Gen. Tech. Rep. PNW-GTR-656. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Station. 366 p.

The 2003 symposium of systems analysis in forest resources brought together researchers and practitioners who apply methods of optimization, simulation, management, science, and systems analysis to forestry problems. This was the 10th symposium in the series, with previous conferences held in 1975, 1985, 1988, 1991, 1993, 1994, 1997, 2000, and 2002. The 42 papers in these proceedings are organized into five application areas: (1) sustainability, criteria and indicators, and assessment; (2) techniques and decision support for forest planning; (3) forest assessment and planning case studies; (4) fire suppression, fire planning, and fuels management; (5) harvest scheduling; and (6) mill supply and forest product markets.

Keywords: Forest planning, forest management, forest modeling, operations research.

(see La Grande Laboratory order form)

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

2006. Time and distance to clear wood in pruned red alder saplings. 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, Pacific Northwest Research Station. 150 p.

Pruning trials in young alder plantations were sampled to evaluate the effects of pruning: (1) live branches on different dates on trees pruned at plantation age 3, 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 pruning in the dormant season or just prior to the beginning of growing season. Cutting the branch collar on dead branches led to shorter times and distances to clear wood than intentionally avoiding such wounding.

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

(see Olympia Laboratory order form.)

Flint, C.G.; Haynes, R.

2006. Managing forest disturbances and diverse community responses: lessons from the Kenai Peninsula, Alaska. Journal of Forestry. July/August: 269–275.

Research from the Kenai Peninsula, Alaska, showed that managing forest disturbances is complicated by diverse human community responses. Interviews and quantitative analysis of mail surveys were used to assess risk perceptions and community actions in response to forest disturbance by spruce bark beetles. Despite high risk perception of immediate threats to personal safety and property, risk perceptions and broader threats to community and ecological well-being were found to be more likely to influence participation in community action. These results imply that increased dialogue between resource managers and local community residents contributes to broader risk assessment and prioritization of risk mitigation strategies.

Keywords: Community action, forest disturbance, risk perception, spruce bark beetles, natural resource management.

(see Portland Laboratory order form.)

Genetics

Horning, M.E.; Cronn, R.C.

2006. Length polymorphism scanning is an efficient approach for revealing chloroplast DNA variation. Genome. 49: 134–142. http://genome.nrc.ca. (8 February 2006).

Phylogeographic and population genetic screens of chloroplast DNA (cpDNA) provide insights into seed-based gene flow in angiosperms. We show that screening universal chloroplast amplicons for length polymorphism provides an accurate and efficient method for identifying cpDNA variation. By sequencing 4500 bp of cpDNA from 17 accessions of *Purshia tridentata* (bitterbrush), we detected 9 haplotypes, 8 of which were identifiable by unique multilocus length combinations. In silico estimates of PCR-RFLP for these loci show that 5 haplotypes would be resolved by agarose electrophoresis. A survey of 4 intraspecific data sets from diverse angiosperms revealed that length variation in cpDNA amplicons is nearly ubiquitous. Combined with automated fluorescent detection, length polymorphism screening of universal cpDNA regions offers a simple screen for intraspecific variation that can be used across angiosperms with minimal optimization, providing detection limits that rival direct sequencing at a fraction of the cost.

Keywords: cpDNA, intraspecific polymorphism, population genetics, phylogeography, indels.

(see Corvallis Laboratory order form.)

Zuniga, C.; Cisneros, R.; Salinas-Moreno, Y.; Hayes, J.L.; Rinehart, J.E.

2006. Genetic structure of *Dendroctonus mexicanus* (Coleoptera: Curculionidae: Scolytinae) in the Trans-Mexican Volcanic Belt. Annals of the Entomological Society of America. 99(5): 945–958.

The Trans-Mexican Volcanic Belt (TMVB) is located between the Neartic and Neotropical regions and is a center of diversification and endemism of trees in the genus *Pinus* the hosts of the bark beetle *Dendroctonus mexicanus*. *D. mexicanus* is distributed across the forested areas of TMVB. We examined whether the genetic structure of *D. mexicanus* is associated with dispersal, hosts, or historic events through isozyme analysis of 17 populations.

Keywords: Dendroctonus*, genetic structure, isozyme, scolytinae, Mexico.*

(see La Grande Laboratory order form.)

Harvesting

Dykstra, D.P.

2005. Forest residues: a global analysis for tropical forests. International Forestry Review. 7(5): 278–279.

Forest residues produced as a consequence of industrial timber harvesting operations represent both an environmental problem and an opportunity cost. Excessive production of residues reduces profitability and may inhibit the recovery of the forest after logging. Recent studies of extensive fires in Indonesia suggested that heavy accumulations of forest residues from logging made the fires much worse than they would have been in undisturbed forest. Based on a comprehensive study carried out by FAO, estimated forest residues produced during 2000 in 84 tropical countries were 4.8 times higher, per cubic meter of industrial roundwood produced, than in the temperate forests of the United States. Although this is partly due to inherent differences between tropical and temperate forests, it suggests that there is considerable scope for reducing tropical forest residues through improved harvesting operations. The FAO study indicates that in tropical forests, an average of about 42 percent of the tree volume felled is eventually delivered to processing facilities or other destinations as industrial roundwood. A reasonable short-term goal might be to increase the recovery rate in tropical forests to around 60 percent by adopting improved harvesting practices such as those promoted through the FAO Model Code of Forest Harvesting Practice.

Keywords: Reduced-impact logging, wood utilization.

(see Portland Laboratory order form.)

Dykstra, D.P.

