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October 2002

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Pacific Northwest Research Station Publications

The following publications may be ordered by using the form on the inside back cover. Circle the code number for the publication.

Bibliographies

02-160

Pacific Northwest Research Station
2002. Recent publications of the Pacific Northwest Research Station, second quarter 2002. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 20 p.

Keywords: Bibliographies (forestry).

(This publication is available to download at http://www.fs.fed.us/pnw/qlist.htm.)

Economics

02-008

Gebert, K.M.; Keegan, C.E., III; Willits, S.; Chase, A.
2002. Utilization of Oregon's timber harvest and associated direct economic effects, 1998. Gen. Tech. Rep. PNW-GTR-532. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 16 p.

With more than 16 million acres of commercial timberland, Oregon's forest products industry is an important part of Oregon's economy and a major player in the Nation's wood products market. Despite declining production over the last decade, in 1998 Oregon was still the leading producer of softwood lumber and plywood in the United States, and the timber harvested in Oregon is the major supplier of the raw material used by Oregon's wood-processing mills. This report traces the flow of Oregon's 1998 timber harvest through the primary wood-using industries and investigates the relations between the harvest and key economic variables such as the value of production, employment, and workers' earnings. Also included is a section on Oregon's secondary wood products industry.

Keywords: Wood products industry, timber harvest, economic effects, employment, labor income, sales value, Oregon.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

01-315

Kilborn, K.A.
2002. Lumber recovery studies of Alaska sawmills, 1997 to 1999. Gen. Tech. Rep. PNW-GTR-544. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 15 p.

This report looks at solid wood product recovery based on the results of 23 studies conducted from April 1997 to July 1999 of 22 sawmills in Alaska (during these years, these mills represented over 90 percent of the state's annual lumber production). Results for all mills studied within the state were reviewed for differences (1) in recovery by regions of the state, (2) in recovery by size of operation, or (3) by type of break-down machinery. Two outstanding areas of opportunity to improve product recovery for nearly every sawmill within the state were reducing target thickness to eliminate oversizing and reducing sawing variation. There were no significant differences in product recovery when comparing studies by region, production level, or equipment type. Requirements of markets during

these years were definite factors in sawmills producing oversized products. There was less thickness variation within bandsaw breakdown equipment than with circular saw breakdown equipment. Followup studies conducted at sawmills where improvements have been made would document the value of the improvements.

Keywords: Alaska, sawmill, lumber, product recovery, forest products.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

01-243

Lindstad, B.H.

2002. A comparative study of forestry in Finland, Norway, Sweden, and the United States, with special emphasis on policy measures for nonindustrial private forests in Norway and the United States. Gen. Tech. Rep. PNW-GTR-538. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 35 p.

In recognition of the cultural, economic, and ecological importance of forestry in Finland, Norway, Sweden, and the United States, this paper compares forest resource data, ownership patterns, management issues, and the impact the forest sector has on the national economies of these four countries. There is particular emphasis on the analysis of policy measures that affect nonindustrial private forests (NIPFs) in Norway and the United States. This comparison of similarities and differences in the management of NIPFs serves to identify different solutions to common challenges faced by the forest sectors of Norway and the United States.

Keywords: Nonindustrial private forests, NIPFs, forest policy, forest regulations, ownership, taxation, economics, Finland, Norway, Sweden, United States, Nordic.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

01-307

Nicholls, D.L.

2002. Evaluation of the retail market potential for locally produced paper birch lumber in Alaska. Gen. Tech. Rep. PNW-GTR-493. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 17 p.

An evaluation of the retail market potential for random width paper birch lumber in Alaska was conducted. Information from lumber manufacturers and retail managers was used to identify current barriers toward customer acceptance of locally produced paper birch lumber. Major retail markets and paper birch producing regions throughout Alaska were considered in this study. Results indicate generally favorable retail market potential for Alaska paper birch with strong interest from both lumber producers and retail store managers. Key issues that were identified included (1) the ability of lumber producers to secure dependable log supplies, (2) consistent moisture content control and dimensional stability of kiln-dried lumber, and (3) appearance features that could potentially influence purchasing decisions, such as heartwood and sapwood variations. Finding suitable selling arrangements between relatively small lumber producers and retailers also was identified as a potential barrier toward successful sales programs. Recent trends in Alaska indicate that greater volumes of paper birch lumber are being kiln dried to the quality standards needed for retail market sales.

Keywords: Market potential, paper birch, lumber, wood products, Alaska.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

01-308

Nicholls, D.L.; Crimp, P.M.

2002. Feasibility of using wood wastes to meet local heating requirements of communities in the Kenai Peninsula in Alaska. Gen. Tech. Rep. PNW-GTR-533. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 17 p.

Wood energy can play an important role in meeting the energy needs of Alaska communities that have access to abundant biomass resources. In Alaska's Kenai Peninsula, a continuing bark-beetle (*Dendroctonus rufipennis* (Kirby)) infestation has created large volumes of standing dead spruce trees (*Picea* spp.). For this evaluation, a site in the Kenai-Soldotna area was chosen for a small industrial-scale (4 million British thermal units per hour) wood-fired hot water heating system, which could be fueled by salvaged spruce timber and also by sawmilling residues. Thirty-six different scenarios were evaluated by using wood fuel costs ranging from $10 to $50 per delivered ton, alternative fuel costs from $1 to $2 per gallon, and fuel moisture contents of either 20 percent or 50 percent (green basis). In addition, two different capital costs were considered. Internal rates of return ranged from less than 0 to about 31 percent, and project payback periods ranged from greater than 20 to 4 years. Potential barriers to the long-term sustainability of a wood energy system in the Kenai Peninsula include the availability of biomass material once current spruce salvage activities subside. The estimated wood fuel requirements of about 2,000 tons per year are expected to be easily met by spruce salvage operations over the short term, and by sawmill residues after salvage inventories diminish. It is expected that a wood energy system would not make a significant impact at reducing overall fuel loads in the area, but instead would be a good demonstration of this type of system while providing other community benefits and energy savings.

Keywords: Wood energy, biomass resources, Alaska.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

01-053

Zhu, S.; Buongiorno, J.; Brooks, D.J.

Global effects of accelerated tariff liberalization in the forest products sector to 2010. Res. Pap. PNW-RP-534. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51 p.

This study projects the effects of tariff elimination on the world forest sector. Projections were done for two scenarios: progressive tariff elimination according to the schedule agreed to under the current General Agreement on Tariff or Trade; and complete elimination of tariffs on wood products as proposed within the Asia-Pacific Economic Cooperation accelerated tariff liberalization initiative. Projections were made by using the global forest products model that provides equilibrium projections of prices and quantities produced, consumed, and traded for 14 commodity groups. Key assumptions include rate of economic growth, availability of wood, demand (price) elasticities, and tariff scenarios.

Keywords: Trade, trade policy, forest products, supply and demand.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

Fire

Ottmar, R.D.; Vihnanek, R.E.; Miranda, H.S. [and others]

2001. Stereo photo series for quantifying cerrado fuels in central Brazil–Volume 1. Gen. Tech. Rep. PNW-GTR-519. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 87 p.

Five series of single and stereo photographs display a range of natural conditions and fuel loadings in cerrado ecosystems in central Brazil. Each group of photographs is accompanied by information summarizing vegetation composition, structure and biomass, woody material biomass, and litter biomass. This photo series is designed to help users appraise fuel and vegetation conditions in natural settings.

Keywords: Cerrado, Brazil, biomass, fuels, photo series, savanna, campo limpo, campo sujo, cerrado ralo, cerrado sensu stricto*, cerrado* denso*.*

(To order a copy of this publication, write Robert Vihnanek at Seattle Forestry Sciences Laboratory, 4043 NE Roosevelt Way, Seattle, WA 98105.)

01-228

Tiedemann, A.R.; Woodard, P.M.

2002. Multiresource effects of a stand-replacement prescribed fire in the *Pinus contorta-Abies lasiocarpa* vegetation zone of central Washington. Gen. Tech. Rep. PNW-GTR-535. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 26 p.

