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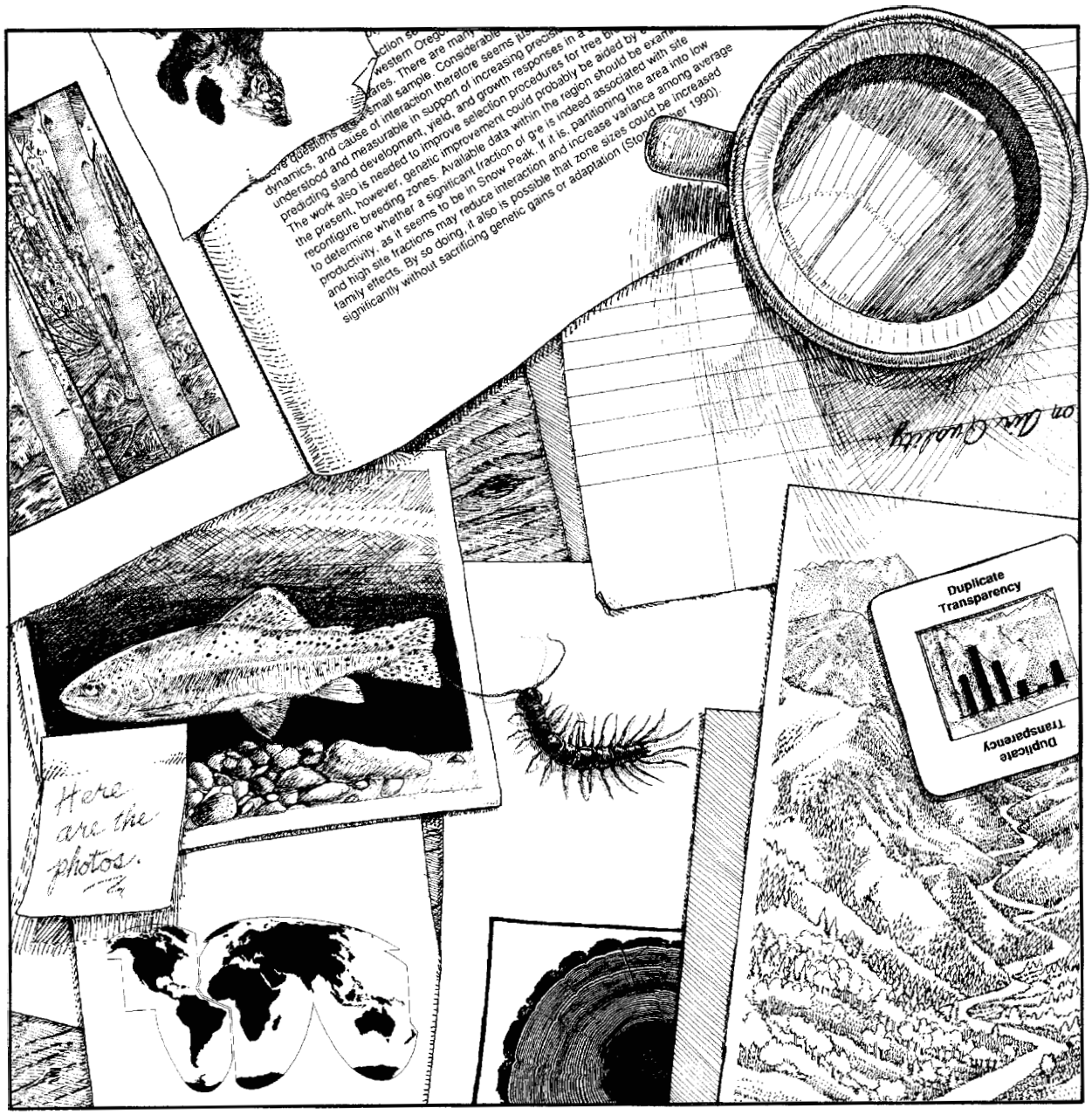
Forest Service

Pacific Northwest
Research Station

Recent Publications of the Pacific Northwest Research Station, Fourth Quarter 2001



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January 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

01-175

Pacific Northwest Research Station

2001. Recent publications of the Pacific Northwest Research Station, second quarter. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 24 p.

Keywords: Bibliographies (forestry).

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

Economics

01-058

Brooks, D.J.; Ferrante, J.A.; Haverkamp, J. [and others]

2001. Economic and environmental effects of accelerated tariff liberalization in the forest products sector. Gen. Tech. Rep. PNW-GTR-517. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 70 p.

This study assessed the incremental economic and environmental impacts resulting from changes in the timing and scope of forest products tariff reductions as proposed in the accelerated tariff liberalization (ATL) initiative in forest products. This initiative was proposed for agreement among member countries of the World Trade Organization. The study's analysis of environmental effects focused on possible changes in timber harvest, in the United States and worldwide, and rested directly on an analysis of the economic (trade, production, and consumption) effects of the initiative. The ATL initiative likely will have no distinguishable impacts on aggregate U.S. timber harvest; it is likely, however, to modify the composition of products manufactured from timber harvested in the United States. Consumption in the United States of most forest products was projected to change by less than 1 percent as a consequence of the ATL. At the world scale, the ATL was projected to increase aggregate world trade in forest products by a maximum of 2 percent. World timber harvest was projected to increase by about 0.5 percent as a consequence of the ATL, and aggregate world production and consumption of forest products was projected to increase by less than 1 percent.

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

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

Ecosystem Structure and Function

00-103

Bachelet, D.; Lenihan, J.M.; Daly, C. [and others]

2001. MC1: a dynamic vegetation model for estimating the distribution of vegetation and associated ecosystem fluxes of carbon, nutrients, and water—technical documentation. Version 1.0. Gen. Tech. Rep. PNW-GTR-508. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 95 p.

MC1 is a new dynamic global vegetation model created to assess the potential impacts of global climate change on ecosystem structure and function at a wide range of spatial scales from landscape to global. It allows scientists to incorporate transient dynamics and make realtime predictions about the patterns of

ecological change. MC1 was created by combining physiologically based biogeography rules, as defined in the MAPSS model, with a modified version of the biogeochemical model, CENTURY. MC1 also includes a fire module, MCFIRE, that mechanistically stimulates the occurrence and impacts of fire events.

Keywords: MC1, model documentation, vegetation response, climate change, MAPSS, CENTURY, dynamic global vegetation model.

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

00-098

Ross, D.W.; Daterman, G.E.; Boughton, J.L.; Quigley, T.M.

2001. Forest health restoration in south-central Alaska: a problem analysis. Gen. Tech. Rep. PNW-GTR-523. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 38 p.

A major spruce beetle outbreak killed most of the spruce trees on millions of acres of forest land in south-central Alaska in the 1990s. From information obtained through workshops and outreach to resource managers and diverse stakeholders, we developed priority issues for restoring the land. Wildfire is a major issue, particularly for the wildland-urban interface areas around Anchorage and on the Kenai Peninsula. Tasks for land managers primarily revolve around the problem of how to reduce risk of wildfire and ensure reforestation in ways that will accommodate the needs for wildlife habitat, maintain healthy hydrologic conditions, and generally conserve ecological values for the future. The research approach outlines a "what if" scenario of management options based on levels of investment and targets for restoration.

Keywords: Ecosystem health, forest health, ecosystem restoration, Alaska, south-central Alaska, wildfire, spruce beetle, wildlife habitat, hydrology, urban forestry.

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

Plant Ecology

00-083

Skovlin, J.M.; Strickler, G.S.; Peterson, J.L.; Sampson, A.W.

2001. Interpreting landscape change in high mountains of northeastern Oregon from long-term repeat photography. Gen. Tech. Rep. PNW-GTR-505. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 78 p.