2005. Introducing precision forestry into the tropics with RILSIM. [CD-ROM]. International Forestry Review. 7(5): 180.

Tropical forests in developing countries have historically suffered from inadequate management owing to remote locations, poor infrastructure, inadequate training and supervision of personnel, and little or no effective governance in the rural areas where they are located. The adoption of reduced-impact logging (RIL) technologies has been proposed as one step that could nudge tropical forest management toward sustainabilty, but many timber concession holders have resisted because of the perception that RIL technologies would inevitably increase their costs. RILSIM, the Reduced-Impact Logging Simulator, has been developed as a financial-analysis tool to help loggers and concession holders analyze the costs of RIL technologies as compared with conventional logging technologies. In addition to its function as a financial-analysis tool, RILSIM is also designed to help loggers organize and manage their operations to improve efficiency while simultaneously reducing environmental impacts. RILSIM is available free of charge and is designed to run efficiently on computers with modest capabilities. The software is compatible with Microsoft Windows 95™ and later operating systems.

Keywords: Computer software, financial analysis, logging operations.

(see Portland Laboratory order form.)

Keller, C.K.; O'Brien, R.; Havig, J.R.; Smith, J.L.; Bormann, B.T.; Wang, D.

2006. Tree harvest in an experimental sand ecosystem: plant effects on nutrient dynamics and solute generation. Ecosystems. 9: 634–646. http://www.springerlink.com. (31 May 2006).

We monitored the hydrochemistry of soil water and discharge (drainage) water in an outdoor forest "sandbox" lysimeter over a 5-year period. We recognized three stages of ecosystem processes driving nutrient dynamics. Before the harvest, i.e., after 15 years of tree growth, dissolved and soil-extractable K and Ca exhibited shallow concentration and depletion, respectively, relative to nonvascular conditions. During the first growing season after the harvest, K concentrations in shallow soil and discharge waters increased and decreased with soil temperature, peaking at approximately three times typical preharvest levels. Calcium and NO_3 concentrations did not definitely increase until the third stage, in the second growing season after harvest when C-limited decomposition and nitrification in the shallow horizons of the sandbox triggered NO_3 and Ca discharge concentration peaks approaching 400 and 250 mM respectively. This stable weathering regime, which confers well-buffered high-ionic-strength terrestrial hydrochemistry, and the persistence of N limitation for a long period following disturbance may be characteristic of early phase primary-successional systems.

Keywords: Biogeochemistry, weathering, succession.

(see Corvallis Laboratory order form.)

Invertebrates

Chan, S.; Draheim, R.; Heimowitz, P.; Johnson, S.L.

2006. New Zealand mud snails: a guide for the prevention of the spread of New Zealand mud snail into non-native habitats through field gear [Brochure]. Corvallis, OR: Oregon Sea Grant, Oregon State University.

This brochure is intended for researchers, monitoring crews, watershed survey groups, and anyone else who travels frequently between aquatic or riparian locations. It is intended to be used as a guide to currently accepted methods for treating field gear to prevent the spread of mud snails.

Keywords: Exotic species, aquatic ecosystem, stream management, technology transfer, brochure.

(see Corvallis Laboratory order form.)

Landscape Ecology

Kennedy, R.E.; Turner, D.P; Cohen, W.B.; Guzy, M.

2006. A method to efficiently apply a biogeochemical model to a landscape. Landscape Ecology. 21: 213–224. http://www.springerlink.com/content/w51712u213u32m4t/. (8 July 2005).

Biogeochemical models offer an important means of understanding carbon dynamics, but the computational complexity of many models means that modeling all grid cells on a large landscape is computationally burdensome. Because most biogeochemical models ignore adjacency effects between cells, however, a more efficient approach is possible. Recognizing that spatial variation in model outputs is solely a function of spatial variation in input driver variables such as climate, we developed a method to sample the model outputs in input variable space rather than geographic space, and to then use simple interpolation in input variable space to estimate values for the remainder of the landscape.

Keywords: Environmental gradients, ecosystem modeling, sampling methodology.

(see Corvallis Laboratory order form.)

Land Use

Adhearn, M.C.; Alig, R.J.

2006. A discussion of recent land-use trends. In: Bell, K.; Boyle, K.; Rubin, J., eds. Economics of rural land-use change: Ashgate studies in environmental and natural resources economics. Aldershot, Hampshire, United Kingdom: Ashgate Publishing: 11–25. Chapter 2.

In spite of the seemingly abundant quantity and quality of land that the United States enjoys, changes in land use give rise to concern. Will current rates of land development negatively affect the opportunities of future generations? Are present development patterns adversely affecting the opportunities and quality of life of present generations? The objective of this chapter is to provide the reader with an understanding of recent national trends in land use change. Data series from the U.S. Department of Agriculture serve as the basis of our historical assessment of land use within the United States. Our assessment clarifies the context of recent policy discussions related to land use change and foreshadows areas of future policy discussions. Moreover, this discussion of recent trends provides a foundation for subsequent discussions of the determinants and consequences of land use change. This chapter focuses on changes in land use within the United States from 1945 to 1997.

Keywords: Land use, cropland, forest land, urban land.

(see Corvallis Laboratory order form)

Alig, R.J.; Krankina, O; Yost, A.; Kuzminykh, J.

2006. Forest carbon dynamics in the Pacific Northwest (USA) and the St. Petersburg region of Russia: comparisons and policy implications. Climatic Change. 79 (3–4): 335–360.