A stand-replacement prescribed fire in an overmature lodgepole pine (*Pinus contorta* Dougl. ex Loud.)-subalpine fir (*Abies lasiocarpa* (Hook.) Nutt.) stand and in a mature lodgepole pine thicket resulted in lower plant diversity within the first year. As fire energy outputs increased, postburn plant cover and diversity decreased. Apparently, most plants were not fire resistant. Postfire recovery seems to depend on immigration of seeds from adjacent unburned areas or on seeds and rhizomes that survive on unburned microsites (refugia) within the burn. The first year after the fire, temperatures increased 10 to 19 °C in forest floor fermentative layer (FL) and 3 to 7 °C in the upper 10 centimeters of soil layer (SL) on several individual dates. After fire, counts of SL and FL total bacteria and proteolytic bacteria increased, and both nitrogen fixation and nitrification increased. Despite the apparent increase in microbiological activity, microbial respiration declined after burning, apparently because of reduced forest floor organic carbon energy reservoir. Diversity of birds increased 1 year after burning. New species of birds included three woodpecker species and mountain bluebird (*Sialia currucoides*). Needle-foraging birds declined or were absent after fire. Effects of fire on most small mammals were not definitive, but there was a marked decline in Townsend's chipmunks (*Tamias townsendii*). In the first year after burning, forage for elk (*Cervus elaphus*) in the burned area was higher in crude protein than in unburned areas, but low productivity and distance from water diminished the value of the burned area for elk.

Keywords: Forest succession, forest floor, understory vegetation, fuels, soil physical properties, wildlife, snags, downed wood, microbial populations, nitrification, nitrogen fixation, small mammals, birds, elk.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

Forest Management

01-177

Haynes, R.W.; Monserud, R.A.

2002. A basis for understanding compatibility among wood production and other forest values. Gen. Tech. Rep. PNW-GTR-529. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 46 p.

In the public debate over forest management, many issues are portrayed as tradeoffs between biophysical and socioeconomic components of ecosystems. This simplistic portrayal ignores potential opportunities for compatible changes in outputs (either goods or services) between alternative management strategies. In response, a research effort called the wood compatibility initiative (WCI) builds on an extensive body of existing work to examine biophysical and socioeconomic compatibility of managed forests. In this paper, we begin by introducing the conceptual model for the initiative, the scale of analysis, and the overall research strategy. After a short discussion on joint production, we provide concrete research examples of compatible wood production at four scales: the stand level, the watershed/landscape level, the ecological province level, and the regional level. These examples are intended to highlight the progress of the WCI during the first 3 years (1998-2000). We then discuss our progress toward understanding compatibility, especially with respect to four key research questions that address the extent to which this information enables us to judge compatibility between wood production and other forest values. Finally, we present our strategy for synthesizing this broad collection of research information on compatible wood production.

Keywords: Joint production, compatible production, forest management research.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

02-056

Rapp, V.

2002. Restoring complexity: second-growth forests and habitat diversity. Science Update. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. May(1): 1-10.

Many areas dedicated to old-growth values on federal lands are fragmented by patches of young second-growth forests planted after timber harvest. When, and if, these conifer plantations develop the characteristics of old-growth forests, then larger parts of the forested landscape will function as complex old forests. Such complex forests would more likely support the full range of biodiversity associated with old-growth forests. Recent scientific research offers some intriguing insights into the processes of forest development that lead to complex forests and habitat diversity. These findings suggest that there are several options for managers. One option is to let conifer plantations develop old-growth characteristics as a result of natural events over time. Another option is to thin the stands in order to restore habitat diversity more quickly and accelerate the development of old-growth characteristics in

conifer plantations. Habitat improvement activities can increase the likelihood that stands would develop the complexity typical of old-growth forests. In dense, uniform conifer plantations, one or more variable-density thinnings could promote increases in biological diversity in the next one to three decades.

Keywords: Old growth, second growth, habitat diversity, late successional reserves, LSRs, thinning, variable density.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

Invertebrates

01-201

Werner, R.A.

2002. Effect of ecosystem disturbance on diversity of bark and wood-boring beetles (Coleoptera: Scolytidae, Buprestidae, Cerambycidae) in white spruce (*Picea glauca* (Moench) Voss) ecosystems of Alaska. Res. Pap. PNW-RP-546. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 15 p.

Fire and timber harvest are the two major disturbances that alter forest ecosystems in interior Alaska. Both types of disturbance provide habitats that attract wood borers and bark beetles the first year after the disturbance, but populations then decrease to levels below those in undisturbed sites. Populations of scolytids, buprestids, and cerambycids are compared 1, 5, and 10 years after burning and timber harvest on flood-plain and upland white spruce sites. This paper reports the effects of ecosystem disturbance, such as silvicultural practices and prescribed fire, on the diversity of wood-inhabiting bark beetles and wood borers in upland and flood-plain white spruce stands in interior Alaska.

Keywords: Bark beetles, wood borers, prescribed fire, timber harvest, silvicultural practices, white spruce, Picea glauca*.*

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

01-200

Werner, R.A.; Holsten, E.H.

2002. Use of semiochemicals of secondary bark beetles to disrupt spruce beetle attraction and survival in Alaska. Res. Pap. PNW-RP-541. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 11 p.

Field experiments using baited multiple-funnel traps and baited felled trees were conducted to test the hypothesis that semiochemicals from secondary species of scolytids could be used to disrupt spruce beetle (*Dendroctonus rufipennis* (Kirby)) attraction. Semiochemicals from three secondary species of scolytids, *Ips perturbatus* (Eichhoff), *Dryocoetes affaber* (Mannerheim), and *Polygraphus rufipennis* (Kirby) were used to disrupt spruce beetle trap catches and reduce attacks on felled trees. Trap catches of spruce beetles were reduced by the combinations of semiochemicals from these secondary scolytids and the addition of methylcyclohexenone to these semiochemicals. The results indicate that inducing attacks by *I. perturbatus* and *D. affaber* on felled susceptible host trees by using semiochemicals could be a viable method to minimize spruce beetle attack and brood development.

Keywords: Dendroctonus rufipennis*,* Ips perturbatus*,* Dryocoetes affaber*,* Polygraphus rufipennis*, bark beetle, disruption, semiochemicals, Lutz spruce,* Picea lutzii*, Alaska.*

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

Monitoring

01-405

Campbell, S.; Azuma, D.; Weyermann, D. 2002. Forests of western Oregon: an overview. Gen. Tech. Rep. PNW-GTR-525. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 27 p.

This publication provides highlights of forest inventories and surveys from 1993 to 2000. It presents both traditional and nontraditional information about western Oregon's forests. The amount of forest land in western Oregon has changed little since the earliest inventory in 1930. About 80 percent of western Oregon is forested. Fifty different tree species were tallied in forest inventories during the 1990s, with Douglas-fir the predominant species in all ecological units in western Oregon. About 52 percent of western Oregon forests are managed by the USDA Forest Service, USDI Bureau of Land Management, and other federal agencies; about 41 percent are privately owned; and the remaining 7 percent are managed by the Oregon Department of Forestry and other nonfederal public agencies. Growth of trees in western Oregon exceeds the amount removed by harvest and mortality. One-third of inventory plots on nonfederal land have one or more noxious weeds. Down wood and snags are important forest components and were tallied in these last inventories. Western spruce budworm, bark beetles, root diseases, dwarf mistletoe, and Swiss needle cast affected many acres of forest land in western Oregon from 1987 to 2000. Lichens, as indicators of air pollution, climate, and forest age and structure, have been tallied on a portion of western Oregon inventory plots beginning in 1998. Monitoring for ozone injury on several sensitive forest species also was begun in 1998; no ozone injury has been detected in western Oregon.

Keywords: Western Oregon, forest land, timberland.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

01-076a

Hall, F.C. 2002. Photo point monitoring handbook: part A–field procedures. Gen. Tech. Rep. PNW-GTR-526. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 48 p. 2 parts.

This handbook is part A of a two-part set. It describes quick, effective methods for documenting change in vegetation and soil through repeat photography. It discusses three critical elements: (1) maps to find the sampling location and maps of the photo monitoring layout; (2) documentation of the monitoring system to include purpose, camera and film, weather, season, sampling system, and equipment; and (3) precise replication in the repeat photography.

Keywords: Monitoring, photography.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

01-076b

Hall, F.C. 2002. Photo point monitoring handbook: part B–concepts and analysis. Gen. Tech. Rep. PNW-GTR-526. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 86 p. 2 parts.

This handbook is part B of a two-part set. In part B, (1) concepts and procedures required to use photographs for analyzing change in photographs are presented, (2) monitoring equipment specifications are presented, and (3) forms for recording information and mounting photographs are provided.

