United States
Department of
Agriculture

Forest Service

Pacific Northwest
Research Station

Recent Publications of the Pacific Northwest Research Station, First Quarter 2002

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

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April 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

01-242

Pacific Northwest Research Station
2001. Recent publications of the Pacific Northwest Research Station, third quarter 2001. 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

01-120

Hummel, S.S.; Barbour, R.J.; Hessburg, P.F.; Lehmkuhl, J.F.
2001. Ecological and financial assessment of late-successional reserve management. Res. Note PNW-RN-531. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 25 p.

This research note reviews the role of management in forest reserves, documents methods for assessing the potential effects of variable-intensity management in late successional reserves (LSRs), and provides an example (the Gotchen LSR) from the east side of the Cascade Range in Washington. Landscape evaluation of the Gotchen LSR revealed that since the 1930s forest structures have become more homogeneous; area and average patch size of young, multistoried forest stands have decreased; and spatial patterns of late-successional forest have changed. These changes have altered vegetation response to disturbances such as fire, insects, and diseases, and suggest that different structures and patterns may better support LSR objectives over space and time. Study results will aid in identifying candidate treatment areas, developing prescriptions to maintain or restore desired stand structures and patterns, and understanding the financial commitment necessary for different management actions.

Keywords: Forest reserves, northern spotted owl, restoration silviculture, habitat management, western spruce budworm, fire hazard.

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

01-171

Nicholls, D.L.; Kilborn, K.A.
2001. Assessment of the lumber drying industry and current potential for value-added processing in Alaska. Gen. Tech. Rep. PNW-GTR-522. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 13 p.

An assessment was done of the lumber drying industry in Alaska. Part 1 was an evaluation of kiln capacity, kiln type, and species dried, by geographic region of the state. Part 2 considered the value-added potential associated with lumber drying. Various costs related to lumber drying were evaluated in a spreadsheet. About 2.2 million board feet of lumber per year currently is being dried in Alaska, over 90 percent of which is softwoods. Total installed kiln capacity is about 94 thousand board feet. On a board-foot basis, lumber drying premiums and profitability were most influenced by species dried (softwoods vs. hardwoods) and not as strongly influenced by geographic location or type of kiln used.

Keywords: Economics, wood products, lumber, dry kiln, Alaska.

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

Ecosystem Structure and Function

01-152

Reynolds, K.M.

2001. Fuzzy logic knowledge bases in integrated landscape assessment: examples and possibilities. Gen. Tech. Rep. PNW-GTR-521. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 24 p.

Knowledge-based solutions are particularly relevant to ecosystem management because the topic is conceptually broad and complex, involving many abstract concepts whose assessment depends on many interdependent states and processes. The ecosystem management decision-support system provides a formal logic framework for integrated analysis across multiple problem domains, has the ability to reason with incomplete information, and assists with optimizing the conduct of assessments by setting priorities on missing data. Most significant, however, is the possibility that knowledge-based reasoning could readily be extended to networks of knowledge bases that provide logical specifications for integrated analyses across spatial scales.

Keywords: Knowledge base, fuzzy logic, landscape, analysis, hierarchy, network, integration, ecosystem management, ecological assessment, landscape analysis.

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

Land Use

01-059

Kline, J.D.; Alig, R.J.

2001. A spatial model of land use change for western Oregon and western Washington. Res. Pap. PNW-RP-528. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 24 p.

We developed an empirical model describing the probability that forests and farmland in western Oregon and western Washington were developed to residential, commercial, or industrial uses over a 30-year period, as a function of spatial socioeconomic variables, ownership, and geographic and physical land characteristics. The empirical model is based on a conceptual framework of landowners maximizing the present value of the future stream of net returns derived from various land uses. The empirical model is used to compute indices representing 50-year projections of future land use and timberland area change in western Oregon and western Washington for the Resource Planning Act assessment, and to identify counties in the study region where potential reductions in timberland area could be greatest. Results suggest that conversion of forest and farmland to urban uses will most likely occur on lands closer to existing population centers, and rate of conversion will increase with the size of those population centers. Relatively modest reductions in the area of timberland due to conversion to urban uses are projected for western Oregon and western Washington, with the greatest reductions occurring on nonindustrial private forest land.

