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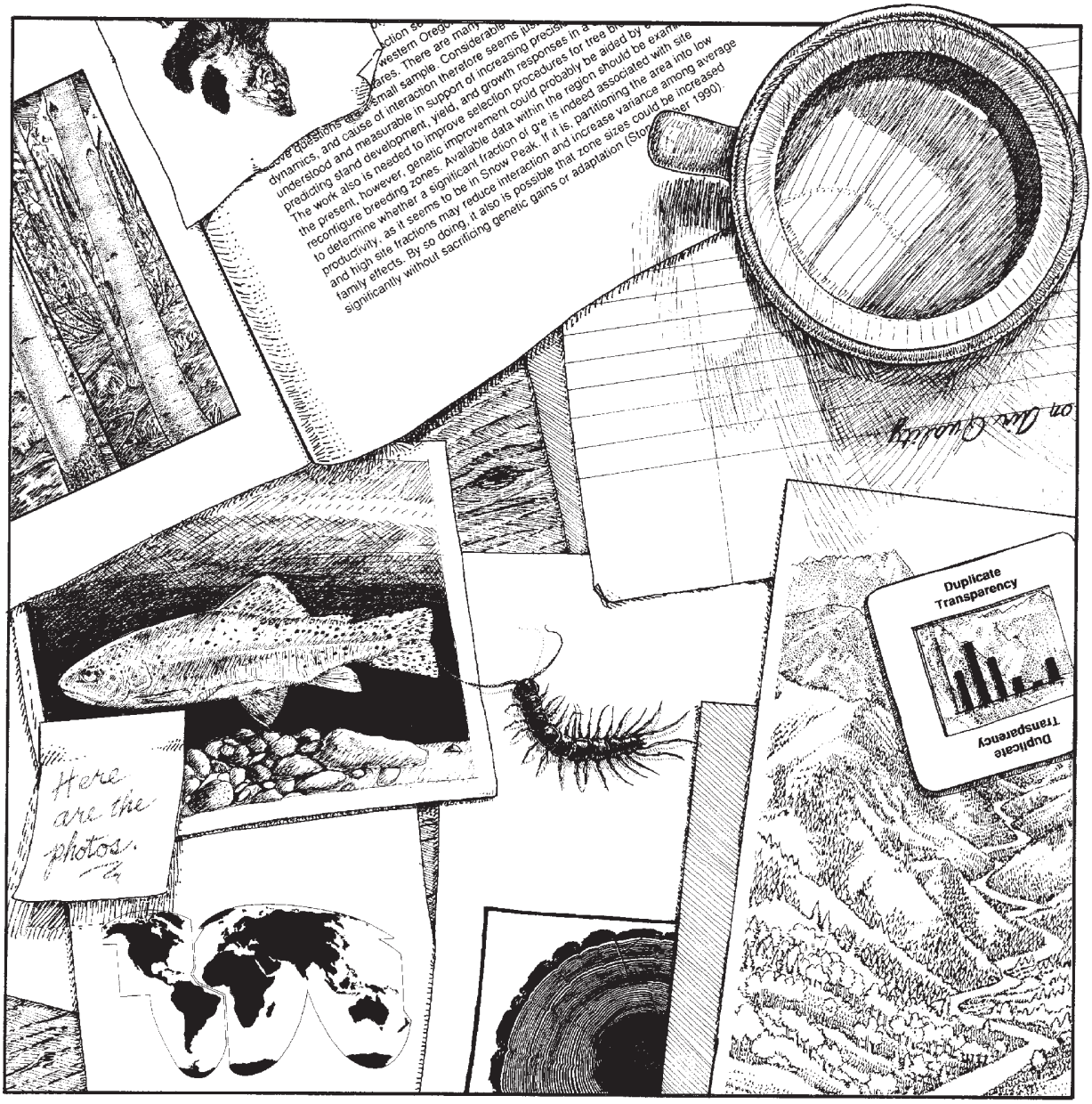
Research Station

Recent Publications of the Pacific Northwest Research Station, Fourth Quarter 2004



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January 2005

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Bibliographies

04-219

Pacific Northwest Research Station
2004. Recent publications of the Pacific Northwest Research Station, third quarter 2004. Portland, OR: U.S. Department of Agriculture, Forest Service. 29 p.

Keywords: Bibliographies (forestry).

Economics

04-005

Fight, R.D.; Barbour, R.J.; Christensen, G..A. [and others]
2004. Thinning and prescribed fire and projected trends in wood product potential, financial return, and fire hazard in New Mexico. Gen. Tech. Rep. PNW-GTR-605. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 48 p.

This work was undertaken under a joint fire science project, "Assessing the need, costs, and potential benefits of prescribed fire and mechanical treatments to reduce fire hazard." This paper compares the future mix of timber products under two treatment scenarios for the state of New Mexico. We developed and demonstrated an analytical method that uses readily available tools to evaluate pre- and posttreatment stand conditions; size, species, and volume of merchantable wood removed during thinnings; size and volume of submerchantable wood cut during treatments; and financial returns of prescriptions that are applied repeatedly over a 90-year period.

Keywords: Wood products, thinning, fire hazard, financial return, New Mexico.

Forest Management

03-387

Hayes, J.L.; Ager, A.A.; Barbour, R.J., tech. eds.
2004. Methods for integrated modeling of landscape change: Interior Northwest Landscape Analysis System. Gen. Tech. Rep. PNW-GTR-610. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 218 p.

The Interior Northwest Landscape Analysis System (INLAS) links a number of resource, disturbance, and landscape simulation models to examine the interactions of vegetative succession, management, and disturbance with policy goals. The effects of natural disturbances like wildfire, herbivory, forest insects and diseases, as well as specific management actions, are included. Outputs from simulations illustrate potential change in aquatic condition and terrestrial habitat, potential for wood utilization, and socioeconomic opportunities. The 14 chapters of this document outline the current state of knowledge in each of the areas covered by the INLAS project and describe the objectives and organization of the project. The project explores ways to integrate the effects of natural disturbances and management into planning and policy analyses; illustrate potential conflicts among current policies, natural disturbances, and management activities; and explore the policy, economic, and ecological constraints associated with the application of effective fuel treatment on midscale landscapes in the interior Northwest.

Keywords: Forest simulation analysis, midscale, vegetation succession, disturbance, management.

04-141

Haynes, R.W.; Fight, R.D.

2004. Reconsidering price projections for selected grades of Douglas-fir, coast hem-fir, inland hem-fir, and ponderosa pine lumber. Res. Pap. PNW-RP-561. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 31 p.

Grade-specific price projections were once again developed for Douglas-fir, coast hem-fir, inland hem-fir, and ponderosa pine lumber. These grade-specific price projections can be used to demonstrate the returns to land management of practices that lead to high-quality logs that produce a larger proportion of high grades of lumber. The price ratios among low, medium, and high grade groupings have been consistent, and interest in these "high-quality" forestry regimes has been persistent.

Keywords: Lumber prices, Douglas-fir, coast hem-fir, inland hem-fir, ponderosa pine.

04-124

Rapp, V.

2004. Ecosystems and people: managing forests for mutual gains. Science Update 8. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 11 p.

Can we as a society produce wood products and other forest values in an environmentally acceptable and sustainable manner? Scientists found promising ways to expand the framework—managing forests in alternate ways that avoid the bipolar framework of "either-or" choices. At the stand level, young-growth forests can be managed for some biodiversity values as well as for wood. Other values are compatible only at the watershed or landscape scales. Social aspects of compatible management can be the most challenging. Compatible forest management looks for ways to sustain human uses of forests and biodiversity in forests. The challenges are huge, but science offers suggestions on opportunities to manage natural resources for mutual gains.

Keywords: Compatible forest management, forest values, biodiversity, landscape analysis, social acceptability.

04-016

Rapp, V.

2004. Reducing fire hazard: balancing costs and outcomes. Science Update 7. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 11 p.

Massive wildfires in recent years have given urgency to questions of how to reduce fire hazard in Western forests, how to finance the work, and how to use the wood—especially in forests crowded with small trees. Forest Inventory and Analysis (FIA) BioSum is a tool for answering these questions. It integrates concepts from forestry, fire science, economics, ecology, and geography, and it connects existing computer models. Scientists use FIA BioSum to predict the effectiveness of fire hazard reduction and the financial implications of treating fuels and using the woody biomass to create useful wood products and generate power under a range of product prices and fuel treatment prescriptions. The FIA BioSum helps users find solutions that have a reasonable balance between acceptable costs and desired outcomes.

Keywords: Fire hazard, small-diameter wood, FIA BioSum, biomass power generation.

Land Use Economics

04-076

Alig, R.J.; Butler, B.J.
2004. Area changes for forest cover types in the United States, 1952 to 1997, with projections to 2050. Gen. Tech. Rep. PNW-GTR-613. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 106 p.