Keywords: Monitoring, photography.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

Plant Ecology

01-182

Mead, B.R.

2002. Constancy and cover of plants in the Petersburg and Wrangell Districts, Tongass National Forest and associated private and other public lands, southeast Alaska. Res. Pap. PNW-RP-540. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 112 p.

This study was undertaken to provide a comprehensive and inclusive description and inventory of the vegetation within the Stikine area of southeast Alaska. Private and other public lands were included as well as Tongass National Forest lands contained in the Petersburg and Wrangell Ranger Districts. Constancy and foliar cover tables are presented, and the methods used to estimate occurrence in the area are described and discussed.

Keywords: Alaska, southeast, foliar cover, species constancy, inventory, plant ecology, Stikine, Wrangell, Kake, Petersburg, Tongass, Zaremo, Kuiu, Kupreanof, Etolin, Cleveland Peninsula, temperate rain forest, species composition, Alaska vegetation classification system.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

Range Management

01-093

Beebe, J.; Everett, R.; Scherer, G.; Davis, C.

2002. Effect of fertilizer applications and grazing exclusion on species composition and biomass in wet meadow restoration in eastern Washington. Res. Pap. PNW-RP-542. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 15 p.

Fertilizer applications and grazing exclusion were used as restoration strategies in degraded wet meadows in eastern Washington to grow biomass in the root systems where it could not be grazed. We used a split-block design to test vegetation responses to six fertilizer rates, eight fertilizer types, and three grazing treatments after three growing seasons. Little change in plant composition was detected, but weed biomass was reduced by 50 percent in cattle plus elk grazing. Although forb shoot biomass did not increase, grass shoot biomass doubled but was influenced by grazing treatments. Root biomass doubled under fertilizer applications. A 10-percent decline in soil bulk density suggested a reduction in soil compaction. These responses were attributed to the increased root biomass. Optimum fertilization rates of 100 kg/ha were recommended along with carefully administered grazing schedules for meadow community restoration.

Keywords: Meadow restoration, grazing treatments, soil bulk density, root biomass, weed reduction, plant composition.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

Recreation

02-001

Quinn, T.

2002. A public utility model for managing public land recreation enterprises. Gen. Tech. Rep. PNW-GTR-543. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 22 p.

Through review of relevant economic principles and judicial precedent, a case is made that public-land recreation enterprises are analogous to traditionally recognized public utilities. Given the historical concern over the societal value of recreation and associated pricing issues, public-land management policies failing to acknowledge

these utilitylike characteristics and a subsequent agency regulatory responsibility are shown to be deficient. Existing institutional barriers, however, sometimes limit the options available to agency managers. Eight strategies for performance enhancement are offered.

Keywords: Public land, recreation, concessioner, public utilities, government regulation, National Park Service, USDA Forest Service, monopolies, public goods..

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

Regional Assessments

02-004

Quigley, T.M.; Gravenmier, R.A.; Graham, R.T., tech. eds.

2001. The interior Columbia basin ecosystem management project: project data [CD-ROM]. Misc. Publ. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station; U.S. Department of the Interior, Bureau of Land Management.

This CD-ROM set contains a series of five CD-ROMs that include digital versions of the spatial data, databases, metadata, and major scientific publication graphics compiled in support of the Interior Columbia Basin Ecosystem Management Project (ICBEMP). Developed to provide end users with readily available geographic information, this CD-ROM set has created a practical way to easily access the large amount of ICBEMP data and information without having to download the information from the project Web site (http://www.icbemp.gov).

Keywords: Columbia basin, data, geographic information system, databases, metadata.

Silviculture

01-172

Marshall, D.D.; Curtis, R.O.

2002. Levels-of-growing-stock cooperative study in Douglas-fir: report no. 15–Hoskins: 1963-1998. Res. Pap. PNW-RP-537. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 80 p.

The levels-of-growing-stock (LOGS) study in Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) was begun to study the relations between growing stock, growth, cumulative wood production, and tree size in repeatedly thinned stands. This report summarizes results from the Hoskins installation through age 55. Growing stock has been allowed to accumulate for 19 years since the last treatment thinning was applied to this high site class II natural stand. Volume and diameter growth were strongly related to growing stock. Basal area growth-growing stock relations were considerably weaker. Differences in tree size and volume distribution were considerable. Culmination of mean annual increment has not occurred for any of the treatments, although the control has culminated for total stem cubic volume and is near culmination for merchantable cubic volume. Only small differences are seen in growth percentages between thinning treatments. Results demonstrate potential flexibility in managing Douglas-fir to reach a range of objectives.

Keywords: Thinning, growing stock, growth and yield, stand density, Douglas-fir, Pseudotsuga menziesii*, series-Douglas-fir LOGS.*

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

Social Sciences

Raettig, T.L.; Elmer, D.M.; Christensen, H.H. 2001. Atlas of social and economic conditions and change in southern California. Gen. Tech. Rep. PNW-GTR-516. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 66 p.

The spatial and temporal dimensions of social and economic changes in southern California in the decade since 1987-88 are displayed in this atlas. Maps, interpretive text, and accompanying tables and graphs portray conditions, trends, and changes in selected social, economic, and natural resource-related indicators for the 26 counties of the diverse region during a period of particularly rapid and intense demographic, social, and economic change. This information about the people, communities, and resources of the region serves as a basic tool for natural resource planners and managers, economic development practitioners, and citizens interested and involved in the future of the region. It is a baseline for monitoring and evaluating potential impacts of ecosystem management strategies.

Keywords: Southern California, conservation strategy, social and economic indicators, GIS, atlas, regional scale, county scale.

(To order a copy of this publication, write Pat Winter, Pacific Southwest Research Station, 4955 Canyon Crest Drive, Riverside, CA 92509.)

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

01-330

Shindler, B.A.; Brunson, M.; Stankey, G.H. 2002. Social acceptability of forest conditions and management practices: a problem analysis. Gen. Tech. Rep. PNW-GTR-537. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 68 p.

Public acceptance of social acceptability is an element in virtually all resource management decisions facing public agencies today. Social acceptability involves varied and numerous factors that are just beginning to be understood and given credence by resource professionals. In this analysis, we describe the social acceptability concept and identify 10 key problem areas that need indepth consideration in order to make progress toward lasting, durable decisions about forest conditions and practices on federal lands. This report serves to improve understanding of the complex sociopolitical processes in resource management and helps structure the management responses to conflict and contentiousness, misunderstanding among participants, and failed citizen-agency interactions.

Keywords: Social acceptability, forest management, decisionmaking, public participation, strategic planning.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

01-203

Taylor, D.E. 2002. Race, class, gender, and American environmentalism. Gen. Tech. Rep. PNW-GTR-534. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51 p.

This paper examines the environmental experiences of middle and working class Whites and people of color in the United States during the 19th and 20th centuries. It also examines their

activism and how their environmental experiences influenced the kinds of discourses they developed. The paper posits that race, class, and gender have profound effects on people's environmental experiences, activism, and social construction of environmental discourses.

Keywords: Environmental discourses, environmental movement, activism, environmental justice, social justice, gender, class, race, wilderness, wildlife, urban parks, civil rights, outdoor recreation, African Americans, Native Americans, Asians, Chicanos, Whites.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

Wildlife

01-276

Bull, E.L.; Deal, J.W.; Hohmann, J.E.
2001. Avian and amphibian use of fenced and unfenced stock ponds in northeastern Oregon forests. Res. Pap. PNW-RP-539. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 9 p.

The abundance of birds and amphibian larvae was compared between fenced and unfenced stock ponds in 1993 to determine if fencing improved the habitat for these species in northeastern Oregon. Fenced stock ponds had significantly higher densities of bird species, guilds, and taxonomic groups than unfenced stock ponds. No differences in the relative abundance of larvae of Pacific treefrogs (*Pseudacris regilla*) or long-toed salamanders (*Ambystoma macrodactylum*) were found between fenced and unfenced ponds. Fencing at least a portion of stock ponds in forested areas provides habitat for a greater diversity and abundance of birds.

Keywords: Amphibians, birds, livestock grazing, northeastern Oregon, stock ponds.

(This publication is available to download in pdf at http://www.fs.fed.us/pnw/pubs.htm.)

Publications Available Elsewhere

The following publications are available through interlibrary loan, by writing to the locations indicated, or by using the form indicated.