Keywords: Land use change, urban sprawl, spatial models.

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

Social Sciences

01-080

Kakoyannis, C.; Shindler, B.; Stankey, G.

2001. Understanding the social acceptability of natural resource decisionmaking processes by using a knowledge base modeling approach. Gen. Tech. Rep. PNW-GTR-518. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 40 p.

The purpose of this research was to assess the suitability of a knowledge base for use in forest management planning by examining its ability to assess the social acceptability of natural resource decisionmaking processes. Our findings note several caveats regarding the use of knowledge bases in evaluating social acceptability. We found, however, that a knowledge base model

can be a useful tool in forest management planning if these limitations are acknowledged. Knowledge bases can account for the variety of factors affecting social acceptability and can facilitate discussions regarding the compatibility and links among social, biological, and economic decision factors.

Keywords: Social acceptability, forest management, decisionmaking, public participation, knowledge base.

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

Special Forest Products

00-283

Vance, N.C.; Borsting, M.; Pilz, D.; Freed, J. 2001. Special forest products: species information guide for the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-513. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 169 p.

This guide is a collection of information about economically important vascular and nonvascular plants and fungi found in the Pacific Northwest that furnish special forest products. Many of these plants and fungi also are found in Alaska, northern Idaho, and western Montana. They contribute to many botanical, herbal, and natural food industries. This guide briefly describes biological and ecological attributes of over 50 plants and fungi, their wild harvest methods, alternatives to wild harvest, and use. The harvest techniques described in the guide are based on the recommendations of experienced harvesters and experts who have worked with these botanical resources and support sustainable practices.

Keywords: Special forest products, nontimber forest products, medicinal plants, edible fungi, botanical industry, herbs, wildcraft, Pacific Northwest, sustainable forestry.

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

Science Findings

In 2001 the PNW Research Station continued its series that presents science findings for people who make and influence decisions about managing lands. The 2001 issues may be ordered by using the order form on the last page of this publication. These publications also are available in electronic format at http://www.fs.fed.us/pnw.

February 2001. Ralph Alig. Finite land, infinite futures? Sustainable options on a fixed land base

March 2001. Mark Wipfli. Food for fish, food for thought: managing the invisible components of streams

April 2001. George H. Stankey. Too early to tell, or too late to rescue? Adaptive management under scrutiny

May 2001. Charlie Crisafulli and Fred Swanson. The rule of time and chance: Mount St. Helens and its legacy of knowledge

July 2001. David Boughton. Paradoxes in science: a new view of rarity

August 2001. John Lehmkuhl. Benefits of hindsight: reestablishing fire on the landscape

September 2001. Chris Christensen, Ellen Donoghue, and Terry Raettig. Absorbing the shock: helping communities when change erupts

October 2001. Andrew B. Carey. Invasion of the exotics: the siege of western Washington

November 2001. Martin G. Raphael. Under the radar: advances in murrelet monitoring

December 2001. Trish Wurtz and John Zasada. Boreal blending: timber and moose in Alaska's interior

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

Meleason, M.A.

2001. A simulation model of wood dynamics in Pacific Northwest streams. Corvallis, OR: Oregon State University. 158 p. Ph.D. dissertation.

STREAMWOOD is an individual-based stochastic model that operates on an annual time step at the reach scale. Stream wood dynamics considered were tree entry, breakage, movement, and decomposition. This model was developed for fifth-order and smaller coniferous-forested streams of the Pacific Northwest. STREAMWOOD was used to assess long-term implications of selected riparian management regimes on the standing crop of wood in channels.

Keywords: Ecosystem processes, woody debris, aquatic systems, stream ecology, detritus, modeling.