The United States has a diverse array of forest cover types on its 747 million acres of forest land. Forests in the United States have been shaped by many natural and human-caused forces, including climate, physiography, geology, soils, water, fire, land use changes, timber harvests, and other human interventions. The major purpose of this document is to describe area projections of forest cover changes on timberland areas of the United States, in support of the 2000 Resources Planning Act assessment by the USDA Forest Service. Forest area projections differ markedly by region, owner, and forest cover type. Although some regions such as the North are projected to have relatively small percentage changes in common types such as maple-beech-birch (less than 5 percent), others in the South have relatively large projected changes: reductions of 19 percent for upland hardwood on nonindustrial private forest timberlands and 58 percent on forest industry timberlands in the South Central region; and increases in excess of 25 percent for planted pine for both private ownerships in the South. Although the area of softwoods is projected to increase across many regions of the country, especially on forest industry lands, hardwoods will remain the dominant forest type on private lands.

Keywords: Forest land area, forest type transitions, succession, forest cover, timber harvesting, Renewable Resources Planning Act.

Resource Inventory

04-051

Campbell, S.; van Hees, W.W.S.; Mead, B.
2004. Southeast Alaska forests: inventory highlights. Gen. Tech. Rep. PNW-GTR-609. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 20 p.

This publication presents highlights of a recent southeast Alaska inventory and analysis conducted by the Pacific Northwest Research Station's Forest Inventory and Analysis Program. Southeast Alaska has about 22.9 million acres, of which two-thirds are vegetated. Almost 11 million acres are forest land and about 4 million acres have nonforest vegetation (herbs and shrubs). Species diversity is greatest in western hemlock-Alaska cedar closed-canopy forests, in mixed-conifer open and woodland forests, and in open tall alder-willow shrub type. Of the forest land, 4.1 million acres are classified as timberland (unreserved productive forest land). About 4.4 million acres of forest land are reserved from harvest; the majority of this reserved land (85 percent) is on the Tongass National Forest. The volume of timber on timberland was estimated at 21,040 million cubic feet; the majority of volume—88 percent—is on the Tongass National Forest. Seventy-four percent of the timberland acres and 84 percent of the growing-stock volume are in sawtimber stands older than 150 years, with western hemlock or western hemlock-Sitka spruce mix predominating. Most timberland in southeast Alaska is relatively low productivity, producing less than 85 cubic feet per acre per year. For most timberland acres, average annual growth exceeds average annual mortality and harvest.

Keywords: Inventory, southeast Alaska, timberland, forest land.

Rural Communities

03-200

Cerveny, L.K.
2004. Preliminary research findings from a study of the sociocultural effects of tourism in Haines, Alaska. Gen. Tech. Rep. PNW-GTR-612. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 144 p.

This report examines the growth and development of the tourism industry in Haines, Alaska, and its effects on community life and land use. It also describes the development of cruise-based tourism and its relation to shifts in local social and economic structures and patterns of land use, especially local recreation use trends. A multisided ethnographic approach was used featuring participant observation and indepth interviews with local residents, cruise line industry personnel, and visitors to southeast Alaska. Results show that tourism brings both positive and negative changes to Alaska communities. Data from this report can assist Forest Service planners to identify factors involved in the relation between tourism growth and community well-being. It also may assist small southeast Alaska communities in decisionmaking related to tourism development.

Keywords: Tongass National Forest, southeast Alaska, tourism, communities.

04-057

Mazza, R., tech. ed.
2004. Economic growth and change in southeast Alaska. Gen. Tech. Rep. PNW-GTR-611. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 71 p.

This report focuses on economic trends since the 1970s in rural southeast Alaska. These trends are compared with those in the Nation and in nonmetropolitan areas of the country to determine the extent to which the economy in rural southeast Alaska is affected by regional activity and by larger market forces. Many of the economic changes occurring in rural southeast Alaska, such as the decline in the manufacturing sector, are reflections of broad-scale changes in the greater U.S. economy. Other changes, such as the increase in nonwage income as a percentage of total income, have been greater in rural southeast Alaska than at the larger scales of comparison. Chapter 1 describes these changes and their underlying causes and outlines some of their implications for the management of the Tongass National Forest. Providing forest-based recreational opportunities and aesthetic amenities is becoming increasingly important as tourism and residential activity compose a larger portion of the region's economy. Chapter 2 provides a historical context for the economic changes in rural southeast Alaska and establishes a global context for these changes, concluding that forces at local, national, and international scales have shaped economic growth patterns in rural southeast Alaska.

Keywords: Southeast Alaska, economy, economic trends, income, rural manufacturing, wood products, community resiliency.

Wood Utilization

04-136

Monserud, R.A.; Lowell, E.C.; Becker, D.R. [and others]
2004. Contemporary wood utilization research needs in the Western United States. Gen. Tech. Rep. PNW-GTR-616. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 49 p.

Contemporary wood utilization research needs in the Western United States are examined. Key focal areas include: A. Changes in forest management actions and policies affect forest conditions and people, which in turn affect wood quality and wood utilization opportunities. B. Effects of natural disturbances (e.g., wildfire, insect outbreaks) on wood quality, wood utilization, and people are poorly understood. C. Regional differences throughout the Western States are poorly understood in the context of wood utilization. D. Technical assistance and feasibility analyses are needed by resource managers, technical organizations, users of natural resources, and others interested in the physical characteristics, processing, and marketing of forest products.

Keywords: Wood utilization, forest products, forest management, wood quality, small-diameter wood utilization.

04-004

Morgan, T.A.; Keegan, C.E., III; Dillon, T. [and others]
2004. California's forest products industry: a descriptive analysis. Gen. Tech. Rep. PNW-GTR-615. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 55 p.

This report traces the flow of California's 2000 timber harvest through the wood-using industries; provides a description of the structure, operations, and condition of California's primary forest products industry; and briefly summarizes timber inventory and growth. Historical wood products industry changes are discussed, as well as trends in harvest, production, and sales. Employment and worker earnings in the state's forest products industry also are examined, and an industry leader's assessment of past and future operating conditions is provided.

Keywords: Forest products, California, timber harvest, employment, bioenergy.

Publications Available Elsewhere

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Aquatic/Riparian Systems

Ashkenas, L.R.; Johnson, S.L.; Gregory, S.V. [and others]
2004. A stable isotope tracer study of nitrogen uptake and transformation in an old-growth forest stream. Ecology. 85(6): 1725-1739.

The understanding of nitrogen dynamics in streams of temperate forest biomes has been historically constrained by a combination of human-caused disturbances and technical limitations. We report here on a study in an undisturbed stream in Oregon, USA, that used stable isotopic tracers to quantify uptake, transformation, and retention of nitrogen. We added $^{15}NH_4Cl$ for 6 weeks to Mack Creek, a third-order stream in a 500-year, old-growth forest, and monitored ^{15}N in dissolved and aquatic and terrestrial riparian food web components. Short uptake lengths and residence times of ammonium indicated strong demand. Nitrification rates were high, with 40 to 50 percent of the $^{15}NH_4$ converted to nitrate over the 220-m study reach. Aquatic bryophytes and biofilm on large wood showed the highest biomass-adjusted uptake rates. All aquatic consumers sampled, both invertebrate and vertebrate, showed incorporation of ^{15}N by the end of the experiment; small invertebrate grazers were more strongly labeled than their food sources, indicating selective feeding. Transfer of N to the terrestrial ecosystem occurred via subsurface flowpaths as indicated by increased ^{15}N label in 15 of the 17 riparian plant species sampled. At the end of the 6-week release, 81 percent of the added tracer was accounted for, with 49 percent exported, and 32 percent retained within the stream and riparian biota. Our results suggest that in streams within undisturbed primary forests, uptake and retention of N might be highly efficient, and that there may be previously undocumented connections between the terrestrial and aquatic ecosystems.

Keywords: Aquatic ecology, nutrient cycling, water chemistry.

(See Corvallis order form 1.)

Benda, L.; Poff, N.L.; Miller, D. [and others]
2004. The network dynamics hypothesis: how channel networks structure riverine habitats. BioScience. 54(5): 413-427.

Hierarchical and branching river networks interact with dynamic watershed disturbances, such as fires, storms, and floods, to impose a spatial and temporal organization on the nonuniform distribution of riverine habitats, with consequences for biological diversity and productivity. Abrupt changes in water and sediment flux occur at channel confluences in a river network and trigger changes in channel and flood plain morphology. This observation, when taken in the context of a river network as a population of channels and their confluences, allows the development of testable predictions about how basin size, basin shape, drainage density, and network geometry interact to regulate spatial distribution of physical diversity in channel and riparian attributes throughout a river basin. Furthermore, the type and extent of channel changes at confluences vary in response to stochastic watershed disturbances but in a predictable fashion, reflecting the underlying spatial structure of river networks.

Keywords: River network, tributary junctions, river dynamics.

(See Corvallis order form 1.)