Ecosystem Structure and Function

Gomi, T.; Sidle, R.C.; Bryant, M.D.; Woodsmith, R.D.

2001. The characteristics of woody debris and sediment distribution in headwater streams, southeastern Alaska. Canadian Journal of Forest Research. 31: 1386-1399.

Large woody debris (LWD), fine woody debris (FWD), fine organic debris, and sediment accumulation were measured in 15 steep headwater streams with five management and disturbance regimes. Clearcut channels logged in 1995 contained large accumulations of logging residue that provided sites for sediment storage. One-half of the LWD in older clearcut channels in young-growth conifer channels was recruited during and after logging and remained for 37 years after logging. The amount of LWD in clearcut and young-conifer channels was significantly higher than in old-growth channels. Channels in young alder riparian forest that experienced recent (1979 and/or 1993) and earlier (1961 and/or 1979) landslides or debris flows contained less LWD and FWD. Most LWD and FWD were found in deposition zones. The recruitment of LWD and FWL from young alder stands resulted in a higher ratio of sediment stored behind woody debris to total sediment volume than in channels with recent landslides. The number of LWD and FWD was significantly correlated with the volumes of sediment stored behind woody debris. Management practices and soil mass movement modified LWD, FWD, and sediment storage and transport of headwater channels.

Keywords: Headwater streams, large wood, sediment, geomorphology, forest practices.

(See Juneau order form.)

Youngblood, A.

2001. Old-growth forest structure in eastern Oregon and Washington. Northwest Science. 75(Special issue): 110-118.

Old-growth forest structure is an important issue in managing for forest health and productivity in eastern Oregon and Washington. Old-growth forest structure is estimated to be as little as 3 percent of presettlement levels; what remains is in isolated patches and is at risk of loss from less frequent but more severe fires. Low-elevation ponderosa pine and Douglas-fir stands are more densely stocked with increased fuel and often represent compositional shifts to more lodgepole pine and grand fir. The changes are attributed to changes in natural disturbance regimes as a result of management of fire, grazing, timber harvest, wildlife, insects, and disease. Treatments that can accelerate development of old-growth forest structure include thinning to accelerate growth on residual stems, returning fire to fire-dependent ecosystems, and maintaining large trees and snags. These methods have risks: prescribed fire may not mimic frequency and severity of historical fire, thinning may activate dormant stem decay, increased connectivity may increase susceptibility to stand-replacement fire, insects, and pathogens. Models for multiple species and interactions of treatments, insects, and disease are not available.

Keywords: Old-growth forest, disturbance processes, forest management, forest health and productivity.

(See La Grande order form.)

Fire

Diaz-Avalos, C.; Peterson, D.L.; Alvarado, E. [and others]
2001. Space-time modelling of lightning-caused ignitions in the Blue Mountains, Oregon. Canadian Journal of Forest Research. 31: 1579-1593.

Generalized linear mixed statistical models were used to investigate the space-time relation of wildfire activity in the Blue Mountains of Oregon. High ignition probabilities were found in several vegetation types at the lower values of their elevation range. While the entire area showed high ignition probabilities in the summer, during spring and fall, the probability is generally higher in the southern Blue Mountains than in the northern part. By using this statistical method, other more complex relations were discovered in the complex biophysical environment.

Keywords: Wildfire, lightning-caused fire, space-time modeling, statistical modeling, Blue Mountains, Oregon.

(See Seattle order form.)

Donnegan, J.A.; Veblen, T.T.; Sibold, J.S.
2001. Climatic and human influences on fire history in Pike National Forest, central Colorado. Canadian Journal of Forest Research. 31: 1526-1539.

We investigated interannual and multidecadal variability in fire regimes, as related to climate and human land use in Pike National Forest, central Colorado. Short- and long-term trends in fire-scar records were related to tree-ring proxy records of moisture availability and to variability in El Niño-Southern Oscillation (ENSO). Fire occurrence is strongly tied to interannual drought conditions and is associated with cycles of ENSO. Fire events tend to occur in years of reduced moisture availability (La Niña years) and are often preceded by 2 to 4 years of increased moisture availability (El Niño years). A period of reduced variability in the tree-ring record from 1770 to 1830 A.D. roughly corresponds to a period of reduced fire occurrence from about 1792 to 1842. Coincident with increased fire occurrence, variability in the climate proxies was high in the mid- to late-1800s until the early 1900s. Multidecadal impacts through land also are evident in the fire record with sharp increases during Euro-American settlement about 1850 and abrupt declines with the start of active fire suppression about 1920. Humans and climatic variation appear to have interacted synergistically to create long-term trends in fire occurrence over the past two centuries.

Keywords: Colorado, climatic variation, dendrochronology, El Niño-Southern Oscillation, fire regimes.

(See Portland order form.)

Ottmar, R.D.; Sandberg, D.V.
2001. Wildland fire in eastern Oregon and Washington. Northwest Science. 75 (Special issue): 46-54.

Wildland fire is a major disturbance agent that shapes the forest health, productivity, and ecological diversity of eastern Oregon and Washington. Fire behavior and the effects of fire on flora, fauna, soils, air, and water are in large part driven by the availability of fuels to consume and the meteorological influences during a fire. Vegetation succession, disturbance processes, and management practices have resulted in an increase of fuels and vulnerability to extreme fire behavior and detrimental fire effects. Hazards of fire are further increased by encroachment of dwellings into forests and rangelands. Prescribed fire, selective logging, and mechanical fuel treatment are being used to reduce fire hazard, but there is disagreement as to the appropriate

balance and efficacy of these actions. New tools to (1) characterize fuelbeds; (2) predict mesoscale meteorology, fire behavior, fire effects, smoke production, and dispersal predictions; and (3) demonstrate tradeoffs between prescribed fire and other fuel treatment methods are continually being improved to assist with wildland fire and prescribed fire decisionmaking in eastern Oregon and Washington.

Keywords: Wildland fire, disturbance processes, land management, fuels.

(See Seattle order form.)

Fish

Bilby, R.E.; Fransen, B.R.; Bisson, P.A.; Walter, J.K.

1998. Response of juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead (*Oncorhynchus mykiss*) to the addition of salmon carcasses to two streams in southwestern Washington, U.S.A. Canadian Journal of Fisheries and Aquatic Sciences. 55: 1909-1918.

Availability of organic matter and nutrients transported from the marine environment to streams by spawning salmon was increased in two small streams in southwest Washington by adding salmon carcasses from a nearby hatchery. Densities of age 0^+ coho salmon, and age 0^+ and 1^+ steelhead increased following carcass additions to the treated streams. A similar increase in density was not observed at the reference sites. Condition factors of salmonids in treated streams increased following carcass addition and remained at high levels while carcasses were present, whereas no similar pattern was observed at the reference sites. Weight of stomach contents of juvenile salmonids at treated sites was 9 to 55 times greater than at reference sites shortly after addition of the carcasses. Stable isotope analysis indicated that the proportion of marine-derived nitrogen in the muscle tissue of juvenile salmonids increased as much as 39 percent following carcass placement. Results suggest that eggs and carcasses of adult salmon provide important resources during a period when other food items are scarce.

Keywords: Coho salmon, Oncorhynchus kitsutch*, salmon carcasses, stream productivity.*

(See Juneau order form.)

Bryant, M.D.

2000. Estimating fish populations by removal methods with minnow traps in southeast Alaska streams. North American Journal of Fisheries Management. 20: 923-930.

Mark-recapture experiments in streams are often subject to unknown immigration or emigration between the mark sample and recapture sample. Depletion estimates using electrofishing equipment and block nets are often used as alternatives, but electrofishing in low conductivity water is not effective and often results in injury to fish. Passive methods, such as minnow traps, are not generally used for removal methods. Three or four sequential sample occasions with minnow traps set for 90-minute periods were used to estimate population numbers of coho salmon fry and juveniles, Dolly Varden, cutthroat trout, and juvenile steelhead with either the Zippen or generalized removal methods. Although concurrent population estimates made with the mark-recapture and removal were not significantly different, mark-recapture estimates were higher than removal estimates in most cases. In pools of three third- to fourth-order streams, more than 50 percent of the total catch was obtained during the first sample occasion and, in most cases, the catch during the fourth occasion was less than 15 percent. In most pools, the probability of

capture (P_c) was greater than 0.4, but lower P_c values were observed for coho salmon fry than other species. Results from this study show that reliable estimates can be obtained by using minnow traps using removal methods if procedures are followed that approximate the assumptions required for the method.