Forests of the United States and Russia can play a positive role in reducing the extent of global warming caused by greenhouse gases, especially carbon dioxide. To determine the extent of carbon sequestration, physical, ecological, economic, and social issues need to be considered, including different forest management objectives across major forest ownership groups. Private timberlands in the U.S. Pacific Northwest are relatively young, well stocked, and sequestering carbon at relatively high rates. Forests in northwestern Russia are generally less productive than those in the northwestern United States but cover extensive areas. A large increase in carbon storage per hectare in live tree biomass is projected on national forest timberlands in the U.S. Pacific Northwest for all selected scenarios, with an increase of between 157 and 175 Mg by 2050 and a near doubling of 1970s levels. On private timberlands in the Pacific Northwest, average carbon in live tree biomass per hectare has been declining historically but began to level off near 65 Mg in 2000; projected levels by 2050 are roughly what they were in 1970 at approximately 80 Mg. In the St. Petersburg region, average carbon stores were similar to those on private lands in the Pacific Northwest: 57 Mg per hectare in 2000 and ranging from 40 to 64 Mg by 2050. Although the projected futures reflect a broad range of policy options, larger differences in projected carbon stores result from the starting conditions determined by ownership, regional environmental conditions, and past changes in forest management. However, an important change of forest management objective, such as the end of all timber harvest on national forests in the Pacific Northwest or complete elimination of mature timber in the St. Petersburg region, can lead to substantial change in carbon stores over the next 50 years.

Keywords: Forest resource scenarios, socioeconomic drivers, climate change.

(see Corvallis Laboratory order form.)

Andrasko, S.R.; Alig, R.J.; Adams, D.; Joyce, L.; Sohngen, B.;

2005. Forestry and agriculture greenhouse gas modeling to support policy. [Brochure]. Oakbrook, IL: Farm Foundation, Farm Foundation Issue Report: 6.

The U.S. Environmental Protection Agency, U.S. Department of Agriculture Forest Service, and Agriculture and Agri-Food Canada held the third workshop of the Forestry and Agriculture Greenhouse Gas Modeling Forum in October, 2004 (http://foragforum.rti.org). Modelers and policy experts presented modeling analyses and discussed program delivery issues, regarding how to improve representation of forest and agricultural mitigation activities in national and subnational economic and biophysical models, in support of climate policy needs.

Keywords: Land use patterns, land use planning, land use decisions.

(see Corvallis Laboratory order form)

Alig, R.J.; Ahearn, M.C.

2006. Effects of policy and technological change on land use. In: Bell, K.; Boyle, K.; Rubin, J., eds. Economics of rural land-use change: Ashgate studies in environmental and natural resources economics. Aldershot, Hampshire, United Kingdom: Ashgate Publishing: 27–40. Chapter 3.

Land use in the United States is dynamic, with millions of acres of land shifting uses each year. Many of these land use changes are the result of market forces in an economy affected by modern technology and policy choices. Changes in land use in the United States over the course of a year are the result of billions of choices made by individuals, corporations, nongovernmental organizations, and governments. This chapter considers forces that act at broad scales to affect land use changes, operating via land markets and evidenced by the revealed behavior of millions of economic agents over a broad geography. The specific foci are the effects of policy and technology on land use choices.

Keywords: Land markets, technology changes, agriculture and forestry policies.

(see Corvallis Laboratory order form)

Alig, R.J.; Bair, L.S.

2006. Forest environmental investments and implications for climate change mitigation. Journal of Environmental Quality. 35: 1389–1395.

Forest environmental conditions are affected by climate change, but investments in forest environmental quality can be used as part of the climate change mitigation strategy. A key question involving the potential use of forests to store more carbon as part of climate change mitigation is the impact of forest investments on the timing and quantity of forest volumes that affect carbon storage. Using an economic optimization model, we project levels of U.S. forest volumes as indicators of carbon storage for a wide range of private forest investment scenarios. Results show that economic opportunities exist to further intensify timber management on some hectares and reduce the average timber rotation length such that the national volume of standing timber stocks could be reduced relative to projections reflecting historical trends. The national amount of timber volume is projected to increase over the next 50 years, but then is projected to decline if private owners follow an economic optimization path. With perfect foresight, future forest investments can affect current timber harvest levels. Forest investments that boost regenerated timber yields per hectare would act to enhance ecosystem services (e.g., forest carbon storage) if they are related to the rate of growth and extent of growing stock inventory.

Keywords: Forest carbon storage, private forest investment, sector modeling.

(see Corvallis Laboratory order form.)

Alig, R.J.; Adams, D.; Joyce, L.; Sohngen, B.

2004. Climate change impacts and adaptation in forestry: tree and market responses. Choices. 3: 1–7.

Potential consequences of climate variability and change on U.S. forests were assessed with climate models, ecological process models, and an economic model of land use and management. With enhanced forest growth overall from climate change, U.S. timber harvests rise over the next 100 years, lowering timber prices, and reducing costs of wood and paper products, with higher total economic welfare. Differences may occur by region, as potential habitats from trees favored by cool environments are very likely to shift north, such that eastern land area associated with aspen, sugar maple, and birch is likely to decline, whereas oak/hickory and oak/pine forests could possibly expand. Among choices by the millions of private landowners affecting adaptation are options to shift land uses, interregional migration of timber production, substitution in timber consumption, altered forest stand management, salvage of dead or dying trees, shifts in planting stock, and changes in fertilization and thinning regimes.

Keywords: Forest growth, environmental services, land use decisions.

(see Corvallis Laboratory order form.)

Alig, R.J.

2004. Human and nature interactions: a dynamic land base of many goods and services. FIA session at monitoring science and technology symposium. [CD-ROM]. RMRS-P-37-CD. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Availability of land is fundamental for sustainable forestry, providing the basis for the production of a wide array of goods and services (e.g., biodiversity, forest carbon sequestration). This paper summarizes types of land-related data contained in major U.S. databases, and gives examples of how such data were used in projecting changes in forest area for use in regional and national studies of forest sustainability. Forest land values are discussed, considering a variety of geographic, biological, regulatory, economic, and social situations. Forest land values provide informational signals on what amounts and types of forest land are likely and prospects for the provision of mixes of land-based goods and services. Advances in data management and processing (e.g., GIS) have allowed for advances in forest land analyses. Emerging issues include impacts of any developing markets for forest-based goods and services, such as forest carbon.