Hill, B.H.; McCormick, F.H.
2004. Nutrient uptake and community metabolism in streams draining harvested and old-growth watersheds: a preliminary assessment. In: Guldin, J.M., tech. comp. Ouachita and Ozark Mountains symposium: ecosystem management research. Gen. Tech. Rep. SRS-74. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 214-220.

The effect of timber harvesting on streams is assessed by using two measures of ecosystem function: nutrient spiraling and community metabolism. This research is being conducted in streams of the southern Appalachian Mountains of North Carolina, the Quachita Mountains of Arkansas, the Cascade Range of Oregon, and the redwood forests of northern California, to understand similarities and differences among stream ecosystem responses to timber harvesting across diverse geographic regions. Data from Cedar and Peacock Creeks in the redwood forest are used to illustrate the principles and usefulness of measuring stream ecosystem function for assessing watershed disturbances.

Keywords: Nutrient spiraling, stream ecosystems, watershed disturbance.

(See Olympia order form. This article is available in pdf format at http://www.srs.fs.usda.gov/pubs/gtr/gtr_srs074/gtr_srs074-hill001.pdf. To order the complete Gen. Tech. Rep. SRS-74, send an email to pubrequests@srs.fs.usda.gov.)

Rundio, D.E.
2002. Coexistence of top predators in headwater streams: pathways of intraguild predation between Pacific giant salamander larvae and cutthroat trout. Corvallis, OR: Oregon State University. 102 p. M.S. thesis.

I examined mechanisms contributing to the coexistence of Pacific giant salamander larvae (*Dicamptodon tenebrosus*) with cutthroat trout (*Oncorhynchus clarki*) in headwater streams and the effects of this coexistence on factors related to *Dicamptodon* fitness. Young-of-year *Dicamptodon* larvae were palatable to trout during initial and repeated offerings, but increased their refuge use in response to nonvisual chemical cues from trout. Cutthroat trout did not affect *Dicamptodon* survival, growth, and behavior (activity level) in a field experiment, although these results were potentially compromised by unexplained gains or losses of larvae from most experimental stream pools.

Keywords: Dicamptodon, Oncorhynchus, *palatability, chemical cues, behavior, predation.*

(Available only through library or interlibrary loan.)

Rundio, D.E.; Olson, D.H.
2003. Antipredator defenses of larval Pacific giant salamanders (*Dicamptodon tenebrosus*) against cutthroat trout (*Oncorhynchus clarki*). Copeia. 2: 402-407.

Amphibian larvae that coexist with predators generally have antipredator defenses for either surviving or avoiding predation attempts. We tested larval Pacific giant salamanders (*Dicamptodon tenebrosus*) for defenses related to surviving or avoiding predation by cutthroat trout (*Oncorhynchus clarki*). Young-of-year *Dicamptodon* were fully palatable to trout during initial and repeated offerings, suggesting that larvae may survive few encounters with trout. However, *Dicamptodon* larvae increased refuge use in response to chemical cues from trout, although they did not select different microhabitats (shallow or deep) between trout treatments and controls. Our results suggest that although *Dicamptodon* larvae are potentially vulnerable to predation by cutthroat trout, increased refuge use by larvae in response to trout chemical cues likely reduces the probability of encounters and may contribute to the coexistence of these species.

Keywords: Dicamptodon, Oncorhynchus, *palatability, chemical cues, behavior, predation.*

(See Corvallis order form 2.)

Atmosphere

Hayhoe, K.; Cayan, D.; Field, C.B. [and others]
2004. Emissions pathways, climate change, and impacts on California. Proceedings of the National Academy of Sciences of the United States of America. 101(34): 12422-12427. http://www.pnas.org/cgi/10.1073/pnas.0404500101. (8 September).

The magnitude of future climate change depends substantially on the greenhouse gas emission pathways we choose. Demographic, socioeconomic, and technological assumptions underlying long-term emission scenarios differ widely, and previous studies have not yet systematically examined the differences between projected regional-scale changes in climate and associated impacts across scenarios. Here we explore the implications of the highest and lowest IPCC emissions pathways for climate change and the impacts on California. This approach can inform decisionmaking aimed at minimizing regional impacts and at preventing "dangerous anthropogenic interference with the climate system."

Keywords: Climate change, greenhouse gas emissions, California, models.

(See Corvallis order form 1.)

Ecosystem Structure and Function

Aubry, K.B.; Hayes, J.P.; Biswell, B.L.; Marcot, B.G.
2003. The ecological role of tree-dwelling mammals in western coniferous forests. In: Zabel, C.J.; Anthony, R.G., eds. Mammal community dynamics: management and conservation in the coniferous forests of western North America. New York: Cambridge University Press: 405-443. Chapter 12.

Managing forests solely for the persistence of a few key vertebrate species or target vegetative conditions is an overly simplistic approach to forest management, and one that is unlikely to provide for long-term ecosystem sustainability. Resource managers might improve the outcome of management decisions in western coniferous forests by considering the ecological roles that mammals play and evaluating the functional webs to which the mammals contribute. By comparing the array of ecological functions that are predicted to occur under a set of alternative management strategies, managers can select the alternative that will most likely provide for long-term ecosystem integrity.

Keywords: Bats, arboreal rodents, forest carnivores, forest structure, forest management.

(Available in bookstores and libraries.)

Hessburg, P.F.; Reynolds, K.M.; Salter, R.B.; Richmond, M.B.
2004. Using a decision support system to estimate departures of present forest landscape patterns from historical reference conditions: an example from the inland Northwest region of the United States. In: Perera, A.H.; Buse, L.J.; Weber, M.G., eds. Emulating natural forest landscape disturbances: concepts and applications. New York: Columbia University Press: 158-175. Chapter 13.

Human settlement and management activities have altered the patterns and processes of forest landscapes across the inland Northwest region of the United States. As a consequence, many attributes of current disturbance regimes (e.g., frequency, duration, and extent of fires) differ markedly from those of historical regimes, and current wildlife species and habitat distributions are inconsistent with their historical distributions. Just as human-caused changes in ecological processes have led to alterations in landscape patterns, changes in patterns have produced alterations in ecosystem processes, and particularly in forest disturbance. Today's public-land managers face substantial societal and scientific pressures to restore landscape patterns of structure, composition, and habitats that will restore some semblance of natural processes and revitalize the productivity of terrestrial ecosystems. Motivations for restoration stem from genuine concerns over the functioning of ecological systems and aversion to the risks and uncertainties associated with current

conditions. But our lack of knowledge of the ecosystem's former characteristics and variability limits our efforts. In this chapter, we present one approach to estimating the extent to which present forest landscape patterns have departed from the baseline conditions that existed before modern management began (around 1900). Our goal is to approximate the range and variation of these historical patterns and use that knowledge to evaluate present forest conditions and assess the ecological importance of departures.

Keywords: Criterion DecisionPlus, decision support, EMDS, historical range of variation, landscape evaluation, monitoring, NetWeaver, restoration, scenario planning.

(Available in bookstores and libraries.)

Marcot, B.G.; Aubry, K.B.
2003. The functional diversity of mammals in coniferous forests of western North America. In: Zabel, C.J.; Anthony, R.G., eds. Mammal community dynamics: management and conservation in the coniferous forests of western North America. New York: Cambridge University Press: 631-664. Chapter 19.

This chapter proposes that the collective importance of terrestrial mammals to ecosystem structure and function is substantial and that the decline or loss of forest mammal species could have detrimental effects on ecosystem diversity, productivity, or sustainability.

Keywords: Keystone species, ecosystem structure and function.

(Available in bookstores and libraries.)

Moore, G.W.
2003. Drivers of variability in transpiration and implications for stream flow in forests of western Oregon. Corvallis, OR: Oregon State University. 160 p. Ph.D. dissertation.

The three major questions were : (1) How does transpiration compare between a young and old stand and why? (2) Does diversity of overstory trees affect transpiration? and (3) How is transpiration related to stream flow? I found that a young, rapidly growing stand (about 40 years since disturbance) used 3.3 times more water during the growing season than an old-growth stand (about 450 years since disturbance) because the young stand had 2.3 times higher sap flow rates per unit sapwood in Douglas-fir, a 21 percent greater total sapwood basal area, and a larger component of hardwoods that use 1.41 times more water than conifers per unit sapwood. In two-species mixtures of Douglas-fir and red alder, I found evidence that mixtures are less productive and have lower annual transpiration than monocultures of these two species.

Keywords: Transpiration, Douglas-fir, red alder, ecophysiology, hydrology.

(Available only through library or interlibrary loan.)

Shaw, D.; Greene, S.
2003. Wind River canopy crane research facility and Wind River Experimental Forest. Bulletin of the Ecological Society of America. 84(3): 115-121.

This publication describes the Wind River Experimental Forest and Wind River canopy crane research facility in Carson, Washington. Historical context, location environment, facility availability, and past and current research are discussed. The field station is also a part of several networks, including experimental forests, canopy cranes, and the Organization for Biological Field Stations.

Keywords: Experimental forests, partnership, research natural area, forest ecosystems, canopy communities, old growth, plantations.