Keywords: Population dynamics, salmonid abundance, Oncoryhnchus kitsutch*, sampling methods.*

(See Juneau order form.)

Forest Management

Kie, J.G.; Lehmkuhl, J.F.
2001. Herbivory by wild and domestic ungulates in the Intermountain West. Northwest Science. 75(Special issue): 55-61.

Management of wild ungulates is seldom undertaken with a focus on the effects on forest health and productivity but rather focusing on populations of the ungulates and their habitat needs. Consequently, only limited research has examined grazing and browsing by ungulates on coniferous forests as a chronic disturbance factor affecting nutrient turnovers, competitive interactions among plant species, and rates and trajectories of successional pathways. Local effects are quite variable and depend on ecosystem productivity. Grazing can have mixed effects on species richness and the spread of exotic plants at the landscape scale. Grazing also can affect nitrogen fixation and rate of nitrogen mineralization. Ungulate density relative to carrying capacity of the site largely determines the effects of herbivory. High population densities of ungulates have been shown to change plant species composition, affect growth of trees, and damage regeneration. Grazing also reduces accumulation of fine fuels on the forest floor, which formerly carried low-intensity, high-frequency ground fires. Effects of wild ungulates can be controlled by hunting regulations, and in some cases, by artificial contraception. Effects of grazing by livestock can be controlled through management actions such as changes in livestock numbers, changes in timing and duration of grazing, altering livestock distribution with fencing and placement of salt and supplemental feed, and specialized rotational grazing systems.

Keywords: Ungulate herbivory, livestock grazing, disturbance processes, forest management, ungulate management.

(See La Grande order form.)

Quigley, T.M.; Hayes, J.L.; Starr, L.; Daterman, G.E.
2001. Improving forest health and productivity in eastern Oregon and Washington. Northwest Science. 75(Special issue): 234-251.

Decline in forest health and productivity in eastern Oregon and Washington has resulted in risks to products, economies, and amenities that are deemed unacceptable to many. Information and management tools exist that will assist managers in improving conditions, but a framework for integrating models and information is needed. Steps in developing a framework include (1) establish goals consistent across scales, (2) assess current conditions and risks, (3) develop management options, (4) describe outcomes of options, (5) establish priorities for action, (6) implement activities, and (7) monitor and evaluate results. Researchers at the Pacific Northwest Research Station will collaborate with managers to develop options for managing insects, disease, and fire disturbances in order to improve ecosystem integrity; integrate biophysical and socioeconomic factors; identify links across scales; and fill significant knowledge gaps at the mid or broad scale. Science can contribute basic understanding of resource conditions and interactions, models to assess risk and opportunities, models that predict future conditions, and

options regarding future management actions. Implementing actions depends on resources for planning and implementation, the financial feasibility of practices on individual sites, the resolve of resource specialists and the public to take action, and acceptance by the public, interest groups, agencies, and policymakers of the management actions proposed.

Keywords: Forest health and productivity, disturbance processes, forest management.

(See La Grande order form.)

Starr, L.; Hayes, J.L.; Quigley, T.M. [and others]
2001. A framework for addressing forest health and productivity in eastern Oregon and Washington. Northwest Science. 75(Special issue): 1-10.

Ecosystems in eastern Oregon and Washington have evolved in the presence of sporadic disturbances such as fire, floods, insects, and disease. Ecological and human factors have combined to change disturbance regimes, structure, and patterns resulting in declining health and productivity in forest and rangeland ecosystems. We expect that with improved understanding of disturbance processes and careful management of the drivers of disturbance, it is possible to enhance ecosystem resiliency. As an aid to managers in determining actions that may be successful in restoring resilience to ecosystems, we describe links among components that may enable managers to harness beneficial effects of disturbances while minimizing the adverse effects. A conceptual framework presented here identifies relations among factors that managers can influence and that are important to ecological processes and outcomes. Integrating social and economic components helps managers balance what the land will allow, what people want, and what society can afford. Influence diagrams help identify important links and the areas where research may help to weigh tradeoffs.

Keywords: Forest health and productivity, disturbance processes, forest management.

(See La Grande order form.)

Geomorphology and Hydrology

D'Amore, D.V.; Stewart, S.R.; Huddleston, J.H.; Glasmann, J.R.
2000. Stratigraphy and hydrology of the Jackson-Frazier wetland, Oregon. Soil Science Society of America Journal. 64: 1535-1543.

The relation between wetland soils and hydrology can be better understood by linking soil geomorphological features to the measurement of groundwater depths in the soil. Soil stratigraphic analysis and long-term measurements of soil water levels in piezometers were used at the Jackson-Frazier wetland in western Oregon to investigate the interaction between local geomorphological history and the hydrology of the wetland. Morphological descriptions confirm the presence of a recent smectitic alluvial deposit (80 to 100 cm) overlying Malpass clay (about 35 cm thick), which overlies Irish Bend silt. X-ray diffraction and isotope analysis support the conclusion of the presence of the Holocene alluvium and Irish Bend silt, but are inconclusive regarding the Malpass clay. Piezometer data from 1992 to 1996 show that the smectitic alluvium controls saturation and drying for the wetland surface, and that a separate water table is present below the Malpass clay in the Irish Bend silt. The recent alluvium and Malpass clay act as an acquitard that restricts the verticle infiltration of surface water and helps restrict the groundwater table in the Irish Bend silt deposit. These stratigraphic relations and associated hydrologic responses provide a means to identify wetlands and predict hydrologic conditions on similar wetland landscapes.

Keywords: Wetlands, oxidation-reduction, hydrology.

(See Juneau order form.)

Dutton, A.L.
2000. Process-based simulations of near-surface hydrologic response for a forested upland catchment: the impact of a road. Stanford, CA: Stanford University. 151 p. M.S. thesis.

The objective of this study was to understand the physical and hydrologic processes that control subsurface flow in a steep forested catchment within the H.J. Andrews Experimental Forest and the role logging roads play in altering the near-surface hydrologic processes. This study combines fieldwork, hydrologic modeling, and slope stability analysis to address the impact of a road in a typical forested western Oregon catchment.

Keywords: Hydrology, hydrologic modeling, roads.

(Available only through library or interlibrary loan.)

Genetics

Sorensen, F.C.; Mandel, N.L.; Aagaard, J.E.
2001. Role of selection versus historical isolation in racial differentiation of ponderosa pine in southern Oregon: an investigation of alternative hypotheses. Canadian Journal of Forest Research. 31: 1127-1139.

The geographic variation of ponderosa pine in southern Oregon shows a sharp break at the crest of the Cascade Range in traits associated with cold hardiness but not vigor. Source-related variation in vigor is greater east than west of the crest.

Keywords: Adaptation, climatic stress, clinal variation, geographic variation, natural selection, stepped cline, ponderosa pine, Pinus ponderosa*.*

(See Corvallis order form.)

Invertebrates

Hayes, J.L.; Daterman, G.E.
2001. Bark beetles (Scolytidae) in eastern Oregon and Washington. Northwest Science. 75(Special issue): 21-30.

Bark beetles are well described in terms of ecology, populations, and risk ratings for the six beetle species of concern in eastern Oregon and Washington: Douglas-fir beetles, mountain pine beetle, western pine beetle, spruce beetle, fir engraver, and to a limited extent, pine engraver. Life histories are well described, and growth models are available for some species. Many interactions between bark beetles and other agents are described. Wildfire, windstorms, disease, other insects, and land management practices can weaken trees and attract bark beetles that become locally epidemic. Beetles, in turn, can introduce pathogens and increase risk of wildfire. Beetles perform useful functions by creating habitat and forage for many organisms. In fact, beetle attractants have been used to create wildlife habitat. Natural control agents such as birds, predatory beetles, parasitoids, and parasites have been studied, but few studies focus on manipulating these agents for pest control. There are few effective monitoring or predictive tools. Pesticide sprays, attractants and antiaggregants, and baiting with tree removal have been useful in specific applications. Antiaggregants have proved useful in large-scale operations for Douglas-fir beetle. Salvage of infested, wind- or fire-damaged trees can prevent buildups if done promptly. Integrating these methods with prescribed fire and tree thinning has been recommended. Decision-support tools are limited to specific localities.

