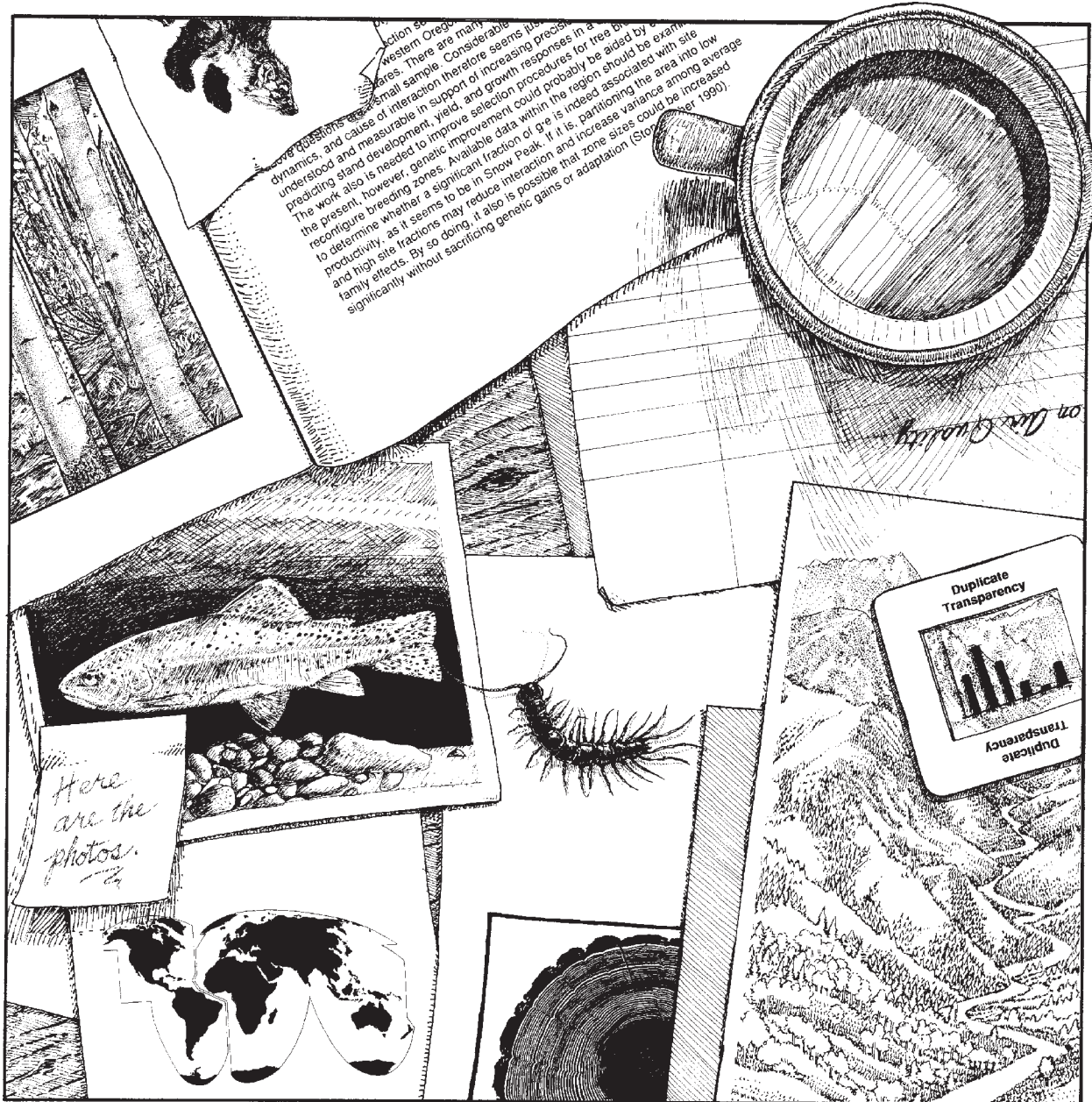




# Recent Publications of the Pacific Northwest Research Station, Third Quarter 2004



This list of recent publications and other products of the Pacific Northwest (PNW) Research Station is published four times a year.

The first section shows items published by the PNW Research Station. The second section shows publications available elsewhere. In each section, items are grouped alphabetically by authors with categories.

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Pacific Wildland Fire Sciences Laboratory  
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Development Center  
204 Siginaka Way  
Sitka, AK 99835-7316

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## Pacific Northwest Research Station Publications

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### Aquatic and Riparian Systems

#### 02-161

Everest, F.H.; Stouder, D.J.; Kakoyannis, C. [and others]

2004. A review of scientific information on issues related to the use and management of water resources in the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-595. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 128 p.

Fresh water is a valuable and essential commodity in the Pacific Northwest States, specifically Oregon, Washington, and Idaho, and one provided abundantly by forested watersheds in the region. The maintenance and growth of industrial, municipal, agricultural, and recreational activities in the region rely on adequate and sustainable supplies of fresh water from surface and ground-water sources. Future development, especially in the semiarid intermountain area, depends on the conservation and expansion of the region's water resources. This synthesis reviews the state of our knowledge and condition of water resources in the Pacific Northwest.

*Keywords: Water distribution, flow regimes, water demand, conflicts, tools, water use.*

#### 03-317

Musslewhite, J.; Wipfli, M.S.

2004. Effects of alternatives to clearcutting on invertebrate and organic detritus transport from headwaters in southeastern Alaska. Gen. Tech. Rep. PNW-GTR-602. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 28 p.

We examined the transport of invertebrates and coarse organic detritus from headwater streams draining timber harvest units in a selective timber harvesting study, alternatives to clearcutting (ATC), in southeast Alaska. Transport in 17 small streams was sampled with 250- $\mu$ m-mesh drift nets in spring, summer, and fall near Hanus Bay at an ATC installation on Catherine and Baranof Islands. Samples were taken before and after nine harvesting treatments were applied. Invertebrate and organic detritus drift densities and community composition were used to assess treatment effects. A comparison of drift densities before and after treatment showed year-to-year differences comparable to natural variation at other sites in this study, but no clear relationship to intensity or type of timber harvest treatments. Natural variation in drift densities prevented detection of any potential timber harvesting effects. Coefficients of variation showed

transport was most variable among streams, followed by seasons and then days. A trend toward an increase in the proportion of true flies (Diptera) and a decrease in the proportion of mayflies (Ephemeroptera) was seen in more intensive treatments. Although transport rates were extremely variable, a mean of 220 mg invertebrate dry mass per stream per day and 18 g detritus per stream per day were transported downstream. The transport of this material suggests that headwaters are potential source areas of aquatic and terrestrial invertebrates and detritus, linking upland ecosystems with habitats (commonly fish bearing) lower in the catchment.

*Keywords: Alternatives to clearcutting, headwater streams, invertebrates, organic detritus, riparian.*

#### **02-175**

Reeves, G.H.; Hohler, D.B.; Larsen, D.P. [and others]

2004. Effectiveness monitoring for the aquatic and riparian component of the Northwest Forest Plan: conceptual framework and options. Gen. Tech. Rep. PNW-GTR-577. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 71 p.

An Aquatic and Riparian Effectiveness Monitoring Plan (AREMP) for the Northwest Forest Plan (NWFP) is intended to characterize the ecological condition of watersheds and aquatic ecosystems. To determine the effectiveness of the NWFP to meet relevant objectives, this report presents the conceptual foundation of options for use in pilot testing and implementing an effectiveness monitoring program for aquatic and riparian systems. The base program would evaluate status and trends of watershed, stream, and riparian conditions by using decision-support models. Although the focus of AREMP is on characterizing ecosystem status and trends, implementing it will also supply information that will be useful in determining causal relations to help explain those trends.

*Keywords: Effectiveness monitoring, aquatic ecosystems, riparian ecosystems, decision-support models.*

## **Bibliographies**

### **04-218**

Pacific Northwest Research Station  
2004. Recent publications of the Pacific Northwest Research Station, second quarter 2004. Portland, OR: U.S. Department of Agriculture, Forest Service. 24 p.

*Keywords: Bibliographies (forestry).*

## **Botany**

### **04-068**

Ager, A.A.; Owens, K.E.

2004. Characterizing meadow vegetation with multitemporal Landsat thematic mapper remote sensing. Res. Note PNW-RN-544. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 12 p.

Wet meadows are important biological components in the Blue Mountains of eastern Oregon. Many meadows in the Blue Mountains and elsewhere in the Western United States are in a state of change owing to grazing, mining, logging, road development, and other factors. This project evaluated the utility of remotely sensed data to characterize and monitor meadow vegetation for 32 meadows in the Wallowa-Whitman and Umatilla National Forests. The meadows had been previously classified into different plant community types based on the occurrence of the specific indicator species of sedge (*Carex* spp.). We analyzed the spectral signature of the sample meadows by using the Kauth-Thomas (tasseled-cap) transformation calculated for a temporal series of five Landsat thematic mapper TM images. The Landsat TM images were obtained for monthly intervals from April to September in 2002. We found that the sequence of Landsat TM scenes provided ample resolution to differentiate most of the plant communities examined. A larger sample size and additional field verification of the meadow vegetation data would have provided a more definitive evaluation of the methods. The multitemporal approach

holds promise for monitoring change in wetland indicator species like the sedges, and for rapid characterization of grass, grasslike, and herbaceous vegetation over large areas. The technique also may be useful to detect the current location and spread of plants, especially those with distinctive vegetative or floral phenologies.

*Keywords: Meadows, Carex, Landsat, multitemporal, sedge.*

## **Economics**

### **03-264**

Barbour, R.J.; Fight, R.D.; Christensen, G.A. [and others]

2004. Thinning and prescribed fire and projected trends in wood product potential, financial return, and fire hazard in Montana. Gen. Tech. Rep. PNW-GTR-606. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 78 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 Montana. 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, Montana.*

### **04-009**

Daniels, J.M.

2004. Assessing socioeconomic resiliency in Washington counties. Gen. Tech. Rep. PNW-GTR-607. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 35 p.