(See Corvallis order form 2.)

Yamanaka, T.; Li, C.-Y.; Bormann, B.T.; Okabe, H.

2003. Tripartite associations in an alder: effects of *Frankia* and *Alpova diplophloeus* on the growth, nitrogen fixation and mineral acquisition of *Alnus tenuifolia*. Plant and Soil. 254: 179-186.

The role of tripartite associations among *Frankia*, *Alpova diplophloeus* (an ectomycorrhizal fungus), and *Alnus tenuifolia* in growth, nitrogen fixation, ectomycorrhizal formation, and mineral acquisition of *A. tenuifolia* was investigated. The seedlings with dual inoculation of *Frankia* and *A. diplophloeus* and grown in the pots of a mixed ground basalt-perlite produced the highest dry weight of shoot and root nodule. Seedlings inoculated with *Frankia* and grown in the pots of a mixed ground basalt-perlite had higher nitrogen fixation, as measured by acetylene reduction activity. Ectomycorrhizas formed with *A. diplophloeus* increased when this fungus was inoculated together with *Frankia*. Mineral composition in the seedlings also was determined. The tripartite association could improve the growth, nitrogen fixation, and mineral acquisition of *A. tenuifolia*.

Keywords: Alnus*, Alpova, mineral weathering, mycorrhizal formation, tripartite symbiosis, weathering.*

(See Corvallis order form 2.)

Fire

Ferguson, S.A.; Collins, R.L.; Ruthford, J.; Fukuda, M.

2003. Vertical distribution of nighttime smoke following a wildland biomass fire in boreal Alaska. Journal of Geophysical Research. 108(D23): 11-1–11-12.

Tethersonde measurements, lidar measurements, and video recording were conducted during the FrostFire experimental burn in Alaska in July 1999. The tethersonde and lidar measurements were made at local midnight. Both sets of measurements show the evolution of the smoke concentration over several days during the experiment with a pronounced maximum. The tethersonde recorded maximum concentrations on the day of the most active burning, with the smoke trapped below an inversion at 115 m AGL. The lidar recorded maximum concentrations aloft on the next night, when the inversion was weaker and ground-level concentrations were smaller. On all nights, upper-level concentrations were about one-thousandth of near-surface concentrations. Both tethersonde and lidar reported similar variations and evolution in smoke concentration over the course of the burn.

Keywords: Smoke management, smoke inversion, boreal forest, fire, smoldering smoke, valley inversion, nighttime inversion.

(See PWFS order form.)

Ferguson, S.A.; Ruthford, J.; Rorig, M.; Sandberg, D.V.

2003. Measuring moss moisture dynamics to predict fire severity. In: Galley, K.E.M.; Klinger, R.C.; Sugihara, N.G., eds. Proceedings of Fire Conference 2000: the first national congress on fire ecology, prevention, and management. Misc. Publ. 13. Tallahassee, FL: Tall Timbers Research Station: 211-217.

In situ moss moisture sensors were compared with sampled moisture data and weather information to assess moisture dynamics in feather mosses (*Hylocomium* and *Pleurozium*) and associated duff on the forest floor of boreal Alaska. Time-domain reflectometers illustrated moisture variability at spatial and temporal scales that are useful in predicting fire severity. For example, *Hylocomium* moss tends to dry at a more rapid rate than *Pleurozium*, the near-surface moisture condition is more spatially variable in the early season than in mid to late season, and rewetting of dry moss requires greater changes in precipitation and relative humidity than further wetting of damp moss.

Keywords: Fuel moisture, fire severity, soil moisture, fire weather, fire, fuel, Alaska, FrostFire.

(See PWFS order form.)

Fried, J.S.; Torn, M.S.; Mills, E.
2004. The impact of climate change on wildfire severity: a regional forecast for northern California. Climatic Change. 64: 169-191.

We estimated the impact of climatic change on wildland fire and suppression effectiveness in northern California by linking general circulation model output to local weather and fire records and projecting fire outcomes with an initial-attack suppression model. The warmer and windier conditions corresponding to a 2 x CO_2 climate scenario produced fires that burned more intensely and spread faster in most locations. Despite enhancement of fire suppression efforts, the number of escaped fires (those exceeding initial containment limits) increased 51 percent in the south San Francisco Bay area, 125 percent in the Sierra Nevada, and did not change on the north coast. Changes in area burned by contained fires were 41 percent, 41 percent, and -8 percent, respectively. When interpolated to most of northern California's wildlands, these results translate to an average annual increase of 114 escapes (a doubling of the current frequency) and an additional 5,000 ha (a 50-percent increase) burned by contained fires. On average, the fire-return intervals in grass and brush vegetation types were cut in half. The estimates reported represent a minimum expected change, or best-case forecast. In addition to the increased suppression costs and economic damages, changes in fire severity of this magnitude would have widespread impacts on vegetation distribution, forest condition, and carbon storage, and greatly increase the risk to property, natural resources, and human life.

Keywords: Forest structure, vegetation types, disturbance processes, succession, coarse woody debris–terrestrial, landscape pattern, wildlife management.

(See Portland order form.)

McKenzie, D.; Gedalof, Z.; Peterson, D.L.; Mote, P.
2004. Climatic change, wildfire, and conservation. Conservation Biology. 18(4): 890-902.

Climate variability is a dominant factor affecting large wildfires in the Western United States, an observation supported by paleoecological data. Although current fire management focuses on fuel reductions, at the regional scale, severe fire weather is the dominant influence on area burned and fire severity. If climatic change increases the amplitude and duration of extreme fire weather, we can expect significant changes in the distribution and abundance of dominant plant species in some ecosystems, thereby affecting habitat of some sensitive plant and animal species. The effects of climatic change will partially depend on the extent to which resource management modifies vegetation structure and fuels.

Keywords: Climatic change, wildfire, GCM, fire history, conservation, fire.

(See PWFS order form.)

Sandberg, D.V.; Chapin, F.S., III; Hinzman, L.
2003. FrostFire: a study of the role of fire in global change in the boreal forest. In: Galley, K.E.M.; Klinger, R.C.; Sugihara, N.G., eds. Proceedings of Fire Conference 2000: the first national congress on fire ecology, prevention, and management. Misc. Publ. 13. Tallahassee, FL: Tall Timbers Research Station: 192-196.

A landscape-scale prescribed research burn in the boreal forest of Alaska, FrostFire, was an unmitigated success for scientists and fire managers. Within the 1000-ha perimeter, fire mimicked natural conditions by burning 402 ha of mostly black spruce, leaving hardwood stands nearly intact. We measured thermal, chemical, and hydrologic properties from the molecular level to build a full picture of carbon, water, and energy pools and fluxes in the boreal forest before, during, and after the fire. The two major client groups for this integrated research are earth system modelers and fire managers. This ex-

periment differed from previous experimental fires because it is in terrain dominated by permafrost, focuses on the large-scale ecological consequences of fire, and takes place on a long-term ecological research site.

Keywords: Boreal forest, boreal fire, carbon modeling, carbon fluxes, fire management, permafrost fire, FrostFire.

(See Corvallis order form 2.)

Vogt, C.; Winter, G.; Fried, J.
2003. Antecedents to attitudes toward prescribed burning, mechanical thinning, and defensible space fuel reduction techniques. In: Jakes, P.J., comp. Homeowners, communities, and wildfire: science findings from the National Fire Plan—Proceedings of the 9th international symposium on society and resource management. Gen. Tech. Rep. NC-231. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station: 74-83.

As fire policy and management take on larger roles in land agencies, a better understanding is needed of public opinion, particularly of homeowners who are most affected by wildland fires. This research assessed homeowners' attitudes toward three fuel management approaches—prescribed burning, mechanical fuel reduction, and defensible space ordinances—in three areas of the United States (California, Florida, and Michigan). Although attitudes differed for the management approaches across regions, most were positive. The personal importance of each fuel treatment and overall trust in the government managing public lands were found to be related to the direction (positive, neutral, negative) of the attitude held toward the fuel treatment.

Keywords: Social acceptance, fuel treatments, fire hazard reduction.

(See Portland order form. To order the complete NC-231, write to North Central Research Station, 1992 Folwell Avenue, St. Paul, MN 55108 or call them at 651-649-5000. The publication also can be downloaded or ordered from their Web site at http://www.ncrs.fs.fed.us/pubs.)

Wimberly, M.C.; Ohmann, J.L.; Pierce, K.B. [and others]
2003. A multivariate approach to mapping forest vegetation and fuels using GIS databases, satellite imagery, and forest inventory plots. In: Proceedings: 2nd international wildland fire ecology and fire management congress. [Place of publication unknown]: American Meteorological Society: J4G1. http://ams.confex.com/ams/FIRE2003/techprogram/paper_65758.htm. (2 September 2004).

