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Pacific Northwest
Research Station

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October 2001

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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

01-079

Pacific Northwest Research Station
2001. Recent publications of the Pacific Northwest Research Station, fourth quarter 2000. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 25 p.

Keywords: Bibliographies (forestry).

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

Economics

01-051

Fight, R.D.; Chmelik, J.T.; Coulter, E.A.
2001. Analysts guide: TreeVal for Windows, version 2.0. Gen. Tech. Rep. PNW-GTR-514. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 21 p.

TreeVal for Windows provides financial information and analysis to support silvicultural decisions in coast Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco). All management actions, including pruning, are supported. Results, including product recovery information, net value, and financial analysis of silvicultural regimes, are available in both tabular and graphical forms to facilitate comparison of alternative regimes.

Keywords: Douglas-fir, Pseudotsuga menziesii*, computer programs, software, computer applications, forestry, forest valuation, product recovery, ecosystem management.*

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

00-360

Montgomery, C.A.
2001. The future of housing in the United States: an economic model and long-term predictions for the 2000 RPA timber assessment. Res. Pap. PNW-RP-531. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 38 p.

This paper reports a structural model of the U.S. housing sector that was used to generate the key housing assumptions used in the 2000 Resources Planning Act timber assessment: number of households, improvement expenditure, and square footage of new residential construction by unit type. Assuming average annual population growth of 0.77 percent and real income growth of 1.99 percent, the model predicts 1.30 percent average annual growth in housing investment, compared to 2.04 percent annual growth since 1952. The allocation between new construction and home improvement remains fairly constant at about 56 percent and 44 percent, respectively. Scenario analysis was used to test sensitivity of the predictions to key macroeconomic assumptions.

Keywords: Housing demand, housing supply, residential construction, maintenance and remodeling of housing, structural models.

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

00-130

Robertson, G.C.; Brooks, D.J.
2001. Assessment of the competitive position of the forest products sector in southeast Alaska, 1985-94. Gen. Tech. Rep. PNW-GTR-504. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 29 p.

This paper provides an assessment of the competitive position of southeast Alaska's forest products sector relative to its major competitors. The data consistently indicated that southeast Alaska has been a high-cost producer of sawn wood products operating at the margin of profitability over the analysis period. This situation is the result of a combination of high labor costs on a per unit of input basis, low productivity in terms of labor inputs in both logging and sawmilling sectors, and raw material inputs in the sawmilling sector. Certain species and log grades, however, are capable of generating considerable profits, and the relation between average profitability for the sum total of southeast Alaska harvests and the profitability of specific components of this harvest also is analyzed. Concluding remarks center on the implications of these findings for current efforts to promote increased value-added timber processing in southeast Alaska.

Keywords: Comparative advantage, labor productivity, timber scarcity, value added, stumpage prices.

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

01-231

Warren, D.D.
2001. Production, prices, employment, and trade in Northwest forest industries, all quarters 1999. Resour. Bull. PNW-RB-235. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 171 p.

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

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

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

Forest Management

00-271

Gucinski, H.; Furniss, M.J.; Ziemer, R.R.; Brookes, M.H., eds.
2001. Forest roads: a synthesis of scientific information. Gen. Tech. Rep. PNW-GTR-509. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 103 p.

Effects of roads in forested ecosystems span direct physical and ecological ones (such as geomorphic and hydrologic effects), indirect and landscape-level ones (such as effects on aquatic habitat, terrestrial vertebrates, and biodiversity conservation), and socioeconomic ones (such as passive use value, economic effects on development and range management). Road effects take place in the contexts of environmental settings, their history, and the state of engineering practices and must be evaluated in those contexts for best management approaches.

Keywords: Roads, roadless areas, forest ecosystems, geomorphology, hydrology, habitat fragmentation, biodiversity, nonmarket values, heritage values, economic development, grazing, mineral resources, fire.

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

Invertebrates

00-306

Niwa, C.G.; Sandquist, R.E.; Crawford, R. [and others]

2001. Invertebrates of the Columbia River basin assessment area. Gen. Tech. Rep. PNW-GTR-512. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 74 p. (Quigley, T.M., ed.; Interior Columbia Basin Ecosystem Management Project: scientific assessment).

A general background is presented on functional groups of invertebrates in the Columbia River basin and how they affect sustainability and productivity of their ecological communities. The functional groups include detritivores, predators, pollinators, and grassland and forest herbivores. Invertebrate biodiversity and species worthy of conservation are discussed. Effects of management practices on wildlands and suggestions to mitigate them are presented. Recommendations for further research and monitoring are given.

Keywords: Nutrient cycling, detritivory, predation, pollination, herbivory, bacteria, fungi, nematodes (roundworms), arachnids (spiders and scorpions), insects, gastropods (snails and slugs), oligochaetes (earthworms), invertebrate biodiversity.

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

Monitoring

08-S

Campbell, S.; Dale, J. Hooper, C. [and others]

2000. Forest health in west coast forests, 1997-1999. Salem, OR: Oregon Department of Forestry. 73 p.

This report examines some forest health issues current in west coast states in 1997, 1998, and 1999. The narrative discusses forest ecosystem disturbance, two significant forest insect and disease problems (Swiss needle cast and spruce beetle), forest fragmentation and urbanization, and introduction of exotic organisms. The forest health monitoring (FHM) program of the USDA Forest Service is briefly described, and FHM plot data are presented in the appendices.

Keywords: Swiss needle cast, spruce beetle, exotics, aerial survey, forest health monitoring, forest fragmentation, urbanization, disturbance.

(This publication was listed in our fourth quarter 2000 publication, but 300 copies are still available.)

Plant Ecology

00-174

Hall, F.C.

2001. Ground-based photographic monitoring. Gen. Tech. Rep. PNW-GTR-503. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 340 p.

Photographic monitoring means taking repeat photos of a topic to document how it changes over time. Critical attributes are (1) maps to find the sampling sites and of the sampling layout; (2) permanent marking of both camera location and photo point, because distance between them must not change among photographs; (3) a meter board used to mark the topic, aim the camera, focus on for best depth of field, and adjust a grid for measurement of change; and (4) precise replication of photographs. Five appendices supplement the text.

Keywords: Monitoring, photographs, landscapes, transects, animal sampling, riparian, succession, forests, rangeland.

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

Resource Inventory

01-139

van Hees, W.W.S.

2001. Summary estimates of forest resources on unreserved lands of the Chatham inventory unit, Tongass National Forest, southeast Alaska, 1998. Resour. Bull. PNW-RB-234. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 12 p.

Summary estimates are presented of forest resource area, timber volume, and growth and mortality of timber on unreserved national forest land in the Chatham inventory unit of the Tongass National Forest. Pacific Northwest Research Station, Forest Inventory and Analysis, crews collected inventory data from 1995 to 2000. Productive forest land area (timberland) was estimated at 1,302 thousand acres, cubic-foot volume on timberland at 7,561 million cubic feet, and net annual growth and mortality at 31,613 and 28,341 thousand cubic feet, respectively.

Keywords: Forest surveys, timber resources, statistics (forest), Alaska (southeast), Chatham.

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

Silviculture

00-336

Miller, R.E.; Smith, J.; Anderson, H.

2001. Detecting response of Douglas-fir plantations to urea fertilizer at three locations in the Oregon Coast Range. Res. Pap. PNW-RP-533. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 20 p.

Fertilizer trials in coast Douglas-fir in the Oregon Coast Range usually indicate small and statistically nonsignificant response to nitrogen (N) fertilizers. Inherently weak experimental designs of past trials have made those trials too insensitive to detect growth differences that actually exist. Ability to detect real differences among treatments should be improved by having more than two replications per treatment and by using covariance analysis to adjust observed treatment means for unequal starting conditions among experimental plots. To demonstrate these assumptions, we used size at fertilization and a prefertilization (calibration) period of growth as covariates in analyzing data from five coastal plantations with three to six replicate plots per treatment. Our objectives were to quantify 4- or 7-year response to N fertilizer and to demonstrate practical means for detecting response. Effects of fertilization on tree diameter and height, and on basal area and volume growth per acre were estimated. Among the five nonthinned plantations, observed gross basal area growth was changed by –2 to 13 percent in the 4 or 7 years after fertilization. Observed responses were increased substantially by covariance analyses at some plantations but decreased at others.

Keywords: Douglas-fir, Pseudotsuga menziesii*, fertilization, nitrogen, urea, tree growth, stand growth.*

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

Soil, Site, Geology

00-106

Miller, R.; Hazard, J.; Howes, S.

2001. Precision, accuracy, and efficiency of four tools for measuring soil bulk density of strength. Res. Pap. PNW-RP-532. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 16 p.