The link between forest management and the well-being of communities in forested areas has traditionally been defined by forest sector employment opportunities. Attempts to redefine this relationship have produced methods that use a more comprehensive approach by combining both economic and social indicators to evaluate community well-being. The goal of this study is to evaluate socioeconomic resilience and forest dependence in Washington counties to identify counties where changes in forest management could negatively affect the well-being of nearby residents, allowing land managers and decision-makers to anticipate the effects of land management policies. Results indicate that Ferry, Pend Oreille, Pacific, Skamania, Stevens, and Wahkiakum Counties all have socioeconomic systems that could be particularly vulnerable to forest management changes. The same analyses were performed for the Washington Department of Natural Resources (DNR) by using only counties on the west side of the Cascade Range. Results show that two counties, Wahkiakum and Pacific, may experience disproportionate negative impacts from changes in DNR state forest management. These findings are preliminary in nature; findings should be reassessed by using community-level data to determine the optimum geographic scale necessary for detailed evaluation of policy effects.

*Keywords: Sustainable forest management, socioeconomic resilience, forest dependency, criteria and indicators, Washington Department of Natural Resources.*

## Fire

### 04-087

Azuma, D.L.; Donnegan, J.; Gedney, D.  
2004. Southwest Oregon Biscuit Fire: an analysis of forest resources and fire severity. Res. Pap. PNW-RP-560. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 32 p.

The Biscuit Fire in southwestern Oregon was one of the largest and most costly in recent history, burning over 499,000 acres and costing over 150 million dollars in suppression efforts. This study uses prefire resource information in conjunction with postfire burn severity to generate statistically reliable prefire resource estimates for the land within the Biscuit Fire perimeter. Resource parameters such as timber volume, down woody material, area by forest type, and understory cover are compared between burn severity classes.

*Keywords: Forest inventory, fire severity, forest resources, Biscuit Fire.*

## Forest Management

### 04-140

Peterson, D.L.; Innes, J.L.; O'Brian, K.  
2004. Climate change, carbon, and forestry in northwestern North America: Proceedings of a workshop November 14-15, 2001, Orcas Island, Washington. Gen. Tech. Rep. PNW-GTR-614. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 117 p.

Managers of all forest lands face increasing pressures to include climate change issues, particularly the deposition of carbon, in long-term management plans. Management, economic, and policy approaches to carbon flows in natural resources are evolving rapidly. This workshop was an opportunity for scientists, resource managers, planners, and policymakers in northwestern North America to learn about and discuss

prominent issues related to climate change and carbon in forest ecosystems. Workshop participants developed a common understanding of the state of science and developed approaches to incorporate carbon allocation in forest management and planning. Individual papers and a summary of major conclusions and inferences are included.

*Keywords: Climate change, Pacific Northwest, forest management, carbon allocation.*

## Geomorphology and Hydrology

### 04-094

Furniss, M.J.; Guntle, J., eds.  
The geomorphic response of rivers to dams [CD-ROM]. Gen. Tech. Rep. PNW-GTR-601. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.

This CD-ROM provides an electronic short course on the geomorphic response of rivers to dams. It is composed of about 7 hours of interactive audio-visual lecture, an interactive exercise, and related CD- and Web-based information and learning resources.

*Keywords: Dams, rivers, geomorphic effects, FERC, regulated flows, channel morphology.*

## Plant Pathology

### 03-425

Hildebrand, D.M.; Stone, J.K.; James, R.L.; Frankel, S.J.  
2004. Alternatives to preplant soil fumigation for Western forest nurseries. Gen. Tech. Rep. PNW-GTR-608. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 27 p.

Field trials at six bare-root forest tree nurseries compared various cultural treatments to fumigation with methyl bromide/chloropicrin or dazomet. Measured effects included population levels of *Fusarium* and *Pythium*, disease incidence, seedbed density, and sizes of conifer

seedlings. Several treatments produced results comparable to or better than with chemical fumigation. Results varied within and among the nurseries. Beneficial cultural practices included (1) incorporation of slowly decomposing organic soil amendments, e.g., aged sawdust; (2) bare fallowing with periodic tilling, and bare fallowing without periodic tilling plus supplemental weed control; and (3) sowing of conifer seed earlier and more shallow than the conventional procedure, and covering seed with a nonsoil mulch such as aged sawdust or hydromulch.

*Keywords: Methyl bromide, chloropicrin, dazomet, bare fallow, conifer seedlings, Fusarium, Pythium.*

## Resource Inventory

### 03-442 Errata

Barrett, T.M.

2004. Estimation procedures for the combined 1990s periodic forest inventories of California, Oregon, and Washington. Gen. Tech. Rep. PNW-GTR-597. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 19 p.

This publication was reported in our first quarter 2004 publication list. Two equations have been corrected; we produced an errata after many publications had been requested. If you need the errata, please indicate that on the order form on the inside back cover.

### 03-429

Fried, J.S.; Bolsinger, C.L.; Beardsley, D.

2004. Chaparral in southern and central coastal California in the mid-1990s: area, ownership, condition, and change. Resour. Bull. PNW-RB-240. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 86 p.

A mid-1990s field-plot-based inventory of primarily woody species, chaparral-dominated lands in California's south and central coast regions found 4.6 million acres of chaparral: 1.6 million acres on national forests and 3 million acres outside of national forests. Chaparral area decreased by 108,000 acres outside national forests between 1984 and 1994 with conversions to urban and agricultural use. Chamise/red shank was the common type of chaparral, followed by mixed and montane, scrub oak, and coastal transition. Outside of national forests, application of a chaparral hazard class rating system based on ocular estimates of percentage of dead material in live shrubs and total shrub cover placed 38 percent of the chaparral in high hazard.

*Keywords: Chaparral extent, fire hazard, southern California vegetation inventory.*



## **Silviculture**

### **03-213**

Curtis, R.O.; Marshall, D.D.; DeBell, D.S., eds.  
2004. Silvicultural options for young-growth Douglas-fir forests: the Capitol Forest study: establishment and first results. Gen. Tech. Rep. PNW-GTR-598. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 110 p.

This publication describes a large, long-term cooperative study of widely different silvicultural regimes applied to young-growth Douglas-fir. Variables evaluated in this study include timber growth and yield, harvest costs, aesthetics and public acceptance, soil disturbance, bird populations, and economics. Descriptive statistics and initial results are presented for the first replications established in 1997-98.

*Keywords: Silviculture, aesthetics, birds, harvest costs, ecosystem management, landscape management.*

## **Wood Utilization**

### **04-130**

Kilborn, K.A.; Parrent, D.J.; Housley, R.D.  
2004. Estimating sawmill processing capacity for Tongass timber. Res. Note PNW-RN-545. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 12 p.

In spring 2001 and 2003, sawmill capacity and utilization information was collected directly from 20 producers (usually the largest and most active) in southeast Alaska. The estimated mill capacity in southeast Alaska for calendar year (CY) 2000 was 501,850 thousand board feet (MBF) (log scale) and for CY 2002 was 453,850 MBF (log scale). The actual production by these mills for CY 2000 was 87,117 MBF (log scale) and for CY 2002 was 39,701.6 MBF (log scale).

*Keywords: Alaska sawmills, lumber capacity.*

## Publications Available Elsewhere

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

### Aquatic and Riparian Systems

Edmonds, R.L.; Francis, R.C.; Mantua, N.J.; Peterson, D.L.

2002. Sources of climate variability in river ecosystems. In: Wissmar, R.C.; Bisson, P.A., eds. *Strategies for restoring river ecosystems: sources of variability and uncertainty in natural and managed systems*. Bethesda, MD: American Fisheries Society: 9-35. Chapter 2.

River ecosystems are naturally variable in time and space, and this variability is largely determined by climate, geology, and topography. We explore how variability in climate influences rivers. Specifically, we discuss major natural drivers of global-scale climate; variability in temperature, precipitation, and streamflow patterns and how they relate to natural climate oscillations; human influence on climate variability; climate variability influence on river systems; and the need to account for this variability in river restoration activities. The Columbia River in the Pacific Northwest, the Colorado River in the Rocky Mountains and Southwest, and the Kissimmee-Okeechobee-Everglades drainage in south Florida are explored in detail.

*Keywords: River ecosystems, climate variability, hydrologic cycle, Columbia River, Colorado River, Kissimmee, Okeechobee, Everglades.*

(Available in bookstores and libraries.)

Wipfli, M.S.; Hudson, J.P.; Caouette, J.P.

2003. Marine subsidies in freshwater ecosystems: salmon carcasses increase the growth rates of stream-resident salmonids. *Transactions of the American Fisheries Society*. 132: 371-381.

We tested the hypothesis that marine-derived resource subsidies (salmon carcasses) increase the growth rates of stream-resident salmonids in southeastern Alaska and that more carcasses translate into more growth. Five carcass treatments of pink salmon (*Onchorhynchus gorbuscha*) were replicated six times in once-through artificial channels; then each channel was stocked with three live age-0 coho salmon (*O. kisutch*). The experiment spanned more than 9 weeks. The body mass and fork length of the young coho salmon significantly increased from carcass additions, but the incremental increases sharply diminished at carcass-loading levels above 1 carcass/m<sup>2</sup>. Further, in a small stream in which we added salmon carcasses to a cumulative density of 0.54 carcasses/m<sup>2</sup>, both cutthroat trout (*O. clarkia*) and Dolly Varden (*Salvelinus malma*) grew significantly faster during the 2 months in which carcasses were added compared with fish in control reaches. Fish maintained their assimilated body mass through winter into the following spring. This study illustrates that marine nutrients and energy

from salmon spawners increase growth rates of resident and anadromous salmonids in streams. This elevated growth should translate into increased survival and reproduction, ultimately elevating freshwater and marine salmon production. Ecological relationships between salmon runs and aquatic community nutrition and productivity may be important for salmon stock protection and restoration and for freshwater and marine ecosystem management.

*Keywords: Salmon, carcass, food webs, growth, lipid, triacylglyceride, fatty acid, fresh water, marine, marine-derived nutrients, subsidy.*

(See Wenatchee order form.)

## Atmosphere

Marland, G.; Pielke, R.A., Sr.; Apps, M.  
[and others]

2003. The climatic impacts of land surface change and carbon management, and the implications for climate-change mitigation policy. *Climate Policy*. 3: 149-157.