Photos taken before 1925 were compared with photos taken as recently as 1999 to interpret changes in landscapes of the high mountains of northeastern Oregon. The photo points show conditions in the Wallowa, Greenhorn, and Elkhorn Mountains above 5,000 feet elevation. Important landscape changes noted were (1) the expansion of subalpine fir (*Abies lasiocarpa*) into mountain grasslands, (2) the invasion of moist and wet meadows by several tree species, (3) a loss of whitebark pine (*Pinus albicaulis*) from subalpine habitats, (4) continued soil erosion stemming from livestock grazing long since discontinued, and (5) high rate of natural gravitational mass wasting. The most important factor contributing to changes in woody vegetation was a reduction in fire frequency. Fires before 1925 were nine times more frequent than fires at the end of the 20th century. Historical land uses and origins of place names are described.

Keywords: Wallowas, Elkhorns, Greenhorns, Oregon, photography (repeat), photo history, land use, long-term change, landscape ecology, tree encroachment, whitebark pine, Pinus albicaulis*, recreation, Eagle Cap Wilderness Area, erosion, fire frequency, climate, subalpine ecosystem.*

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

Recreation

01-082

Brooks, D.J.; Haynes, R.W.
2001. Recreation and tourism in south-central Alaska: synthesis of recent trends and prospects. Gen. Tech. Rep. PNW-GTR-511. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 19 p.

Tourism has been the fastest growing component of Alaska's economy for the past decade and is an important export sector for the regional economy. Opportunities to participate in outdoor recreation also are important components of the quality of life for residents of Alaska. Successful planning for the Chugach National Forest therefore will require an understanding of (1) recreation and tourism as an economic sector, (2) factors contributing to growth in activity in south-central Alaska, and (3) prospective future levels and types of demand.

Keywords: National forest management, planning, demand, projections, south-central Alaska.

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

Social Sciences

01-087

Christensen, H.H.; Donoghue, E.M.
2001. A research framework for natural resource-based communities in the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-515. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 21 p.

The Pacific Northwest Research Station developed a problem analysis to direct the research on natural resource-based communities in the Pacific Northwest for the next 5 years. The problem analysis identified four problem areas: (1) social values related to rural peoples, communities, and development, and their ties to resource management are largely unknown; (2) traditional concepts of rurality do not reflect the complex, varied socioeconomic structures of today's rural places and people; (3) the theories, models, and practices of collaborative stewardship as they relate to ecosystem management are largely unknown; and (4) patterns, processes, causes, and effects of socioeconomic change across rural communities and regions of the Pacific Northwest are poorly understood.

Keywords: Rural development, rural communities, research and development, social values, socioeconomic well-being, Pacific Northwest, natural resource management, Montreal process criteria and indicators.

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

Wood Utilization

01-196

Barbour, R.J.; Wong, A.H.H., tech. coords.
2001. Sustainable production of forest products 2000: Proceedings of IUFRO division 5 research group 5.12. Gen. Tech. Rep. PNW-GTR-520. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 60 p.

The concept of sustainability in the context of forest management holds a different meaning by almost every group espousing it. Many of these differences arise from the various goals and objectives of those promoting the idea of sustainable forest management. In general, a sustainable approach to forest management uses innovative strategies to conserve biodiversity, improve the balance among alternative forest values, and maintain healthy ecosystems. It often is expected to retain aesthetic, historical, spiritual, and other qualities of the land. Various silvicultural techniques may be used.

Keywords: Sustainable forestry, wood, forest products, silviculture.

(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.

Aquatic and Riparian Systems

Micucci, S.M.

2000. Estuarine function with emphasis on fishes in a marine and a freshwater estuary. Columbus, OH: The Ohio State University. 35 p. M.S. thesis.

The goal of this study was to compare the biological characteristics between two different types of coastal ecosystems, focusing on freshwater Old Woman Creek (OWC), Ohio, and saltwater Padilla Bay (PB), Washington, both National Estuarine Research Reserves. Within each estuary, fish were sampled from vegetated, edge, and open areas during spring, early summer, and later summer in 1998 and 1999. Fish species density and diversity increased through time during both years and differed between sites and among similar habitats. More fish were found in open and edge areas than vegetated habitats in OWC and more fish in vegetated than other habitats in PB. Overall, species diversity was low for both sites owing to the influence of a single dominant species in each site.

Keywords: Estuarine function, estuaries, coastal ecosystems.

(Available only through library or interlibrary loan.)

Rundio, D.E.; Olson, D.H.

2001. Palatability of southern torrent salamander (*Rhyacotriton variegates*) larvae to Pacific giant salamander (*Dicamptodon tenebrosus*) larvae. Journal of Herpetology. 35(1): 133-136.

Pacific giant salamander larvae consumed juvenile Plethodon salamanders in 97 percent of paired trials but consumed southern torrent salamander larvae in only 24 percent. These results indicated that torrent salamanders are relatively unpalatable to Pacific giant salamanders.

Keywords: Rhyacotrition, *Plethodon, Dicamptodon, amphibians, palatability, predation.*

(See Corvallis order form 2.)

Stouder, D.J.; Bisson, P.A.; Olson, D.

2000. Overview of riparian zones in the Pacific Northwest. In: Agee, J.K., ed. Summit 2000 Washington private forests forum. Seattle, WA: University of Washington: 101-102.

Riparian zones form the boundary between terrestrial and aquatic environments. They mediate the transfer of energy and materials between those two types of environments, provide habitats for plants and animals and protect water quality. Riparian zones are embedded into larger landscapes, landscapes with varied land use histories, landscapes that are not all forested, and areas that have been highly impacted in many nonforested environments, whether agricultural or urban. There will not be a "one size fits all" prescription for restoring riparian zones. Our challenge is to make answers to riparian research questions useful in the real world of on-the-ground applications.

Keywords: Riparian zones.

(See Olympia order form.)

Atmosphere

Ferguson, S.A.
2000. The spatial and temporal variability of rain-on-snow. In: International science workshop 2000: Proceedings–a merging of theory and practice. [Bozeman, MT]: Montana State University: 178-183.

Snow melt during rainfall causes large-scale flooding and avalanching. These rain-on-snow events are best documented for the coastal mountain ranges of western North America. To determine what role they play in interior mountains, we analyzed flood frequencies in the Columbia River basin and modeled rain-on-snow potential from daily temperature and precipitation data. Rain-on-snow events are more likely during cool, wet years (such as 1982): more events and more widespread distribution of events occur during this type of climate. The cool temperatures allow low-elevation snow to accumulate, and frequent storms bring the possibility of midwinter rain. Warm, dry years (1988) are less likely to produce rain-on-snow events. During all years, areas most susceptible to rain on snow are those where topography allows incursion of relatively warm, moist marine air that flows from the Pacific Ocean to the Columbia Plateau and up the Snake River valley.

Keywords: Snow, avalanches, rain on snow, floods, disturbance ecology.

(See Seattle order form.)

Economics

Alexander, S.J.; McLain, R.J.
2001. An overview of nontimber products in the United States today. Journal of Sustainable Forestry. 13(3/4): 59-66.

In the 1980s and 1990s, forest management organizations gradually increased funding levels for nontimber forest product (NTFP) management and research, and a small but growing body of scientific literature on NTFPs has emerged in mainstream scientific journals. This shift in behavior on the part of forest managers, policymakers, and scientists stems in part from new understanding about the critical role of species and structural diversity for sustainable forest management. The article briefly outlines the products, issues, stakeholders, and knowledge about NTFPs in the Pacific Northwest.

Keywords: Nontimber forest products.

(See Corvallis order form 1.)