Regional maps of forest vegetation and fuels are increasingly needed for assessing fire risk, planning fuel management, and modeling fire behavior and effects. These maps must accurately and consistently portray multiple vegetation and fuels attributes across environmentally heterogeneous, multiownership landscapes. We applied the gradient nearest-neighbor method to predictively map forest vegetation and fuels in the Oregon Coastal Province. Predictor variables included Landsat TM imagery, climate maps, topographic variables, and landownership. Vegetation and fuel variables were measured directly or modeled allometrically by using data from 800 field plots. Predicted patterns of forest structure were predominantly a function of the Landsat imagery, whereas gradients in species composition were strongly associated with climate. Prediction accuracy differed widely for vegetation and fuel attributes. Structural variables derived from the characteristics of overstory trees had the highest accuracy, whereas variables related to dead trees had the lowest accuracy. In assessing the utility of these maps for management and planning, managers and scientists will need to assess the relative importance of accurately predicting the total amount of fuels at a particular location versus characterizing the spatial configuration of fuels at a larger landscape scale.

Keywords: Woody fuels, disturbance ecology, environmental gradients, forest structure, coarse woody debris, landscape pattern, gradient analysis, predictive vegetation mapping, trees, Landsat TM, forest management, fire management, fuels management, fire risk.

(See Corvallis order form 2.)

Fish

Halupka, K.C.; Willson, M.F.; Bryant, M.D. and others]
2003. Conservation of population diversity of Pacific salmon in southeast Alaska. North American Journal of Fisheries Management. 23: 1057-1086.

Maintenance of intraspecific diversity within and among populations is necessary to preserve the evolutionary potential of species and to sustain productive fisheries. We identified populations with distinctive phenotypic and demographic characteristics of variation among Pacific salmon in southeast Alaska and adjacent areas of Canada and identified them graphically as outliers from the distribution of mean values of traits taken from populations throughout the region. We reviewed allozyme surveys to identify populations that differed from geographic clustering patterns of allele frequencies. About 9,000 populations occur in the study area, and sufficient data were available from 2,062 (23 percent) of them to analyze at least one characteristic. We identified 47 populations, represented by adequate datasets that have distinctive characteristics. Fifty-two additional populations that were represented by limited samples or that had unusual nominal traits may be regionally distinctive. We suggest that conservation priorities should include populations that are well sampled and that have (1) distinctive run timing, (2) a distinctive trait in combination with large run size, (3) allozyme frequencies that diverge from geographic clustering patterns, (4) more than one distinctive characteristic, and (5) freshwater habitat shared with other distinctive populations.

Keywords: Salmonid diversity, anadromous salmonids, genetics diversity, life history.

(See Juneau order form.)

White, S.M.
2003. A watershed perspective on the distribution and habitat requirements of young Bonneville cutthroat trout in the Thomas Fork of the Bear River, Wyoming. Laramie, WY: University of Wyoming. 75 p. M.S. thesis.

Associations between trout density and habitat conditions at the reach scale were elucidated by using discriminant analysis. Age-0 trout were confined to small portions of the surveyed drainage, and their abundance declined between 2000 and 2002 with the increasing effects of a drought. Indices of spatial autocorrelation and nonspatial heterogeneity revealed that in livestock-influenced streams, age-0 trout distributions were more spatially aggregated and variable about the average value than distributions in the relatively pristine drainage where age-0 trout were more evenly dispersed. At the watershed scale, age-0 trout densities aggregated in areas of likely groundwater discharge. At the reach scale, age-0 trout were associated with spawning gravel and exposed stream margins, whereas trout older than 1 year were associated with refuge habitat and were more abundant in the pristine streams. These results exemplify the need to manage for the needs of different life history stages and at multiple spatial scales.

Keywords: Bonneville cutthroat trout, beaver, livestock.

(Available only through library or interlibrary loan.)

Willson, M.F.; Gende, S.M.; Bisson, P.A.
2004. Anadromous fishes as ecological links between ocean, fresh water, and land. In: Polis, G.A.; Power, M.E.; Huxel, G.R., eds. Food webs at the landscape level. Chicago, IL: The University of Chicago Press: 284-300. Chapter 19.

Anadromous fishes form ecological links from ocean to freshwater to land. Anadromous fishes, returning from the ocean to freshwater streams to spawn, enrich the freshwater food chain. Terrestrial carnivores and scavengers, foraging on these fishes, transport marine-derived nutrients in the form of fish carcasses and digesta from freshwater to land, enriching the riparian food chain and influencing the biology of major terrestrial consumers.

Keywords: Anadromous fishes, salmon, keystone species.

(Available from bookstores and libraries.)

Forest Management

Hummel, S.S.; Holmson, B.
2003. Managing multiple landscape objectives in a forest reserve. In: Proceedings: Society of American Foresters 2003 national convention. Bethesda, MD: Society of American Foresters: 277-281.

The Northwest Forest Plan requires conservation of structurally complex, late-successional forests within a network of established reserves (LSR) because such forests provide habitat for endangered wildlife species. Some habitat elements, like layered canopies and dead wood, can also create favorable conditions for wildfires and insects on drier sites. This paper describes challenges involved in balancing habitat conservation and fuels management in a 15,000-acre LSR east of the Cascade Range in the Gifford Pinchot National Forest. Cooperation between federal land managers and scientists generated new knowledge about disturbance ecology in the LSR and provided a common understanding of landscape dynamics and silvicultural treatments to the interagency planning team responsible for preparing an environmental impact statement. The objectives, schedules, incentives, and information needs of land managers and scientists differ, however, and these differences complicate cooperative efforts. We describe some potential pitfalls and ways to avoid them by maintaining synergy in the people and funding necessary to complete multiyear efforts.

Keywords: Restoration silviculture, fuels management, habitat conservation.

(See Portland order form.)

McIver, J.D.; Adams, P.W.; Doyal, J.A. [and others]
2003. Environmental effects and economics of mechanized logging for fuel reduction in northeastern Oregon mixed-conifer stands. Western Journal of Applied Forestry. 18(4): 238-249.

Fuel reduction by mechanical thinning and removal was studied in mixed-conifer stands in northeastern Oregon between 1995 and 1997. A single-grip harvester was coupled with either a forwarder or a skyline yarding system, and economics, fuel reduction, stand damage, soil disturbance, and effects on soil biota and down woody material were measured in three replicates of paired stands. The two log extraction systems achieved nearly equivalent total fuel reduction, with 45.7 and 46.8 percent reduction in mass by the forwarder and skyline system, respectively. Stem density and basal area were also reduced similarly for the two log extraction systems. Of stems examined, 32 percent had noticeable damage and large woody material for wildlife also changed. Of 37 logged hectares, 1.4 percent of the soil area was compacted. The percentage of area in which soil was displaced varied from 5 to 43 percent among units. The effects of compaction on litter microarthropods were persistent, with significantly lower numbers in compacted litter a year after harvest. Although revenue was similar for forwarder and skyline

units, total costs were $81 per metric ton in the skyline units compared to $46 per metric ton in the forwarder units. These results are discussed in the context of options available to managers for balancing fuel reduction needs with both ecological and economic constraints.

Keywords: Fire risk reduction, soil compaction, skyline yarding, forwarder, single-grip harvester, soil biota, stand damage.

(See La Grande order form.)

Reynolds, K.M.
2003. A logic approach to design specifications for integrated application to diverse models in forest ecosystem analysis. In: Amaro, A.; Reed, D.; Soares, P., eds. Modelling forest systems. Wallingford, United Kingdom: CAB Publishing: 379-385. Chapter 33.

This paper discusses the use of logic models as metadata specifications for the integrated application of possibly numerous forest models needed to address the broader, more complex and abstract problems posed by modern ecosystem management and ecosystem research issues. A hypothetical example is presented to demonstrate the use of logic models as metadata specifications for multimodel applications and the potential for hypermedia linkage from meta model topics to forest model archive metadata for specific forest models.

Keywords: Forest, ecosystem, model, integration, framework, meta model, logic.

(Available in bookstores and libraries.)

Genetics

Cronn, R.; Small, R.L.; Haselkorn, T.; Wendel, J.F.
2003. Cryptic repeated genomic recombination during speciation in *Gossypium gossypioides*. Evolution. 57(11): 2475-2489.

The Mexican cotton *Gossypium gossypioides* is a perplexing entity, with conflicting morphological, cytogenetic, and molecular evidence of phylogenetic affinity to other American cottons. We reevaluated the evolutionary history of this enigmatic species by using 15.4 kb of DNA sequence. Phylogenetic analyses show that chloroplast DNA (7.3 kb), nuclear ribosomal internal transcribed spacers (ITS; 0.69 kb), and unique nuclear genes (8.4 kb) each yield conflicting phylogenetic resolutions for *G. gossypioides.* Eight low-copy nuclear genes provide a nearly unanimous resolution of *G. gossypioides* as the basal-most American diploid cotton, whereas cpDNA sequences resolve *G. gossypioides* deeply nested within the American diploid clade sister to Peruvian *G. raimondii*, and ITS places *G. gossypioides* in an African (rather than in an American) clade. These data, in conjunction with previous evidence from the repetitive fraction of the genome, implicate a complex history for *G. gossypioides* involving temporally separated introgression events from genetically divergent cottons that currently are restricted to different hemispheres. It seems that *G. gossypioides* experienced nuclear introgression from an African species shortly after divergence from the remainder of the American assemblage. More recently, hybridization with a Mexican species resulted in cpDNA introgression and perhaps a second round of cryptic nuclear introgression. *G. gossypioides* provides a striking example of the previously unsuspected chimeric nature of some plant genomes and the phylogenetic complexity produced by multiple historical reticulation events.