Keywords: Land use economics, land values, environmental services, land use decisions.

(see Corvallis Laboratory order form.)

Kline, J.D.

2006. Public demand for preserving open space. Society and Natural Resources. 19: 645–659.

I describe an economic rationale for increasing public support for preserving open space, based on the growing scarcity of open space lands and other socioeconomic factors. I then examine open space referenda in the United States to identify key factors that are correlated with both the prevalence of countrywide open space referenda in the United States, and with voter support for statewide referenda in individual states. Data for analysis come from Trust for Public Land's Land Vote database, the U.S. Census, and other sources. The results suggest how key socioeconomic trends—most notably, population growth, rising incomes, development and increasing open space scarcity—tend to motivate increased interest and support for preserving open space.

Keywords: Farm, forest, and open space preservation; forest benefits and values; wildland-urban interface.

(see Corvallis Laboratory order form.)

Monitoring

Fassnacht, K.S.; Cohen, W.B.; Spies, T.A.

2006. Key issues in making and using satellite-based maps in ecology: a primer. Forest Ecology and Management. 222: 167–181.

In recent years, the use of satellite imagery in ecological research and ecosystem management has increased significantly. While there is a substantial body of literature exploring the application of remote sensing to ecological endeavors, there is a need for nontechnical overview of fundamental issues that ecologists should consider when using remote sensing. In this paper, we provide such an overview with respect to (1) feature description and spatial representation and (2) accuracy assessment, illustrating our points with examples from recent applications of remote sensing in ecological research and ecosystem management in western Oregon and Washington.

Keywords: Remote sensing.

(see Corvallis Laboratory order form.)

Mycology

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

2005. Sporocarp mycophagy: nutritional, behavioral, evolutionary, and physiological aspects. In: Dighton, J.; White, J.F.; Oudemans, P., eds. The fungal community: its organization and role in the ecosystem. London, England: CRC Press: 599–611. Chapter 29.

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 differences 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 Laboratory order form.)

Colgan, W.; Trappe, J.M.

2004. NATS truffle and truffle-like fungi 10: *Pachyphloeus thysellii* 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 priguensis* 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 Laboratory order form.)

Plant Ecology

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, U.S.A. Tree Physiology. 26: 421–430.

Past greenhouse and growth chamber research has established that termainal buds of Douglas-fir seedlings from many seed sources have a chilling requirement of approximately 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 climate warming scenarios.

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

(see Olympia Laboratory order form.)

Johnson, G.R.; Okula, J.P.

2006. Antelope bitterbrush reestablishment: a case study of plant size and browse protection effects. Native Plants Journal. 7(2): 125–133.

After an intense fire in south-central Oregon, 1-0 bare-root seedlings of antelope bitterbrush (*Purshia tridentata* Pursh DC.) were planted over a 4-year period to reestablish mule deer winter range. Monitoring plots were established at time of planting, and the growth and survival of the seedlings were assessed seasonally and annually to examine which planting variables affected regeneration success. Condition of nursery stock was the single most important factor affecting survival. Growth and survival of shrubs were improved in plots where plants had been protected with Vexar mesh tubing. Other important factors were initial seedling size and seed source. Survival after the first growing season was well correlated with survival 2 to 4 years later.

Keywords: Restoration, Purshia tridentata*, antelope bitterbrush, regeneration.*

(see Corvallis Laboratory order form.)

Plant Pathology

Kelsey, R.G; Thies, W.G.; Schmitt, C.L.

2006. Using chemical markers to detect root disease in stressed ponderosa pine stands with low incidence of disease in eastern Oregon. Forest Ecology and Management. 232: 205–215.

Ponderosa pine (284) in eastern Oregon's Blue Mountains were categorized into three crown classes based on the level of "lion's tail" appearance of their branches, a potential symptom of black-stain root disease. Extraction of their roots verified that only 23 had more than trace levels of disease. The three crown classes were not reliable for predicting the presence, or severity of root disease. Acetaldehyde, acetone, methanol, and ethanol concentrations were all higher, and water contents lower, in trees with root disease, compared to those without disease. A logistic regression model with acetone fresh weight concentrations as the only explanatory variable was selected as the best model for predicting trees with root disease.

Keywords: Pinus ponderosa*, predicting root disease, biomarkers, acetone, Blue Mountains.*

(see Corvallis Laboratory order form.)

Remote Sensing

Anderson, H.E.; Reutebuch, R.E.; McGaughey, R.J.

2005. Accuracy of an IFSAR-derived digital terrain model under a conifer forest canopy. Canadian Journal of Remote Sensing. 31(4): 283–288.

Accurate digital terrain models (DTMs) are necessary for a variety of forest resource management applications, including watershed management, timber harvest planning, and fire management. Traditional methods for acquiring topographic data typically rely on aerial photogrammetry, where measurement of the terrain surface below forest canopy is difficult and error prone. The recent emergence of airborne P-band interferometric synthetic aperture radar (IFSAR), a high-resolution, microwave remote sensing technology, has the potential to provide significantly more accurate terrain models in forested areas. Low-frequency, P-band radar energy physically penetrates through the vegetation canopy and reflects from the underlying terrain surface, allowing for accurate measurement of the terrain surface elevation even in areas with dense forest cover. In this study, the accuracy of a high-resolution DTM derived from P-band IFSAR data collected over a mountainous forest area in western Washington state was rigorously evaluated through a comparison with 347 topographic checkpoints measured with total station survey equipment and collected under a variety of canopy densities. The

mean DTM error was -0.28 ± 2.59 m (mean ± standard deviation), and the root mean squared error (RMSE) was 2.6 m. DTM elevation errors for four canopy cover classes were -0.67 ± 1.20 m (RMSE = 1.38 m) for clearcut, -0.62 ± 1.00 m (RMSE = 1.18 m) for heavily thinned, -0.41 ± 2.32 m (RMSE = 2.36 m) for lightly thinned, and 0.20 ± 3.31 m (RMSE = 3.32 m) for uncut.