Changes in the Earth's vegetative cover contribute to anthropogenic climate change through a variety of processes. Mitigation policies recognize that changes in the Earth's surface can impact the atmospheric concentration of carbon dioxide. These policies do not, however, generally incorporate the effects of land-surface changes on surface albedo, fluxes of sensible and latent heat to the atmosphere, and distribution of energy within the climate system. Changes in energy surface budgets can affect local, regional, and global climate. Given the goal of mitigating climate change, we must consider human influence on all system components and work toward a better representation of the full system. Acknowledging the impact of changes in surface energy budgets raises the importance of treating land-surface change as a

component of climate change. It also makes it more challenging to create a system of credits and debits wherein emission or sequestration of carbon in the biosphere is equated with emission of carbon from fossil fuels. Recognition of the complexity of human-caused changes in climate must not, however, be used as an excuse to avoid actions that would minimize our disturbance of the Earth's environmental system and that would reduce societal and ecological vulnerability to environmental change and variability.

*Keywords: Climate change, carbon sequestration, land use change, surface energy balance.*

(See Corvallis order form 1.)

## Economics in Forest Management

Samils, N.

2002. The socioeconomic impact of truffle cultivation in rural Spain and its potential to encourage pioneer cultivation in Sweden. Uppsala, Sweden: Swedish University of Agricultural Sciences. 72 p. M.S. thesis.

The world market for truffles was estimated at 260 tons in the year 2000. The production of the Périgord truffle, *Tuber melanosporum* (Vitt.), was estimated at 45 to 50 tons. Production of *T. melanosporum* from preinoculated host plants started in Europe in 1975. Theoretically, truffle plantations may have a positive impact on rural economies and also improve biodiversity by reintroducing oaklands. This paper summarizes a socioeconomic study in Sarrión, Spain, where orchard owners and others were interviewed. The results showed an increase in land prices associated with truffle plantations and a strong belief in the new crop.

*Keywords: Truffles, rural development, nontimber products.*

(Available only through library or interlibrary loan.)

## Ecosystem Structure and Function

Acker, S.A.; Gregory, S.V.; Lienkaemper, G. [and others]

2003. Composition, complexity, and tree mortality in riparian forests in the central western Cascades of Oregon. *Forest Ecology and Management*. 173: 293-308.

This paper compares composition, complexity, and temporal patterns of tree mortality in upland forests and riparian forests along low- and mid-order streams on the west side of the Cascade Range of Oregon. The sampled forests include both mature and old-growth stands. A primary research objective was to determine whether tree species composition changes and compositional and structural complexity increase from upland to low-order streamside to mid-order streamside forests, a sequence of presumed increasing potential for fluvial disturbance.

*Keywords: Riparian vegetation, disturbance, landscape, landscape dynamics.*

(See Corvallis order form 1.)

Bilby, R.E.; Reeves, G.H.; Dolloff, C.A.

2003. Sources of variability in aquatic ecosystems: factors controlling biotic production and diversity. In: Wissmar, R., ed. *Strategies for restoring river ecosystems: sources of variability and uncertainty in natural and managed systems*. Bethesda, MD: American Fisheries Society: 129-146. Chapter 6.

Productivity and biodiversity of stream and river ecosystems differ at multiple spatial and temporal scales. In this chapter, we illustrate the degree to which biological properties differ in stream systems, we examine some of the factors that are responsible for variation, and we suggest how this type of information can be incorporated into restoration plans.

*Keywords: Aquatic ecosystems, natural variability.*

(Available in bookstores and libraries.)

Marshall, J.D.; Monserud, R.A.

2003. Foliage height influences specific leaf area of three conifer species. *Canadian Journal of Forest Research*. 33: 164-170.

Specific leaf area (SLA), the ratio of projected leaf area to leaf dry mass, is a critical parameter in many forest process models. The SLA describes the efficiency with which the leaves capture light relative to biomass invested in the leaf. The SLA increases from top to bottom of a canopy, but it is unclear why. We sampled stands with low and elevated canopies (young and old stands) to determine whether SLA is related to water potential, as inferred from branch height and length, or shade, as inferred from branch position relative to the rest of the canopy, or both. We studied western white pine (*Pinus monticola* Dougl.), ponderosa pine (*Pinus ponderosa* Laws.), and interior Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco var. *glauca*) in northern Idaho. The SLA decreased with branch height at rates that differed among species. Branch length had no influence on SLA. There were no differences with canopy elevation, but the slopes of lines relating SLA to branch height may have differed between the canopy elevation classes. The results are consistent with predictions based on the hypothesis that SLA decreases as the gravitational component of water potential falls. The lack of a strong shading effect simplifies the estimation of canopy SLA for process models, requiring only species and branch heights.

*Keywords: Canopy height, leaf morphology, water potential, shade tolerance, Douglas-fir, ponderosa pine, western white pine.*

(See Portland order form.)

Ozanne, C.M.P.; Anhuf, D.; Boulter, S.L.  
[and others]

2003. Biodiversity meets the atmosphere: a global view of forest canopies. *Science*. 301: 183-186.

The forest canopy is the functional interface between 90 percent of Earth's biomass and the atmosphere. Multidisciplinary research in the canopy has challenged concepts of global species richness, plant physiology, and the provision of ecosystem services. Trees respond in a species-specific manner to elevated carbon dioxide levels, while climate change threatens plant-animal interactions in the canopy and will likely alter the production of biogenic aerosols that affect cloud formation and atmospheric chemistry.

*Keywords: Canopy research, ecosystem processes, biodiversity, global change.*

(See Corvallis order form 2.)

Schindler, D.E.; Scheuerell, M.D.; Moore, J.W.  
[and others]

2003. Pacific salmon and the ecology of coastal ecosystems. *Frontiers in Ecology and the Environment*. 1(1): 31-37.

One spectacular phenomenon in nature is the annual return of millions of salmon to spawn in their natal streams and lakes along the Pacific coast of North America. The salmon die after spawning, and the nutrients and energy in their bodies, derived almost entirely from marine sources, are deposited in the freshwater ecosystems. This represents a vital input to the ecosystems used as spawning grounds. Salmon-derived nutrients make up a substantial fraction of the plants and animals in aquatic and terrestrial habitats associated with healthy salmon populations. The decline of salmon numbers throughout much of their southern range in North America has prompted concern that the elimination of this "conveyor belt" of nutrients and energy may fundamentally change the productivity of these coastal freshwater and terrestrial ecosystems, and consequently their ability to support wildlife, including salmon. If progress is to be made toward understanding and conserving the connection between migratory

salmon and coastal ecosystems, scientists and decisionmakers must explore and understand the vast temporal and spatial scales that characterize this relationship.

*Keywords: Pacific salmon, nutrients, nitrogen, ecosystems, streams.*

(See Juneau order form.)

## Fire

Bisson, P.A.; Rieman, B.E.; Luce, C.  
[and others]

2003. Fire and aquatic ecosystems of the Western USA: current knowledge and key questions. *Forest Ecology and Management*. 178: 213-229.

To effectively protect aquatic ecosystems we argue that it will be important to (1) restore the processes that maintain aquatic habitats and communities (including processes that benefit from fires), and not just control fire or fuels; (2) prioritize projects according to risks and opportunities for fire control as well as the protection of aquatic ecosystem integrity; and (3) develop new consistency in the management and regulatory process. Ultimately all fire-related management is uncertain; the role of science is to apply thoughtful scientific design and hypothesis testing methods to management applications. Policymakers and the public will benefit from an expanded appreciation of fire ecology that enables them to implement watershed management projects as experiments with hypothesized outcomes, adequate controls, and replication.

*Keywords: Wildfire, fire and fuels management, conservation, restoration, aquatic ecosystems.*

(See Olympia order form.)

Donovan, G.H.; Rideout, D.B.

2003. A reformulation of the Cost Plus Net Value Change (C+NVC) model of wildfire economics. *Forest Science*. 49(2): 318-323.

The Cost Plus Net Value Change (C+NVC) model provides the theoretical foundation for wildland fire economics and provides the basis for the National Fire Management Analysis System. The C+NVC model is based on the earlier

Least Cost Plus Loss (LC+L) model. Mathematical and graphical analysis of the LC+L model illustrates two errors in model formulation. First, suppression is incorrectly modeled as a model output. Second, suppression and primary protection are incorrectly modeled as negatively correlated. These errors are shown to be perpetuated by the contemporary C+NVC model and to have serious implications for the model's capacity to correctly identify the most efficient level of fire management expenditure. A corrected graphical representation of the C+NVC model is presented that allows the most efficient level of fire management expenditure to be correctly identified.

*Keywords: Economics, fire, cost plus net value change.*

(See Portland order form.)

Donovan, G.H.; Rideout, D.B.

2003. An integer programming model to optimize resource allocation for wildfire containment. *Forest Science*. 49(2): 331-335.

Determining the specific mix of firefighting resources for a given fire is a necessary condition for identifying the minimum of the Cost Plus Net Value Change function. Current wildland fire management models may not reliably do so. The problem of identifying the most efficient wildland fire organization is characterized mathematically by using integer-programming techniques. This mathematical exposition is then solved by using the LINGO optimization language. Sensitivity analysis is conducted on model inputs to demonstrate the flexibility of the model architecture. Further, the model is used to model budget constraints faced by fire managers.

*Keywords: Linear programming, integer programming, wildfire management, optimization, economics.*

(See Portland order form.)

Jakes, P.J.; Nelson, K.; Lang, E. [and others] 2003. A model for improving community preparedness for wildfire. In: Jakes, P.J., comp. Homeowners, communities, and wildfire: science findings from the National Fire Plan. Proceedings of the 9<sup>th</sup> international symposium on society and management. Gen. Tech. Rep. NC-231. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station: 4-9.

Communities across the country are being told that they can take steps to improve their preparedness for wildfire. For these steps to have long-term impacts, however, the community must have the foundation necessary to continue these efforts after special programs have moved on or outside funding has been exhausted. Research is showing that sufficient levels of social capital, human capital, and cultural capital are important to wildfire preparedness. In addition, agency involvement and landscape can affect the success of preparedness efforts.

*Keywords: Wildfire, community preparedness, social capital, human capital, cultural capital.*

(See Juneau 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>.)

Weisberg, P.J.; Swanson, F.J.

2003. Regional synchronicity in fire regimes of western Oregon and Washington, USA. *Forest Ecology and Management*. 172: 17-28.