We compared three core samplers and a cone penetrometer as measures of soil compaction after clearcut harvest on stony and stone-free soils. Precision (i.e., consistency) of each tool at depths of 0-10, 10-20, and 20-30 centimeters was determined from two adjacent samples at 21 or more sampling locations in each harvested area. Because one bulk density (D_b) sampler provided a continuous sample of each decimeter depth, it was designated as the standard. Based on time requirements and precision of each tool, we examined the efficiency of double sampling (by using a combination of penetrometer and core sampler for estimating D_b). Results from the stone-free soil indicated an advantage in both

precision and efficiency in applying double-sampling theory to estimate D_b over sampling exclusively by the more time-consuming core samplers.

Keywords: Bulk density, measurement precision, relative accuracy, cone penetrometer, soil strength.

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

Watershed Management

99-190

Kahklen, K.

2000. A method for measuring sediment production from forest roads. Res. Note PNW-RN-529. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 17 p.

Predicting sediment production from forest roads is necessary to determine the impact on watersheds and associated terrestrial and stream biota. A method is presented for measuring sediment originating from a road segment for individual storm events and quantifying sediment transport and variables associated with sediment production. The method includes data loggers, a rain gauge, a traffic counter, Parshall flumes with stilling wells, hydrostatic pressure transducers, and water pumping samplers. A sampling protocol is described, which worked well for the forest roads in southeast Alaska and can be adapted for use in other regions. Examples of data collection and analysis are explained for sites near the road and comparison of these to downstream sites for sediment delivery quantification. This method can be used to determine the downstream transport of sediment originating from roads and developing regression models or validating existing sediment models.

Keywords: Road erosion, sediment, forest roads, sediment transport.

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

Wood Utilization

00-234

Barbour, R.J.; Parry, D.L.

2001. Log and lumber grades as indicators of wood quality in 20- to 100-year-old Douglas-fir trees from thinned and unthinned stands. Gen. Tech. Rep. PNW-GTR-510. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 22 p.

Even though landowners in the coastal Pacific Northwest manage their land for a wide range of objectives, many include wood production as either a primary or secondary objective. This report examines the differences in wood characteristics that might be expected by landowners who remove wood in the 70- to 100-year age range as compared to wood removed in the 40- to 60-year age range. Comparisons of differences in domestic log grades suggest that the proportion of log volume in the higher grades (Special Mill and number 2 Sawmill) increases with both stand age and tree size. Simulation of lumber grade yields based on log characteristics suggested that yields of higher grades of lumber increase until about age 60 to 70, then level off over the rest of the age range examined here. This analysis included structural lumber products but not higher value appearance-grade products, and there is some evidence that yields of these products might have begun to increase in the oldest trees. The analysis also demonstrated that the younger trees had larger branches and more juvenile wood, possibly because they had been grown in stands with a higher level of early stand management than the older trees. If these young trees were grown to ages of 70 to 100 years, it is unlikely they would produce log and lumber grade yields found in the older trees examined here.

Keywords: Wood quality, log grade, lumber grade, thinning, Douglas-fir, Pseudotsuga menziesii*, ecosystem management, sustainable forestry.*

(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/Riparian Systems

Bilby, R.E.; Heffner, J.T.; Fransen, B.R. [and others]

1999. Effects of immersion in water on deterioration of wood from five species of trees used for habitat enhancement programs. North American Journal of Fisheries Management. 19: 687-695.

Logs of standard dimensions from five species of trees were submerged in a stream to evaluate changes in strength and decomposition over a 5-year period. Changes in structural properties occurred only for wood near the outer surface of the logs. Nearly all bark was removed from the logs within 12 months. Modulus of rupture, modulus of elasticity, and wood density did not change for wood more than 12 millimeters from the log surface for any of the species. Bigleaf maple exhibited the highest resistance to rupture, and western redcedar exhibited the lowest. Western redcedar also was the most easily flexed. Microbial activity on the surface of the logs was highest at the start of the experiment and decreased rapidly with time of immersion. The two hardwood species generally had higher levels of microbial activity than the conifer species from 12 months through 60 months of immersion. Differences in the rate of decomposition between conifer and hardwood logs were much less than in terrestrial environments. Our results suggest that hardwood logs can be used in stream enhancement projects where the wood will be submerged.

Keywords: Stream habitat enhancement, wood decomposition, Douglas-fir, Pseudotsuga menziesii*, western redcedar,* Thuja plicata*, western hemlock,* Tsuga heterophylla*, bigleaf maple, Ac*er macrophyllum*, red alder,* Alnus rubra*.*

(See Olympia order form.)

Williamson, N.M.

Crown fuel characteristics, stand structure, and fire hazard in riparian forests of the Blue Mountains, Oregon. Seattle, WA: University of Washington. 98 p. M.S. thesis.

This study examined a number of factors influencing fire behavior in riparian areas and, in particular, the occurrence of crown fire behavior. This study also compared crown fire hazard between riparian and upslope stands in the Blue Mountains of northeast Oregon.

Keywords: Prescribed fire, crown fire behavior, northeast Oregon.

(Available only through library or interlibrary loan.)

Economics

Ahn, S.; Plantinga, A.J.; Alig, R.J.

2000. Predicting future forestland area: a comparison of econometric approaches. Forest Science. 46(3): 363-376.

We tested the ability of econometric land use models to accurately forecast forest area. We constructed a panel data set for Alabama consisting of county and time-series observation for 1964 to 1992. We estimated models by using restricted data sets–namely, data from early periods–and use of out-of-sample values of dependent and independent variables to construct precise tests of the forecasting accuracy of the model. Three model specifications were examined: ordinary least squares, dummy variables (fixed effects), and error components (random effects). The dummy variables model produced more accurate forecasts at the county and state level than the other model specifications. This result is related to the ability of the

dummy variables model to more completely control for cross-sectional variation in the dependent variables. This suggests that the estimated model parameters better capture the temporal relation between forest area and economic variables

Keywords: Forest area, econometric analysis, forecasting, land rent.

(See Corvallis order form 1.)

Kline, J.D.; Moses, A.; Alig, R.J.
2001. Integrating urbanization into landscape-level ecological assessments. Ecosystems. 4: 3-18.

We use a gravity model to describe the urbanization potential of forest and agricultural land as a combination of population and proximity. We develop an empirical model describing the probability that forests and agricultural land in western Oregon and western Washington were developed for residential, commercial, or industrial uses over a 30-year period as a function of urbanization potential, other socioeconomic factors, and geographic and physical land characteristics. We use the empirical model to generate geographic information system coverages depicting the probability of future land-use change that can be integrated with landscape-level ecological models developed for the Oregon Coast Range.

Keywords: Land use change, urbanization, spatial models, ecological economics.

(See Corvallis order form 2.)

Ecosystem Structure and Function

Bachelet, D.; Neilson, R.P.
2000. Biome redistribution under climate change. In: Joyce, L.A.; Birdsey, R., tech. eds. The impact of climate change on America's forests: a technical document supporting the 2000 USDA Forest Service RPA assessment. Gen. Tech. Rep. RMRS-GTR-59. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 18-43.

Results from the biogeographical MAPSS model and others illustrate possible changes in vegetation distribution due to climate change. The choice of climate change scenario and the treatment of carbon dioxide effects in each model strongly influence the predictions and add uncertainty to them. Results may be used to indicate the direction of possible change but should not be taken as solid predictions. Disturbance regimes will be affected by climate change but are difficult to simulate and also affect the outcome of the models. Important factors such as grazing, weed invasions, diseases and pests, and changes in land use could drastically alter the response of the vegetation to climatic changes and yet are not included in our analyses.

Keywords: Biogeography, climate change, global warming, vegetation modeling, vegetation distribution, carbon dioxide effects, disturbance.

(See Corvallis order form 1. The complete publication can be ordered by emailing rschneider @fs.fed.us or writing to Publications, Rocky Mountain Research Station, 240 W. Prospect, Fort Collins, CO 80526. Reference RMRS-GTR-59.)

Carey, A.B.
1998. Ecological foundations of biodiversity: lessons from natural and managed forests of the Pacific Northwest. In: Trofymow, J.A.; MacKinnon, A., eds. Proceedings of a workshop on structure, process, and diversity in successional forests of coastal British Columbia. Victoria, BC: Canadian Forest Service: 127-133.