Alexander, S.J.; McLain, R.J.; Blatner, K.A.
2001. Socio-economic research on nontimber forest products in the Pacific Northwest. Journal of Sustainable Forestry. 13 (3/4): 95-103.

Much of the nontimber forest products industry in the United States has been active for a long time, particularly the floral green, edible berry, and medicinal markets, but few publications have discussed specific products, prices, and markets. Three studies describe the industry in the Pacific Northwest in the late 1940s and early 1950s. Comparisons to recent studies show that many of the same products are being harvested in the Pacific Northwest and that the industry has grown. Current research studies being undertaken by the USDA Forest Service, Washington Department of Natural Resources, Oregon State University, Washington State University, Confederated Tribes of Warm Springs, Yakama Indian Nation, and others are outlined.

Keywords: Nontimber forest products, prices, markets.

(See Corvallis order form 1.)

Alig, R.J.; Adams, D.M.; McCarl, B.A.
1998. Impacts of incorporating land exchanges between forestry and agriculture in sector models. Journal of Agricultural and Applied Economics. 20(2): 389-401.

The forest and agriculture sectors are linked by having a portion of their land bases suitable for use in either sector. Public policies aimed at one

sector have impacts, either expected or inadvertent, on the other. We developed a linked model of the United States forest and agriculture sectors that has both land use and forest management investment as endogenous decisions. Impacts from simulated federal farm and conservation policies are amplified when the option of bidirectional land movements is eliminated.

Keywords: Land use change, forest sector, intertemporal model.

(See Corvallis order form 1.)

McLain, R.J.; Alexander, S.J.
2001. Synthesis and future directions for non-timber forest product research in the United States. Journal of Sustainable Forestry. 13(3/4): 163-165.

Nontimber forest product research in the United States is in its infancy, and participants in such projects are struggling to develop long-term, successful approaches. Programs able to address the complex socioecological questions raised about nontimber forest product use and management will need to have strong links among research programs in various regions of the United States and internationally. Research on nontimber forest products in the United States is addressing several topics, including ecosystem management, biology and yields, market and recreational demand and value, tribal rights, and harvester behavior, knowledge, and demographics.

Keywords: Nontimber forest products, research needs.

(See Corvallis order form 2.)

Ecosystem Structure and Function

Acker, S.A.; Harcombe, P.A.; Harmon, M.E.; Greene, S.E.
2000. Biomass accumulation over the first 150 years in coastal Oregon *Picea-Tsuga* forest. Journal Vegetation Science. 11: 725-738.

Temporal patterns of net primary productivity, standing biomass, tree mortality, and coarse woody debris are compared for two sets of Sitka spruce-western hemlock plots along the central Oregon coast. Forest stands were initiated by a wildfire in 1848.

Keywords: Terrestrial-upland habitat, forest ecosystem, biomass, woody debris, ecosystem processes, productivity, spruce-hemlock forests.

(See Corvallis order form 1.)

Li, C.Y.; Strzeczyk, E.
2000. Belowground microbial processes underpin forest productivity. Phyton. 40(4): 129-134.

The chemical substrates in mycorrhizal fungi or mycorrhizas often stimulate the growth and nitrogenase activity of the associated nitrogen fixers. In addition, the associated nitrogen fixers are producers of plant-growth-promoting substances and B-group vitamins. Combined inoculation of mycorrhizal fungi with nitrogen fixers enhances mycorrhiza formation. Other microbes in the mycorrhizosphere have capacities to break down primary minerals, thereby releasing nutrients available for uptake by plants. Land restoration thus can be achieved by planting trees with nitrogen-fixing and rock-weathering capacities, such as alders and some pines. The treatment can enhance nutrient availability and increase soil organic matter that provides organic substrate for nutrient release, maintains soil structure, and enhances water-holding capacity. Changes in tree species composition on the site are likely to alter belowground processes through changes in functional processes of organisms that constitute ecosystems.

Keywords: Microbial processes, ecological functions.

(See Corvallis order form 2.)

Liegel, L.H.
1999. Deforestation. In: Alexander, D.E.; Fairbridge, R.W., eds. Encyclopedia of environmental science. Dordrecht, The Netherlands: Kluwer Academic Publishers: 113-115.

Large-scale deforestation destroys habitats used by plants, animals, and indigenous people. Natural reforestation processes begin immediately after cutting stops, and recovery is encouraged through tree planting, aggressive forest management, and replacement of groundcover if cut areas are not redisturbed. People in still-developing countries have the right to exist and aspire to a standard of living that provides basic food, clothing, and shelter needs. Depending on land availability, technology, local birth rate, and many other factors, some form of controlled deforestation is probably the only way to obtain and maintain basic human necessities. To choose alternatives that slow or stop deforestation, one must consider both the long-term sustainability of human and natural resources and the natural carrying capacity of the land itself.

Keywords: Forest management, sustainability, tropical ecosystems, temperate ecosystems, FAO, clearcutting, shifting cultivation.

(See Corvallis order form 2.)

Fish

Reeves, G.H.; Sedell, J.R.
2001. The role of Oregon forests in restoring and maintaining salmon populations. In: Oregon salmon: essays on the state of the fish at the turn of the millennium. Portland, OR: Oregon Trout: 64-69.

Forested streams are an integral component of many anadromous salmon and trout habitats in the Oregon Coast Range, but these streams have been extensively altered by human activities for 150 years. Managers and policymakers face a challenge in trying to restore the streams and make them productive for fish. Particular focus is needed on the gradient streams in the lower portions of stream networks.

Keywords: Oregon Coast Range, salmon, habitat.

(See Corvallis order form 2.)

Tinus, C.A.; Reeves, G.H.
2001. Redside shiner (*Richardsonius balteatus*) shoals provide a behavioral competitive refuge for subordinate juvenile steelhead trout (*Oncorhynchus mykiss*). Canadian Journal of Fisheries and Aquatic Sciences. 58: 319-324.

A factorial experiment in 80-liter tanks examined the relative effects of 0, 3, and 9 redside shiner (*Richardsonius balteatus*) at 15 and 20 °C on the growth and survival of three junvenile steelhead (*Oncorhynchus mykiss*) per tank. Neither the largest steelhead nor any juvenile steelhead in the presence of nine redside shiner died. In treatments where no redside shiner were present, mortality for the smallest steelhead was 80 percent. Survival of the smallest juvenile steelhead thus was significantly enhanced by the presence of redside shiner.

A second experiment was conducted in 5800-L stream channels at 15 °C with natural substrate. Ten steelhead were held either alone or with 20 redside shiner. In the absence of redside shiner, fin damage was 16 times greater in the smallest three steelhead compared to the smallest three steelhead in treatments with shiner. In both experiments, if a redside shiner group was present, the smallest steelhead took refuge within the shiner group, thereby avoiding attack by dominant steelhead. We have termed this phenomenon a “behavioral competitive refuge.”

Keywords: Steelhead trout, redside shiner, behavioral competitive refuge, indirect effects, intraspecific competition.

(See Corvallis order form 2.)

Willson, M.F.; Gende, S.M.; Marston, B.H.
1998. Fish and the forest: expanding perspectives on fish-wildlife interactions. BioScience. 48(6): 455-462.

The reproductive biology of several wildlife species is keyed to runs of anadromous fish. Nutrients from the fish are deposited along streambanks via transport of carcasses and dung deposition by predators; there the nutrients enter the terrestrial food chain. Predators also may exert important selection pressures on the fish

and influence many aspects of life history. Thus there are strong interactions between the aquatic and terrestrial systems, which argues for an innovative and integrated approach to both research and management.

Keywords: Anadromous fish, salmon, eulachon, wildlife, food web, southeast Alaska, ecological interactions.