We analyzed temporal patterns of area burned at 25-year intervals over a 600-year period by using 10 tree-ring-based fire history studies located west of the crest of the Cascade Range in the Pacific Northwest and related them to influences of humans, climate, and stand development effects on fuel accumulation. Patterns of temporal variation in area burned were strikingly

similar among the 10 studies, suggesting a regionally synchronous response. An early period of widespread fire from the 1400s to about 1650 was followed by a period of reduced fire extent from about 1650 to 1800, associated with cool climatic conditions. Fires were again widespread from 1801 to about 1925 and were associated with European exploration and settlement and warm climatic conditions, combined with large areas of forest greater than 300 years old. Fire suppression began around 1911 but seems to have been most effective in limiting the amount of area burned since about 1950. Human-caused change, climatic conditions, and the degree of stand/fuel development seemed to interact in their influence on temporal variation in fire regimes.

*Keywords: Fire history, disturbance, climate variability effects.*

(See Corvallis order form 2.)

## **Fish**

Bisson, P.A.; Coutant, C.C.; Goodman, D. [and others]

2003. Decision support models as tools for developing management strategies: examples from the Columbia River basin. In: Wissmar, R.C.; Bisson, P.A., eds. Strategies for restoring river ecosystems: sources of variability and uncertainty in natural and managed systems. Bethesda, MD: American Fisheries Society: 233-242. Chapter 10.

We examine decision-support models designed to help recover salmon in the Columbia River basin as a case study for the use of models to help resolve scientific uncertainty and select

among management options. Three distinct approaches are represented in the models: decision analysis, statistical, and expert system. Of the three approaches, decision analysis provides the clearest management advice, and it is the most formal about factoring uncertainty into analyses. The statistical model is the traditional scientific approach, and it can operate with a large degree of detachment from policy. The limitation of a statistical model is that the scope of the questions and their answers is restricted by availability of data, and in a domain that is data poor, many pressing questions go unanswered. Expert system approaches fill gaps in data with expert opinion. In the context of salmon recovery, expert opinion allows consideration of the most concrete menu of specific options for salmon management.

*Keywords: Salmon recovery, ecosystem management, Columbia River basin.*

(Available in bookstores and libraries.)

Bramblett, R.G.; Bryant, M.D.; Wright, B.E.; White, R.G.

2002. Seasonal use of small tributary and main-stem habitats by juvenile steelhead, coho salmon, and Dolly Varden in a southeastern Alaska drainage basin. Transactions of the American Fisheries Society. 131: 498-506.

Seasonal movement and distribution of juvenile steelhead, coho salmon, and Dolly Varden in the Staney Creek watershed were measured with weirs at 2 tributary confluences and with minnow traps at 10 tributaries and adjacent main stream reaches. Juvenile steelhead and coho salmon moved into tributaries through the weirs during

the fall as flows increased and temperatures decreased. Most steelhead overwintered in the streams and emigrated in spring. More steelhead were captured in the main stream than in tributaries during the summer. However, catch per unit effort was similar in the main stem and in tributaries during the fall and spring. Juvenile coho salmon were abundant in the tributaries and main stem during all seasons, and Dolly Varden used the tributaries during all seasons. More steelhead entered the tributary with more cobble and boulder substrate, and more coho entered the tributary with more pool area, undercut banks, and large woody debris. These results underscore the significance of links between main stem habitats and small tributaries to juvenile salmonids.

*Keywords: Juvenile steelhead, Dolly Varden, coho salmon.*

(See Juneau order form.)

Spruell, P.; Hemmingsen, A.R.; Howell, P.J. [and others]

2003. Conservation genetics of bull trout: geographic distribution of variation at microsatellite loci. *Conservation Genetics*. 4: 17-29.

We used four microsatellite loci to characterize the genetic population structure of 54 bull trout (*Salvelinus confluentus*) populations from the Northwestern United States. The distribution of genetic variation as measured by microsatellites is consistent with previous results but provides finer resolution than allozyme or mitochondrial DNA analysis. There is relatively little genetic variation within populations, but substantial differentiation between populations. The current microsatellite analysis coupled with previously published allozyme and mitochondrial DNA data support the existence of at least four major groups of bull trout: (1) "coastal" bull trout populations; (2) populations from the Klamath Basin in southwestern Oregon; (3) "Snake River" populations, which also include the John Day, Umatilla, and Walla Walla Rivers; and (4) populations from the Clark Fork drainage. Within the major assemblages, populations are further subdivided, primarily at the drainage level. Most of

the genetic similarities we have detected probably reflect patterns of historical gene flow. In some cases, genetic drift and low levels of variation seem to have influenced the relations inferred from these data. We suggest that, based on the distribution of genetic variation, all populations of bull trout make important contributions to the overall genetic diversity of the species, and conserving the remaining populations should be a focus of recovery efforts.

*Keywords: Bull trout, Salvelinus, genetics, microsatellites, aquatic conservation, endangered species, fish, DNA.*

(See La Grande order form.)

Wissmar, R.C.; Bisson, P.A.

2003. Strategies for restoring rivers: problems and opportunities. In: Wissmar, R.C.; Bisson, P.A., eds. *Strategies for restoring river ecosystems: sources of variability and uncertainty in natural and managed systems*. Bethesda, MD: American Fisheries Society: 245-262. Chapter 11.

Development of effective restoration strategies for river systems requires the use of scientific concepts about sources of variability and uncertainty. Most of these concepts are based on physical and biological properties, their processes and variability, and human-induced uncertainties within river drainages and their differences across regions. Important natural properties include climate, hydrology, geology, geomorphology, disturbance regimes like floods and fires, connectivity between river channels and floodplains, plant and animal population and community characteristics, and trophic dynamics. A major question when developing restoration strategies is, "How can we use information about variations in natural properties and anthropogenic actions to assist policymakers by reducing the uncertainty of decisions and to better manage river ecosystems?" We evaluate several concepts of variability in river ecosystems that are presented in this book: spatial and temporal scales, connectivity, and disturbance. Case studies of fish responses to temperature



and hydrologic variability are used to show how this information can be applied to restoration plans. We also focus on the need to incorporate concepts of “recovery” into restoration strategies, and present several examples of recovery processes that occur following disturbances and potential restorative actions. Finally, we explore alternatives for evaluating and treating uncertainty in societal and policy arenas.

*Keywords: River restoration, hydrologic variability, recovery.*

(Available from bookstores and libraries.)

### **Forest Management**

Arthaud, G.J.; Barrett, T.M.  
2003. *Systems analysis in forest resources*. Dordrecht, The Netherlands: Kluwer Academic Publishers. 326 p.

The papers in this volume were presented at the 8<sup>th</sup> symposium in systems analysis for forestry. Techniques presented include optimization and simulation modeling, decision-support systems, alternative planning techniques, and spatial analysis. Over 30 papers and extended abstracts are grouped into the topical areas of fire and fuels; networks and transportation; forest and landscape planning; ecological modeling, biodiversity, and wildlife; and forest resource applications.

*Keywords: Operations research, management science, forest analysis, forest modeling.*

(Available in bookstores and libraries.)

DePuit, E.J.; Quigley, T.M.  
2002. U.S. Forest Service research on small diameter timber in the Pacific Northwest: the CROP project and related work. In: Baumgartner, D.M.; Johnson, L.R.; DePuit, E.J., comps., eds. *Small diameter timber: resource management, manufacturing, and markets—symposium proceedings*. MISC0509. Pullman, WA: Washington State University, Cooperative Extension Service: 41-49.

Issues, challenges, and information needs are identified for improving ecological health and socioeconomic sustainability of overstocked, small-diameter forests in the interior Pacific Northwest. The context, history, goals, approach, and accomplishments of the Creating Opportunities Project are reviewed as an example of a comprehensive research effort to generate information relevant to improving understanding, management, and ultimate condition and value of overstocked, small-diameter forests. Related research efforts of the Pacific Northwest Research Station are briefly described.

*Keywords: Small-diameter timber, overstocked stands, forest health.*

(See Wenatchee order form.)

Flewelling, J.W.; Monserud, R.A.  
2002. Comparing methods for modelling tree mortality. In: Crookston, N.L.; Havis, R.N., comps. *Second Forest Vegetation Simulator conference*. Proc. RMRS-P-25. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 168-177.

Our goal is to compare different methods for estimating the parameters of individual tree mortality models. We examine general methods including maximum likelihood and weighted nonlinear regression, and a few specialized methods including Proc LOGISTIC in SAS, and an implementation of the Walker-Duncan algorithm. For fixed period lengths, almost all methods for fitting the logistic mortality model should work. The LOGISTIC procedure is quite robust and the easiest to use. For unequal period lengths, either a weighted nonlinear least

squares or a maximum likelihood formulation is needed to specify the annualized logistic mortality model: NLIN(wtLS) and NLIN(LOSS) in SAS. Of course, other statistical packages that mimic these procedures should give the same results.

*Keywords: Mortality modeling, FVS, stand modeling.*

(See Portland order form. To order the complete proceedings, contact Richard Schneider at [rschneider@fs.fed.us](mailto:rschneider@fs.fed.us); write him at RMRS, 490 W Prospect, Fort Collins, CO 80526; or call him at (970) 498-1392. It is also available online at [http://www.fs.fed.us/rm/pubs/rmrs\\_p025.html](http://www.fs.fed.us/rm/pubs/rmrs_p025.html).)

Fried, J.S.; Barbour, R.J.; Fight, R.

2003. FIA BioSum: applying a multiscale evaluation tool in southwest Oregon. *Journal of Forestry*. March: 8.

In southwest Oregon's Klamath ecoregion, utilization can pay the way toward fire-resistant forest in some cases, but it is the use of merchantable-size material, not the biomass-sized material, that makes this possible, and only a small fraction of the landscape can be treated without infusions of considerable additional subsidy or incentives. Energy generation at least provides a place to dispose of biomass-sized material; leaving such material on the ground in the woods would not likely be acceptable to most fuel managers, and disposing of it by open burning would add other costs and risks to the fuel-treatment enterprise.

*Keywords: Thinning, biomass assessment, fire-hazard reduction.*

(See Portland order form.)

Haynes, R.W.