Keywords: Digital terrain model, elevation model, terrain mapping, forest mapping.

(see Pacific Wildland Fire Sciences Laboratory order form.)

Berterretche, M.; Cohen, W.B.; Hudak, A.T.; Maiersperger, T.K.; Gower, S.T.

2005. Comparison of regression and geostatistical methods for LAI mapping with Landsat ETM+ data over a boreal forest. Remote Sensing of Environment. 96: 49–61.

The study compared different methods of using remote sensing and field data to obtain maximum growing season leaf area index (LAI) maps in a boreal forest in Manitoba, Canada. The comparison included orthogonal regression analysis (reduced major axis, RMA) and two geostatistical techniques; kriging with an external drift (KED), and conditional simulation (CS). All three methods preserved the basic statistics of the field measurements (i.e., mean, median, and standard deviation). In terms of overall spatial patterns, all three methods reproduced in their derived surfaces the spatial variability and anisoptropy observed in semivariograms of the field-measured LAI data. However, KED showed a reduced anisotropy and lower global variance (i.e., lower sill), relative to RMA and CS. Prediction and estimation methods that take a deterministic approach provide a single predicted map with aspatial (e.g., standard error, in regression techniques) or poor spatial (e.g., KED variance) assessment of errors. The main conclusion was that the selection of optimal mapping technique depends on the final uses of the map, because not all the desired map characteristics can be achieved simultaneously.

Keywords: Spatial statistics, remote sensing.

(see Corvallis Laboratory order form.)

Cohen, W.B.; Goward, S.N.

2004. Landsat's role in ecological applications of remote sensing. Bioscience. 54(6): 535–545.

Remote sensing, geographic information systems, and modeling have combined to produce a virtual explosion of growth in ecological investigations and applications that are explicitly spatial and temporal. Of all remotely sensed data, those acquired by Landsat sensors have played the most pivotal role in spatial and temporal scaling. Modern terrestrial ecology relies on remote sensing for modeling biogeochemical cycles and for characterizing land cover, vegetation biophysical attributes, forest structure, and fragmentation in relation to biodiversity. Given the more than 30-year record of Landsat data, mapping land and vegetation cover change and using the derived surfaces in ecological models is becoming commonplace. In this article, we summarize this large body of work, highlighting the unique role of Landsat.

Keywords: Remote sensing, Landsat, spectral vegetation mapping, change detection.

(see Corvallis Laboratory order form.)

Cohen, W.B.; Maiersperger, T.K.; Turner, D.P.; Ritts, W.D.; Pflugmacher, D.; Kennedy, R.E. Kirschbaum, A.; Running, S.W.; Costa, M.; Gower, S.T.

2006. MODIS land cover and LAI collection 4 product quality across nine sites in the Western Hemisphere. IEEE Transactions of Geoscience and Remote Sensing. 44(7): 1843–1857.

Global maps of land cover and leaf area index (LAI) derived from the moderate resolution imaging spectrometer (MODIS) reflectance data are an important resource in studies of global change, but errors in these must be characterized and well understood. Product validation requires careful scaling from ground and related measurements to a gain commensurate with MODIS products. We present an updated BigFoot project protocol for developing 25-m validation data layers over 49-km^2 study areas.

Keywords: Accuracy assessment, land cover, MODIS, Landsat.

(see Corvallis Laboratory order form.)

Healey, S.P.; Cohen, W.B.; Zhiqiang, Y.; Krankina, O.N.

2005. Comparison of tasseled cap-based Landsat data structures for use in forest disturbance detection. Remote Sensing of Environment. 97: 301–310.

Landsat satellite data has become ubiquitous in regional-scale forest disturbance detection. The tasseled cap (TC) transformation for Landsat data has been used in several disturbance-mapping projects because of its ability to highlight relevant vegetation changes. We used an automated composite analysis procedure to test four multi-date variants of the TC transformation in their ability to facilitate identification of stand-replacing disturbance.

Keywords: Disturbance, Landsat, change detection, tasseled cap, disturbance index.

(see Corvallis Laboratory order form.)

Gobron, N.; Pinty, B.; Aussedat, O.; Chen, J.M.; Cohen, W.B.; Fensholt, R.; Gond, V.; Hummerich, K.F.; Lavergne, T.; Melin, F.; Privette, J.L.; Sandholt, I.; Taverner, M.; Turner, D.P.; Verstraete, M.M.; Widlowski, J.L.

2006. Evaluation of fraction of absorbed photosynthetically active radiation products for different canopy radiation transfer regimes: methodology and results using Joint Research Center products derived from SeaWiFS against ground-based estimations. Journal of Geophysical Research. 111(D13110): 1–15.

This paper discusses the quality and the accuracy of the Joint Research Center (JRC) fraction of absorbed photosynthetically active radiation (FAPAR) products generated from an analysis of SeaWiFS data. The FAPAR value acts as an indicator of the presence and state of the vegetation, and it can be estimated from remote sensing measurements by using a physically based approach.

Keywords: Remote sensing.

(see Corvallis Laboratory order form.)

Krankina, O.N; Harmon, M.E; Cohen, W.B.; Oetter, D.R.; Zyrina, O.; Duane, M.V.

2004. Carbon stores sinks, and sources in forests of northwestern Russia: can we reconcile forest inventories with remote sensing results? Climatic Change. 67: 257–272.