Fifteen years of research on old-growth and managed coniferous forests have provided sufficient understanding of biodiversity to suggest a basis for ecosystem management. First, natural old forests have a metaphysics–values associated with their existence and function can never be addressed fully with the scientific method alone; we cannot recreate old growth. Second, five processes underlie forest development: crown-class differentiation, decadence, canopy stratification, understory development, and development of habitat breadth. Third, processes shape trophic pathways, lead to niche diversification, and help to structure fungal, invertebrate, and vertebrate communities. Fourth,

substantial uncertainty exists in every aspect of ecosystem management. Thus, achieving diverse benefits from forests requires active, intentional, and adaptive ecosystem management.

Keywords: Biodiversity, adaptive management, ecosystem management.

(See Olympia order form.)

Neilson, R.P.; Lenihan, J.M.; Bachelet, D.
2000. Overview of dynamic general vegetation models. In: Hawkes, B.C.; Flannigan, M.D., eds. Landscape fire modeling–challenges and opportunities. Victoria, BC: Canadian Forest Service, Pacific Forestry Centre: 3-4.

This is an overview of process-based dynamic general vegetation models (DGVM), generally constructed from a biogeography model and a biogeochemistry model and accompanied by a fire model. The overview discusses three challenges in DGVM construction: accurately representing the process and the ecosystem structure, accounting for subgrid-cell spatial homogeneity, and accounting for temporal heterogeneity, specifically disturbance and succession. The models, MC2 and BIOMAP, are discussed in relation to these challenges.

Keywords: General vegetation models, DVGM, overview, challenges, ecosystem processes, ecosystem structure, spatial heterogeneity, succession, disturbance.

(See Corvallis order form 2. The complete publication is available at no charge from Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre, 5320-122 Street, Edmonton, AB T6H 3S5.)

Paustian, S.J.; Hemstrom, M.; Dennis, J.G. [and others]
1999. Ecosystem processes and functions: management considerations. In: Sexton, W.T.; Malk, A.J.; Szaro, R.C.; Johnson, N.C., eds. Ecological stewardship: a common reference for ecosystem management. Oxford, United Kingdom: Elsevier Science, Ltd.: 255-279.

Our goals for this chapter were to illustrate the effects of past resource management on a range of ecological processes that influence ecosystem functions. We outlined a management approach and a variety of assessment approaches that can help managers work more in concert with key ecological processes.

Keywords: Ecosystem processes, Everglades restoration, western rangeland riparian ecosystems, western Cascade landscapes, Columbia basin disturbance, watershed analysis process, multiple scale monitoring, long-term monitoring.

(Available in bookstores and libraries.)

Fire

Cairns, M.A.; Hao, W.M.; Alvarado, E.; Haggerty, P.K.
2000. Carbon emissions from spring 1998 fires in tropical Mexico. In: Neuenschwaner, L.F.; Ryan, K.C., eds. Crossing the millennium: integrating spatial technologies and ecological principles for a new age in fire management: Proceedings from the joint fire science conference and workshop. [Moscow, ID]: University of Idaho: 242-248.

Total carbon (C) emissions from the spring 1998 fires in tropical Mexico were estimated by using NOAA-AVHRR satellite imagery, biomass density maps, fuel consumption estimates, and a carbon emission factor. The fires burned about 482 000 hectares, with the land use and land cover classes most extensively impacted being the tall and medium selvas (tropical evergreen forests), open and fragmented forests, and perturbed areas. Total prompt emissions were 4.6 TgC during the 2-month study period, which contributed an additional 24 percent to the region's average annual net C emissions from forestry and land use change. If fire episodes

such as the one that occurred in Mexico become the norm around the world owing to warmer and drier conditions, then an increase in C emissions may represent a significant positive feedback to global climate change**.**

Keywords: Wildfires, tropics, carbon emissions, biomass, Mexico.

(See Seattle order form. This publication also is available at http://www.nifc.gov/joint_fire_sci/index.html .)

Hardy, C.C.; Burgan, R.E.; Ottmar, R.D.
2000. A database for spatial assessments of fire characteristics, fuel profiles, and PM10 emissions. In: Sampson, R.N.; Atkinson, R.D.; Lewis, J.W., eds. Mapping wildfire hazards and risks. New York: Food Products Press: 229-244.

This paper describes the procedures and data used to develop a database of 28 fire, fuels, and smoke attributes for the broad-scale scientific assessment of the Columbia River basin. These attributes relate to three general areas: (1) fire weather, fire moisture, and fire characteristics; (2) fuel loading and fuel consumption; and (3) PM10 smoke emissions. The process flow and development protocols for creation of the database are fully described and illustrated. Methods and protocols used to develop this comprehensive array of fire-related data are applicable to any ecosystem for which predictions are needed for wildfire hazard, fire potential, biomass consumption, and smoke emissions.

Keywords: Fire, smoke, emissions, particulate, PM10, database, Interior Columbia River Basin Ecosystem Management Project.

(Available in bookstores and libraries.)

Ottmar, R.D.; Vihnanek, R.E.
2000. Stereo photo series for quantifying natural fuels. Volume VI: Longleaf pine, pocosin, and marshgrass types in the Southeast United States. PMS 835. Boise, ID: National Wildfire Coordinating Group, National Interagency Fire Center. 56 p.

Three series of single and stereo photographs display a range of natural conditions and fuel loadings in longleaf pine, pocosin, and marshgrass types in the Southeast United States. Each group of photos includes inventory information summarizing vegetation composition, structure and loading, and as appropriate, woody material loading and density by size class, forest floor depth and loading, and various site characteristics. The natural fuel series is designed to help land managers appraise fuel and vegetation conditions in natural settings.

Keywords: Woody material, biomass, fuel loading, natural fuels, longleaf pine, pocosin, marshgrass.

(Available from the National Interagency Fire Center, Bureau of Land Management, 3833 S. Development Avenue, Boise, ID 83705. Order NFES #2630. Orders are taken by mail or fax request at (208) 387-5573. The cost for this volume is $30.09.)

Ottmar, R.D.; Vihnanek, R.E.; Wright, C.S.
2000. Stereo photo series for quantifying natural fuels. Volume III: Lodgepole pine, quaking aspen, and gambel oak types in the Rocky Mountains. PMS 832. Boise, ID: National Wildfire Coordinating Group, National Interagency Fire Center. 85 p.

Three series of single and stereo photographs display a range of natural conditions and fuel loadings in lodgepole pine, quaking aspen, and gambel oak types in the Rocky Mountains. Each group of photos includes inventory information summarizing vegetation composition, structure and loading, and as appropriate, woody material loading and density by size class, forest floor

depth and loading, and various site characteristics. The natural fuel series is designed to help land managers appraise fuel and vegetation conditions in natural settings.

Keywords: Woody material, biomass, fuel loading, natural fuels, lodgepole pine, quaking aspen, gambel oak.

(Available from the National Interagency Fire Center, Bureau of Land Management, 3833 S. Development Avenue, Boise, ID 83705. Order NFES #2629. Orders are taken by mail or fax request at (208) 387-5573. The cost for this volume is $36.82.)

Scherer, G.; Zabowski, D.; Java, B.; Everett, R. 2000. Timber harvesting residue treatment. Part II: Understory vegetation response. Forest Ecology and Management. 126: 35-50.

Understory vegetation response to six postharvest slash treatments, ranging from a high-intensity burn to mechanically chopped slash and untreated slash left in place, was documented for four eastern Washington mixed forest sites. Harvest substantially reduced understory cover, particularly among forbs. Shrub species persisted after harvest and, in some treatments, increased in cover. Slash treatments increased the abundance of weedy species that are not normally present in these forests. Treatments such as broadcast burning and pile and burn showed greater dominance by invader species. Overall, harvesting reduced species diversity, but the response among slash treatments differed. After three growing seasons, species cover, richness, and diversity had no clear effect on seedling growth in plots having slash treatment.

Keywords: Slash treatments, forest weeds, broadcast burning, understory diversity, seedling response, eastern Washington, grand fir, Abies grandis*, Douglas-fir,* Pseudotsuga menziesii.

(See Wenatchee order form.)

Zabowski, D.; Java, B.; Scherer, G. [and others] 2000. Timber harvesting residue treatment. Part 1: Responses of conifer seedlings, soils, and microclimates. Forest Ecology and Management. 126: 25-34.

Timber harvest residues typically have been burned within coniferous forest areas along the east side of the Cascade Range of Washington. Three slash treatments where residues were burned in the spring and fall and three treatments where residues were not burned were compared to determine the effects on soils and seedlings. Results showed that seedling performance was best with spring broadcast burning across all sites. None of the slash treatments that avoided burning increased growth relative to not using a slash treatment. If slash burning cannot be used to reduce quantities of timber harvest residues, then leaving the slash untreated appears to be the best alternative for seedling growth.