(Available only through library or interlibrary loan.)

Economics

Fight, R.D.; Barbour, R.J.

2001. The financial challenge of ecosystem management. In: Proceedings of the management of fire maintained ecosystems workshop. [Place of publication unknown]: [British Columbia Forest Service]: 74-77.

One of the biggest challenges of ecosystem management is paying for it. Although not all ecosystem management activities are capable of being self-financing, or are expected to be, it is important to be able to evaluate different strategies for accomplishing ecosystem management objectives. It also is important to be able to estimate the resources that would be required to implement a management strategy across a set of stand conditions in a management area. This paper describes the important attributes of an analysis approach that meets this need.

Keywords: Ecosystem management, economic evaluation, small-diameter timber, forest management.

(See Portland order form.)

Hartsough, B.R.; Zhang, X.; Fight, R.D.

2001. Harvesting cost model for small trees in natural stands in the interior northwest. Forest Products Journal. 51(4): 54-61.

Realistic logging cost models are needed for long-term forest management planning. Data from many studies were combined to estimate the costs of harvesting small trees in natural stands in the interior northwest of North America. Six harvesting systems were modeled. Four address gentle terrain: manual log-length, manual whole-tree, mechanized whole-tree, and mechanized cut-to-length systems. Two cable systems were included for steeper terrain: manual log-length and mechanized cut-to-length systems. A stand-alone program incorporating all the relations is available.

Keywords: Logging cost, simulation, timber harvesting.

(See Portland order form.)

Ecosystem Structure and Function

Bachelet, D.; Neilson, R.P.; Lenihan, J.M.; Drapek, R.J.

2001. Climate change effects on vegetation distribution and carbon budget in the United States. Ecosystems. 4: 164-185.

We used an equilibrium model (MAPSS) and a dynamic model (MC1) to (1) simulate changes in potential vegetation distribution under historical conditions and across a wide gradient of future temperature changes, (2) simulate changes in the associated carbon pools by using MC1 output to illustrate possible trajectories of vegetation change near the high and low ends of the temperature gradient, and (3) analyze the extent of areas in the United States having a negative carbon balance. Both models showed that a moderate increase in temperature produces an increase in vegetation density and carbon sequestration across most of the United States with small changes in vegetation types.

Keywords: Climate change, carbon budget, vegetation distribution, simulation, modeling.

(See Corvallis order form.)

Dale, V.H.; Joyce, L.A.; McNulty, S.; Neilson, R.P.

2000. The interplay between climate change, forests, and disturbances. The Science of the Total Environment. 262: 201-204.

Climate change is predicted to affect future forest conditions by altering forest processes and biodiversity. Furthermore, economic forces may be able to compensate for monetary repercussions of climate change impacts on forests but not necessarily for the way people relate to forests, such as through recreation. All these impacts may be moderated, however, by interactions between climate change, disturbances, and forests. It is important to understand how particular disturbances influence forests and are affected by climate change. This article focuses on seven disturbances common to forests and explores how these disturbances affect forests and how they may be altered by climate change. These key forest disturbances are fire, drought, introduced species, insect and pathogen outbreaks, hurricanes, and other wind and ice storms.

Keywords: Climate change, forests, biodiversity, disturbance.

(See Corvallis order form.)

Hessburg, P.F.; Salter, R.B.; Richmond, M.B.; Smith, B.G.

2000. Ecological subregions of the interior Columbia basin, USA. Applied Vegetation Science. 3: 163-180.

We conducted a multivariate regionalization of the interior Columbia River basin to group land units that are influenced by the same higher order climate regimes, geology, landform features, and geomorphic processes. We grouped 7,496 watersheds of the basin into 53 ecological subregions based on their similar areal composition of potential vegetation and climate attributes. All watersheds were classified to a single subregion that was more appropriate than the others, but there were strong resemblances between members of a given subregion and those of another nearby. Finally we evaluated the biogeoclimatic context of each subregion considering four levels in Bailey's nested land unit hierarchy. We did so to determine whether the environmental context of subregions was organized in nested, overlapping, or independent hierarchies and to determine scale. Most subregions nested within their respective biogeoclimatic contexts, but some overlapped, and context occurred at one of at least four scales. It may be more accurate to assume that

ecological units of a land unit hierarchy are often but not always nested. Likewise, it may be more accurate to assume that the environmental context of a particular ecological phenomenon occurs at more than a single scale across broad regional landscapes.