The goal of this paper is to compare the estimates of carbon stores and flux in forest ecosystems of the St. Petersburg region based on forest inventory summaries and Landsat-based models of forest attributes. We attempt to reconcile those estimates, identify sources of discrepancies and strengths, and compensate for limitations. To meet our goal, we combined some previously published results with new data analysis and modeling.

Keywords: Forest inventory, remote sensing.

(see Corvallis Laboratory order form.)

Lee, K.; Cohen, W.B.

2002. Comparison of AVIRIS and Landsat ETM+ for the estimation of leaf area index. In: Proceedings of 2002 AVIRIS workshop; March 5–8, 2002; Jet Propulsion Lab, Pasadena, CA. ftp://popo.jpl.nasa.gov/pub/docs/workshops/02_docs/toc.html.

Although there are several parameters of interest in the quantitative aspects of vegetative remote sensing, leaf area index (LAI) has been one of the most useful and important parameters to characterize the vegetation activities from local to global scales. Since plant canopy is composed of leaves, which is a direct source of the energy-matter interactions in most Earth-observing remote-sensing systems, LAI has been an attractive variable of interest in vegetative remote sensing.

Keywords: AVIRIS, Landsat ETM+.

(see Corvallis Laboratory order form.)

Langford, W.T.; Gergel, S.E.; Dietterich, T.G.; Cohen, W.B.

2006. Map misclassification can cause large errors in landscape pattern indices: examples from habitat fragmentation. Ecosystems. 9: 474–488. http://www.springerlink.com/content/h753t04653527j12/. (13 April 2006).

One of the greatest threats to biodiversity worldwide is fragmentation of habitat. Remote sensing imagery is routinely classified into different land cover types and then used as base maps to measure fragmentation by using landscape metrics such as mean patch size and number of patches on a landscape. No classified map, however, is ever complete. We determined whether it is possible for different maps with the same classification error to have significantly different errors in the derived measures of fragmentation.

Keywords: Fragmentation, landscape structure.

(see Corvallis Laboratory order form.)

Resource Inventory

Fiala, A.C.S.; Garman, S.L.; Gray, A.N.

2006. Comparison of five canopy cover estimation techniques in the western Oregon Cascades. Forest Ecology and Management. 232: 188–197.

We compared four commonly used ground-based techniques for estimating overstory cover—line-intercept, spherical densiometer, moosehorn, and hemispherical photography—and cover estimates generated from the Forest Vegetation Simulator (FVS) in five Douglas-fir/western hemlock structure types in western Oregon. Differences in cover estimates among the ground-based methods were not related to stand-structure type ($p = 0.33$). As expected, estimates of cover increased and stand-level variability decreased with increasing angle of view among techniques. The moosehorn provided the most rapid and conservative estimates of vertical-projection overstory cover.

Keywords: Canopy cover, line-intercept, densiometer, moosehorn, hemispherical photography.

(see Corvallis Laboratory order form.)

Rural Communities

Charnley, S.

2005. From nature tourism to ecotourism? The case of the Ngorongoro Conservation Area, Tanzania. Human Organization. Lawrence, KS: Department of Anthropology, University of Kansas. 64(1): 75–88.

This paper examines what is needed to transform nature tourism to protected areas into ecotourism, having genuine social benefits and serving as a tool for sustainable community development. It draws on the case of the Ngorongoro Conservation Area, Tanzania's most visited protected area, and a multiple land use zone inhabited by the pastoral Maasai peoples. I argue that for ecotourism to promote sustainable development in communities that are its supposed beneficiaries, three fundamental conditions must be met. First, opportunities to capture the economic benefits of tourism must be structured in a way that is culturally appropriate, and therefore accessible to the target population. Second, for communities to benefit from ecotourism, they need secure land tenure over the area in which it takes place, as well as the ability to make land use decisions for that area. Third, tourism benefits to local communities must be more than economic; they must promote deeper social and political justice goals that, if left unaddressed, restrict peoples' ability to enjoy the economic benefits of tourism. Without these elements, the conservation outcomes of ecotourism are likely to be less favorable.

Keywords: Ecotourism, sustainable development, Maasai, Ngorongoro.

(see Portland Laboratory order form.)

Silviculture

Brodie, L.C.; Harrington, C.A.

2006. Response of young red alder to pruning. Gen. Tech. Rep. PNW-GTR-669. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 150 p.

To determine the biological effects of pruning red alder (*Alnus rubra* Bong.) we selected 530 trees in 3-, 6- and 10-year-old plantations. The rate of branch occlusion was well correlated with tree basal area growth, and branch size. Live branches occluded more rapidly than dead branches, and dead branches occluded more rapidly if the branch collar was wounded during pruning. The number of epicormic branches induced by pruning was minimal, but increased with tree age and where trees were growing in an open condition. Time of year of treatment had little effect on tree growth rates, occlusion rate, epicormic branch formation, and damage. Pruning young trees did not result in any damage or loss of growth.

Keywords: Red alder, Alnus rubra*, pruning, branches, clear wood.*

(see Olympia Laboratory 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. In: Proceedings: Annual conference of Southeastern fish and wildlife agencies 57: 252–267.

To ascertain the effects of various silvicultureal mangement techniques on the 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 the controls than 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 communiteis, herpetofauna, longleaf pine, silvicultural treatment, small mammals.

(see Olympia Laboratory 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 Montreal Process (MP), 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. To track consequences, we urge creation of regional research and operations databases that can be used to: (1) address MP values, (2) define detrimental soil disturbances, (3) develop risk rating systems for operational application, and (4) improve best management practices (BMPs) and ameliorative treatments that avoid or correct detrimental disturbances.

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

(see Olympia Laboratory 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 relationships, Olympic Mountains, climate change, carbon storage, adaptive management.

(see Pacific Wildland Fire Sciences Laboratory order form.)

Social Sciences

Charnley, S.; Englebert, B.