Keywords: Harvesting residues, broadcast burning, timber harvest slash, prescribed burning, chopping.

(See Wenatchee order form.)

Fish

Rooper, C.N.; Bryant, M.D.; McCurdy, S.J. 2000. Use of scales to assess summer growth of resident cutthroat trout in Margaret Lake, Alaska. North American Journal of Fisheries Management. 20: 467-480.

The opening of a fish ladder in 1990 enabled migration of anadromous fish into Margaret Lake, Alaska, and the environment in the lake for resident cutthroat (*Oncorhynchus clarki*) changed dramatically. Cutthroat trout summer growth was inferred from scales by comparing plus growth (the distance from the last annulus to the scale edge) from 1989 to 1997. Bias in scale aging also was estimated, as this has been shown to be problematic when aging fish scales, especially cutthroat trout. Ages in the study ranged from 1 to 11 years, and no significant aging error was found. Within-fish variance in distances between adjacent annuli were not significant when multiple scales were measured from the same fish. Plus-growth data showed

that growth of cutthroat trout decreased with increasing fish age. Plus growth at age two was significantly higher than that of subsequent year classes. Cutthroat trout growth increased each year during the study. This increase may have been attributable to increased prey availability at the study site through introduction of juvenile anadromous salmon to the system, to increased total system production caused by nutrient influxes associated with spawning anadromous fish, or to other environmental factors such as increased lake temperature.

Keywords: Cutthroat trout, Oncorhynchus clarki*, Alaska, growth.*

(See Juneau order form.)

Mesa, M.G.
1999. Ecological influence of bacterial kidney disease on juvenile spring chinook salmon: effects of predator avoidance ability, smoltification, and physiological responses to stress. Corvallis, OR: Oregon State University. 153 p. Ph.D. dissertation.

Juvenile chinook salmon (*Oncorhynchus tshawytscha*) were experimentally infected with *Renibacterium salmoninarum* (Rs), the causative agent of bacterial kidney disease (BKD), to investigate the effects of BKD on predator avoidance ability, smoltification, and physiological responses to stress. When equal numbers of Rs-challenged and -unchallenged fish were subjected to predation by northern pikeminnow (*Ptychocheilus oregonensis*) or smallmouth bass (*Micropterus dolomieui*), Rs-challenged fish were eaten in significantly greater numbers than were controls. A dramatic proliferation of BKD was associated with maximal responses of indicators of smoltification, thereby suggesting that the process of smoltification can trigger outbreaks of the disease. Experiments indicated that BKD is stressful for fish, particularly during the later stages of the disease. Collectively these results illustrate the impact of BKD on juvenile salmonids and also ascribe some ecological significance to this disease beyond that of direct pathogen-related mortality.

Keywords: Chinook salmon, Oncorhynchus tshawytscha*, smoltification, bacterial kidney disease.*

(Available only through library or interlibrary loan.)

Forest Management

Turchin, P.; Davidson, J.; Hayes, J.L.
1999. Effects of thinning on development of southern pine beetle infestations in old growth stands. Southern Journal of Applied Forestry. 23(4): 193-196.

A study was conducted to quantify the relation between southern pine beetle (SPB) infestation growth and the intertree spacing in old-growth pine stands. The problem with extrapolating the results of previous studies to old-growth stands is that it is unclear whether the same mechanism will operate in stands of older trees characterized by double the diameter (20-25 centimeters versus 40-60 centimeters). In this study we focused on experimentally answering the question of how three levels of thinning (resulting in different average intertree distances) affect the rate of SPB infestation growth in mature loblolly pine stands, over 60 years old and over 40 centimeters in average diameter at breast height. We also included a hardwood removal treatment. Both intermediate and severe thinning had strong effects on the rate of infestation growth. The effects of intermediate and severe thinning were similar; there was no statistically detectable difference between these two treatments. Hardwood removal seemed to decrease the infestation growth rate compared to no thinning, but this effect was not statistically significant.

Keywords: Old growth, loblolly pine, Pinus taeda*, bark beetles,* Dendroctonus frontalis*, thinning, hazard rating.*

(See La Grande order form.)

Genetics

Johnson, G.R.; Wheeler, N.C.; Strauss, S.H.
2000. Financial feasibility of market-aided selection in Douglas-fir. Canadian Journal of Forest Research. 30: 1942-1952.

The paper simulates potential additional gains that could be achieved through the use of marker-aided selection (MAS) compared with standard phenotypic selection. A number of genetic models and marker technologies are examined. The economic returns are evaluated in terms of how many hectares would be needed for costs to equal benefits. Given the size of the current second generation Douglas-fir breeding programs, MAS is not yet commercially feasible. Research must still identify quantitative trait loci, marker costs must be reduced, and breeding programs must plant more progeny per family if MAS is to become economically feasible.

Keywords: Quantitative trait loci, MAS, marker-aided selection, breeding, economics, computer simulation.

(See Corvallis order form 1.)

Johnson, R.; Lindstrom, O.M.; Cappiello, P.E.; Dirr, M.A.
2000. Cold hardiness of *Lagerstroemia* taxa. SNA Research Conference. 45: 467-470.

Stem cold hardiness was determined for 21 *Lagerstoemia* taxa over 2 years. Significant taxa differences were observed. Midwinter lowest survival temperatures (LST) ranged from –13 °C to –21 °C in December and –12 °C to –19 °C in January. Correlations of LSTs were not consistent from month to month or year to year. This lack of correlation makes it difficult to recommend the most cold tolerant cultivars and hinders breeding efforts for cold hardiness.

Keywords: Cold hardiness, crapemyrtle, Lagerstroemia*, genetic variation.*

(See Corvallis order form 1.)

St. Clair, J.B.; Sniezko, R.A.
1999. Genetic variation in response to shade in coastal Douglas-fir. Canadian Journal of Forest Research. 29: 1751-1763.

We grew Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco var. *menziesii*) families from two climatically distinct seed sources for 2 years under four levels of shade. The response to shade differed for several traits between the two populations and among families within populations. The magnitude of variation associated with the interaction, was small, however, compared with the overall effects of genetic selection or of shade. Families selected based on performance in an open light environment resulted in nearly the same response to selection when grown under shade as families selected based on performance in the shade. We conclude that seedlings from families selected in an open light environment are appropriate for use in the low-light environments of alternative silvicultural systems and that use of such genetically selected stock may compensate for the less favorable growing conditions.

Keywords: Douglas-fir, Pseudotsuga menziesii*, genetic variation*.

(See Corvallis order form 2.)

Geomorphology and Hydrology

Jones, J.A.; Grant, G.E.
2001. Comment on “Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon.” Water Resources Research. 37(1): 175-178.

This is a comment on a paper previously published in Water Resources Research that challenges results reported in a 1996 paper by Jones and Grant, also in Water Resources Research. We compare these new results with our earlier ones and maintain that the original conclusions stand.

Keywords: Peak flows, hydrology, cumulative effects, forest harvest, experimental watershed studies.

(See Corvallis order form 1.)

Jones, J.A.; Grant, G.E.
2001. Comment on "Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon." Water Resources Research. 37(1): 179-180

We report a correction to an error in a previous manuscript published in Water Resources Research. The corrected values reduce previously reported values for peak flow increases on small watersheds following timber harvest.

Keywords: Peak flows, hydrology, cumulative effects, forest harvest, experimental watershed studies.

(See Corvallis order form 1.)

Invertebrates

Cronin, J.T.; Hayes, J.L.; Turchin, P.
2000. Evaluation of traps used to monitor southern pine beetle aerial populations and sex ratios. Agricultural and Forest Entomology. 2: 69-76.

For the southern pine beetle (*Dendroctonus frontalis* Zimmerman), various kinds of traps have been employed to monitor and forecast population trends, but their accuracy in assessing pine beetle abundance and sex ratio in the field had not been directly verified. In this study, we used fluorescent powder to mark pine beetles emerging from six isolated infestations. We then compared estimates of total abundances and proportions of males emerging from within each infestation to the estimates from three types of traps: passive sticky traps (2, 4, 10, and 20 meters away from the source of beetles), multifunnel traps baited with pine beetle attractants (100 meters away), and pine trees baited with attractants (100 meters away). We found that numbers of marked beetles captured in traps were completely uncorrelated with the numbers of marked beetles emerging from the focal infestations. This suggests that traps positioned around an infestation are ineffective at estimating relative abundances of beetles within the infestation. Most tests are needed to validate the usefulness of these traps as monitoring tools for the southern pine beetle.

Keywords: Bark beetles, Dendroctonus frontalis*, dispersal, insect traps, mark-release-recapture, population monitoring.*

(See La Grande order form.)