(See Juneau order form.)

Zimmerman, C.E.; Reeves, G.H.
2000. Population structure of sympatric anadromous and nonanadromous *Oncorhynchus mykiss*: evidence from spawning surveys and otolith microchemistry. Canadian Journal of Fisheries and Aquatic Sciences. 47: 2153-2162.

This study determined the extent of segregation in timing and use of spawning habitat by sympatric steelhead and resident rainbow trout in the Deschutes River, Oregon. Understanding the temporal and spatial use of spawning habitat provides an indication of potential reproductive isolation between the two life history forms. Combined with evidence concerning the heritability of migratory behavior, such evidence can be used to determine reproductive isolation between life history forms of rainbow trout.

Keywords: Steelhead trout, rainbow trout, spawning behavior.

(See Corvallis order form 2.)

Geomorphology and Hydrology

Duan, J.; Grant, G.E.
2000. Shallow landslide delineation for steep forest watersheds based on topographic attributes and probability analysis. In: Wilson, J.P.; Gallant, J.C., eds. Terrain analysis: principles and applications. New York: John Wiley and Sons: 311-329. Chapter 13.

We describe a model that delineates shallow landslide areas in steep, forested watersheds and accounts for spatial heterogeneity in topography, soils, and vegetation. The model was tested by using observed landslide inventory data from a 64-km^2 drainage in western Oregon. The model can be applied to broadly delineate unstable areas where forest harvesting should be avoided.

Keywords: Geomorphology, mass movement, models.

(See Corvallis order form 1.)

Snyder, K.U.
2000. Debris flows and flood disturbance in small, mountain watersheds. Corvallis, OR: Oregon State University. 53 p. M.S. thesis.

This study examined debris flows occurring in a 125-km^2 study area in the Blue River watershed on the west side of the Cascade Range of Oregon. The overall objectives were to characterize the spatial and temporal patterns of debris flows from 1946 through 1996 and to examine the associations between land use practices and debris flow occurrence.

Keywords: Mass movement, landslide causes, slope stability.

(Available only through library or interlibrary loan.)

Vanderbilt, K.L.
2000. Patterns of nitrogen fluxes in watersheds of the H.J. Andrews Experimental Forest, Oregon. Corvallis, OR: Oregon State University. 110 p. Ph.D. dissertation.

Seasonal and annual patterns of nitrogen fluxes and concentrations in stream water in six conifer-dominated watersheds at the H.J. Andrews Experimental Forest, Oregon, were studied to gain insight into factors influencing nitrogen retention in this ecosystem.

Keywords: Nitrogen cycling, timber harvesting, watershed.

(Available only through library or interlibrary loan.)

Wemple, B.C.; Swanson, F.J.; Jones, J.A.
2001. Forest roads and geomorphic process interactions, Cascade Range, Oregon. Earth Surface Processes and Landforms. 26: 191-204.

This study focused on the effects at local, hillslope, and basic scales of a forest road network during an individual storm event. An extreme storm event in February 1996 provided the opportunity to examine road network interactions with the routing of water and sediment at a site where some aspects of these interactions had been documented in prior studies. We examined effects of the road network on initiation, movement, and interception of sediment by an array of mass movement and fluvial processes that operate on parts or the whole of the road: prism cutslope, ditch, road surface, and fill slope.

Keywords: Geomorphology, roads, landscape analysis, watershed management, sedimentation, debris slides/flows, flood channel geomorphology.

(See Corvallis order form 2.)

Information Science

Baker, K.S.; Benson, B.J.; Henshaw, D.L. [and others]
2000. Evolution of a multisite network information system: the LTER information management paradigm. BioScience. 50(11): 963-978.

The experience of data managers for long-term ecosystem research sites in designing a networked information system provides the biological community with a model for developing multisite information systems. Here, we describe the evolution of the network information system (NIS), highlight important components, and present specific examples of software modules that enable cross-site data information.

Keywords: Database management system, information managers, data exchange, intersite studies, LTER, metadata, data archive.

(See Corvallis order form 1.)

Invertebrates

Joseph, G.; Kelsey, R.G.; Peck, R.W.; Niwa, C.G.
2001. Response of some scolytids and their predators to ethanol and 4-allylanisole in pine forests of central Oregon. Journal of Chemical Ecology. 27(4): 697-715.

Lindgren multiple funnel traps were set up in pine forests of central Oregon to determine responses of scolytid bark beetles to 4-allylanisole (4AA at 0, 0.6, 4.3 mg/h) and ethanol (4.5, 41.4 mg/h) in a 3 x 2 factorial design. All baits had a 1:1 mixture of a- and ß-pinene with a release rate of 11.4 mg/h. Of 13,396 scolytids caught, *Dendroctonus valens* made up 60 percent, *Hylurgops* spp. 18.5 percent, *Ips* spp. 16 percent, *Hylastes* spp. 1.8 percent, *Ganthotrichus retusus* 0.9 percent, and bark-beetle predators 2.8 percent. Increasing the release rate of ethanol in the absence of 4AA increased numbers of most scolytid species caught by 1.5 to 3.7 times, thereby confirming its role as an attractant. 4-allylanisole may have some utility for managing the behavior of secondary bark beetles most sensitive to this compound.

Keywords: Methyl chavicol, bark beetles, primary attraction, host selection, host volatiles.

(See Corvallis order form 1.)

Land Use Economics

Kline, J.; Alig, R.
2000. Research report 3: forest impacts. Eugene, OR: ECONorthwest. 23 p.

The Willamette Valley Alternative Futures Project funded this study to compare the consequences of the continuation of current land use trends to those of a more compact pattern of growth that could protect farm and forest lands, encourage redevelopment and infill, and save taxpayers' money. The two scenarios showed different

amounts of forest land being directly converted to urban and rural residential uses or otherwise affected by the proximity of urban and rural residential uses to the point where the forest land would become less productive. This report describes the changes in the distribution of forest land across population density categories and changes in forest production under the two scenarios.

Keywords: Land use changes, planning, forest production, Willamette Valley.

(Available at `http://www.econorthwest.com/wvaf`.)

Plantinga, A.J.; Alig, R.; Cheng, H.-t.
2001. The supply of land for conservation uses: evidence from the conservation reserve program. Resources Conservation and Recycling. 31: 199-215.

From 1987 to 1990, the conservation reserve program operated similarly to a competitive market for conservation lands. We estimated supply functions for conservation lands for nine regions in the United States. The results allow regions to be grouped according to low (Mountain, North Plains), moderate (Corn Belt, Lake States, South Plains), and high (Appalachian, Delta States, Northeast, Southeast) costs based on acreage enrolled.

Keywords: Grassland supply function, land conservation costs, Food Security Act of 1985.

(See Corvallis order form 2.)

Plant Ecology

Cordell, S.; Goldstein, G.; Meinzer, F.C.; Vitousek, P.M.
2001. Morphological and physiological adjustment to N and P fertilization in nutrient-limited *Metrosideros polymorpha* canopy trees in Hawaii. Tree Physiology. 21: 43-50.

Leaf-level studies of *Metrosideros polymorpha* canopy trees at both ends of a substrate-age gradient in the Hawaiian Islands pointed to different patterns of adjustment to both nutrient limitation and removal of this limitation by long-term (8 to 14 years) nitrogen (N), phosphorus (P), and N-P fertilization. Two study sites were located at the same elevation, had similar annual precipitation, and supported forests dominated by *M. polymorpha* but differed in the age of the underlying volcanic substrate and in soil nutrient availability, with relatively low N at the young site (300 years) and relatively low P at the oldest site (4,100,000 years).