Keywords: Gossypium gossypioides*, hybridization, introgression, phylogenetic incongruence, speciation.*

(See Corvallis order form 1.)

Cronn, R.; Wendel, J.F.
2003. Cryptic trysts, genomic mergers, and plant speciation. New Phytologist. 161: 133-142.

It has long been recognized that interspecific hybridization is common in plants, enhancing processes of diversification and speciation. With the widespread use of molecular tools, interspecific hybridization—as revealed through incongruence among two or more phylogenetic data sets—is now inferred to be even more prevalent than indicated by morphological and cytogenetic evidence. By using *Gossypium* as an example, we show how multiple molecular markers have

implicated a high frequency of historical hybridization between lineages whose modern descendents are strongly isolated by geography and intrinsic genetic barriers. For example, transoceanic dispersal of propagules from Africa to the New World led to the creation of a novel allotraploid lineage, as well as the introgression of African repetitive elements into a Mexican diploid species. By mechanisms that remain obscure, fully one-quarter of modern *Gossypium* species seem to have experienced historical interspecific cytoplasmic and possibly nuclear introgression. These remarkable observations of interspecific genetic exchange emerge from a genus for which such contact would seem improbable, implying that historical hybridization is a more creative force than suspected in angiosperm evolution.

Keywords: Hybridization, speciation, introgression, gene flow, Gossypium*.*

(See Corvallis order form 1.)

Geomorphology and Hydrology

Gatziolis, D.; Fried, J.S.
2004. Adding Gaussian noise to inaccurate digital elevation models improves spatial fidelity of derived drainage networks. Water Resources Research. 40(2): W02508.

An economical approach to improving predictions of hydrological models produced highly accurate representations of ephemeral and perennial stream networks. Traditional drainage network extraction from digital elevation models (DEMs) often yields inaccurate and inconsistent results because of elevation errors. Topographic wetness index maps calculated from alternative terrain representations, produced by adding random errors to a DEM of a subwatershed with low relief, were combined to delineate a stream network that matches one produced by more time-intensive (and costly) differential Global Positioning System field methods, particularly with respect to the ephemeral component of the drainage network.

Keywords: Grid-based hydrologic modeling, DEM errors.

(See Portland order form.)

Lancaster, S.T.; Grant, G.E.
2003. You want me to predict what? In: Wilcock, P.R.; Iverson, R.M., eds. Prediction in geomorphology. Geophysical Monogr. 135. Washington, DC: American Geophysical Union: 41-50

Application of geomorphic landscape models to issues relevant to land management offers geomorphologists opportunities to do interesting, relevant science. But working in conjunction with managers and policymakers risks modelers' expectations coming into conflict with those of managers and policymakers. Geomorphologists must effectively communicate the capabilities and limitations of geomorphic landscape modeling, and expanding the capabilities of landscape modeling to deal with issues relevant to land management calls for a level of model complexity that landscape modelers have not often embraced.

Keywords: Geomorphology, landscape analysis, landscape modeling, watershed management.

(See Corvallis order form 1.)

Nakamura, F.; Swanson, F.J.
2003. Dynamics of wood in rivers in the context of ecological disturbance. In: Gregory, S.V.; Boyer, K.L.; Gurnell, A.M., eds. The ecology and management of wood in world rivers. American Fisheries Society Symposium 37. Bethesda, MD: American Fisheries Society: 279-297.

Disturbance relevant to dynamics of wood in rivers can take many forms. We consider effects of ecosystem disturbance related to wood in river systems in geographic settings, which include high-gradient, boulder-dominated streams, braided, gravel-bed streams, and low-gradient, sand-bed streams.

Keywords: Wood in rivers, disturbance, geomorphology.

(See Corvallis order form 2.)

Land Use

Kline, J.D.; Azuma, D.L.; Moses, A.
2003. Modeling the spatially dynamic distribution of humans in the Oregon (USA) Coast Range. Landscape Ecology. 18: 347-361.

A common approach in land use change analyses in multidisciplinary landscape-level studies is to delineate discrete forest and nonforest, or urban and nonurban land use categories for integration into other submodels describing socioeconomic and ecological processes. Such discrete land use categories, however, may be inappropriate when the socioeconomic and ecological processes under study are sensitive to a range of human habitation. In this paper, we characterize the spatial distribution of humans throughout the forest landscape of western Oregon. We develop an empirical model describing the spatial distribution and rate of change in historical building densities as a function of a gravity index of development pressure, existing building densities, slope, elevation, and existing land use zoning. We use the empirical model to project pixel-level changes in building densities that are applied to a 1995 base map of building density to describe the future spatial distributions of buildings over time. The projected building density maps are key inputs into a multidisciplinary landscape-level analysis of socioeconomic and ecological processes in Oregon's Coast Range.

Keywords: Ecological economics, land use change, landscape modeling, urbanization.

(See Corvallis order form 1.)

Landscape Ecology

Nonaka, E.
2003. Disturbance and landscape history as a reference for evaluating forest management effects at a regional scale: examples from the Coast Range of Oregon, USA. Corvallis, OR: Oregon State University. 149 p. M.S. thesis.

This thesis evaluates the historical range of variation (HRV) in coastal forests. It uses simulation models to evaluate how current and alternative policies might change the age distribution of forests relative to that of the historical disturbance regime. The thesis also estimates the HRV of dead wood for coastal forests.

Keywords: Fire history, landscape dynamics.

(Available only through library or interlibrary loan.)

Natural Resource Policy

Wiskind, A.
2003. Down by the creek: understanding landowner perspectives on streamside health and management. Corvallis, OR: Oregon State University. 119 p. M.S. thesis.

Policymakers and private landowners have come to recognize the importance of streamside areas in the maintenance of water quality and fish habitat. Because nonindustrial landowners own 42 percent of the streamside area in the Coast Range, their management is a significant factor in the streamside health of western Oregon. This study assesses landowner perceptions of streamside health and management in the Gales Creek basin, a mixed-use watershed west of Portland. Data were collected from 21 forest, agricultural, and urban landowners by using qualitative research methods, indepth interviews, and field tours. Key findings from the research are: (1) landowners' streamside management supports their more general goals for their land—forestry, agriculture, or residential; (2) maintaining streamside health is not usually a primary objective of landowner management; rather it is a fortuitous, but unintended, side effect of their pursuit of other goals; (3) landowners may assert autonomy over their land when their goals are threatened by natural

resource policy; and (4) landowners possess specific knowledge of their streamside areas but are limited in their understanding of conditions at larger spatial and temporal scales. They believe their knowledge should be incorporated into policymaking. Some implications from these findings for the development of landscape-scale policy are included.

Keywords: Streamside health and management, private landowners, resource policy.

(Available only through library or interlibrary loan.)

Plant Ecology

Anderson, P.D.; Palmer, B.; Houpis, J.L.J. [and others]
2003. Chloroplastic responses of ponderosa pine (*Pinus ponderosa*) seedlings to ozone exposure. Environment International. 29: 407-413.

Integrity of chloroplast membranes is essential to photosynthesis. Loss of thylakoid membrane integrity has been proposed as a consequence of ozone exposure and therefore may be a mechanistic basis for decreased photosynthetic rates commonly associated with ozone exposure. To investigate this hypothesis, *Pinus ponderosa* seedlings were exposed to ambient air or ozone concentrations maintained at 0.15 or 0.30 $\mu l \bullet L^{-1}$ for 10 $h \bullet day^{-1}$ for 51 days during their second growing season. Needles exposed to elevated ozone exhibited decreases in chlorophyll a and b content. The decreases were dependent on the duration and intensity of ozone exposure. When based on equal amounts of chlorophyll, ozone-exposed sample tissue exhibited an increase in total protein. When based on equal amounts of protein, ozone-exposed samples exhibited an increase in 37kD proteins, possibly consisting of breakdown products, and a possible decrease in 68kD proteins, Rubisco small subunit. There was also a change in the ration of Photosystem I protein complexes CPI and CPII that may have contributed to decreased photosynthesis. Net photosynthetic rates were decreased in the high ozone treatment, suggesting that observed structural and biochemical changes in the chloroplast were associated with alterations of the photosynthetic process.

Keywords: Chloroplast, membrane, ozone, photosynthesis, pine, protein.

(See Corvallis order form 2.)