Keywords: Bark beetles, Dendroctonus pseudotsugae, Dendroctonus ponderosae, Dendroctonus brevicomis, Dendroctonus rufipennis, Scolytus ventralis, Ips pini*, insect pest management, disturbance processes, forest management.*

(See La Grande order form.)

LaBonte, J.R.; Scott, D.W.; McIver, J.D.; Hayes, J.L.

2001. Threatened, endangered, and sensitive insects in eastern Oregon and Washington forests and adjacent lands. Northwest Science. 75(Special issue): 185-198.

The integral roles of insects in forest ecosystems render them essential to forest health. Although most insect species in eastern Oregon and Washington forests are presumed to be abundant and secure, some may be rare or in decline. Fifteen east-side insect species are currently listed as threatened, endangered, or sensitive (TES). Reasons for their listing include peripheral populations, relict species, species with restricted habitats or hosts, and endemic species. Whether the needs of currently listed TES east-side forest insects are being met can only be ascertained if adequate information is available on their distribution, abundance, habitat requirements, and biology. This information, however, is lacking for many species. Five of the TES species discussed in this paper have poorly known distributions, and better information may change their status. Applying general principles for the conservation of invertebrate diversity may help prevent other east-side forest insects from being classed as TES and could aid species already listed. Many practices by federal land managers are helping to protect TES populations and habitat. Specific practices, such as preservation of key habitats at risk, may be necessary to prevent the decline or local extinction of some TES insects. Given the inadequate information available for most nonpest forest insects and their great diversity, a more systematic approach to their conservation and management is needed.

Keywords: Threatened and endangered insects, forest management, forest health and productivity.

(See La Grande order form.)

Land Use

Pavey, J.S.

2001. Changing land use management on an urban national forest: case studies of the Mt. Baker-Snoqualmie National Forest and the middle fork of the Snoqualmie River watershed. Seattle, WA: University of Washington. 73 p. M.S. thesis.

This study was designed to answer four questions: (1) How has land use management on the Mount Baker-Snoqualmie National Forest changed since 1960? (2) How has land use management within the middle fork of the Snoqualmie River watershed changed since 1960? (3) Are changes in land use management reflective of the changing values of an increasingly urban society? and (4) If the changes in land use management do reflect the changing values of an increasingly urban society, then what are the implications for rural communities and lands adjacent to the national forest, and what are the implications for the Forest Service?

Keywords: Land use management, urban forests.

(Available only through library or interlibrary loan.)

Mycorrhizae

Molina, R.; Pilz, D.; Smith, J. [and others]

2001. Conservation and management of forest fungi in the Pacific Northwestern United States: an integrated ecosystem approach. In: Moore, D.; Nauta, M.M.; Evans, S.E.; Rotheroe, M., eds. Fungal conservation: issues and solutions. Cambridge, England: Cambridge University Press: 19-63. Chapter 3.

This chapter addresses fungal conservation and management issues at different scales (species, populations, communities, and landscapes) relevant to ecosystem planning. The chapter emphasizes the unique issues related to fungi in forests of the Pacific Northwest, research direction and approaches, and application of

research to the conservation and management of forest fungi. The paper discusses basic research components including ecosystem function, community ecology, and population and biology, and concludes by focusing on the development of tools and concepts to apply this knowledge, including applications in inventory and monitoring. Although the research program presented here is unique to the Pacific Northwest and federal policies on public lands in the United States, it provides a relevant framework to approach fungal conservation issues at various scales and for different objectives in other parts of the world.

Keywords: Pacific Northwest, forest fungi, forest management, nontimber forest products.

(Available in bookstores and libraries.)

Plant Ecology

Thysell, D.R.; Carey, A.B.
2001. Manipulation of density of *Pseudotsuga menziesii* canopies: preliminary effects on understory vegetation. Canadian Journal of Forest Research. 31: 1513-1525.

Both foresters and conservation biologists propose active management of second-growth forests to conserve biodiversity. Our goal was to determine if inducing heterogeneity in managed forest canopies could promote a diversity of native species without contributing markedly to invasion by exotic species. We examined short-term responses of understory plants to variable-density thinning of 55- to 65-year-old stands of *Pseudotsuga menziesii*. Our study stands had been managed either with retention of old-growth legacies (large live trees, dead trees, and fallen trees) with no thinning or with removal of legacies and twice-repeated conventional thinnings. Variable-density thinning initially resulted in decreased understory cover, increased importance of 11 exotic species, decreased importance of two native species, and increased importance of 20 native species, including two species of trees. Within 3 years, understory cover recovered, species richness increased by more than 150 percent, four exotics persisted with increased importance, and four native graminoids and four native nongraminoids increased in importance, while seven nongraminoid natives decreased in importance. Variable-density thinning shows promise as part of holistic silvicultural systems applied across landscapes throughout stand rotations and as a restoration technique for second-growth forests.

Keywords: Forest management, vascular plants, exotic plants, diversity, thinning, disturbance.

(See Olympia order form.)

Plant Pathology

Manter, D.K.; Kelsey, R.G.; Stone, J.K.
2001. Quantification of *Phaeocryptopus gaeumannii* colonization in Douglas-fir needles by ergosterol analysis. Forest Pathology. 31: 229-240.

Current assessments of infection levels of *Phaeocryptopus gaeumannii*, the incitant pathogen of Swiss needle cast disease, typically rely on surveys of abundance of fruit bodies on diseased needles. The relation between this measure and internal fungal colonization is unknown. In this paper, we report a series of experiments designed to determine if ergosterol, a fungal membrane sterol, can be used to quantify *P. gaeumannii* internal colonization with Douglas-fir needles. We found that ergosterol content in seven commonly occurring Douglas-fir foliar fungi is proportionally related to biomass, and in *P. gaeumannii* this relation is not affected by age of the culture. Furthermore, at four sites tested, *P. gaeumannii* was the most common fungus species isolated from Douglas-fir needles, accounting for approximately 50 percent of the isolations. Ergosterol content in these needles was best related to *P. gaeumannii* despite the presence of other fungi. We attribute the strong relation between ergosterol and *P. gaeumannii* to its greater proportion of fungal biomass in comparison to all other fungi present within Douglas-fir needles.

Keywords: Swiss needle cast disease, ergosterol, endophyte, disease assessment, Pseudotsuga menziesii*, fungal biomass.*

(See Corvallis order form.)

Range Management

McInnis, M.L.; McIver, J.
2001. Influence of off-stream supplements on streambanks of riparian pastures. Journal of Range Management. 54(6): 648-652.

We tested the hypothesis that providing cattle free-choice off-stream water and trace mineralized salt would lessen negative impacts of grazing on cover and stability of streambanks compared to pastures lacking these amenities, and may therefore reduce the potential of accelerated erosion.

Keywords: Grazing, greenline, water quality, livestock, off-stream water.

(See La Grande order form.)

Regional Assessments

Haynes, R.W.; Quigley, T.M.; Clifford, J.L.; Gravenmier, R.A.
2001. Science and ecosystem management in the interior Columbia basin. Forest Ecology and Management. 153: 3-14.

Significant changes over the past 150 years in aquatic, terrestrial, landscape, and socioeconomic systems have altered biophysical systems in the interior Columbia basin. Changes and conflict in public policy concerns, such as resource use vs. restoration vs. conservation are especially evident in the more than 34 percent of total forest and rangeland in the United States that are federally administered. In the last decade, design and implementation of complex land management strategies have become issues for public land managers. In turn, the scientific community is often challenged to develop approaches for management of complete ecosystems. This paper discusses the use of science in the assessment and evaluation phases of one large-scale (multiregion) ecosystem management effort on federal lands in the Columbia River basin, the Interior Columbia River Basin Ecosystem Management Project. It briefly describes the evaluations of three alternative management strategies that are detailed by other papers in this issue of *Forest Ecology and Management*. This paper contends that understanding the context of land management decisions is essential to defining the veracity or applicability of alternative management strategies. Evaluating the alternatives is a complicated science process that requires understanding the effects of each set of direction over both the short and long term, projecting the effects of those directions, making assumptions about pieces not yet developed, and modeling resource change.

Keywords: Forest management, ecosystems, land management planning.

(See Portland order form.)

Remote Sensing

Reutebuch, S.E.; Patterson, D.; Bollenbacher, B.
2001. Positional accuracy of large-scale aerial photography controlled with airborne inertial and GPS data. In: Greer, J.D., ed. Remote sensing and geospatial technologies for the new millennium: Proceedings of the 8th Forest Service remote sensing applications conference [CD-ROM]. Bethesda, MD: American Society for Photogrammetry and Remote Sensing.