Keywords: Metrosideros polymorpha*, chlorophyll content, leaf traits, nutrient limitation, photosynthesis.*

(See Corvallis order form 1.)

Cordell, S.; Goldstein, G.; Meinzer, F.C.; Vitousek, P.M.
2001. Regulation of leaf life-span and nutrient-use efficiency of *Metrosideros polymorpha* trees at two extremes of a long chronosequence in Hawaii. Oecologia. 27: 198-206.

Leaf traits related to lifespan and nutrient-use efficiency were studied in the dominant Hawaii tree species, *Metrosideros polymorpha*, at both ends of a natural fertility gradient, from young, nitrogen-poor soils to older, phosphorous-poor soils. Different types of adjustments to removal of nutrient limitation through long-term fertilization (9 to 15 years) with nitrogen (N), phosphorous (P), and a combined treatment of N plus P were observed at each site. Although removal of the main nutrient limitation at each site led to reduced integrated nutrient-use efficiency at both sites, the mechanisms differed depending on site limitations: a shorter leaf life span in the young, N-limited site and substantially higher foliar P in the P-fertilized plots at the old, P-limited sites.

Keywords: Leaf lifespan, Metrosideros polymorpha*, nitrogen limitation, nutrient-use efficiency, phosphorous limitation.*

(See Corvallis order form 1.)

Hennon, P.E.; Trummer, L.M.

2001. Yellow-cedar (*Chamaecyparis nootkatensis*) at the northwest limits of its natural range in Prince William Sound, Alaska. Northwest Science. 75(1): 61-71.

Little is known about yellow-cedar (*Chamaecyparis nootkatensis* D. Don Spach) around Prince William Sound, Alaska; even the northeast limit of the range of this valuable tree is not resolved. Mapping the occurrence of yellow-cedar from aircraft, boat, and by foot revealed two general locations: small populations on or near Hawkins Island and larger and more extensive populations from Glacier Island to Cedar Bay, Wells Bay, and Unakwik Inlet. A population of yellow-cedar on the eastern shore of Unakwik Inlet represents the farthest known northwest extension of the natural range. Results from plots located in the eastern and north-central areas of Prince William Sound indicate that yellow-cedar is common in all diameter classes but is younger than the associated western hemlock and mountain hemlock. The tree is reproducing prolifically in the north-central portion of the sound. Reproduction, growth, and the vigorous appearance of trees suggest that yellow-cedar is currently thriving and increasing in abundance near the edge of its range. Direct human use of these forests has been limited to the harvesting of small-diameter trees and the common occurrence of bark removal on the larger yellow-cedar trees.

Keywords: Yellow-cedar, Alaska-cedar, Chamaecyparis nootkatensis*, range, distribution, phytogeography.*

(See Juneau order form.)

Melcher, P.J.; Goldstein, G.; Meinzer, F.C. [and others]

2001. Water relations of coastal and estuarine *Rhizophora mangle*: xylem pressure potential and dynamics of embolism formation and repair. Oecologia. 126: 182-192.

Physiological traits related to water transport were studied in *Rhizophora mangle* (red mangrove) growing in coastal and estuarine sites in Hawaii. Our results and results from pressure volume relations suggested that *R. mangle* adjusts hydraulic properties of the water-transport system, as well as the leaf osmotic potential, in concert with the environmental growing conditions.

Keywords: Cavitation, cryo-scanning electron microscopy, mangrove, Rhizophora mangle*, xylem water transport.*

(See Corvallis order form 2.)

Perkins, D.L.

2001. Ecology of treeline whitebark pine (*Pinus albicaulis*) populations in central Idaho: successional status, recruitment and mortality, and a spring temperature reconstruction from whitebark pine tree rings. Logan, UT: Utah State University. 175 p. Ph.D. dissertation.

This research investigated the successional status of treeline whitebark pine (*Pinus albicaulis*) populations on 14 stands in central Idaho and used empirical statistical models to determine the principal factors affecting recruitment and mortality. The longest lived whitebark pines from four additional high-elevation sites were used to develop a tree-ring chronology to reconstruct over 1,000 years of average April-through-May temperatures. The assessment of stand structures using size-frequency distributions generally provided evidence that treeline whitebark pine populations currently are self-sustaining in areas of low to nonexistent incidence of white pine blister rust (*Cronartium ribicola*). The presence of subalpine fir (*Abies lasiocarpa*) in all size classes on sample plots, however, suggested potential replacement of, or codominant climax with, whitebark pine. Inference from Poisson regression models suggested that stand structure variables are important to whitebark pine establishment that may be constrained by interference competition and available growing space. Subalpine fir establishment seemed to be constrained by distance to seed source at lower elevations and by favorable site water-balance effects on north aspects.

Keywords: Whitebark pine, Pinus albicaulis*, Idaho.*

(Available only through library or interlibrary loan.)

Thysell, D.R.; Carey, A.B.
2001. *Quercus garryana* communities in the Puget Trough, Washington. Northwest Science. 75(3): 219-235.

We examined oak communities on Fort Lewis Military Reservation to (1) assess encroachment by exotic plants and Douglas-fir to determine amounts of regeneration of oak and other tree species and (2) compare oak community diversity with that of nearby Douglas-fir forests and native prairies. For the 22 largest communities, we determined densities of trees, distributions of tree diameters and heights, amounts of regeneration for each tree species, evidence of exogenous disturbances, and covers of vascular understory species. For study sites, we calculated basal areas of tree species, richness and diversity of vascular plants, and percentages of species that were exotic. Maintenance of oak communities and the natural mosaic of the Puget Sound area may require active tree-density management in oak stands, removal of Douglas-fir, development of replacement oak sites, suppression of exotics before and during controlled burning, and new information about regeneration, growth, and maturation of Oregon white oak in this, the northern portion of its range.

Keywords: Oregon white oak, Quercus garryana*, Douglas-fir,* Pseudotsuga menziesii*, Puget Trough, Washington, regeneration, exotic plants.*

(See Olympia order form.)

van Hees, W.W.S.; Dobelbower, K.; Winterberger, K.
2001. Forest type definitions by cluster analysis. Western Journal of Applied Forestry. 16(3): 101-105.

A method is presented to develop forest type definitions by using cluster analysis of forest inventory data collected in southeast Alaska from 1995 through 1998. Species stocking levels were used as variables for cluster development. Pacific Northwest Research Station forest inventory staff could not compute forest type for some forested conditions in southeast Alaska using then-existing forest type definitions. Forest type definitions developed by cluster analysis improved computed assignment of forest type.

Keywords: Cluster analysis, southeast Alaska, forest type.

(See Anchorage order form.)

Whitford, W.G.; Nielson, R.; de Soyza, A.
2001. Establishment and effects of establishment of creosotebush, *Larrea tridentata*, on a Chihuahuan Desert watershed. Journal of Arid Environments. 47: 1-10.

Creosotebush (*Larrea tridentata*) spread into many areas of the Chihuahuan Desert during the past 150 years. Despite the importance of this process in the degradation of rangelands, no empirical studies have examined the establishment of this shrub and the immediate post-establishment changes in soil and structure of the community. We established an *L. tridentata* seedling transplant study in three plant communities on a northern Chihuahuan Desert watershed and examined the effects of creosotebush of documented age on soil properties and other species in the plant community. We hypothesized that creosotebush seedling survival would be highest in a grassland with a history of grazing and lowest in a mature stand of *L. tridentata* and an ungrazed, black-grama (*Bouteloua eriopoda)* grassland.

Keywords: Creosotebush, Larrea tridentata*, seedling establishment, seedling survival, soil properties, Chihuahuan Desert, transplant study.*

(See Corvallis order form 2.)