Speer, J.H.; Swetnam, T.W.; Wickman, B.E.; Youngblood, A.
2001. Changes in pandora moth outbreak dynamics during the past 622 years. Ecology. 82(3): 679-697.

Dendrochronology techniques were used to assess tree-ring samples from ponderosa pine (*Pinus ponderosa* Dougl. ex Laws.) stands affected by recent and well-documented outbreaks of pandora moth (*Coloradia pandora* Blake) in central Oregon. A characteristic signature in the pattern of ring widths was identified and verified as caused by pandora moth defoliation. This signature was then used to reconstruct a 622-year record of 22 individual outbreaks in 14 old-growth ponderosa pine stands. Spectral analyses showed consistent intervals between outbreaks, suggesting quasi-cyclical population dynamics at regional and decadal scales.

Keywords: Dendroecology, insect outbreaks, pandora moth, Coloradia pandora *Blake, ponderosa pine,* Pinus ponderosa*, population cycles, spectral analyses, forest disturbance.*

(See La Grande order form.)

Land Use

Kline, J.D.; Azuma, D.L.; Moses, A.; Alig, R.J. 2000. Urbanization impacts on private forest conditions in western Oregon. In: DeCoster, L.A., ed. Proceedings: forest fragmentation 2000: sustaining private forests in the 21st century. Alexandria, VA: Sampson Group, Inc.: 135-139.

We describe ongoing research examining the influence of urbanization and forest fragmentation on private forest conditions in western Oregon. We used recently available spatial data describing increasing densities of buildings and forest conditions collected at three time intervals between 1974 and 1994. We used the data to (1) develop an empirical model describing historic change in building densities, (2) project future building densities, (3) examine the influence of building densities on forest conditions, and (4) project future forest conditions. The research is intended to broaden integrated analysis of the economic and ecological impacts of urbanization and forest fragmentation.

Keywords: Urbanization, forest conditions, forest fragmentation.

(See Corvallis order form 2.)

Kline, J.D.; Benford, F.A.; Swenson, J.J. 2000. Historic and projected trends in private forest land in the Western U.S. In: DeCoster, L.A., ed. Proceedings: forest fragmentation 2000: sustaining private forests in the 21st century. Alexandria, VA: Sampson Group, Inc.: 73-79.

Concern about urbanization and forest fragmentation in western states tends to focus on potential impacts to forest productivity, increasing fire danger, and potential changes in public attitudes toward forestry. We examined recent historical and projected trends in timberland area for major western forest regions and discuss emerging issues related to expansion of urban land uses into traditionally forested landscapes. Although total timberland area is changing relatively slowly, some concern exists regarding forest lands located along the forest-urban interface. Likely economic and ecological impacts of current urbanization and forest fragmentation trends in western states remain uncertain.

Keywords: Urbanization, forest fragmentation, land use, trends.

(See Corvallis order form 2.)

Sohngen, B.; Alig, R. 2000. Mitigation, adaptation, and climate change: results from recent research on US timber markets. Environmental Science and Policy. 3: 235-248.

This paper reviews recent studies addressing how U.S. timber markets may adapt to climate change and how forests could be used to mitigate potential climate change. The results of a number of economic studies are discussed in light of the ecological and economic assumptions used to estimate adaptation or mitigation. Although the economic impact estimates suggest that markets in the United States will benefit from climate change, the results are influenced by both the types of ecological effects measured and the treatment of the adjustment of timber processing capital.

Keywords: Afforestation, carbon sequestration, U.S. forest sector.

(See Corvallis order form 2.)

Landscape Ecology

Fosberg, M.A.; Cramer, W.; Brovkin, V. [and others] 1999. Strategy for a fire module in dynamic global vegetation models. International Journal of Wildland Fire. 9(1): 79-84.

Disturbance from fire, land use, and other factors may be as important as climate change in shaping future landscapes. Therefore, a strategy was developed to introduce disturbance into dynamic global vegetation models. This strategy (focused mainly on fire) was based on the fact that vegetation burning influences atmospheric chemistry, that feedbacks of energy, water, and trace gases to the atmosphere are influenced by vegetation, and that changes in the composition of ecosystems have direct impact on the carbon

pool, biodiversity, and health and productivity of the land. A great deal of consideration was given to the model shell being able to include other disturbances in the future, which will lead to the focus on the use of a hazard function.

Keywords: Fire, disturbance, dynamic global vegetation models, simulation, hazard function.

(See Corvallis order form 1.)

Monitoring

Busing, R.T.

1998. Forest health monitoring in California, Oregon, and Washington: results and interpretation. In: Hansen, M.; Burk, T., eds. Integrated tools for natural resource inventories in the 21st century: Proceedings of the IUFRO conference. Gen. Tech. Rep. NC-212. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station: 265-271.

From 1992 to 1997, standardized plots were established at about 500 sites in California, Oregon, and Washington as part of the national forest health monitoring program. In California, 197 plots were established from 1992 to 1995; in Oregon and Washington, 304 plots were established in 1997. Summarizing of baseline data by state revealed similarities and differences among states. Additional trend data will allow further assessment of changes in tree condition in relation to environmental changes.

Keywords: Forest health monitoring, environmental changes.

(See Corvallis order form 1. The complete General Technical Report can be ordered by writing U.S. Department of Agriculture, Forest Service, North Central Research Station, 1992 Folwell Ave., St. Paul, MN 55108. Reference GTR-NC-212.)

Mycorrhizae

Castellano, M.A.

1999. *Hysterangium*. In: Cairney, J.W.G.; Chambers, S.M., eds. Ectomycorrhizal fungi: key genera in profile. Berlin: Springer-Verlag: 311-323. Chapter 13.

Hysterangium is a large genus among sequestrate species and is commonly collected in large numbers in eastern and western North America, Australasia, and Europe. Several *Hysterangium* species are important members of ectomycorrhizal fungal communities: they contribute significantly to sporocarp productivity and produce perennial matlike structures in forest floor and mineral soil that occupy significant portions of the forested area. The difficulty of culturing from sporocarps and manipulation of pure cultures of *Hysterangium* has restricted physiological work.

Keywords: Fungi, mycorrhizae, mycophagy, seedling growth, forest ecology.

(Available in bookstores and libraries.)

Grubisha, L.C.; Trappe, J.M.; Molina, R.; Spatafora, J.W.

2001. Biology of the ectomycorrhizal genus *Rhizopogon*. V: Phylogenetic relationships in the Boletales inferred from LSU rDNA sequences. Mycologia. 93(1): 82-89.

The phylogenetic relation between the closely related fungal genera *Suillus* and *Rhizopogon* and their placement in the Boletales was tested through maximum parsimony analyses of large subunit nuclear ribosomal DNA sequences. The Boletales was strongly supported as a monophyletic genus, although its monophyly could not be rejected by the data. The overall taxonomy and systematic position of Rhizopogon within Boletales are discussed.

Keywords: Fungal systematics, truffles, mushrooms, DNA.

(See Corvallis order form 1.)

Natural Resource Policy

Mills, T.J.

2000. Position advocacy by scientists risks science credibility and may be unethical. Northwest Science. 74(2): 165-168.

Increasingly, research scientists from public agencies such as the USDA Forest Service are being asked to bring science information to the decisionmaking table. At issue is whether they should express those values by advocating for any particular decision outcome during a public debate in which they are being counted on to be neutral providers of credible science information. At best, it will further confuse already contentious and complex public debates. At worst, it is an unethical misrepresentation of personal values as if they were science information.

Keywords: Natural resource policy, ethics, decisionmaking.

(See Headquarters order form.)

Plant Ecology

Cordell, S.; Goldstein, G.; Melcher, P.J.; Meinzer, F.C.

2000. Photosynthesis and freezing avoidance in ohia (*Metrosideros polymorpha*) at treeline in Hawaii. Arctic, Antarctic, and Alpine Research. 32(4): 381-387.

Metrosideros polymorpha (ohia), the dominant tree species in Hawaii forest ecosystems, grows from sea level to tree line (2500 meters). Carboxylation efficiency increased, and average net carbon dioxide assimilation and integrated photosynthetic nitrogen use efficiency remained relatively constant with increasing elevation despite suboptimal temperatures and decreased soil nitrogen availability at tree line. High-elevation populations avoided freezing by supercooling and exhibited ice nucleation temperatures about 3 °C lower than those of low-elevation populations. Smaller leaf size with reduced intercellular spaces and low apoplastic water content apparently contributed to enhanced supercooling in high-elevation populations. The temperature threshold for irreversible tissue damage decreased 7 °C from sea level to tree line, an adjustment apparently only large enough to avoid freezing-induced tissue damage up to the current location of tree line.