The positional accuracy of large-scale aerial photography controlled with airborne inertial or data from a geographic positioning system (GPS) was evaluated for dispersed inventory plots in Montana. The specified target location of each plot was compared to the actual recorded position of photo centers. Average targeting error was 77 feet (n=36); the photo targeting root-mean-square-error was 102 feet. Ground checkpoints were measured with differential GPS and compared to photogrammetrically measured positions. The average planimetric difference was 4.3 feet; standard deviation was 2.1 feet. It seems that large-scale aerial photos can be accurately targeted over dispersed plots without ground targets, and that accurate measurements can be made from such photos.

Keywords: Remote sensing, photogrammetry, forest monitoring.

(See Seattle order form.)

Silviculture

Buermeyer, K.R.; Harrington, C.A.
2002. Fate of overstory trees and patterns of regeneration 12 years after clearcutting with reserve trees in southwest Washington. Western Journal of Applied Forestry. 17(2): 78-85.

Twelve years after a clearcut harvest with reserve trees in an even-aged, 145-year-old Douglas-fir stand in southwest Washington, we assessed the status of the overstory trees and the regeneration. In a 1-hectare block within the unit and straddling the two thinning blocks, all conifer seedlings were mapped and coded by species and size class; the positions of overstory trees, skid trails, bare mineral soil, major shrub clumps, and down trees were recorded; and 10 seedlings from each size class within each prior thinning block were sampled to determine age. There was no obvious pattern of regeneration based on direction from reserved trees, but both seedling density and seedling size within the driplines of reserved tree crowns were less than in the rest of the area. Clearcutting with reserve trees resulted in reasonable survival of the overstory trees and adequate but slow growth rates in the naturally regenerated Douglas-fir. If tree species other than Douglas-fir were desired on this site, interplanting would be needed.

Keywords: Regeneration, Douglas-fir, Pseudotsuga menziesii*, Washington, management, clearcutting.*

(See Olympia order form.)

Social Science

Hall, T.E.; Bigler Cole, H.
2001. Sociocultural factors and forest health management. Northwest Science. 75(Special issue): 208-233.

This paper reviews the state of knowledge about how sociocultural forces and human values have influenced forest health and productivity (FHP) measures, as well as how FHP practices can affect human societies and values. A recent boom in research pertaining to the "human dimensions" of resource management has led to the development of many tools to assess sociocultural factors and techniques to enhance and support decisionmaking processes, and these are reviewed as well. Two broad categories are used to describe sociocultural factors: "social forces" (including residence patterns and demographic characteristics) and "human values" about what is appropriate or desirable. The paper includes tables that reference key research publications and sources on social science research methods.

Keywords: Forest management, decisionmaking.

(See La Grande order form.)

Mills, T.J.; Clark, R.N.
2001. Roles of research scientists in natural resource decision-making. Forest Ecology and Management. 164: 189-198.

Scientists are being asked to frame their research in ways that maintain scientific independence yet are responsive to management questions, at scales that often challenge existing scientific knowledge, and under severe time constraints. With the Interior Columbia Basin Ecosystem Management Project as an example, lessons learned from the interaction among scientists and natural resource decisionmakers are discussed and propositions for appropriate roles are presented. When properly generated, presented, and accountably used, science facilitates discussion among competing interests by helping to define the range of available choice and focusing discussions on consequences of social choice. By expanding and revealing the range of possible outcomes, scientists increase the likelihood that management decisions are understood and that those decisions can endure.

Keywords: Decision analysis, ecosystem management, forest management, interior Columbia River basin, science and policy.

(See Headquarters order form.)

Soil

Vance, N.C.; Entry, J.A.
2000. Soil properties important to the restoration of a Shasta red fir barrens in the Siskiyou Mountains. Forest Ecology and Management. 138: 427-434.

Because of past major disturbances, the highly erodible, granitic soil in a Shasta red fir (*Abies magnifica* A. Murr. var. *shastensis*) barrens located on the north side of the Siskiyou Mountains crest is a major contributor of sediment to the aquatic system. We examined soil properties that may be associated with vegetation patterns in the barrens and adjacent Shasta red fir forest and have application to restoring native plant diversity and cover to the barrens. These include plant available nutrients, soil carbon, microbial biomass, and enzymes-involved inorganic matter decomposition nutrient cycling. Soils supporting forest vegetation contained higher concentrations of carbon, nitrogen, potassium, calcium, and magnesium, indicating differences between forest and barrens in important soil chemical properties. Calcium and magnesium were extremely low in the barrens soil, suggesting loss of these nutrients by erosion. Soil organic matter was higher in forest than in barrens soil and was positively correlated with soil, dehydrogenase, and acid phosphatase activity. Although microbial biomass was extremely low, dehydrogenase and acid phosphatase activity were sensitive indicators of differences in organic matter and microbial activity between forest and barrens soil. They may be useful in monitoring ecological change and helpful in understanding vegetation patterns.

Keywords: Soil fertility, Shasta red fir forest, Abies magnifica*, barrens, restoration, microbial biomass, soil enzymes.*

(See Corvallis order form.)

Special Forest Products

Vance, N.C.
2001. Research in non-timber forest products: contributions of the USDA Forest Service, Pacific Northwest Research Station. Journal of Sustainable Forestry. 13(3/4): 71-82.

Nontimber forest products (NTFPs) have emerged as a complex set of issues reflecting changes in society and how natural resources are regarded. These issues range from the sustainability of forest management practices to the relation of diverse cultures and communities to public lands and their resources. Research and its relation to this set of issues is a relatively unknown aspect of NTFPs. This paper reports on early NTFP research by scientists in the USDA Forest Service's Pacific Northwest Research Station. It characterizes efforts over about 5 years and identifies their key elements. It also discusses the role research has and could play in addressing the problems and questions associated with NTFPs and sustainable forestry.

Keywords: Pacific Northwest, nontimber forest products, Forest Service, native forest plants, native forest fungi.

(See Corvallis order form.)

Threatened, Endangered, or Sensitive Species

Bull, E.L.; Aubry, K.B.; Wales, B.C.
2001. Effects of disturbance on forest carnivores of conservation concern in eastern Oregon and Washington. Northwest Science. 75(Special issue): 180-184.

The effects on forest carnivores of forest insects, tree diseases, wildfire, and management strategies designed to improve forest health (e.g., thinning, prescribed burns, and road removal) are discussed. Forest carnivores of conservation concern in eastern Oregon and Washington include the Canada lynx, fisher, and wolverine. All three species depend to some degree on

forest structures, stands, and landscapes created by insects, disease, and fire. Wildfire and insect outbreaks maintain a mosaic of structural stages across the landscape that are used by lynx. Thinning of dense lodgepole pine stands that result largely from wildfire and insect outbreaks is detrimental to snowshoe hares, which are a primary prey of lynx. Fishers use large stands of mature forest and snags, hollow live trees, logs, stumps, witches-brooms, and other structures for rest and den sites. Salvage harvesting, thinning, and conversion from predominantly fir stands to ponderosa pine may adversely affect habitat for fishers. Use of roads is perhaps most detrimental to wolverines because they are easily trapped and avoid humans.

Keywords: Furbearers, species of concern, disturbance processes, forest management, lynx, fisher, wolverine.

(See La Grande order form.)

Luginbuhl, J.M.; Marzluff, J.M.; Bradley, J.E.
2001. Corvid survey techniques and the relationship between corvid relative abundance and nest predation. Journal of Field Ornithology. 72(4): 556-572.

We conducted a 4-year study on the Olympic Peninsula of Washington to assess the relation between corvid (gray jay, Steller's jay, American crow, and common raven) abundance and risk on nest predation. We assessed risk of predation by using artificial midcanopy nests and assessed corvid abundance by using a variety of techniques, including point-count surveys, transect surveys, and the broadcast of corvid territorial and predator attention calls. Point counts of corvid abundance had the strongest correlation with predation on artificial nests containing eggs. The relation between nest predation and corvid abundance was strongest when study plots were used as replicated measures of landscape condition rather than as independent samples. We suggest using the maximum value for each corvid species attained from several temporally replicated point-count surveys in each study plot. Corvid point-counts should be conducted on days with light winds and no more than light precipitation. Use of attraction calls is important for gaining a meaningful measure of corvid abundance. Their use may overrepresent corvids at the local plot scale but is important in assessing the landscape-scale presence of wide-ranging (American crows) and often nonvocal (gray jays) corvids.