Wimberly, M.C.; Spies, T.A.
2001. Influences of environment and disturbance on forest patterns in coastal Oregon watersheds. Ecology. 82(5): 1443-1459.

We assessed the relative influences of environment and disturbance on riparian and hillslope forests in the Cummins Creek Wilderness in the Oregon Coast Range. Species composition of hillslope forests was associated primarily with environmental gradients, whereas the structure of hillslope forests was related to a disturbance-generated patch mosaic. Disturbances, topography, and vegetation were more tightly linked in riparian areas than on hillslopes. Our findings suggest a conceptual model in which the relative influences of environment and disturbance on forest vegetation are contingent on the facet of vegetation considered (composition versus structure) and the portion of the landscape examined (hillslope versus riparian).

Keywords: Environmental gradients, disturbance, seed source limitation, forest structure, community composition, riparian forests, succession.

(See Corvallis order form 2.)

Plant Pathology

Filip, G.M.; Schmitt, C.L.; Parks, C.G.
2000. Mortality of mixed-conifer regeneration surrounding stumps infected by *Heterobasidion annosum* 15-19 years after harvesting in northeastern Oregon. Western Journal of Applied Forestry. 15(4): 189-193.

In 1989, a high frequency (89 percent) of *Heterobasidion annosum*, cause of annosus root disease, was found in true fir stumps cut 5 to 9 years earlier in northeastern Oregon. Despite high stump-infection levels, mortality of surrounding regeneration was low (1.4 percent) in 1989 and even lower (0.7 percent) in 1999. High-elevation mixed-conifer stands in northeastern Oregon often are overstocked with regeneration. This regeneration includes *H. annosum*-susceptible species, such as grand fir and subalpine fir, and *H. annosum*-tolerant species, such as Douglas-fir, Engelmann spruce, and western larch. Despite low observed mortality levels and because 30 years or more often are needed to observe root-disease progress in new stands, we are reluctant to abandon the recommendation that forest managers consider treatment of true fir stumps with boron-containing products to prevent infection by *H. annosum*.

Keywords: Annosus, root disease, northeastern Oregon, boron.

(See La Grande order form.)

Hedwall, S.J.
2000. Bird and mammal use of dwarf mistletoe-induced witches' brooms in Douglas-fir in the Southwest. Flagstaff, AZ: Northern Arizona University. 66 p. M.S. thesis.

Despite their impact on trees, dwarf mistletoe-induced witches' brooms may be important to wildlife. To determine whether birds and mammals select witches' brooms for nesting, roosting, or foraging sites, I compared bird and mammal use of broomed and unbroomed Douglas-fir in mixed-conifer forests in northern Arizona. I systematically selected broomed and unbroomed trees in three stands. I found more evidence of bird and mammal use in broomed trees than in unbroomed trees. Due to the debilitating effects of dwarf mistletoes on their host trees and their ability to affect stand conditions, innovative management will be required to maintain stand conditions and provide broom structures for wildlife.

Keywords: Arceuthobium *spp., red squirrels.*

(Available only through library or interlibrary loan.)

Plant Physiology

Copes, D.L.; Mandel, N.L.

2000. Effects of IBA and NAA treatments on rooting Douglas-fir stem cuttings. New Forests. 20: 249-257.

Results from 10 different rooting investigations made between 1984 and 1996 are reported. Auxin concentrations from 0 to 98.6 mM for IBA and 0 to 7.4 mM for NAA were tested alone and in combination on over 30,000 Douglas-fir cuttings. No one auxin concentration or combination was consistently superior to others. Auxin treatments significantly enhanced rooting over controls. The IBA response was nonlinear, whereas NAA seemed to be linear across the tested concentrations. The IBA treatment of 24 mM and NAA of 7.4 mM resulted in good rooting results in every study.

Keywords: Vegetative propagation, rooting, cuttings, propagules, clone, indole-3-butyric acid, 1-napthalenacetic acid, IBA, NAA.

(See Corvallis order form 1.)

Range Management

Walburger, K.; DelCurto, T.; Vavra, M. [and others]

2000. Influence of a grazing system and aspect, north vs. south, on the nutritional quality of forages, and performance and distribution of cattle grazing forested rangelands. Proceedings, Western Section, American Society of Animal Science. 51: 181-184.

This study was designed to determine if grazing treatment and pasture aspect have an effect on forage quality, ADG, and cattle distribution and to determine if forage quality drives pasture preference within a mountain upland pasture.

Keywords: Beef cattle, grazing management, forage quality.

(See La Grande order form.)

Regional Assessments

Hessburg, P.F.; Smith, B.G.; Salter, R.B. [and others]

2000. Recent changes (1930s-1990s) in spatial patterns of interior Northwest forests, USA. Forest Ecology and Management. 136: 53-83.

We characterized recent historical and current vegetation composition and structure of a representative sample of subwatersheds on all ownerships within the interior Columbia River basin and portions of the Klamath and Great Basins. We characterized change in vegetation spatial patterns by using an array of class and landscape metrics and a spatial pattern analysis program, and we translated change in vegetation patterns to change in patterns of vulnerability to wildfires, smoke production, and 21 major forest pathogen and insect disturbances.

Keywords: Change detection, landscape assessment, spatial patterns, reference variation, ecosystem health, forest health, fire exclusion, disturbance regimes.

(See Wenatchee order form.)

Remote Sensing

Cohen, W.B.; Maierspergers, T.K.; Spies, T.A.; Oetter, D.R.

2001. Modelling forest cover attributes as continuous variables in a regional context with Thematic Mapper data. International Journal of Remote Sensing. 22(12): 2279-2310.

We modeled forest vegetation attributes as continuous variables across western Oregon by using a multi-image mosaic of Thematic Mapper data. Four specific attributes were modeled by using regression analysis: percentage green vegetation cover, percentage conifer cover, conifer crown diameter, and conifer stand age.

Keywords: Forest structure, forest composition, land cover, Landsat TM.

(See Corvallis order form 1.)

Maiersperger, T.K.; Cohen, W.B.; Ganio, L.M.
2001. A TM-based hardwood-conifer mixture index for closed canopy forests in the Oregon Coast Range. International Journal of Remote Sensing. 22(5): 1053-1066.

The purpose of this study was to develop, implement, and test methods for quantifying the relative proportion of hardwood and conifer cover from Thematic Mapper (TM) imagery. We focused on closed canopy forests in the Oregon Coast Range, where hardwood, conifer, and mixed stand conditions are prevalent. Based on our understanding of the patterns of spectral variation expressed by these forests in TM data space, we hypothesized that a vegetation index could be developed to measure hardwood-conifer mixing proportions.

Keywords: Vegetation indices, hardwood-conifer forests.

(See Corvallis order form 2.)

Silviculture

Wurtz, T.L.; Wahrenbrock. W.W.
2000. Can mulch mats help regenerate beetle-killed spruce forests? Agroborealis. 32(2): 4-6.

Over the past 15 years, 3 million acres of south-central Alaska and Kenai Peninsula forests have been infested with spruce beetles. A major obstacle to regenerating these forests is the grass *Calamagrostis canadensis*, which spreads aggressively when the forest canopy opens up and competes with slow-growing white spruce seedlings. Over 5 years, only the largest mats tested had a significant positive impact on growth; there was no effect on survival of spruce seedlings. Under the conditions tested in this study, we consider mulch mats to be unfeasible for forestry application in Alaska.

Keywords: Alaska, boreal forest, Kenai Peninsula, white spruce, Picea glauca, Calamagrostis canadensis, *spruce beetle,* Dendroctonus rufipennis*, mulch mats.*

(See Fairbanks order form.)