Keywords: Frost resistance, stress physiology, ohia, Metrosideros polymorpha.

(See Corvallis order form 1.)

Lehmkuhl, J.F.

1999. The organization and human use of terai riverine grasslands in the Royal Chitwan National Park, Nepal. In: Richard, C.; Basnet, K.; Sah, J.P.; Raut, Y., eds. Grassland ecology and management in protected areas of Nepal: Proceedings of a workshop. [Place of publication unknown]: [Publisher unknown]: 37-49.

I studied the landscape dynamics, organization, and productivity of a tall-grass and riverine forest mosaic in the eastern portion of Chitwan National Park, Nepal. Aerial photograph interpretation, relevé sampling, experimental plots, models, and foraging studies were done. A model of landscape dynamics showed that fluvial action controlled landscape organization. Ten grasslands and three forest associations were identified on edaphic and successional gradients. Aboveground net primary production appeared to be among the highest in the world. Large herbivore consumption was estimated at 6 percent of aboveground production. Humans legally harvested 11,132 tons of grass worth NRs 10 million in 1987. Experimental testing of the effects of mechanical disturbance, staggered burning, and cutting to maintain, create, or restore grasslands and provide compatible human use is proposed to gain reliable management information.

Keywords: Grasslands, disturbance ecology, alternative forest products, Nepal.

(See Wenatchee order form.)

Meinzer, F.C.; Goldstein, G.; Andrade, J.L. 2001. Regulation of water flux through tropical forest canopy trees: Do universal rules apply? Tree Physiology. 21: 19-26.

Sapwood area and sap flow were measured in 27 cooccurring canopy species in a Panama forest to determine the extent to which relations between tree size, sapwood area, and sap flow were species-specific, or were constrained by universal functional relations between tree size, conducting xylem area, and water use. For the 24 species in which active xylem area was estimated over a range of size classes, diameter at breast height (d.b.h.) accounted for 98 percent of the variation in sapwood area and 67 percent of the variation in sapwood depth when data for all species were combined; d.b.h. alone accounted for more than 90 percent of the variation in both maximum and total daily sap flux density in the outermost 2 centimeters of sapwood for all species taken together. The shared relation between tree size and time of maximum sap flow at the base of the tree suggested that a common relation between diurnal stem water storage capacity and tree size existed. These results were consistent with a recent hypothesis that allometric scaling of plant vascular systems, and therefore water use, is universal.

Keywords: Allometric relations, sap flow, sapwood, stem water storage.

(See Corvallis order form 2.)

Stratton, L.C.; Goldstein, G.; Meinzer, F.C. 2000. Temporal and spatial partitioning of water resources among eight woody species in a Hawaiian dry forest. Oecologia. 124: 309-317.

Spatial and temporal partitioning of soil water resources was characterized among seven indigenous and one invasive Hawaii dry forest species to determine whether the degree of partitioning was consistent with the relatively high species richness in these forests. Two endemic species, one evergreen and the other drought deciduous, had xylem sap hydrogen isotope ratios indicative of water uptake mainly from deeper soil layers. The remaining six species apparently obtained water from shallower soil layers. Xylem sap hydrogen isotope ratios were negatively correlated with minimum annual leaf water potential and positively correlated with leaf solute content, an integrated measure of leaf water deficit. Species preferentially tapping water from deeper soil layers tended to exhibit greater seasonality of leaf production than species relying on shallower soil water sources. Overall, character displacement in spatial and temporal patterns of soil water uptake was consistent with the relatively high diversity of woody species in dry forests of Hawaii.

Keywords: Resource partitioning, soil water uptake, stable isotopes, species diversity, tropical dry forests.

(See Corvallis order form 2.)

Plant Pathology

Hessburg, P.F.; Hansen, E.M. 2000. Infection of Douglas-fir by *Leptographium wageneri*. Canadian Journal of Botany. 78(10): 1254-1261.

Roots of 1-year-old Douglas-fir seedlings were dip-inoculated in a mycelium-spore suspension of *Leptographium wageneri* var. *pseudotsuga* (Lw) inoculum and transplanted in a sterile potting medium. Infection frequency was scored for three categories of seedlings: fully dormant, nondormant 4 weeks, and nondormant 8 weeks. Infection success was ocularly predicted by examining all putative new infections and all other areas of abnormal sapwood coloration under a bright-field microscope with phase contrast optics. Ocular predictions were 100 percent reliable in a prior experiment involving 223 inoculated Douglas-fir seedlings and paired ocular predictions and pathogen isolations. In this investigation, all lesions were sectioned freehand and examined at 250-1,000 diameter magnification for the presence of Lw hyphae and characteristic pathological anatomy. Complete root system dissections revealed that roots were infected through wounds and natural openings where a path to the xylem was exposed. Lw never penetrated living cortical or cambial tissues to gain access to xylem. For dormant inoculated

seedlings, 63 percent of infections occurred through wounds incurred at the nursery. Wound infection frequency decreased to zero in seedlings inoculated 8 weeks out of dormancy. Seedlings inoculated 4 and 8 weeks out of dormancy were most frequently infected through openings occurring at sites of new lateral root initiation. Demonstrated susceptibility to infection of dead fine root stubs in seedlings suggests that during periods of high fine-root mortality, these sites also may be important for new infection of healthy trees and perhaps egress from already diseased trees.

Keywords: Black-stain root disease, Leptographium wageneri, Verticicladiella wageneri, Ophiostoma wageneri, Ceratocystis wageneri*, infection courts, entrance courts, wounding, vascular wilt.*

(See Wenatchee order form.)

Plant Pathology

Beatty, J.S.; Mathiasen, R.L.; Parks, C.G.
1998. Additional populations of *Arceuthobium hondurense* discovered in Honduras. Phytologia. 85(4): 268-270.

In March 1999, Honduran dwarf mistletoe (*Arceuthobium hondurense* Hawksw. & Wiens) was observed parasitizing *Pinus oocarapa* Schiede 5 kilometers east of Lepaterique, Department Francisco Morazan, Honduras (1950 meters in elevation), along the main road to Tegucigalpa. Honduran dwarf mistletoe is one of the rarest in the New World, and this is only the third confirmed location for this dwarf mistletoe. The reasons for the occurrence of this dwarf mistletoe in extremely disjunct locations (greater than 40 kilometers apart) within a landscape of almost continuous forests of its principal host remain unknown. We speculate that because most of these pine forests consist of second-growth stands, many populations of *A. hondurense* that once existed have been eliminated by the large-scale harvesting of Honduran forests.

Keywords: Honduran dwarf mistletoe, Arceuthobium hondurense*,* Pinus oocarapa*, harvesting.*

(See La Grande order form.)

Maguire, D.; Kanaskie, A.; Voelker, B. [and others]
[N.d.]. Growth trends in the first 2-year growth period following establishment of phase III permanent plots. In: Swiss needle cast annual report. Corvallis, OR: Oregon State University, Department of Forest Science: 76-78.

Preliminary studies of the impact of Swiss needle cast (SNC) on growth rate are presented. The average needle retention in 1998 was used as an indicator of SNC severity. Needle retention is a measure of the average number of years of foliage on a tree. The retention value was used in a growth model to estimate the impact SNC had on subsequent basal area growth over the next 2 years.

Keywords: Swiss needle cast, Phaeocryptopus gaeumannii*, growth modeling.*

(See Corvallis order form 2.)

Temel, F.; Johnson, R.
[N.d.]. Early testing of Douglas-fir families for Swiss needle cast resistance. In: Swiss needle cast annual report. Corvallis, OR: Oregon State University, Department of Forest Science: [Pages unknown].

Preliminary results of an early screening trial are reported. Heritabilities of foliage health traits were similar in 2-year-old and 10-year-old field trials. Genetic correlations between age-2 and age-10 traits in the two different sets of trials ranged from 0.41 to 1.0.

Keywords: Swiss needle cast, Phaeocryptopus gaeumannii*, breeding, genetics.*

(See Corvallis order form 2.)

Thies, W.G.; Niwa, C.G.; Westlind, D.J.; Loewen, M.
2000. Prescribed fire effects on incidence of root disease and bark beetle attacks in ponderosa pine stands. In: Goheen, E.M., comp. Proceedings of the 5th joint meeting of the western international forest disease work

conference and western forest insect work conference. Central Point, OR: U.S. Department of Agriculture, Forest Service, Southwest Oregon Forest Insect and Disease Service Center: 25-30.