2002. U.S. timber supply and demand in the United States, 1996 to 2050. In: Baumgartner, D.M.; Johnson, L.R.; DePuit, E.J., comps., eds. *Small diameter timber: resource management, manufacturing, and markets—symposium proceedings*. MISC0509. Pullman, WA: Washington State University, Cooperative Extension Service: 33-36.

The United States has a 100-year history of periodic national assessments of timber supply and demand. These assessments set the context for broad-scale forestry issues such as the small-diameter timber issue in the interior West. Here the solid wood products industries and public lands dominate the forest sector. Both complicate the already complex small-diameter issue.

*Keywords: Timber resources, timber harvest, demand, supply.*

(See Portland order form.)

Monserud, R.A.

2002. Large-scale management experiments in the moist maritime forests of the Pacific Northwest. *Landscape and Urban Planning*. 59(3): 159-180.

We examine seven multiresource silvicultural experiments established in the past decade in the moist maritime forests of the Pacific Northwest (Alaska, British Columbia, Washington, and Oregon). All focus on the effect of various alternatives to the clearcutting plantation management system traditionally used in the United States. This set of experiments employs randomized block designs and replicated treatment units large enough to be commercially operational. Because of their large size and emphasis on joint resource production, these studies can be viewed as ecosystem management experiments. The effect of silviculture on both wildlife

habitat and biodiversity is examined in the studies, with considerable emphasis on accelerating development of old-growth characteristics and retaining biological legacies. Even though the aquatic conservation strategy is an important driving component of the Northwest Forest Plan, only one experiment examines the interaction of density management and aquatics in western Washington and Oregon. The interaction of social acceptance and wood production is a major component in only two of the seven studies. These studies collectively represent a major research investment by both research and land management organizations. These long-term studies promise to provide new management options for producing commodities while maintaining or enhancing habitat, water quality, and aesthetics from the forest. As treatment results become available, the possibility exists for a future joint analysis across all or most studies for certain resources that are measured, such as the interaction of silvicultural treatment with an improvement in wildlife habitat and biodiversity. A test of common hypotheses about ecosystem management would greatly increase not only the power of the test but the return on investment from these rather expensive experiments.

*Keywords: Alternative silviculture, wood production, social acceptance, biodiversity, statistical power, compatibility.*

(See Portland order form.)

Monserud, R.A.

2003. Evaluating forest models in a sustainable forest management context. *FBMIS*. 1: 35-47.

Questions regarding the sustainability of forests have become pressing international issues in recent years. Concerns range from fears of over-exploiting the forest resource to possible climate change effects on forest integrity. My objective is to examine the expected utility of general classes of forest growth models for answering questions about the sustainability of forest management. Six classes of forest models are reviewed: forest yield models; ecological gap models (population succession); ecological compartment models (resource fluxes); process/mechanistic models; vegetation distribution models; and hybrid models. The review reveals structural shortcomings in several classes of models as potential tools for evaluating questions of sustainability. For example, the great disadvantage of the forest yield models is that they are not linked to the underlying causes of productivity (the carbon and nutrient cycles, the moisture regime, climate). Yield models implicitly assume that environmental conditions remain constant. This assumption is clearly unsuitable for evaluating climate change scenarios, which are crucial for long-term sustainability considerations. Hybrid models hold the greatest promise because they are predicated on producing an operational process with useful products on yield for the manager. The hybrid modelers base as much of their system on causal process models as is practical, and openly embrace relevant empirical results from yield models to complete the system.

*Keywords: Sustainability, forest yield models, ecological gap models, ecological compartment models, process/mechanistic models, vegetation distribution models, hybrid models.*

(See Portland order form. FBMIS is an online journal. This article can be found at [http://www.fbmis.info/A/3\\_1\\_MonserudR\\_1.](http://www.fbmis.info/A/3_1_MonserudR_1.))

Robinson, A.P.; Monserud, R.A.  
2003. Criteria for comparing the adaptability of forest growth models. *Forest Ecology and Management*. 172: 53-67.

We develop criteria that assess the adaptability of forest growth simulation models for extension into new populations and applications. The most important criteria summarize the infrastructure of the model: portability, extendibility, source code availability, and adequate documentation. We apply these criteria to a set of stand growth models for simulation of a wide range of management alternatives in the Pacific Northwest. None of the candidate models is fully adaptable, but the Forest Vegetation Simulator came closest.

*Keywords: Model comparison, criteria, adaptability, forest growth models, Pacific Northwest.*

(See Portland order form.)

Zhou, X.; Mills, J.R.; Teeter, L.  
2003. Modeling forest type transitions in the southcentral region: results from three methods. *Southern Journal of Applied Forestry*. 27(3): 190-197.

In recent years much interest has developed about the dynamics of forest type transitions, especially the transitions of land to and from pine plantations. Forest inventory and analysis data were used to derive historical forest type transition matrices to represent future transitions among six forest types. Relative to these historical rates, forest landowners have a forward-looking view of how these transitions will evolve. This paper presents the results of 50-year forest type projections developed from two sets of type transition matrices: the historical type transition matrices tracked transitions that occurred on an inventory plot during one remeasurement cycle, and the transition matrices developed from the

survey responses of the owners' intentions to regenerate stands following harvest. It also presents projections of timberland area and inventories made for eight states in the south-central United States by using a form of the aggregate timberland assessment system modified to accommodate type transitions. The projections are compared to the recent results of the 2000 RPA where a hybrid type transition approach was used.

*Keywords: Forest type transition, timber inventory projection, RPA timber assessment, land use, timberland area change, pine plantation, FIA data.*

(See Portland order form.)

## Genetics

Adams, K.L.; Cronn, R.; Percifield, R.; Wendel, J.F.

2003. Genes duplicated by polyploidy show unequal contributions to the transcriptome and organ-specific reciprocal silencing. *Proceedings of the National Academy of Sciences*. 100(8): 4649-4654.

Most eukaryotes have genomes that exhibit high levels of gene redundancy, much of which seems to have arisen from one or more cycles of genome doubling. Polyploidy has been particularly prominent during flowering plant evolution, yielding duplicated genes (homoeologs) whose expression may be retained or lost either as an immediate consequence of polyploidization or on an evolutionary timescale. Expression of 40 homoeologous gene pairs was assayed by cDNA-SSCP in natural (1-2 million years old) and synthetic tetraploid cotton (*Gossypium*) to determine if homoeologous gene pairs are expressed at equal levels following polyploid formation. Silencing or unequal expression of one homoeolog was documented for 10 of 40 genes

examined in ovules of *Gossypium hirsutum*. Assays of homoeolog expression in 10 organs revealed variable expression levels and silencing, depending on the gene and organ examined. Remarkably, silencing and biased expression of some gene pairs are reciprocal and developmentally regulated, with one homoeolog showing silencing in some organs and the other silenced in other organs, suggesting rapid sub-functionalization. Duplicate gene expression was examined in additional natural polyploids to characterize the pace at which expression alteration evolves. Analysis of a synthetic tetraploid revealed homoeolog expression and silencing patterns that sometimes mirrored those of the natural tetraploid. Both long-term and immediate responses to polyploidization were implicated, as were epigenetic causal factors. Data suggest that some silencing events may be epigenetically induced immediately by polyploidization and maintained over millions of years.

*Keywords: Polyploidy, Gossypium, cotton, homoeologs.*

(See Corvallis order form 1.)

Cedroni, M.L.; Cronn, R.C.; Adams, K.L.  
[and others]

2003. Evolution and expression of MYB genes in diploid and polyploid cotton. *Plant Molecular Biology*. 51: 313-325.

R2R3-MYB transcription factors have been implicated in a diversity of plant-specific processes. Among the functions attributed to MYB factors is the determination of cell shape, including regulation of trichome length and density. Because MYB transcription factors are likely to play a role in cotton fiber development, the molecular evolutionary properties of six MYB genes previously shown to be expressed in cotton fiber initiation were examined. In accordance with

their presumed central role, each of the genes displays conservative substitution patterns and limited sequence divergence in diploid members of the genus *Gossypium*, and this pattern is conserved in allotetraploid cottons. In contrast to highly reiterated rDNA repeats, GhMYB homoeologues exhibit no evidence of concerted evolution, but instead appear to evolve independently in the allopolyploid nucleus. Expression patterns for the MYB genes were examined in several organs to determine if there have been changes in expression patterns between the diploids and the tetraploid, or between duplicated copies in the tetraploid. Spatial and temporal expression patterns seem to have been evolutionarily conserved, both during divergence of the diploid parents of allopolyploid cotton and following polyploid formation. However the duplicated copies of MYB1 in the tetraploid are not expressed at equal levels or equivalently in all organs, suggesting possible functional differentiation.

*Keywords: Cotton, Gossypium, duplicate gene expression, evolution, gene family, MYB, polyploidy.*

(See Corvallis order form 1.)

Wendel, J.F.; Cronn, R.C.

2002. Polyploidy and the evolutionary history of cotton. *Advances in Agronomy*. 78: 139-186.

The cotton genus (*Gossypium*) includes about 50 species distributed in semiarid regions of the tropics and subtropics. Included are four species that independently have been domesticated for their fiber, two each in Africa-Asia and the Americas. *Gossypium* species exhibit extraordinary morphological variation, ranging from herbaceous perennials to small trees with a diverse array of reproductive and vegetative characteristics. A parallel level of cytogenetic and genomic

diversity has arisen during the global radiation of the genus, leading to the evolution of eight groups of diploid ( $n = 13$ ) species (genome groups A through G, and K). The evolutionary history of the genus has included multiple episodes of transoceanic dispersal, invasion of new ecological niches, and a surprisingly high frequency of natural interspecific hybridization among lineages that presently are both geographically isolated and intersterile. Recent investigations have clarified many aspects of this history, including relations within and among the eight genome groups, the domestication history of each of the four cultivated species, and the origin of the allopolyploid cottons. Allopolyploid cottons appear to have arisen within the last million years, as a consequence of transoceanic dispersal of an A-genome taxon to the New World followed by hybridization with an indigenous D-genome diploid. Subsequent to formation, allopolyploids radiated into three modern lineages, including those containing the commercially important species *G. hirsutum* and *G. barbadense*. Genome doubling has led to an array of molecular genetic interactions, including interlocus concerted evolution, differential rates of genomic evolution, intergenomic genetic transfer, and probable alterations in gene expression. The myriad underlying mechanisms also are suggested to have contributed to both ecological success and agronomic potential.