2005. Evaluating public participation in environmental decision-making: EPA's Superfund community involvement program. Journal of Environmental Management. 77: 165–182.

This article discusses an 8-year, ongoing project that evaluates the Environmental Protection Agency's Superfund community involvement program. The project originated as a response to the Government Performance and Results Act, which requires federal agencies to articulate program goals, and evaluate and report their progress in meeting those goals. The evaluation project assesses how effective the Superfund community involvement program is in promoting public participation in decisions about how to clean up hazardous wastes at Superfund sites. In the article we (1) share our experience with evaluating an agency public participation program, including lessons learned about methods of evaluation, (2) report evaluation results, and (3) address a number of issues pertaining to the evaluation of public participation in environmental decisionmaking. Our goal is to encourage more environmental managers to incorporate evaluation into their public participation programs as a tool for improving them. The evaluation focused on citizen satisfaction with EPA information about the Superfund site, citizen understanding of environmental and human health risks associated with the site, and citizen satisfaction with opportunities provided by EPA for community input and with EPA's response. Although the evaluation results were mixed, in general, community members who were most informed about and involved in the cleanup process at Superfund sites generally were also the most satisfied with the community involvement process, and the job that EPA was doing cleaning up the site.

Keywords: Environmental management, community, decisionmaking.

(see Portland Laboratory order form.)

Charnley,S.

2005. Industrial plantation forestry: Do local communities benefit? Journal of Sustainable Forestry. 21(4): 35–57.

This paper critically examines the local community benefits associated with intensively managed industrial roundwood plantations (IMPIRs). It is based on a review of existing literature. I focus on three issues: natural resource access and control, job creation, and the effects of creating forest reserves as a corollary of establishing industrial roundwood plantations. The cases reviewed here indicate that IMPIRs often bring about land ownership concentration, loss of customary rights of resource access, rural displacement, and socioeconomic decline in neighboring communities. Beneficiaries include large rural landowners who sell or lease their land to forestry companies, and people who are able to find jobs in the forestry sector. IMPIRs do not appear to provide enough quality jobs to stimulate community development, and rarely benefit people who are already politically and economically marginalized. The paper concludes by suggesting ways in which plantation forestry can become more integrated with surrounding communities to increase local benefits.

Keywords: Plantation forestry, social impacts, rural communities.

(see Portland Laboratory order form.)

Charnley, S.

2006. The Northwest Forest Plan as a model for broad-scale ecosystem management: a social perspective. Conservation Biology. 20(2): 330–340.

The Northwest Forest Plan was evaluated as a model for ecosystem management to achieve social and economic goals in communities located around federal forests in the U.S. Pacific Northwest. My assessment is based on the results of socioeconomic monitoring conducted to evaluate progress in achieving the plan's goals during its first 10 years. The assessment criteria I used related to economic development and social justice. The Northwest Forest Plan incorporated economic development and social justice goals in its design. Socioeconomic monitoring results indicate that plan implementation to achieve those goals met with mixed success. I hypothesize there are two important reasons the plan's socioeconomic goals were not fully met: (1) some of the key assumptions underlying the implementation strategies were flawed and (2) agency institutional capacity to achieve the goals was limited. From a social perspective, the Northwest Forest Plan as a model for ecosystem management is perhaps most valuable for its attempt to link the biophysical and socioeconomic goals of forest management by creating quality jobs for residents of forest communities in forest stewardship and ecosystem management work thereby contributing to conservation.

Keywords: Forest management, rural communities, socioeconomic monitoring, conservation and development.

(see Portland Laboratory order form.)

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

2006. Socioeconomic change in planning provinces of the Northwest Forest Plan region. Northwest Science. 80(2): 73–85.

The Northwest Forest Plan's 1994 Record of Decision (ROD) established a framework for a new ecosystem approach to federal land management across 24 million acres of the Pacific Northwest. One strategy outlined in the Plan's ROD combined ecosystem management and civic involvement in the creation of planning provinces. Ecosystem management at the province level would require improved coordination among governmental entities responsible for land management decisions and the public they serve. The ROD also directed agencies to monitor the effectiveness of the Plan, including the implementation of a socioeconomic monitoring program. This paper focuses on these two directives of the Plan. We assess how socio-economic conditions of communities in the Plan's planning provinces have changed between 1990 and 2000. We hope to inform the ongoing use of planning provinces as a strategy for ecosystem management. We focus our analysis on a composite measure of community socioeconomics well-being, and use this measure to compare communities within the 12 planning provinces based on their proximity to Forest Service and Bureau of Land Management lands.

Keywords: Forest based communities, Northwest Forest Plan, socioeconomic well-being, planning province, ecosystem management.

(see Portland Laboratory order form.)

Soil

Curran, M.P.; Maynard, D.G.; Heninger, R.L.; Terry, T.A.; Howes, S.W.; Stone, D.M.; Niemann, T.; Miller, R.E.; Power, R.F.

2005. An adaptive management process for forest soil conservation. The Forestry Chronicle. 81(5): 717–722.

Soil disturbance guidelines should be based on comparable disturbance categories adapted to specific local soil conditions, validated by monitoring and research. Guidelines, standards, and practices should be continually improved based on an adaptive management process, which is presented in this paper. Core components of this process include: reliable monitoring protocols for assessing and comparing soil disturbance for operations, certification and sustainability protocols; effective methods to predict the vulnerability of specific soils to disturbance and related mitigative measures; and, quantitative research to build a database that documents the practical consequences of soil disturbance for tree growth and soil functions.

Keywords: Soil disturbance, soil compaction, rutting, monitoring (implementation, effectiveness, and validation), criteria and indicators, Montreal Process.

(see Olympia Laboratory order form.)

D'Amore, D.V.; Hennon, P.E.