Chan, S.S.; Radosevich, S.R.; Grotta, A.T.
2003. Effects of contrasting light and soil moisture availability on the growth and biomass allocation of Douglas-fir and red alder. Canadian Journal of Forest Research. 33: 106-117.

The authors examined growth and biomass allocation of individual Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) and red alder (*Alnus rubra* Bong.) seedlings grown for 3 years under contrasting combinations of light and water. Alder growth was always greater than Douglas-fir. Full sunlight and soil moisture at field capacity caused large differences in size between the two species. With limited light and water, differences were smaller. Under full light and limited water, Douglas-fir allocated a high portion of its biomass to roots, whereas red alder allocated a high percentage to aboveground biomass components. Under light and water resource-limiting situations, red alder allocated more mass to stem, whereas Douglas-fir allocated more to roots. Red alder growth responded negatively to water limitation, whereas Douglas-fir did not. Red alder exhibited greater foliage plasticity to light. Species differences in size and allocation in response to resource availability may determine pathways by which Douglas-fir can coexist under conditions of full light and limiting soil moisture availability. Furthermore, when contrasted with red alder, Douglas-fir's relatively greater tolerances to low light allow it to better persist in the understory. Red alder's rapid early growth and competitive ability will be superior under full light and nonlimiting soil moisture conditions.

Keywords: Competitive ability, resource availability, light, soil moisture, growth analysis, species differences, interactions, comparative growth, Douglas-fir, red alder.

(See Corvallis order form 1.)

Spies, T.A.
2004. Ecological concepts and diversity of old-growth forests. Journal of Forestry. 102(3): 14-20.

The conceptual basis of old growth is complex and often confusing. A comprehensive ecological understanding of old growth requires a multiscale perspective from individual trees to whole landscapes and regions. A concensus on a single general ecological definition will probably never be reached, but this limitation should not preclude the development of specific definitions that are needed by managers and policymakers for forest types and localities. Old-growth forests share many attributes such as spatial heterogeneity but are also diverse in many ways including their resilience, stature, spatial pattern, and stability. This diversity means that old growth differs in terms of significance of biological diversity, effort required for conservation and restoration, and threat from direct or indirect human activities.

Keywords: Succession, forest structure, plant communities, ecology.

(See Corvallis order form 2.)

Wender, B.W.; Harrington, C.A.; Tappeiner, J.C., II
2004. Flower and fruit production of understory shrubs in western Washington and Oregon. Northwest Science. 78(2): 124-140.

We observed flower and fruit production for nine understory shrub species in western Washington and Oregon. We examined the relation of reproductive output to plant size, plant age, site factors, and overstory density, as well as the impacts of operational stand thinning. For all species, plant size was a more useful predictor of flower and fruit abundance than other variables. Thinning increased the probability and abundance of flowering and fruiting for four species, but the response for all but one species was not consistent between sites or from year to year.

Keywords: Shrubs, flowers, reproduction, overstory density.

(See Olympia order form.)

Plant Physiology

Joseph, G.; Kelsey, R.G.
2004. Ethanol synthesis and aerobic respiration in the laboratory by leader segments of Douglas-fir seedlings from winter and spring. Journal of Experimental Botany. 55(399): 1095-1103.

We quantified constitutive and induced ethanol concentrations and aerobic respiration rates in stem segments from leaders of Douglas-fir seedlings from families with varying stem diameter growth. Measurements were made in winter and spring when the cambium was dormant and active, respectively. Induced ethanol concentrations were higher in December than in May, and they were negatively related to stem diameters. Relationships for CO_2 efflux rates depended on how they were calculated. The CO_2 efflux per unit surface area was higher in May than December and was unaffected by stem diameters, whereas CO_2 efflux per unit volume or specific surface area was negatively related with stem diameter. The CO_2 efflux per unit volume was the most sensitive at detecting small changes in respiration rates. Aerobic respiration rates and N_2 induced ethanol concentrations were positively related, indicating that rapidly respiring stems of Douglas-fir are capable of rapid ethanol fermentation if tissues become hypoxic or anoxic.

Keywords: Pseudotsuga menziesii*, hypoxia, anoxia, fermentation, anaerobic respiration, CO_2 efflux, aerobic respiration, ethanol.*

(See Corvallis order form 1.)

Range Management

Wells, M.
2003. Influence of cow age/experience and landscape thermal regimes on distribution and grazing patterns of cattle in northeastern Oregon mixed conifer forested rangelands. Corvallis, OR: Oregon State University. 91 p. M.S. thesis.

Two studies were conducted to determine the factors influencing distribution of cattle on northeastern Oregon mixed-conifer forested rangelands. Cattle preferred areas with shallow slopes, westerly aspects, and areas farther from water than the mean distance to water in the pasture. Cattle of different age classes used pasture resources differently. Temperature probes placed within the pasture indicated temperatures varied widely on a daily basis.

Keywords: Livestock, grazing, forested rangelands, temperature, distribution.

(Available only through library or interlibrary loan.)

Regional Assessments

Peterson, C.E.; Shriner, D.S.
2004. Contributions of acid rain research to the forest science-policy interface: learning from the national acid precipitation assessment program. Scandinavian Journal of Forest Research. 19(Suppl. 4): 157-165.

Outcomes from the 1980s National Acid Precipitation Assessment Program (NAPAP) research efforts influenced not only public policy (e.g., amendments to the Clean Air Act) but broadly influenced how forestry research organizations and the public value science credibility for better informed decisionmaking. The blueprint for quality assurance and quality control as recently implemented in the USDA Forest Service Research branch originated under NAPAP, as did much of our current thinking about integrated and interdisciplinary science and the idea that final syntheses of work require upfront planning and funding. The current emphasis on annualized inventories and building the research and analytical capacity of forest inventory and analysis (FIA) was fueled by debates during NAPAP on how FIA data contribute to understanding forest "growth and decline." The many ways in which knowledge gained by NAPAP participants helped to subsequently shape and build a more credible science foundation have only become evident over the decade intervening since the end of NAPAP and, as a result, went unrecognized by many of the post-NAPAP critics.

Keywords: NAPAP, science-policy interface, science relevancy, science credibility, synthesis and integration.

(See Portland order form.)

Spies, T.A.; Johnson, K.N.
2003. The importance of scale in assessing the compatibility of forest commodities and biodiversity. In: Monserud, R.A.; Haynes, R.W.; Johnson, A.D., eds. Compatible forest management. Dordrecht, The Netherlands: Kluwer Academic Publishers: 211-235. Chapter 8.

A better understanding of how scale influences compatibility is needed if management for diverse forest values is to become more effective. Because scale has different meanings and can be an abstract concept, concrete examples of scale effects are needed. The goals of this paper are to (1) identify the major components of scale from an ecological perspective, (2) examine how scale influences perceptions of ecological condition, and (3) examine how ownership and stand-level management actions scale up to regions in terms of biodiversity and timber production. Measures and perceptions of compatibility of biodiversity and commodities are influenced by scale in various ways.

Keywords: Landscape, tradeoffs, biodiversity, ownership effects.

(Available in bookstores and libraries.)

Silviculture

Deal, R.L.; Barbour, R.J.; McClellan, M.H.; Parry, D.L.

2003. Development of epicormic sprouts in Sitka spruce following thinning and pruning in south-east Alaska. Forestry. 76(4): 401-412.

The frequency and size of epicormic sprouts in Sitka spruce (*Picea sitchensis* (Bong.) Carr) were assessed in five 23- to 29-year-old stands that were uniformly thinned and pruned to 2.4-, 3.7-, and 5.2-m lift heights. Sprouts were very common 6 to 9 years after treatment, with 232 of 236 trees producing an average of 9 to 11 sprouts per meter of tree bole. The total number of sprouts were similar for the different pruning treatments, but more large sprouts were produced in the 5.2-m pruning lift. Trees that developed large sprouts were significantly smaller, shorter, and had less crown length than trees without large sprouts. Results suggest that spruce responds to thinning and pruning treatments with the production of numerous epicormic sprouts. If one of the main goals of pruning is to produce clear, higher valued wood, then Sitka spruce might be a poor species to prune.

Keywords: Sitka spruce, pruning, wood quality, epicormic sprouts, southeast Alaska, forest management.

(See Portland order form.)

Deal, R.L.; Hennon, P.E.; Orlikowska, E.H.; D'Amore, D.V.

2004. Stand dynamics of mixed red alder-conifer forests of southeast Alaska. Canadian Journal of Forest Research. 34: 969-980.