Social Sciences

Kline, J.D.; Armstrong, C.
2001. Autopsy of a forestry ballot initiative: characterizing voter support for Oregon's Measure 64. Journal of Forestry. May: 20-27.

On November 3, 1998, Oregon voters soundly rejected a ballot initiative intended to promote sustainable forest practices and protect forest ecosystems by restricting clearcut logging and herbicide and pesticide use. We found that initiative support was greater in more urban counties comprised of more educated residents earning higher incomes and higher proportions of registered Democrats. Opposition was strongest in counties comprised of higher proportions of forest industry employees and higher proportions of native-born Oregonians.

Keywords: Clearcutting, sustainable forestry, forest policy, public referenda.

(See Corvallis order form 1.)

Soil

Terry, T.A.; Harrison, R.B.; Harrington, C.A.
2001. Fall River long-term site productivity study: objectives and design. Pap. 01-1. [Federal Way, WA]: Weyerhaeuser Company, Western Timberlands R&D. 10 p.

The purpose of this note was to outline the objectives of the Fall River long-term site productivity study and describe the treatments being investigated and the experimental design. The study will provide information for a database that can be used to develop soil-management guidelines to maintain and enhance long-term site productivity under intensive forest management regimes.

Keywords: Site productivity, harvest level, soil disturbance, compaction.

(See Olympia order form.)

Threatened, Endangered, Sensitive Species

Cooper, B.A.; Raphael, M.G.; Mack, D.E. 2001. Radar-based monitoring of marbled murrelets. The Condor. 103: 219-229.

We used radar to measure daily, monthly, and annual patterns of marbled murrelet (*Brachyramphus marmoratus*) abundance and movements at 12 major river valleys on the Olympic Peninsula of Washington. Landward movements of murrelets peaked from about 20 to 75 minutes before sunrise, followed by a seaward exodus from about 20 minutes before sunrise to about 65 minutes after sunrise. This general pattern of a landward movement followed by a seaward exodus varied little, but the timing of the seaward exodus gradually became later from May to July. Within a morning, numbers of landward radar targets averaged twice the numbers of seaward targets, and morning counts were about five times evening counts. Species identification error rates were lower for landward radar counts than for seaward counts. Radar counts differed through the season, with numbers increasing from May to July, then dropping in August. Seaward counts were more variable than landward counts. There was wide overlap among months in the amount of daily variation in both landward and seaward counts. Radar seems to be a powerful, cost-effective, and nonintrusive tool that can establish an index of abundance for murrelets at specific inland breeding areas.

Keywords: Brachyramphus marmoratus*, marbled murrelet, daily and monthly variation, monitoring, radar.*

(See Olympia order form.)

Watershed Management

Carey, A.B.; Lippke, B.R.; Sessions, J. 1999. Intentional systems management: managing forests for biodiversity. Journal of Sustainable Forestry. 9(3/4): 83-125.

We developed a conceptual model of forest ecosystem development specific to west-side western hemlock/Douglas-fir forest. Next we developed alternative management pathways that emphasized preservation, maximization of the net present value of timber, and biodiversity. Four indices to forest ecosystem health were developed, including capacity to support vertebrate diversity, forest floor function based on the integrity of the forest-floor mammal community, ecological productivity based on the abundance of the arboreal rodent community, and production of deer and elk. A harvest and scheduling model was adapted for 300-year landscape simulations. Biodiversity management is a net benefit solution for multiple-use public lands and trust lands.

Keywords: Biodiversity, forestry, landscape management, Olympic Peninsula, Pacific Northwest, timber, Washington, wildlife.

(See Olympia order form.)

Starr, L.; McIver, J.; Quigley, T.M. 2000. Sustaining the land, people, and economy of the Blue Mountains: the Blue Mountains Natural Resources Institute. In: Smith, H.Y., ed. The Bitterrroot Ecosystem Management Research Project: what we have learned: Symposium proceedings. RMRS-P-17. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 125-128.

In La Grande, Oregon, the Blue Mountains Natural Resources Institute approached issues by determining whether a critical issue was one of information needs or of differing values. We arranged local forums for discussion, disseminated available information, and undertook research projects as appropriate. One issue we researched involving both values and information

needs was fuel reduction. Through an adaptive management cycle of treatment, evaluation, and refinement, we brought new understanding to management options for fuel treatment efforts and the ecological and economic results. A survey on acceptance of fuel reduction methods allowed integration of social, ecological, and economic factors, an essential feature of ecosystem management.

Keywords: Ecosystem management, fuel reduction, adaptive management.

(See La Grande order form.)

Wildlife

Bull, E.L.; Akenson, J.J.; Henjum, M.G.
2000. Characteristics of black bear dens in trees and logs in northeastern Oregon. Northwestern Naturalist. 81: 148-153.

Two-thirds of 164 black bear (*Ursus americanus*) dens were associated with hollow trees or logs in northeastern Oregon from 1993 to 1999. Hollow trees with the den entrance in the broken-off trunk comprised 19 percent of the dens and were typically large-diameter grand fir (*Abies grandis*) with Indian paint fungus (*Echinodotium tinctorium*) decaying the heartwood. Hollow trees with a base entry comprised 11 precent of the dens, and most were in large-diameter grand fir and western larch *(Larix occidentalis*) with basal decay. Twenty-five percent of the dens were excavated underneath logs; many of these logs were large and lacked decay. Although a wide variety of habitat types were used, the majority of trees used for denning were in moist, old-growth stands of grand fir. Retaining large-diameter grand fir and western larch with evidence of decay where they occur and maintaining large-diameter logs where large trees are lacking will increase den site options for black bears in northeastern Oregon.

Keywords: Black bear, Ursus americanus*, dens, hollow trees, northeastern Oregon.*

(See La Grande order form.)

Bull, E.L.; Hayes, M.P.
2000. Livestock effects on reproduction of the Columbia spotted frog. Journal of Range Management. 53(3): 291-294.

We evaluated reproduction and recruitment of the Columbia spotted frog (*Rana luteiventris*) in 70 ponds used by livestock and in 57 ponds not used by livestock in northeastern Oregon. No significant differences were detected in the number of egg masses or recently metamorphosed frogs between the ponds. No pond characteristic measured could satisfactorily predict egg mass numbers, but percentage of aquatic vegetation and dissolved oxygen were good indicators of numbers of recently metamorphosed frogs. Both variables were stronger predictors of numbers in grazed ponds than in ungrazed ponds.

Keywords: Livestock grazing, northeastern Oregon, Rana luteiventris*.*

(See La Grande order form.)

Bull, E.L.; Hayes, M.P.
2001. Post-breeding season movements of Columbia spotted frogs (*Rana luteiventris*) in northeastern Oregon. Western North American Naturalist. 61(1): 119-123.

Fifty percent of radio-tagged Columbia spotted frogs (*Rana luteiventris*) remained in breeding ponds, and 50 percent moved to other permanent ponds or river stretches during spring and summer 1998. Distances that frogs traveled to other water bodies ranged from 15 to 560 meters. Movements seemed to be influenced by availability of habitat and aquatic conditions. Frogs moved when other permanent water sources were within 100 meters, whereas frogs at an isolated breeding pond did not. We believe frogs moved to nonbreeding permanent ponds in spring and early summer during larval metamorphosis. In July, frogs moved to river stretches where water temperatures averaged 5.5 °C cooler than ponds.

Keywords: Columbia spotted frog, Rana luteiventris*, movements, northeastern Oregon, ranid.*

(See La Grande order form.)

Bull, E.L.; Heater, T.W.
2001. Home range and dispersal of the American marten in northeastern Oregon. Northwestern Naturalist. 82: 7-11.