Keywords: Nest predation, corvid, marbled murrelet, Brachyramphus marmoratus*, artificial nest, survey technique.*

(See Olympia order form.)

Watershed Management

Braudrick, C.A.; Grant, G.E.
2001. Transport and deposition of large woody debris in streams: a flume experiment. Geomorphology. 41: 263-283.

Large woody debris is an integral component of forested streams in the Pacific Northwest and elsewhere, yet little is known about the dynamics of wood transport in streams. We report the results of flume experiments that examine interactions between hydraulics, channel geometry, transport distance, and deposition of wood.

Keywords: Coarse woody debris, channel geomorphology, flume studies, wood movements.

(See Corvallis order form.)

Wildlife

Bayrakçi, R.; Carey, A.B.; Wilson, T.M.
2002. Current status of the western gray squirrel population in the Puget Trough, Washington. Northwest Science. 75(4): 333-341.

The Puget Trough population of the western gray squirrel, which is listed as threatened in the state of Washington, is centered in Oregon white oak ecotones on the Fort Lewis Military Reservation. Our goal was to determine the status of the squirrel in this region. In September 1998, we found five western gray squirrels in 133 oak sites. In early 1999, we searched for squirrels by using

techniques that included surveys on foot, surveys with simulated squirrel calls, live trapping, and bait stations with motion-sensitive cameras. No squirrels were detected in any oak sites in 1999. One squirrel was photographed in a ponderosa pine stand adjacent to oaks. The squirrel population at Fort Lewis seems to have experienced a sharp decline since low population numbers were reported in 1992-93. Reduction in oak habitat quantity and quality, compounded by poor acorn crops, undependable food supplies, drought, and death of squirrels by motor vehicles, may be responsible for this decline. Competition with eastern gray squirrels or Douglas' squirrels did not seem to be a factor. Our ability to formulate mutually exclusive hypotheses underlying the decline of the western gray squirrel at Fort Lewis is limited by our lack of understanding of how these squirrels persist in highly fragmented oak ecotones. Without immediate management, the continued existence of this species in the Puget Trough remains doubtful.

Keywords: Puget Trough, western gray squirrel, Sciurus griseus, *eastern gray squirrel*, Sciurus carolinensis, *threatened species, Oregon white oak,* Quercus garryana, *ponderosa pine,* Pinus ponderosa.

(See Olympia order form.)

Carey, A.B.
2001. Experimental manipulation of spatial heterogeneity in Douglas-fir forests: effects on squirrels. Forest Ecology and Management. 152: 13-30.

Squirrel communities composed of simultaneously abundant populations of *Glaucomys*, *Tamias*, and *Tamiasciurus* are (1) a result of high reproductive activity of forest plants and fungi and of complexity of ecosystem structure, composition, and function; (2) indicative of high carrying capacity for vertebrate predators; and (3) characteristic of late stages of coniferous forest development in the Pacific Northwest. I hypothesized that silvicultural manipulation of forest canopies could result in spatial heterogeneity that would reproduce the biocomplexity and plant-fungal reproductive activity associated with high squirrel populations. I predicted that accelerating development of biocomplexity would require more than 20 years, but that short-term effects of manipulation of heterogeneity would be predictable and apparent in 5 years or less: initial decreases followed by increase in *Glaucomys* populations, nonlinear increases in *Tamias* populations, and little change in *Tamiasciurus* populations. If these predictions proved accurate, confidence in long-term predictions would be enhanced.

Keywords: Biocomplexity, forest ecology, Glaucomys*, silviculture,* Tamias*,* Tamiasciurus*, squirrels.*

(See Olympia order form.)

Carey, A.B.; Harrington, C.A.
2001. Small mammals in young forests: implications for management for sustainability. Forest Ecology and Management. 154: 289-309.

Small mammals have been proposed as indicators of sustainability in forests in the Pacific Northwest and elsewhere. Mammal community composition and species abundances purportedly result from interactions between species, forest-floor characteristics, large coarse woody debris, understory vegetation, and overstory composition. Coarse woody debris is thought to be particularly important because of its diverse ecological functions; covers from 10 to 15 percent have been recommended based on retrospective studies of forests and small mammals. Unfortunately, ecological correlations are not necessarily indicative of causal relations, and magnitudes depend on composition of finite, usually nonrandom, cross-sectional samples. Retrospective studies must be replicated to confirm relations. We conducted a large-scale, cross-sectional survey of 30- to 70-year-old coniferous forests in western Washington to

determine if previously reported relations would hold with an unrelated, larger sample. Our results support hypotheses that (1) biocomplexity resulting from interactions of decadence, understory development, and overstory composition provides preinteractive niche diversification with predictable, diverse, small-mammal communities, and (2) these communities incorporate numerous species and multiple trophic pathways and, thus, their integrity measures resiliency and sustainability.

Keywords: Management, sustainability, Pacific Northwest, small mammals.

(See Olympia order form.)

Carey, A.B.; Wilson, S.M.
2001. Induced spatial heterogeneity in forest canopies: responses of small mammals. Journal of Wildlife Management. 65(4): 1014-1027.

We hypothesized that creation of a mosaic of interspersed patches of different densities of canopy trees in second-growth Douglas-fir would accelerate development of biocomplexity. Spatial heterogeneity was expected to lead to a variety of fine-scale plant associations, foliage height diversity, and abundant small mammals. Understory species richness and herb cover were greater 3 years after variable-density thinning than without thinning. Variable-density thinning resulted in larger populations of deer mice, a species associated with understory shrubs; creeping voles, a species associated with herbaceous vegetation; and vagrant shrews, a species usually associated with openings, but common in old growth. No forest-floor small-mammal species, including those associated with old-growth forest, declined in abundance following variable-density thinning. Annual variation in population size was not related to treatment. Variable-density thinning holds promise for accelerating the development of biocomplexity in second-growth forest through promoting spatial heterogeneity and compositional diversity in the plant community, increasing diversity and abundance in small-mammal communities while maintaining small-mammal richness, and similarly affecting other vertebrate communities. When combined with long rotations, legacy retention, and management for snags and coarse woody debris, variable-density thinning has broad applicability to enhance biodiversity.

Keywords: Biocomplexity, ecosystem management, forest management, Pacific Northwest, Pseudotsuga menziesii*, small mammals, variable-density thinning.*

(See Olympia order form.)

Gende, S.M.; Womble, J.N.; Willson, M.F.; Marston, B.H.
2001. Cooperative foraging by stellar sea lions, *Eumetopias jubatus*. The Canadian Field-Naturalist. 115(2): 355-356.

Stellar lions were observed cooperatively foraging for eulachon (*Thaleichthyes pacificus*) and possibly herring (*Clupea pallasi*) in Berners Bay, southeast Alaska, in spring 1996-99.

Keywords: Stellar sea lion, Eumetopias jubatus*, eulachon, herring, cooperative foraging, southeast Alaska.*

(See Juneau order form.)

Wilson, S.M.; Carey, A.B.
2001. Small mammals in oak woodlands in the Puget Trough, Washington. Northwest Science. 75(4): 342-349.

We surveyed 22 Oregon white oak ecotones to determine small-mammal community structure and population abundance. Study areas were located on the Fort Lewis Military Reservation, Washington, within the Puget Trough physiographic province and the western hemlock vegetation zone. Small mammals were sampled at each site by using paired live-trap lines for four nights, July and August 1999. In order of decreasing abundance, the deer mouse, vagrant shrew, Trowbridge's shrew, and creeping vole were the most abundant and consistently trapped species in oak ecotones. The dusky shrew and the southern red-backed vole were infrequently captured in oak ecotones but were abundant in nearby managed Douglas-fir forests. The relative influences of prairie and Douglas-fir forest in oak ecotones determine understory plant conditions and local small-mammal species occurrence. Abundant vagrant shrews and a few dusky shrews in oak ecotones suggest that soil food webs and organic matter accumulation differ between oak ecotones and Douglas-fir forest. This study is the first to sample small-mammal communities in Puget Trough ecotones.

Keywords: Oregon white oak, Quercus garryana*, small mammals, Puget Trough.*

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