Keywords: Regionalization, hierarchy theory, land unit hierarchy, interior Columbia River basin, reference conditions, change analysis, representativeness assessment.

(See Wenatchee order form.)

Rojas, N.S.; Li, C.Y.; Perry, D.A.; Ganio, L.M.
2001. *Frankia* and nodulation of red alder and snowbrush grown on soils from Douglas-fir forests in the H.J. Andrews Experimental Forest of Oregon. Applied Forest Ecology. 17: 141-149.

More red alder nodulated when grown in clearcut soils than in soils of adjacent old-growth forest or of adjacent 20-year-old Douglas-fir plantation with an understory of snowbrush, and more snowbrush nodulated when grown in soil from the adjacent 20-year-old Douglas-fir plantation with an understory of snowbrush. Red alder biomass and nodule weight were highest when plants were grown in clearcut soils. Snowbrush biomass and nodule weight were highest in soils of the adjacent 20-year-old Douglas-fir plantation. The biomass of snowbrush plants in clearcut soils was higher in bottom slope soils than in soils from any other position.

Keywords: Red alder, snowbrush, Frankia*, actinorhizal plants.*

(See Corvallis order form.)

Sinton, D.S.; Jones, J.A.; Ohmann, J.L.; Swanson, F.J.
2000. Windthrow disturbance, forest composition, and structure in the Bull Run basin, Oregon. Ecology. 81(9): 2539-2556.

This study examined relations among forest landscape dynamics, environmental factors (climate and landforms), and disturbance history in forests dominated by Douglas-fir, western hemlock, and Pacific silver fir in the Bull Run basin in northwestern Oregon and evaluated the findings in a broader geographic context.

Keywords: Windthrow, fire history, disturbance ecology, environmental gradients, forest composition, forest structure, landscape dynamics, edges, ordination.

(See Corvallis order form.)

Fire

Berkley, E.L.
2000. Temporal and spatial variability of fire occurrence in western Oregon, A.D. 1200 to present. Eugene, OR: University of Oregon. 110 p. M.S. thesis.

Eight dendrochronological studies from western Oregon were synthesized to determine possible synchronous fire occurrence from A.D. 1200 to present. Fires were most widespread in the 1800s, particularly between 1850 and 1875, and fires were widespread, but less numerous, in the 1500s. Many fires occurred during the 1600s and 1700s, but they were localized and asynchronous.

Keywords: Fire history, variability, spatial, temporal.

(Available only through library or interlibrary loan.)

Gilless, J.K.; Fried, J.S.
2000. Generating beta random rate variables from probabilistic estimates of fireline production times. Annals of Operations Research. 95: 205-215.

An extension of probabilistic PERT/CPM is proposed as a framework for soliciting expert opinion to characterize random variables for stochastic treatment in simulation models. By eliciting minimum, modal, ninetieth percentile, and maximum estimates, the distribution of variables with probability density functions of beta form can be explicitly characterized without relying on the traditional, but empirically unverified, assumption of a standard deviation equal to one-sixth of the range. This practical and inexpensive technique is illustrated by application to a wildfire protection planning problem–estimating the time required to produce a given length of fireline by different firefighting resources under diverse conditions. The estimated production times are an essential input to a planning model of initial attack on wildland fires used by the California Department of Forestry and Fire Protection and provide that agency with useful "rules-of-thumb" for use in firefighter training.

Keywords: Expert opinion, stochastic simulation, fire control.

(See Portland order form.)