Home ranges of American martens (*Martes americana*) averaged 2869 hectares for males and 1416 hectares for females in northeastern Oregon. Home ranges were largely mutually exclusive for martens of the same sex. Only 1 of 11 adult male martens used two distinct home ranges in successive years. Two of nine females expanded their home ranges during the breeding season by moving from managed to unmanaged stands and were found with radiocollared males. Sixty percent of juvenile martens dispersed an average of 22.7 kilometers away from the study area; the remainder stayed within the study area.

Keywords: American marten, Martes americana*, dispersal, home range, movements, northeastern Oregon.*

(See La Grande order form.)

Bull, E.L.; Heater, T.W.
2001. Survival, causes of mortality, and reproduction in the American marten in northeastern Oregon. Northwestern Naturalist. 82:1-6.

Survival rates, mortality, and reproduction in the American marten were determined in northeastern Oregon. The probability of survival of martens was 0.56 for 1 year, 0.38 for 2 years, 0.22 for 3 years, and 0.16 for 4 years. Twenty-two of 35 radio-collared martens were killed; 82 percent were killed by predators, 14 percent died from exposure, and 4 percent died from reasons related to the collar. Eight martens were killed by bobcats, 4 by raptors, 4 by martens, and 2 by coyotes. Of 13 reproductive efforts, only 4 females weaned at least on kit, 8 efforts failed, and the outcome of one was unknown.

Keywords: American marten, Martes americana*, survival, mortality, northeastern Oregon, reproduction.*

(See La Grande order form.)

Gende, S.M.; Quinn, T.P.; Willson, M.F.
2001. Consumption choice by bears feeding on salmon. Oecologia. 127: 372-382.

Over 18,000 bear-killed salmon were investigated between 1994 and 1998 in Bristol Bay (sockeye) and southeastern Alaska (pink and chum). These data revealed striking patterns of partial and selective consumption that differed with sex, size, spawning status, stage of the spawning run, habitat, and spawner density. Bears preferentially consumed the brain and dorsal hump in males and the roe in females. The brains and bodies were selectively consumed from large fish of both sexes, whereas smaller fish were more likely to be bitten and dropped. The belly region of small males was consumed more often, suggesting that bears may make size-related "mistakes." More biomass was consumed per fish when salmon were captured ripe versus spawned-out. Over the course of the spawning season, the variance in the amount of biomass eaten per fish increased, as many fish were either consumed almost entirely or were bitten and dropped. More biomass was consumed per fish as relative availability decreased.

Keywords: Brown bear, Ursus *spp., consumption, foods, foraging, predation, lipids.*

(See Juneau order form.)

Stussy, R.J.; Findholt, S.L.; Johnson, B.K. [and others]
2000. Selenium levels and productivity in three Oregon elk herds. Northwest Science. 74(2): 97-101.

A deficiency in selenium (Se), an essential dietary trace mineral, has been linked to decreased productivity in livestock and some species of wildlife. Productivity of elk (*Cervus elaphus*) in some areas of the Coast Range, Cascade Range, and Blue Mountains of Oregon is low or declining, yet the Se status of these herds is unknown. We compared liver Se levels and measures of elk productivity for 447 female elk collected from these three geographic regions during controlled hunts held in December and January 1987-93. Elk liver Se concentrations

ranged from 0.002 to 3.419 parts per million, with 42 percent of the elk liver samples considered deficient by standards for cattle. Liver Se concentrations differed significantly among areas and between some years within areas. LIver Se was not related to age, body condition, or conception dates of females older than 1 year, and mean herd Se concentration was not related to postseason calf to cow ratios. Liver Se was not significant in predicting the probability of pregnancy or lactation in females 3 to 13 years of age. We concluded that liver Se levels were not related to the elk productivity parameters we measured; however, liver Se may not be the most appropriate measure of an animal's Se status because it does not represent a measure of the bioactive form of Se. We recommend measuring levels of Se in blood.

Keywords: Selenium, elk.

(See La Grande order form.)

Wertz, T.L.; Akenson, J.J.; Henjum, M.G.; Bull, E.L.

2001. Home range and dispersal patterns of subadult black bears in northeastern Oregon. Western Black Bear Workshop. 7: 93-100.

Movement patterns of subadult black bear (*Ursus americanus*) from 1993 to 1999 were examined to determine whether these patterns influenced animal distribution and habitat use. In the Blue Mountains of northeastern Oregon, 11 subadult females and 18 subadult males were radio-collared. Average home range size for subadult females was 4121 hectares; none left the study area. Seven of 18 subadult males left the study area and moved an average of 53.3 kilometers. All seven dispersed west or south from the study area through a designated wilderness area. This dispersal pattern may indicate a distinct travel corridor to and from our study area. We discuss the influence of connective travel corridors on subadult male movement patterns and impacts on the amount of hunting opportunity or tag allocations allowed in this area.

Keywords: Black bear, Ursus americanus*, dispersal, home range, tracking hounds, Oregon, subadult.*

(See La Grande order form.)

Wood Utilization

Lowell, E.C.

2001. Veneer recovery from beetle-killed spruce trees, Kenai Peninsula, Alaska. Western Journal of Applied Forestry. 16(2): 65-70.

A four-level visual classification system based on tree conditions was developed for beetle-killed spruce on the Kenai Peninsula, Alaska. The veneer recovery study estimated volume and value of veneer recovered from trees in all but the most deteriorated class (class 4). Trees were selected by diameter at breast height and deterioration class from plots spanning the peninsula. Results showed significantly lower recovery of both volume and value for logs from dead trees compared to logs from live trees. The recommendation is to have two deterioration classes: one for live and infested trees and a second for dead trees.

Keywords: Dendroctonus rufipennis*, Sitka spruce, white spruce, veneer recovery.*

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Mead, B.; Hiserote, B.

2001. The Pacific coast region. In: Johnson, T.G., ed. United States timber industry–an assessment of timber product output and use, 1996. Gen. Tech. Rep. SRS-45. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 41-46.

This report is a compilation of timber product output for the United States and the five Resources Planning Act regions for 1996 and is a companion report to the Forest Resources of the United States, 1997. Roundwood output from the Nation's forests totaled 16.4 billion cubic feet, 8 percent less than in 1991. Saw logs were the leading roundwood product at 7.1 billion cubic feet; pulpwood ranked second at 5.2 billion cubic feet; and veneer logs were third at 1.3 billion cubic feet. The South supplied 58 percent of the Nation's timber product output and had 7 of the top 10 producing states. Softwood species accounted for 61 percent of output, and nonindustrial private forest owners supplied 60 percent of the Nation's roundwood products. Mill byproducts generated from primary manufacturers totaled 6.1 billion cubic feet. Only 2 percent of the mill residues were not used. Mill residue was used primarily for fuel and fiber products.

Keywords: Pulpwood, removals, residue, roundwood, saw logs, veneer logs.

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Scott, G.M.; Bormett, D.W.; Sutherland, N.R. [and others]

2000. Beetle-killed spruce utilization in the Kenai Peninsula. Tappi Journal. 83(6): 1-7.

Infestation of the *Dendroctonus rufipennis* beetle has resulted in large stands of dead and dying timber on the Kenai Peninsula in Alaska. Tests were conducted to evaluate the value of beetle-killed trees as pulpwood. The results showed that live and dead spruce wood can be pulped effectively. The two least deteriorated classes and the most deteriorated class of logs had similar characteristics when pulped; the remaining class had somewhat poorer pulpability. The more deteriorated wood required the same or slightly less refining energy to achieve a certain level of freeness from decay. The presence of sap rot decay was an important indicator of pulping efficiency and resultant pulp quality. Log deterioration had mixed effects on paper properties.

Keywords: Pulp, paper, beetle-killed spruce, dead spruce, Kenai Peninsula.

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