*Keywords: Polyploidy, Gossypium, cotton.*

(See Corvallis order form 2.)

Wendel, J.F.; Cronn, R.C.; Alvarez, I.  
[and others]

2003. Intron size and genome size in plants.  
*Molecular Biology*. 19(12): 2346-2352.

We studied the relationship between intron size and genome size for orthologous genes from diploid and allopolyploid species of *Gossypium*

(cotton) and from taxa representing its phylogenetic outgroup. Our data unequivocally show that intron size and genome size are uncoupled. It may well be that this will turn out to be common in plants.

*Keywords: Molecular evolution, cotton, Gossypium, C value, DNA content variation.*

(See Corvallis order form 2.)

## Geomorphology and Hydrology

Anderson, J.K.

2002. Patterns in stream geomorphology and implications for hyporheic exchange flow. Corvallis, OR: Oregon State University. 82 p. M.S. thesis.

Changes in the size, spacing, and character of slope breaks in stream water surface profiles are predictable based on drainage basin area and stream reach gradient. The spacing between slope breaks increases, and the size of steps decreases with increasing drainage basin area. Models incorporating distances between slope breaks as a scaling metric can be used to make reasonable predictions for the shape of the water surface profile at different points along the river continuum.

*Keywords: Stream/fluviol geomorphology, hydrology, hyporheic zone.*

(Available through library and interlibrary loan.)

Gatzliolis, D.; Fried, J.S.

2003. An investigation of the influence of digital elevation model inaccuracies on terrain-based delineation of drainage networks. In: Arthaud, G.J.; Barrett, T.M., eds. *Systems analysis in forest resources*. Dordrecht, The Netherlands: Kluwer Academic Publishers: 105-107.

Precise delineation of ephemeral and perennial drainage networks is increasingly important to forest managers seeking to achieve fine-grained linking of ground-based measurements of vegetation and remote sensing data to address issues concerning riparian forest systems. Existing maps and digital coverages often contain

errors making them unsuitable for spatial overlay and buffer impact assessment. We investigated via simulation the effect of intentionally introduced DEM errors on the delineation of the drainage network for a small, mid-Michigan watershed.

*Keywords: Grid-based hydrologic modeling, DEM errors.*

(See Portland order form.)

Wondzell, S.M.; King, J.G.

2003. Postfire erosional processes in the Pacific Northwest and Rocky Mountain regions. *Forest Ecology and Management*. 178: 75-87.

Erosional processes are controlled, or affected, by the prevailing climate, geology, and topography and produce characteristic differences in erosion across regions. Regional differences are further accentuated by differences in the degree to which vegetation regulates erosion and by disturbances that disrupt vegetation. Because vegetation is an important factor controlling erosion, wildfire can accelerate erosion rates in most forest ecosystems. Surface erosion is a dominant response to wildfire in the interior Northwest but has not been documented for the Pacific Northwest. Debris slides and debris flows are more frequent after wildfire in both regions, typically resulting from soil saturation and loss of cohesion provided by roots following fire. However, overland flow can also generate debris flows in the interior Northwest, but this has not been observed in the Pacific Northwest. Episodic erosional events after wildfire dominate long-term erosion budgets for steep, mountainous forest regions.

*Keywords: Erosion, fire, surface erosion, debris slides, debris flows, ravel.*

(See Olympia order form.)

## Land Use

Kline, J.D.

2003. Characterizing land use change in multidisciplinary landscape-level analyses. *Agricultural and Resource Economics Review*. 32(1): 103-115.

Economists increasingly face opportunities to collaborate with ecologists on landscape-level analyses of socioeconomic and ecological processes. This often calls for developing empirical models to project land use change as input into ecological models. Providing ecologists with the land use information they desire can present many challenges regarding data, modeling, and econometrics. This paper provides an overview of relatively recent adaptation of economics-based land use modeling methods toward greater spatial specificity desired in integrated research with ecologists. Challenges presented by data, modeling, and econometrics are highlighted, followed by an example based on a multidisciplinary landscape-level analysis in Oregon's Coast Range.

*Keywords: Spatial land use, landscape models, forest/urban interface, ecological economics.*

(See Corvallis order form 1.)

Kline, J.D.

2003. Private forest management in urbanizing landscapes. In: Teeter, L., ed. *Proceedings: global initiatives and public policies: first international conference on private forestry in the 21<sup>st</sup> century*. Auburn, AL: Auburn University, School of Forestry and Wildlife Sciences: 141-143.

Private forest lands face increasing pressures from growing human populations, resulting in the increasing encroachment of urban uses onto forested landscapes. Previous research suggests that increasing population densities can lead to reduced management and harvest among private forest owners. In this way, urban encroachment can adversely affect the future supply of timber produced by private forests

as well as alter habitat for terrestrial and aquatic species. Both outcomes are of particular interest in the United States where increasing public concern for ecological protection has led to reduced timber harvesting on public lands and greater reliance on private forest lands for future timber supplies. Meanwhile, socioeconomic change accompanying population growth and urbanization also can influence forestry activities by reshaping the political environment in which forestry takes place, with resulting changes in regulations and laws affecting forestry. In this paper, we examine the potential impacts of population growth, urban encroachment, and socioeconomic change on private forest management.

*Keywords: Urbanization, forest fragmentation, socioeconomic change.*

(See Corvallis order form 1.)

### **Land Use Economics**

Sohngen, B.; Alig, R.; Choi, S.

2003. Economic analysis of soil carbon in afforestation and forest management decisions. In: Kimble, J.M.; Heath, L.S.; Birdsey, R.A.; Lal, R., eds. *The potential of U.S. forest soils to sequester carbon and mitigate the greenhouse effect*. New York: CRC Press: 395-407. Chapter 24.

This paper shows how soil carbon can be included in traditional economic analysis of land use change and forest management. An empirical example is developed by using oak-hickory forests in the Midwestern United States. The results suggest that soil carbon dramatically increases the value of forests as carbon sinks. Forest management is sensitive to the rate of accumulation and potential losses of carbon at harvest when carbon is a valued commodity, particularly when the value of carbon sequestration increases. The paper also discusses alternative policy mechanisms that may be used to

promote carbon sink efforts in the United States. Our analysis suggests that land rental payments likely pay for carbon well in advance of when the carbon is actually accumulated, particularly if soil carbon accumulation is relatively low. Carbon growth subsidy and harvest tax or carbon rental schemes may be more efficient but will require additional information on both above- and belowground sequestration rates.

*Keywords: Carbon sequestration, carbon payments, carbon policy.*

(Available in bookstores and libraries.)

### **Landscape Ecology**

Black, A.E.; Morgan, P.; Hessburg, P.F.

2003. Social and biophysical correlates of change in forest landscapes of the interior Columbia basin, USA. *Ecological Applications*. 13(1): 51-67.

Understanding multiscale interactions among human activities and biophysical factors is a critical step toward managing for long-term ecosystem integrity. We assessed the role of several economic, demographic, cultural, climatic, topographic, and geologic factors in forest spatial pattern changes (from the 1930s to the 1990s) across 800 000 km<sup>2</sup> of the interior Northwest. We used general linear models and partial multiple regression analysis, supplemented by logistic and correlation analysis, to explore the interactions. Models explained 40 to 93 percent of total variation. Broad-scale social systems encompassing landownership, economic market structures, and cultural values appear in all significant models regardless of the response scale.

*Keywords: Biophysical assessment, change detection, Columbia River basin, social assessment, spatial pattern.*

(See Wenatchee order form.)



## Landscape Ecology

McKenzie, D.; Peterson, D.W.; Peterson, D.L. [and others]

2003. Climatic and biophysical controls on conifer species distributions in mountain forests of Washington state, USA. *Journal of Biogeography*. 30: 1093-1108.

We quantified relations between conifer species distributions and climatic and biophysical variables to provide better insight into the potential for redistribution of species on the landscape in response to climatic change. Data are from 10,653 mature, undisturbed stands in Washington state, USA. We compared simple climatic variables to biophysical variables derived from climatic variables. Climatic and biophysical variables were taken from the output of climatological and hydrological simulation models and estimated for each plot in the tree database. Generalized linear models were used to estimate the probability of occurrence of 14 conifer species as a function of climatic and biophysical predictors. Models were validated by a combination of bootstrapping and receiver operating characteristic curves. For the majority of species, we were able to fit variables representing both moisture and temperature gradients. By identifying the ecological niches of multiple species, we can forecast their redistribution on the landscape in response to climatic change, evaluate the predictions of simulation models, and alert managers to particularly sensitive or vulnerable ecosystems and landscapes.

*Keywords: Species distribution, mountain forests, climate change, conifers, generalized linear models, unimodal response.*

(See PWFSL order form.)

Pinay, G.; O'Keefe, T.; Edwards, R.; Naiman, R.J.

2003. Potential denitrification activity in the landscape of a western Alaska drainage basin. *Ecosystems*. 6: 336-343.

With  $^{15}\text{N}$  as a tracer, it has been shown that Pacific salmon are apparently important vectors of marine-derived nitrogen (MD-nitrogen) to oligotrophic freshwater systems and their riparian zones. Microbial denitrification in fresh waters and in riparian soils, however, has the potential to mimic the  $^{15}\text{N}$  signature of MD-nitrogen. We examined denitrification potentials in six biophysical patch types of the Lake Nerka catchment in southwest Alaska to develop a broader ecosystem context within which the relative importance of MD-nitrogen can be accurately assessed. We found significant pools of denitrifying bacteria in all the soils of the main landscape patch types of the catchment. The lowest denitrifying activity was measured in the peat bogs. A significant relation was found between soil organic matter and potential denitrification activity in three landforms. These three landscape structures also contained the most active denitrifying bacteria community. Finer soils of riparian zones along spawning streams host a larger and more active denitrifying community than those along nonspawning streams where finer sediments are not as prevalent. The high density of denitrifying bacteria in the riparian soils of spawning streams could contribute to the observed increased delta  $^{15}\text{N}$  in spawning stream riparian zones.

*Keywords: Landscape, denitrification, Alaska, riparian zone, salmon.*

(See Juneau order form.)

## Monitoring

Hemstrom, M.A.