In 1997, a study on fire effects was initiated in ponderosa pine type near Burns, Oregon. Tree treatments (fall burn, spring burn, and no burn) were applied to 30-acre plots and replicated in six stands. Variables included tree, stand, and site characteristics; first-order fire effects (duff consumption, bole and crown injury); attacks by wood boring and bark beetles; and the spread of black stain root disease. The concurrent study of three disturbance factors (fire, insects, and disease) on a common set of plots will enable the development of management guidelines to relate observed fire effects to predicted stand performance and the development of insect and disease outbreaks.

Keywords: Ponderosa pine, Pinus ponderosa*, black stain root disease, insect vectors, fire.*

(See Corvallis order form 2.)

Range Management

Bachelet, D.; Lenihan, J.M.; Daly, C.; Neilson, R.P.
2000. Interactions between fire, grazing, and climate change at Wind Cave National Park, SD. Ecological Modelling. 134: 229-244.

A new dynamic vegetation model, MC1, which includes biogeography, biogeochemistry, and fire disturbance, was used to analyze the impacts of climate, fire, and grazing on vegetation distribution and carbon cycling at Wind Cave National Park, South Dakota. A climate change scenario generated by a general circulation model was used to project future trends in vegetation dynamics. Future climate projections simulate warmer and drier weather by the end of 21st century, which will promote the growth of grasses. An increase in grass biomass produces fuel buildup and promotes higher fire frequency. Grazing reduces grass biomass and thus indirectly reduces fire frequency, thereby enhancing the growth and expansion of the forest.

Keywords: Wind Cave National Park, fire, grazing, climate change, management, ponderosa pine, semiarid grasslands, simulation model, biogeography, biogeochemistry, carbon, nitrogen, water.

(See Corvallis order form 1.)

Remote Sensing

Andersen, H.; Reutebuch, S.E.; Keane, G.
1999. Locating dead timber using two scales of color aerial photography. In: 17th biennial workshop on color photography and videography in resource assessment. [Bethesda, MD]: American Society for Photogrammetry and Remote Sensing: 231-240.

A cooperative trial with the Confederated Tribes of Warm Springs, Oregon, was conducted to determine the feasibility of using two different scales (1:10,000 and 1:20,000) of color aerial photographs for timber salvage detection. The 1:10,000 photos were viewed by using 6X optics, and the 1:20,000 photos were viewed at 8X in an analytical stereoplotter. Seven different timber classes were recognized: weakened and yellowing trees, recent standing dead, older standing dead, snags, recent dead on ground, older dead on ground, and unspecified on ground. Of the field-checked areas, 86 percent were classified correctly. All recent standing dead trees, which are the most valuable trees, were classified correctly.

Keywords: Aerial photos, timber salvage detection.

(See Seattle order form.)

Lefsky, M.A.; Harding, D.J.; Parker, G.G. [and others]

1999. Progress in lidar altimeter remote sensing of stand structure in deciduous and coniferous forests using slicer data. In: Dsathó, B.M., ed. Mapping surface structure and topography by airborne and spaceborne lasers. Columbus, OH: Ohio State University, Byrd Polar Research Center: 23-30.

The development of forest ecology applications of lidar remote sensing will depend on detailed knowledge of canopy organization and the interaction of lidar sensors with that organization. By using data from the SLICER device, we made several introductory studies of the interaction of the sensor with two very different canopy types, and developed algorithms that relate lidar measurements to standard field measurements of forest canopies. Additionally, we have shown the utility of these measurements for the estimation of forest land structure attributes, such as aboveground biomass and leaf-area index in both forest types.

Keywords: Remote sensing, lidar, forest structure, aboveground biomass.

(See Corvallis order form 2.)

Woodcock, C.E.; Macomber, S.A.; Song, C. [and others]

1999. Regional to continental monitoring of change in temperate conifer forests. In: Pecora 14, LandSatellite information III proceedings. Bethesda, MD: American Society for Photogrammetry and Remote Sensing: 322-327.

The successful launch of Landsat 7 promises a dramatic change in the availability and affordability of high-resolution optical imagery. One result will be the opportunity to pursue regional- to continental-scale mapping and monitoring of natural resources while maintaining the high degree of spatial detail in the landscape observable at Landsat resolutions. We are developing methods for monitoring change in temperate conifer forests applicable at these scales. At the heart of our approach is an effort to process previously unseen images, which requires careful atmospheric correction of images and application of classification algorithms in different places or times than where they were trained. The fuzzy ARTMAP artificial neural network is the classification algorithm being used.

Keywords: Change detection.

(See Corvallis order form 2.)

Resource Inventory

Lefsky, M.A.; Cohen, W.B.; Hudak, A. [and others]

1999. Integration of lidar, Landsat ETM+, and forest inventory data for regional forest mapping. In: Dsathó, B.M., ed. Mapping surface structure and topography by airborne and spaceborne lasers. Columbus, OH: Ohio State University, Byrd Polar Research Center: 119-125.

Recent work has established the utility of waveform sampling lidar for predicting forest structural attributes. Nevertheless, serious obstacles to its widespread use still exist. They include the lack of waveform sampling lidar sensors capable of measuring forest canopy structure over large extents, and the practical difficulty of developing widely applicable relations to predict forest stand structure indices from measurements of canopy structure. Although the advent of advanced devices such as NASA's LVIS and VCL sensors will allow the collection of larger datasets than previously possible, neither sensor is capable of collecting spatially comprehensive datasets at the regional scales critical for forest management. Methods to integrate data from these devices with conventional optical remote sensing products such as those from the Landsat Enhanced Thematic Mapper Plus sensor therefore will play a critical role in the development of lidar remote sensing.

Keywords: Remote sensing, lidar, forest inventory, forest structure, aboveground biomass.

(See Corvallis order form 2.)

Silviculture

Chan, S.S.; Maas-Hebner, K.G.; Emmingham, W.H.

1999. Commercial thinning and underplanting to increase structural and species diversity in young managed Douglas-fir stands. In: Pioneering new trails: Proceedings of the Society of American Foresters 1999 national convention. Bethesda, MD: Society of American Foresters: 282-290.

Large areas of the highly productive forests of western Oregon and Washington have been intensively managed in even-aged stands primarily for wood production. The resulting stands are densely stocked with Douglas-fir and lack species and structural diversity, such as multiayered canopies, large snags, and large downed woody debris, associated with late-successional stands. Habitat diversity often is lacking in these stands and has become a primary concern in ecosystem-based management. Our study examined the processes and effects of commercial thinning, at normal to very wide spacings, and underplanting with a variety of tree species to promote the development of structurally diverse stands for both biodiversity and forest commodities. Establishing a mosaic of small openings, variable-spaced thinning to wider spacings, or repeated thinning entries is recommended if late-successional stand characteristics are desired.

Keywords: Density management, underplanting, structural diversity, canopy development, Douglas-fir.

(See Corvallis order form 1.)

Social Sciences

Kline, J.D.

2000. Comparing states with and without growth management analysis based on indicators with policy implications comment. Land Use Policy. 17: 349-355.

In a 1999 volume of this journal, Nelson defined and computed several statewide indicators designed to evaluate the effectiveness of growth management efforts in Oregon and Florida. Two indicators are intended to measure how well states have contained urban sprawl and preserved farmland. They are computed by using U.S. Census of Population and U.S. Census of Agriculture data. In this comment, I highlight potential problems associated with using these data to evaluate urban sprawl and farmland preservation and recompute Nelson's indicators by using alternative land use data. Differences and similarities between my indicators and those computed by Nelson are discussed.

Keywords: Growth management, land use planning, zoning.

(See Corvallis order form 1.)

Watershed Management

Nakamura, F.; Swanson, F.J.; Wondzell, S.M.

2000. Disturbance regimes of stream and riparian systems–a disturbance-cascade perspective. Hydrological Processes. 14: 2849-2860.

The objectives of this paper were to further the understanding of (1) temporal and spatial patterns of geomorphic processes that disturb stream ecosystems in mountain landscapes; (2) factors controlling the distribution of these processes, including transitions from one geomorphic process to another in disturbance cascades down a stream network; (3) effects of land use and stream network structure on this disturbance regime; and (4) ecological implication of geomorphic disturbance.

Keywords: Disturbance, mass movement, debris flow, stream, riparian zone.

(See Corvallis order form 2.)

Wildlife

Blaustein, A.R.; Hays, J.B.; Hoffman, P.D. [and others]

1999. DNA repair and resistance to UV-B radiation in western spotted frogs. Ecological Applications. 9(3): 1100-1105.

The effect of UV-B radiation on spotted frog embryos was examined by field experiments and laboratory assessments of photoreactivating

enzyme activity. Photolyase activities were high, and hatching success was unaffected by UV-B. UV-B does not seem to be contributing to population declines of spotted frogs.