Stand structure and dynamics were determined in mixed red alder (*Alnus rubra* Bong.)-conifer forests of southeast Alaska by assessing stand development, tree density, total basal area, diameter distribution of live and dead trees, and mean diameter of all and largest conifers in 40-year-old red alder-conifer stands that developed after logging. Forty-five plots were established in nine mixed stands that ranged from no alder to 86 percent alder. Alder height growth was initially rapid, then slowed considerably, whereas conifer height growth was initially slow, then rapidly increased with conifers now being 4 to 9 m taller than associated alders. Most alder diameters were 20 to 30 cm, and conifer diameters were small (3 to 10 cm) with a few large (>25 cm) trees. Total stand basal area significantly decreased with increasing proportions of alder, but density of live and dead trees was not closely associated with alder composition. Sixty percent of all dead trees died standing. Overall, these mixed red alder-conifer stands provided more heterogeneous structures than pure conifer stands with more even diameter distributions, multiple canopy layers, and similar numbers of large-diameter conifers.

Keywords: Silviculture, red alder, stand dynamics, mixed alder-conifer forests, southeast Alaska.

(See Portland order form.)

Reutebuch, S.E.; Harrington, C.A.; Marshall, D.D.

2004. Use of large-scale silvicultural studies to evaluate management options in the Pacific Northwest forests of the United States. Forest, Snow Landscape Research. 78(1/2): 191-208.

Many large-scale silvicultural experiments have been established to develop and assess silviculture options for Pacific Northwest Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco var. *menziesii*) forests. This paper summarizes three such studies that focus on major life stages of managed stands—early development, midrotation, and regeneration harvest. Development of silvicultural treatments that are needed to restore and maintain Oregon white oak (*Quercus garryanna* Dougl. ex Hook.) in western Oregon and Washington also is presented. In addition

to responses of overstory trees and understory plants to silvcultural treatments, several other aspects, such as coarse woody debris retention, residual stand damage, soil disturbance, economics, and public acceptance of treatments, are being investigated. Advantages, special considerations, and challenges of conducting large-scale, operational silviculture research studies are discussed.

Keywords: Silviculture research, stand manipulation, forest structure.

(See Olympia order form.)

Social Sciences

Gustafson, E.; Nestler, J.; Gross, L. [and others]
2003. Evolving approaches and technologies to enhance the role of ecological modeling in decision making. In: Dale, V.H., ed. Ecological modeling for resource management. New York: Springer: 135-164.

This chapter discusses evolving modeling approaches and technologies for ecological modeling and application to decisionmaking. It discusses model conceptualization and design and shows how new approaches to model structuring might enhance problem formulation in decisionmaking; explains issues surrounding the construction and implementation of models; and discusses technologies for communicating the output from models to improve their usefulness to decisionmakers.

Keywords: Ecological modeling, decisionmaking.

(Available in bookstores and libraries.)

Johnson, R.L.; Stankey, G.
2002. Forest and stream management in the Oregon Coast Range: socioeconomic and policy interactions. In: Hobbs, S.D.; Hayes, J.P.; Johnson, R.L. [and others], eds. Forest and stream management in the Oregon Coast Range. Corvallis, OR: Oregon State University Press: 7-30.

The central thesis of this chapter is that the changing sociopolitical landscape of the Pacific Northwest will have profound impacts on the nature, extent, and level of forest management on the Oregon coast in the 21st century. Rapid and radical changes have three key dimensions that bear directly and profoundly on the management of these forests in the future: (1) shifting conceptions of forest resources, (2) changing judgments of the social acceptability of forest management practices and conditions, and (3) changes in the relationship between political power and organizational authority.

Keywords: Oregon coast, forest management, sociopolitical landscape.

(Available in bookstores and libraries.)

Reynolds, K.M.; Reeves, G.H.
2003. Role of knowledge-based systems in analysis and communication of monitoring data. In: Busch, D.E.; Trexler, J.C., eds. Monitoring ecosystems: interdisciplinary approaches for evaluating ecoregional initiatives. Washington, DC: Island Press: 189-210. Chapter 7.

Evaluation of monitoring data is fundamental to an adaptive ecosystem management process because it simultaneously concludes the iteration on the cycle and generates revisions to current knowledge that become the basis for adaptation in the next iteration. The objective

of this chapter is to discuss practical approaches to integrated evaluation across disciplines and spatial scales, and landscape-level application of the latter.

Keywords: Monitoring, planning, evaluation.

(Available in bookstores and libraries.)

Stankey, G.H.
2003. Adaptive management at the regional scale: breakthrough innovation or mission impossible? A report on an American experience. In: Wilson, B.P.; Curtis, A., eds. Proceedings of the 2002 Fenner conference on the environment: agriculture for the Australian environment. Albury, Australia: Johnstone Centre, Charles Sturt University: 159-177.

The 1993 Northwest Forest Plan, which established 10 adaptive management areas (AMA), proposed a long-term strategy for management of the areas, grounded in recognition that management experience and emerging knowledge would lead to new understanding that, in turn, would challenge the validity of the assumptions upon which the allocations were founded. The research presented here on the 10 AMAs includes a literature review, interviews with 50 agency personnel who administered the program as well as university cooperators familiar with the program, and reviews of plans, proposals, and policy papers.

Keywords: Endangered species, Pacific Northwest, policy, USDA Forest Service.

(See Corvallis order form 2. Full text in pdf format is available at http://www.csu.edu.au/special/fenner/papers/ref/TOC.html. [27 July 2004].)

Stankey, G.H.; McCool, S.F.
2004. Social sciences and natural resources management: an assessment of advances. In: Manfredo, M.J.; Vaske, J.J.; Bruyere, B.L. [and others]. Society and natural resources: a summary of knowledge. Jefferson, MO: Modern Litho: 21-34. Chapter 3.

Public debate over the sustainability and use of natural resources and ecosystems is increasingly contentious and divisive. The challenges for public and private sector decisionmakers at local, regional, and national levels are equally volatile, complex, and contested. This chapter examines the impact, contributions, and challenges facing the social sciences as they seek to contribute to efforts to address these challenges. It offers a foundation for understanding how the social sciences can contribute to community discourse and deliberation about the sustainability of natural resources and ecosystems.

Keywords: Integrated management, ecosystem management, science-policy relations.

(Available in bookstores and libraries.)

Wildlife

Marcot, B.G.; Johnson, D.H.
2003. Owls in mythology and culture. In: Duncan, J.R. Owls of the world: their lives, behavior and survival. Toronto, ON: Key Porter Books: 89-105. Chapter 2.

Throughout human history owls have variously symbolized dread, knowledge, wisdom, death, and religious beliefs in a spirit world. In most Western cultures, views of owls have changed

drastically over time. Owls can serve simultaneously as indicators of scarce native habitats and of local cultural and religious beliefs. Understanding historical and current ways in which owls are viewed, and not imposing Western views on other cultures, is an important and necessary context for crafting owl conservation approaches palatable to local peoples.

Keywords: Owls, owl lore, owls in culture.

(Available in bookstores and libraries.)

Nauman, R.S.; Olson, D.H.
2004. Surveys for terrestrial amphibians in Shasta County, California, with notes on the distribution of Shasta salamanders (*Hydromantes shastae*). Northwestern Naturalist. 85: 35-38.

We examined the distribution of the rare Shasta salamander*, Hydromantes shastae*, by conducting surveys to the north of known sites and compiling existing site records. Shasta salamanders were found at 2 of 40 sites surveyed, one extending the known range 16 km to the northeast. A total of 726 animals of 8 amphibian species were found, including *Aneides flavipunctatus*, which was associated with riparian areas, and *Ensatina eschscholtzii*, which was associated with upslope habitat.

Keywords: Shasta salamander, Hydromates shastae*, plethodontid salamanders, Shasta County, conservation,* Aneides flavipunctatus*,* Ensatina eschscholtzii*.*

(See Corvallis order form 2.)

Stewart, K.M.; Bowyer, R.T.; Kie, J.G. [and others]
2003. Niche partitioning among mule deer, elk, and cattle: Do stable isotopes reflect dietary niche? Ecoscience. 10(3): 297-302.

Exploration of the effects of introduced species on habitat and diet selection of native ones is especially important in coevoluntionarily naïve assemblages. We used microhistological analyses and ratios of stable istotopes $d^{13}C$ and $d^{15}N$ to examine niche relations among mule deer, elk, and range cattle. We determined stable istotope ratios and diet composition from fecal pellets and used principal components analysis to reduce dimensionality of data on diet composition. Principal component 1 represented a habitat axis with understory vegetation dominated by sedges (negative loadings) to forbs (positive loadings). Principle component 2 represented a grazing (negative loadings) to browsing (positive loadings) continuum. Stable isotope ratios of both $d^{13}C$ and $d^{15}N$ were significantly different among those three large herbivores. Our microhistological and isotopic data indicated competitive displacement of mule deer by elk and cattle. Values of $d^{15}N$, but not $d^{13}C$, likely represented both diet and habitat separation between elk and cattle. Thus, data indicated that stable isotope analysis could provide a useful tool in evaluating dietary niche breadth as well as differences in habitat use. Nonetheless, how diet selection and habitat use changes with seasons and whether spatial and dietary displacements are maintained through time among these three ruminants remain to be examined.

Keywords: Cattle, diet composition, elk, microhistological analysis, mule deer, stable isotope.

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