2002. Late-successional forest monitoring in the Pacific Northwest. In: Busch, D.E.; Trexler, J.C., eds. *Monitoring ecosystems: interdisciplinary approaches for evaluating ecoregional initiatives*. Washington, DC: Island Press: 289-320. Chapter 11.

Monitoring the effectiveness of the Northwest Forest Plan in conserving and managing late-successional and old-growth forests requires an understanding of the Northwest Forest Plan goals, translation of those goals into measurable attributes, a conceptual model, and careful selection of monitoring indicators. This chapter summarizes the effectiveness monitoring methods and program, presenting the rationale, conceptual models, modeling indicators, anticipated thresholds and trends, and an example analysis from the Oregon Coast pilot monitoring test area. Monitoring the effectiveness of complex policy and management decisions is possible provided the monitoring plan can specify measurable indicators and thresholds of change. Monitoring complex ecological conditions over large landscapes can require substantial investment and may take years or decades to generate results. A proactive approach that predicts anticipated trends that would follow attainment of management goals can help managers avoid this time lag.

*Keywords: Effectiveness monitoring, old-growth forest, late-successional forest, remote sensing, Pacific Northwest forest.*

(Available in bookstores and libraries.)

## Plant Ecology

Berryman, S.D.

2002. *Epiphytic macrolichens in relation to forest management and topography in a western Oregon watershed*. Corvallis, OR: Oregon State University. 153 p. Ph.D. dissertation.

This dissertation describes patterns in epiphytic macrolichen community composition, diversity, and biomass across various stand types in the Blue River watershed of western Oregon. It first examines the relative importance of ecological factors such as stand age, remnant tree retention, and topography to lichen communities in the landscape. It then develops models for estimating epiphytic macrolichen biomass and uses these models to assess potential impacts of forest management strategies on future lichen biomass in the watershed.

*Keywords: Lichens, biodiversity, forest canopy.*

(Available through library or interlibrary loan.)

Luo, T.; Neilson, R.P.; Tian, H. [and others]  
2002. A model for seasonality and distribution of leaf area index of forests and its application to China. *Journal of Vegetation Science*. 13: 817-830.

We have constructed a phenological model of leaf area index (LAI) of forests based on three biological principles of leaf growth: (1) growth of leaf mass at stand age, (2) seasonal changes of leaf mass, and (3) geographical distribution patterns of leaf area index. We used it to predict LAI in China's forests. The simulated results show that this model is able to predict high LAI

values that are hardly detected by satellite. The predicted maximum LAI is consistent with field data. For major forest types, the predicted monthly LAI is closely related to field soil water contents, which indirectly indicated that the simulations are well based. Seasonal patterns of predicted monthly LAI in large areas are consistent with seasonal changes of satellite NDVI data, especially in the northeast forests and the forests growing on the Taiwan Mountains, the southeast Tibetan Plateau, and the Aertai Mountains. In July, predicted LAI values in northeast temperate and boreal forests are higher than in south tropical and subtropical forests, which is consistent with NDVI data.

*Keywords: Leaf area index, model, simulation, China, phenology, forests.*

(See Corvallis order form 1.)

Meinzer, F.C.; James, S.A.; Goldstein, G.; Woodruff, D.

2003. Whole-tree water transport scales with sapwood capacitance in tropical forest canopy trees. *Plant, Cell and Environment*. 26: 1147-1155.

We examine how whole-tree water transport properties scale with species-specific variation in sapwood water storage capacity. We hypothesized that constraints on relationships between sapwood capacitance and other water relations characteristics led to predictable scaling relationships between capacitance and whole-tree behavior. Small cylinders of sapwood from four tropical forest tree species selected to represent a range of wood density, tree size and architecture, and taxonomic diversity were used to generate moisture-release curves in thermocouple psychrometer chambers from which species-specific values of sapwood capacitance were calculated. Sapwood capacitance was then used

to scale several whole-tree water transport properties determined from measurements of upper branch and basal sap flow, branch water potential, and axial and radial movement of deuterated water ( $D_2O$ ) injected into the base of the trunk as a tracer. Sapwood capacitance ranged from 83 to 416  $kg/m^3/MPa$  among the four species studied and was strongly correlated with minimum branch water potential, soil-to-branch hydraulic conductance, daily utilization of stored water, and axial and radial movement of  $D_2O$ . The species-independent scaling of whole-tree water transport properties with sapwood capacitance indicated that substantial convergence in plant function at multiple scales was revealed by a simple scaling variable related to a biophysical property of water transport tissue.

*Keywords: Capacitance, D/H ratios, hydraulic conductance, plant water potential, sap flow.*

(See Corvallis order form 2.)

Warren, J.M.; Bassman, J.H.; Eigenbrode, S.  
2002. Leaf chemical changes induced in *Populus trichocarpa* by enhanced UV-B radiation and concomitant effects on herbivory by *Chrysomela scripta* (Coleoptera: Chrysomelidae). *Tree Physiology*. 22: 1137-1146.

We monitored key leaf chemical constituents in relation to dietary characteristics of a specialist insect herbivore. Our results provide evidence that effects of UV-B radiation at the molecular-photochemical level can elicit significant responses at higher trophic levels.

*Keywords: Cottonwood, leaf beetle, plant-insect interactions, Salicaceae, ultraviolet radiation.*

(See Corvallis order form 2.)

Warren, J.M.; Bassman, J.H.; Fellman, J.K. [and others]

2003. Ultraviolet-B radiation alters phenolic salicylate and flavonoid composition of *Populus trichocarpa* leaves. *Tree Physiology*. 23: 527-535.

Foliar phenolic composition was investigated for cottonwood ramets subjected to ultraviolet-B radiation. Extracted phenolics were separated by HPLC and identified by using diode-array and mass spectrometry. Flavonoids increased in response to ambient UV-B radiation. Enhancement of UV-B radiation, from 1X to 2X ambient levels, resulted in increased salicortin. Increased salicortin explained 30 to 40 percent of the total (5 percent) increased UV-absorption potential of 2X-treated tissue. Salicylates also are important to plant-herbivore-predator relations. These findings suggest that by stimulating certain specific phenolics, enhanced solar UV-B radiation may significantly alter trophic structure in some ecosystems.

*Keywords: Cottonwood, phenolic glycosides, salicin.*

(See Corvallis order form 2.)

## Remote Sensing

Reutebuch, S.E.; Carson, W.W.

2002. Estimating forest parameters with high-resolution airborne imagery: a review of enabling technologies and applications. In: Greer, J.D., ed. Rapid delivery of remote sensing products: Proceedings of the 9<sup>th</sup> Forest Service remote sensing applications conference. Bethesda, MD: American Society for Photogrammetry and Remote Sensing: [Pages unknown].

Key enabling technologies have been developed over the past decade that allow more widespread and cost-effective use of airborne remote sensing data in forest measurement and sampling. The authors review key technological developments that are used with a variety of airborne sensors such as aerial film cameras, digital cameras, and multispectral and hyperspectral

sensors. They present results from a test of large-scale aerial photography (1:3,000) acquired over permanent sample plots in Montana. Finally, the authors outline natural resource applications in which high-resolution imagery can be used for estimating forest parameters.

*Keywords: Remote sensing, resource inventory.*

(See PWFSL order form.)

## Resource Inventory

Gray, A.

2003. Monitoring stand structure in mature coastal Douglas-fir forests: effect of plot size. *Forest Ecology and Management*. 175: 1-16.

National and regional interest in the distribution and trends of forest habitat structure and diversity has placed demands on forest inventories for accurate stand-level data. A primary need in the coastal Pacific Northwest is information on the extent and rate of development of mature forest structure. The objective of this study was to evaluate alternative sampling schemes within a standard national cluster-plot design able to efficiently determine density of large live trees and snags, tree mortality, and tree species richness. A simulation approach used stem maps from 19 permanent forest plots of at least 1 hectare (ha) dominated by mature *Pseudotsuga menziesii* (Douglas-fir) that had been sampled for up to 23 years. Clustered subplots sampling between 0.5 and 81 percent of the stand area were randomly located in stands to select mapped trees. Sample error analysis compared the deviation between sample data and full-stand values by subplot size for 30 iterations per subplot size per stand. Comparison with analyses of regional inventory plots allowed greater inference concerning results. Samples of at least 40 percent of a stand (four 18-meter [m] radius subplots) were required to reduce errors for estimated density of large trees (at least 122 centimeters [cm] d.b.h.) below 25 percent of true

density at least 66 percent of the time. For mortality, subplots sampling at least 50 percent of a stand were needed to reach errors below 50 percent of true mortality at least 66 percent of the time. However, for trees less than 75 cm d.b.h., the standard inventory sample of 0.07 ha with four 7.3-m radius subplots did meet these accuracy levels for density and mortality. Relatively large plots were required to estimate species richness within one species of tree richness, particularly for the relatively diverse smaller tree size classes. Efficient sampling of species richness could use species lists instead of measuring small trees on large plots. Reducing sample errors to acceptable levels will increase the utility of inventory plot data to evaluate stand structure, successional development, carbon sequestration, species diversity, and ground-truthing for remote sensing.

*Keywords: Plot size, inventory, old growth, stand structure, Pseudotsuga menziesii, Douglas-fir.*

(See Corvallis order form 1.)

## Silviculture

Deal, R.L.; Hennon, P.E.; Wipfli, M.S.; Orlikowska, E.H.

2003. Developing multi-functional forests using red alder in young-growth conifer stands of southeast Alaska, U.S.A. In: Proceedings of the IUFRO international interdisciplinary conference: uneven-aged forest management—alternative forms, practices, and constraints. Vantaa, Finland: Finnish Forest Research Institute: 1-3.

Red alder (*Alnus rubra* Bong.) appears to influence the productivity and structural diversity of young-growth conifer forests and affect the major resources (timber, wildlife, and fisheries) of forested ecosystems in southeast Alaska. We used an integrated, multidisciplinary approach to understand how red alder influences forest, wildlife, and aquatic resources in young-growth ecosystems. We investigated wood production (live and dead trees), understory vegetation, aquatic and riparian ecology, and fish occurrence across nonriparian, riparian, and associated headwater stream habitats. We sampled sites in 40-year-old red alder-conifer stands (primarily Sitka spruce [*Picea sitchensis* (Bong.) Carr.] and

western hemlock [*Tsuga heterophylla* (Raf.) Sarg.]) that developed following logging in two adjoining watersheds on Prince of Wales Island. We selected two distinct types of study sites: nonriparian, where the focus was to evaluate the influence of red alder on vegetation and wildlife habitat, and stream-riparian, where the focus was red alder effects on vegetation, invertebrates, woody debris, and fish. To integrate results, we used the proportion of red alder as a percentage of basal area of live trees as a common sampling variable for all forest, wildlife, and aquatic resources.