Keywords: Amphibians, DNA repair, frogs and ultraviolet radiation, oocytes, photolyase, photoreactivation, Rana luteiventris, Rana pretiosa*, spotted frogs, ultraviolet radiation, UV-B resistance.*

(See Corvallis order form 1.)

Bull, E.L.
2000. Comparison of two radio transmitter attachments on Columbia spotted frogs (*Rana luteiventris*). Herpetological Review. 31(1): 26-28.

Radio transmitters were attached to Columbia spotted frogs with a waistband attachment and an armband attachment. The armband attachment was suitable for gravid females for several days. The waistband attachment was suitable for nongravid frogs for long periods with proper fitting and frequent monitoring for abrasions.

Keywords: Columbia spotted frog, Rana luteiventris, *radio transmitters, northeastern Oregon, transmitter harness.*

(See La Grande order form.)

Bull, E.L.
2000. Seasonal and sexual differences in American marten diet in northeastern Oregon. Northwest Science. 74(3): 186-191.

In northeastern Oregon, the frequency of occurrence of prey items found in 1,014 scats from American martens was 62.7 percent vole-sized prey, 28.2 percent squirrel-sized prey, 22.4 percent invertebrates, 19.4 percent birds, 13.3 percent plant material, and 2.4 percent rabbits and hares. A significantly higher proportion of voles, red-backed voles, and chipmunks was found in the summer diet, and a higher proportion of squirrels, woodrats, and mountain cottontails was found in the winter diet. Differences between sexes and among years occurred in the diet as well.

Keywords: American marten, diet, prey.

(See La Grande order form.)

Bull, E.L.; Heater, T.W.
2000. Resting and denning sites of American martens in northeastern Oregon. Northwest Science. 74(3): 179-185.

Resting and denning sites of the American marten (*Martes americana*) are important habitat components because they provide protection from predators, inclement weather, and thermal stress. Resting sites used by 35 radio-collared martens were in trees with natural platforms (43 percent), in trees with cavities (23 percent), in hollow logs or slash piles (7 percent), and underground (3 percent). Thirty natal and postnatal dens were in trees with cavities (40 percent), subnivean (under snow) (23 percent), in hollow logs (37 percent), underground (17 percent), and in slash piles (6 percent). Resting and denning sites in cavities and hollow logs were typically large-diameter structures with extensive heartwood decay that had created hollow chambers. The majority of platforms used as resting sites were formed by broom rust *(Chrysomyxa arctostaphyli* and *Melampsorella caryophyllacearum*) and dwarf mistletoe (*Aceuthobium* spp.). Incorporating habitat needs of martens into forest management practices by retaining coarse woody debris and trees with brooms is one component necessary for maintaining viable populations of the species.

Keywords: American marten, Martes americana*, habitat use, northeastern Oregon, natal dens, rest sites.*

(See La Grande order form.)

Cassidy, K.M.; Grue, C.E.; Smith, M.R. [and others]
2001. Using current protection status to assess conservation priorities. Biological Conservation. 97: 1-20.

We mapped land cover of Washington state at a 100-hectare minimum mapping unit by using 1991 LandSat satellite Thamatic Mapper imagery. The distributions of all breeding terrestrial vertebrates were modeled by using the land cover map. We determined areas of highest vertebrate richness for each major taxa, the level of protection for each species based on its current modeled distribution, and the human conversion and protection status of ecosystems at the level of the vegetation zone. Conclusions were that (1) there are numerous flaws with hot-spot analysis (that is, selection of areas of highest species richness); (2) protection status of either individual species or vegetation based on current distributions can be misleading because of past extirpation or habitat conversion, respectively; and (3) the conservation priorities of Washington state (based on ecosystem analysis) are the steppe zones of eastern Washington and the Puget-Willamette Trough of western Washington.

Keywords: Gap analysis, Washington state, species conservation, habitat modeling.

(See Olympia order form.)

De Santo, T.L.; Willson, M.F.
2001. Predator abundance and predation of artificial nests in natural and anthropogenic coniferous forest edges in southeast Alaska. Journal of Field Ornithology. 72(1): 136-149.

In a series of artificial nest predation experiments conducted in southeast Alaska between 1994 and 1997, the risk of nest predation among open, edge, and interior forest habitats associated with natural (wetland) and human-caused (clearcut and suburb) openings was tested. Nest predators, known (Steller's jays and red squirrels) and probable (common ravens and northwestern crows), were censused. In general, higher nest predation was seen in habitats with the highest abundance of nest predators. Nests in wetland forest edges, where both jays and squirrels were detected frequently, were depredated more often than nests in wetland openings or forest interior, where predators were less common. High nest predation was seen in the edges of suburbs, where jays and crows were abundant, and in clearcut openings, edges, and interior forest, where squirrels were a common nest predator throughout. Edge characteristics and the surrounding matrix can influence the composition and abundance of nest predators and ultimately affect the reproductive success of birds.

Keywords: Stellar's jay, Cyanocitta stelleri*, red squirrel,* Tamiasciurus hudsonicus, *nest predation, forest edges, silviculture effects on birds, predator abundance, southeast Alaska, temperate rain forests.*

(See Juneau order form.)

Lehmkuhl, J.F.; Marcot, B.G.; Quinn, T.
2001. Characterizing species at risk. In: Johnson, D.H.; O'Neill, T.A., directors. Wildlife-habitat relationships in Oregon and Washington. Corvallis, OR: Oregon State University Press: 474-495. Chapter 19.

We define the components of risk analysis, describe the criteria for identifying species at risk, review methods of species risk analysis, examine the attributes of species currently considered at risk, and work several examples of risk analysis by using life history and habitat relations information. In the most general sense, species risk analysis determines the likelihood of some defined outcome. We concluded that although life history can be used to qualitatively characterize potential vulnerability levels, it does not serve as an adequate quantitative predictor of vulnerability among species.

Keywords: Risk analysis, population viability, extinction.

(Available in bookstores and libraries.)

Leu, M.
2000. Breeding territory settlement patterns and mate choice in a monochromatic Tyrannid flycatcher. Seattle, WA: University of Washington. 129 p. Ph.D. dissertaton.

For monochromatic Pacific-slope flycatchers (*Empidonax difficilis*), territory settlement patterns occur preemptively on the breeding grounds along a habitat-quality gradient defined by red alder (*Alnus rubra* Bong.) and preferred nesting substrate densities. Early arriving adult males excluded later arriving males, including yearling males, from gaining access to high-quality habitat. Females differentiated among habitat quality types by selecting habitat according to preference of red alder or male body condition. The availability of preferred nest substrate did not play a role in female settlement patterns in high-quality habitat; females seemed to select territory quality according to a hierarchical process. The research suggests that female territory patterns in Pacific-slope flycatchers may be adjusted throughout the pairing phase.

Keywords: Pacific-slope flycatchers, territory settlement patterns.

(Available only through library or interlibrary loan.)

Preisler, H.K.; Brillinger, D.R.; Ager, A.A. [and others]
1999. Analysis of animal movement using telemetry and GIS data. In: American Statistical Association: 1999 proceedings of the section on statistics and the environment. Alexandria, VA: American Statistical Association: 100-105.

We used stochastic differential equations to analyze the recorded movement of elk over 9 months in the Starkey Experimental Forest in northeastern Oregon. The differential equations were adapted to include habitat data in a biologically meaningful manner. The goal of the Starkey project is to study movements of elk and other wild ungulates to better understand the dynamics of habitat selection and foraging behavior.

Keywords: Diffusion models, elk, Ornstein-Ulenbeck, potential functions, stochastic differential equations.

(See La Grande order form.)

Wood Utilization

Myers, G.C.; R.J. Barbour; Abubakr, S.
1999. Small-diameter trees used for thermomechanical pulps. Tappi Journal. 82(10): 105-110.

Chemithermomechanical pulps (CTMP) were prepared and evaluated from lodgepole pine and mixed Douglas-fir/western larch sawmill residue chips; lodgepole pine, Douglas-fir, and western larch submerchantable logs; and lodgepole pine, Douglas-fir, and western small trees. Pulps from Douglas-fir small trees, Douglas-fir submerchantable logs, and lodgepole pine trees required the most electrical energy, had marginal strength properties, and had poor printing properties (opacity, brightness). Western larch submerchantable logs and small trees had the lowest electrical energy consumption, poor strength properties, but some of the better printing properties.

Keywords: Wood utilization, forest management, pulp, CTMP, chips.

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____ J.A. Jones and G.E. Grant
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____ J.D. Kline
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