2006. Evaluation of soil saturation, soil chemistry, and early spring soil and air temperatures as risk factors in yellow-cedar decline. Global Change Biology. 12: 524–545.

Yellow-cedar (*Callitropsis nootkatensis* (D. Don) Oerst.) is a valuable tree species that is experiencing widespread decline and mortality in southeast Alaska. This study evaluated the relative importance of potential soil-related risk factors associated with yellow-cedar decline: soil saturation, soil aluminum toxicity or calcium deficiency, and air and soil temperature. Data were collected from permanent vegetation plots established in two low-elevation coastal forests exhibiting broad ranges in cedar mortality. Measurements of each risk factor were contrasted among classified forest zones to indicate if there were strong links between the decline and the individual risk factors.

Keywords: Soil temperature, calcium, aluminum, yellow-cedar.

(see Juneau Laboratory order form.)

Wildlife

Bowyer, R.T.; Kie, J.G.

2006. Effects of scale on interpreting life-history characteristics of ungulates and carnivores. Diversity and Distributions. 12: 244–257.

Many life-history characteristics are scale-sensitive. This paper discusses how varying temporal and spatial scales can affect interpretration of data concerning life-history characteristics of large herbivores and carnivores.

Keywords: Scale, large mammals, life histories.

(see La Grande Laboratory order form.)

Bull, E.L.

2006. Sexual differences in the ecology and habitat selection of western toads (*Bufo boreas*) in northeastern Oregon. Herpetological Conservation and Biology. 1(1): 27–38.

Aspects of western toad survival, mortality, movements, habitat selection, and diet were investigated in northeastern Oregon from 2002 to 2005. Of 100 radio-tagged toads, 32 percent survived until September, 29 percent were killed by predators, 10 percent died of other causes, and 29 percent were missing or lost transmitters. Females traveled significantly farther than males, and maximum distances traveled by female and male toads were 6230 m and 3870 m, respectively. Toads selected habitats with little or no canopy, south-facing slopes, close to water, and with high densities of refugia (burrows, rocks, logs). Toad diet consisted of 82 percent ants, 13 percent beetles, and <1 percent in each of an additional 8 orders of insects.

Keywords: Bufo boreas*, diet, habitat selection, movements, predation, northeast Oregon, western toad.*

(see La Grande Laboratory order form.)

Karraker, N.E.; Pilliod, D.S.; Adams, M.J.; Bull, E.L.; Corn, P.S.; Diller, L.V.; Dupuis, L.A.; Hayes, M.P.; Hossack, B.R.; Hodgson, G.R.; Hyde, E.J.; Lohman, K.; Norman, B.R.; Ollivier, L.M.; Pearl, C.A.

2006. Taxonomic variation in oviposition by tailed frogs (*Ascaphus*. spp.) Northwestern Naturalist. 87: 87–97.

Tailed frogs (*Ascaphus* spp.) oviposit in cryptic locations in streams of the Pacific Northwest and Rocky Mountains. This aspect of their life history has restricted our understanding of their reproductive ecology. The recent split of *A. montanus* in the Rocky Mountains from *A. truei* was based on molecular differentiation, and comparisons of their ecology are limited. Our objectives were to provide a rangewide summary of information on *Ascaphus* oviposition, compare some aspects of the reproductive ecology of the two species, and examine geographic variation in their reproductive traits. Reproductive ecology of the two species differed. *Ascaphus truei* had smaller clutches, oviposited later in the summer, and had a longer duration of oviposition than *A. montanus*. A greater number of communal oviposition sites were attributed to *A. montanus*. These ecological differences support the recent taxonomic revision of *Ascaphus* and suggest that different management strategies may be necessary for each species where conservation is a priority.

Keywords: Pacific tailed frog, Ascaphus truei*, Rocky Mountain tailed frog,* Ascaphus montanus*, reproduction, clutch size, oviposition, communal oviposition, geographic variation.*

(see La Grande Laboratory order form.)

Lehmkuhl, J.F.; Kistler, K.D.; Begley, J.S.

2006. Bushy-tailed woodrat abundance in dry forests of eastern Washington. Journal of Mammalogy. 87(2): 371–379.

We studied bushy-tailed woodrats in the eastern Washington Cascade Range to estimate their density and survival in three typical dry forest cover types. We live-trapped each fall for 4 years. Woodrat density averaged 0.49 animals/ha. Stands fell into 4 woodrat-density groups, with densities ranging from 0.13/ha to 0.93/ha. Woodrat density could be predicted well by the amount of large snags, mistletoe brooms, and soft down logs. Apparent annual survival was 14 percent. Management to reduce woody fuels and to restore fire regimes in ponderosa pine and dry Douglas-fir forest likely will reduce bushy-tailed woodrat populations unless prescriptions can mitigate the loss of snag, mistletoe, and down log cover.

Keywords: Bushy-tailed woodrat, dry forest management, fuel management.

(see Wenatchee Laboratory order form.)

Wood Utilization

Eastin, I.; Ganguly, I.; Shook, S.; Brackley, A.

2005. Material use in the US deck market: an assessment of the market potential for Alaska yellow-cedar. In: CINTRAFOR Working Paper 98. Seattle, WA: University of Washington, College of Forest Resources. 80 p.

To better understand material use and contractor preferences within the deck-building industry, CINTRAFOR, with funding support from the Forest Service Wood Utilization Center, recently completed a survey of 205 deck builders and 213 home builders across the United States. This paper presents the results of this survey with recommendations from Alaska lumber producers. Results show that deck builders base their material purchase decisions less on price, preferring to focus on material quality. This research indicates that the target market for Alaska yellow-cedar should be deck builders located on the west coast because decks built there are larger, more expensive, and more likely to use naturally durable woods.

Keywords: Alaska yellow-cedar, deck-building industry, market survey.

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