*Keywords: Silviculture, multifunctional forests, red alder, stand dynamics, mixed alder-conifer stands.*

(See Portland order form.)

Deal, R.L.; Tappeiner, J.C.; Hennon, P.E.  
2002. Developing silvicultural systems based on partial cutting in western hemlock-Sitka spruce stands of southeast Alaska. *Forestry*. 75(4): 425-431.

The effects of partial cutting on species composition, stand structure and growth, tree size distribution, and tree disease and mortality were evaluated on 73 plots in 18 stands that were harvested 12 to 96 years ago in southeast Alaska. Partially cut stands had diverse and highly complex stand structures similar to uncut stands. Sitka spruce was maintained in mixed hemlock-spruce stands over a wide range of cutting intensities. Basal area, tree species composition, and stand growth were predominantly from trees left after cutting. We did not detect significant changes in tree species composition, stand growth, hemlock dwarf mistletoe infection, and incidence of tree wounding or mortality rates with partial cuts. Silvicultural systems using partial cutting could provide a sustainable timber resource including more valuable spruce trees, while also maintaining stand structural diversity and old-growth characteristics.

*Keywords: Partial cutting, stand structure, silviculture systems, hemlock dwarf mistletoe, Sitka spruce, western hemlock, southeast Alaska.*

(See Portland order form.)

## Social Sciences

Cheng, A.S.; Kruger, L.E.; Daniels, S.E.  
2003. "Place" as an integrating concept in natural resource politics: propositions for a social science research agenda. *Society and Natural Resources*. 16: 87-104.

This article lays out six propositions centering on a relationship between people-place connections and strategic behavior in natural resource politics. The first two propositions suggest a strong and direct connection between self-identity, place, and how individuals perceive and value the environment. The third, fourth, and fifth propositions tie together social group identity and place, particularly emphasizing the influence of social group identity on strategic behavior in natural resource politics. The sixth proposition relates to the geographic scale of place as a strategic choice in natural resource decision-making. Taken together, the propositions suggest that natural resource politics is as much a contest over place meanings as it is a competition among interest groups over scarce resources.

*Keywords: Group identity, natural resource conflict, natural resource decisionmaking, natural resource policy analysis, sense of place.*

(See Juneau order form.)

Stankey, G.H.; Bormann, B.T.; Ryan, C.  
[and others]  
2003. Adaptive management and the Northwest Forest Plan: rhetoric and reality. *Journal of Forestry*. 101(1): 40-46.

Adaptive management represents a process to use management policies as a source of learning, which in turn can inform subsequent actions. However, despite its appealing and apparently straightforward objectives, examples of successful implementation remain elusive, and a review of efforts to implement an adaptive approach in the Northwest Forest Plan proves the point. Barriers include an institutional and regulatory environment that stymies innovation,

increasing workloads coupled with declining resources that constrain learning-based approaches, and a lack of leadership. The time is right to learn from experiences and consider alternatives.

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

(See Corvallis order form 2.)

## Threatened, Endangered, Sensitive Species

Raphael, M.G.; Mack, D.E.; Marzluff, J.M.; Luginbuhl, J.M.  
2002. Effects of forest fragmentation on populations of the marbled murrelet. *Studies in Avian Biology*. 25: 221-235.

The marbled murrelet is a threatened seabird that nests on branches of large trees within older coniferous forest in coastal areas of the Pacific Northwest. Surveys suggest that murrelets prefer to nest in contiguous stands of mature, complexly structured forest. We examined relations between the amount and pattern of nesting habitat at scales of the regions, watershed, and nest site. At the regional scale, abundance of murrelets, estimated from offshore surveys, is correlated with amount of nesting habitat in some areas and to a lesser extent with fragmentation of that habitat. We found a similar pattern at the watershed scale. At the scale of nest sites and surrounding stands, fragmentation may have greater effect. Observations of active nests indicate high failure rates, mostly owing to predation within such stands. Corvids have been implicated as primary predators. Forest fragmentation can affect the abundance and distribution of corvids, and thus it is possible that fragmentation might lead to higher rates of predation on murrelet nests.

*Keywords: Brachyramphus marmoratus, marbled murrelet, corvid, fragmentation, nesting habitat, nest predation, nest success.*

(See Olympia order form.)

## Wildlife

Aubry, K.B.; Lewis, J.C.

2003. Extirpation and reintroduction of fishers (*Martes pennanti*) in Oregon: implications for their conservation in the Pacific states. *Biological Conservation*. 114: 79-90.

In this paper we review causal factors for the extirpation of fisher populations in Oregon, document the history of fisher translocations to Oregon, describe the current distribution of fishers in Oregon, and discuss resulting implications for their conservation in the Pacific States. We show that extant populations of fishers in Oregon are restricted to two disjunct and genetically isolated populations: one in the southern Cascade Range and one in the northern Siskiyou Mountains. Fishers in the southern Cascade Range in Oregon are descended from translocated fishers that originated in British Columbia and Minnesota. The loss of fisher populations from Washington and northern and central Oregon has resulted in the isolation of extant populations in Oregon by more than 650 kilometers from those in southern British Columbia. Because of the extensive loss of fisher populations in the Pacific States, additional reintroductions may be required to restore fishers to their historical range.

*Keywords: Distribution, status, history, genetics, trapping, Martes pennanti, fishers.*

(See Olympia order form.)

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

2002. Employing stochastic differential equations to model wildlife motion. *Bulletin of the Brazilian Mathematical Society*. 33(3): 93-116.

Stochastic differential equations (SDEs) are used to describe the motion of particles in three-dimensional space; in this paper SDEs are used to describe the motion of wildlife, including a seal in a frozen lake in Alaska, an elephant seal migrating a great distance in the Pacific Ocean, and a group of "free-ranging" elk in a reserve in Oregon. Trajectories of the animals were

sampled about every 30 seconds, every 24 hours, and every two hours, respectively. For the elk, nonparametric estimates of the drift and variance terms of an SDE model are discussed and evaluated, and the fit of the model is assessed. A number of questions concerning diffusion processes are posed at the end of the paper.

*Keywords: Circadian rhythm, diffusion model, ringed-seal, elephant seal, elk, nonparametric regression, potential function, stochastic differential equation, vector field.*

(See La Grande order form.)

Lehmkuhl, J.F.; Loggers, C.O.; Creighton, J.H.

2002. Wildlife considerations for small diameter timber harvesting. In: Baumgartner, D.M.; Johnson, L.R.; DePuit, E.J., comps., eds. *Small diameter timber: resource management, manufacturing, and markets—symposium proceedings*. MISC 0509. Pullman, WA: Washington State University, Cooperative Extension Service: 85-92.

Extensive landscape analysis for the Interior Columbia Basin Ecosystem Management Project showed that forested landscapes in the interior Pacific Northwest are dominated by small-diameter trees as a result of previous management and wildfire in the 20<sup>th</sup> century. Old forest habitats have declined and become fragmented, and wildlife associated with them has become imperiled. These middle-aged, small-diameter stands might be actively managed to diversify vegetation (and hence, habitat) in the short term and accelerate development of characteristics of older forest in the long term. We discuss some wildlife management principles that public and private land managers can apply in small-diameter forests to benefit wildlife, briefly review what is known about impacts of thinning on wildlife, and suggest wildlife guidelines for small-diameter timber management.

*Keywords: Thinning, wildlife.*

(See Wenatchee order form.)

Noyes, J.H.; Johnson, B.K.; Dick, B.L.; Kie, J.G.  
2002. Effects of male age and female nutritional condition on elk reproduction. *Journal of Wildlife Management*. 66(4): 1301-1307.

We managed an elk population with a 78-km<sup>2</sup> enclosure to allow a single cohort of bulls to function as herd sires as they matured from 1½ to 5½ years. We estimated conception dates, pregnancy rates, age, body condition, and lactation status of cows killed in December. Conception dates occurred earlier as bull age increased. Low condition of cows bred by 4-year-old bulls in our study resulted in a mean conception date that did not differ from the other 4 years. Condition of cow elk was highest in 1995 when breeding was by yearling bulls. Pregnancy rates did not differ among age of bulls. Conception dates (adjusted for cow condition) pooled by age of bulls occurred earlier as bull age increased. The largest differences in mean conception dates were between yearling bull sires (4 October) and 5-year-old bull sires (20 September). Because of the many factors that affect calf elk survival, we stress the importance of understanding the interactions between age of bulls and nutritional condition of cows prior to interpreting the results of management strategies designed to retain older bulls.

*Keywords: Breeding, bull age, Cervus elaphus, conception date, elk, kidney fat index, nutritional condition, Oregon, pregnancy rate, reproduction.*

(See La Grande order form.)

## Wood Utilization

Lowell, E.C.; Barbour, R.J.  
2002. Opportunities and challenges of utilizing small diameter timber from fuel reduction thinning programs. ASAE Pap. 025004. St. Joseph, MI: American Society of Agricultural Engineers: [Pages unknown].

Trees being removed in fuel reduction treatments are often smaller in diameter than those historically removed in a timber harvest. There are many opportunities to use this material, but the resource characteristics must match the final product and a scale appropriate to the manufacturing method of the local community. Research has shown that this material is suitable for a number of products, ranging from structural lumber (small-diameter trees coming from suppressed stands seem to have properties similar to old growth), to cutstock (clearcuttings), to roundwood products (posts and poles). Using emerging technology to capture as much value from this resource as possible is key in offsetting treatment costs. Challenges associated with these treatments include conflicting expectations for forested landscapes, the economics of harvesting and hauling this material by using the existing infrastructure, and the tradeoffs of performing these activities where they are most needed.

*Keywords: Small-diameter timber, fuel reduction treatments, wood utilization, value-added products.*

(See Portland order form.)



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