Weisberg, P.J.; Swanson, F.J.
2001. Fire dating from tree rings in western Cascades Douglas-fir forests: an error analysis. Northwest Science. 75(2): 145-156.

Cross dating, the matching of tree-ring patterns to determine absolute dates for tree-ring series, is a valuable technique for dating wildfires. Most recent fire history studies conducted in Pacific Northwest Douglas-fir forests, however, have not employed cross dating. The goal of this study was to determine the accuracy of noncross-dated, field-counted fire history data (that is, fire scar and tree origin years). Specifically the accuracy of (1) field counts versus cross dating, (2) laboratory ring counts on well prepared cross sections versus cross dating, and (3) fire frequency estimates derived from field counts, laboratory counts, and cross dating was compared.

Keywords: Fire history, fire ecology, disturbance, landscape analysis.

(See Corvallis order form.)

Winter, G.J.; Fried, J.S.
2001. Estimating contingent values for protection from wildland fire using a two-stage decision framework. Forest Science. 47(3): 349-360.

Knowing the perceived value of an increase in collective (agency-provided) fire protection that achieves a risk reduction target can contribute much to policy debates on the restructuring and funding of fire protection infrastructure and fuel management. Seventy-five percent of 265 residents of a Michigan jack pine forest who were interviewed chose to participate in a hypothetical market for a 50-percent reduction in risk and, on average, were willing to pay over $57 per year for such risk reduction. Results were consistent with a two-stage decision model: (1) participation in the hypothetical market for risk reduction and (2) how much is the risk reduction worth. Risk perception and objectively assessed risk influenced the probability of market participation. For market participants, willingness to pay was related to property value and household income, suggesting that value at risk and ability to pay weigh heavily in this decision.

Keywords: Risk reduction, wildfire, ability to pay.

(See Portland order form.)

Forest Management

Cascade Center for Ecosystem Management
2001. Small watershed studies: 50 years in the Lookout Creek basin. Corvallis, OR: Oregon State University, Department of Forest Science; [U.S. Department of Agriculture, Forest Service], Pacific Northwest Research Station; [U.S. Department of Agriculture, Forest Service], Willamette National Forest, Blue River Ranger District. 2 p.

Fifty years of aquatic and terrestrial research findings from long-term ecological studies of watersheds in and adjacent to the H.J. Andrews Experimental Forest, Oregon, are summarized. Effects of management activities are documented.

Keywords: Experimental watershed studies, H.J. Andrews Experimental Forest.

(See Corvallis order form.)

Castleberry, S.B.; Ford, W.M.; Miller, K.V.; Smith, W.P.
2000. Influences of herbivory and canopy opening size on forest regeneration in a southern bottomland hardwood forest. Forest Ecology and Management. 131: 57-64.

We examined the effects of browsing of white-tailed deer (*Odocoileus virginianus*) and canopy opening size on relative abundance and diversity of woody and herbaceous regeneration in various sized forest openings in a Southern United States bottomland hardwood forest over three growing seasons. We created 36 canopy openings (gaps), ranging from 7 to 40 meters in radius, by group selection timber harvest. Fenced exclosures were constructed in the center of each gap and vegetation was sampled monthly. Plant species richness, diversity, evenness, relative abundance, and a browsing index were calculated for each gap size and for each exclosure type. Herbaceous richness, diversity, or evenness did not differ among exclosure types in any year of the study. Low browsing rates during the 3 years indicated that differences among exclosure treatments and gap sizes likely are not attributable to deer herbivory. Other factors, such as soil disturbance, may have influenced the initial vegetative response more than did either herbivory or gap size.

Keywords: White-tailed deer, herbivory, group selection, bottomland hardwoods, regeneration, South Carolina.

(See Juneau order form.)

Monserud, R.A.
2001. The history of stand growth modeling in the Northwest. Western Forester. 46(4): 6-7.

Nearly a century ago mensurationists were struggling to construct the first North American yield tables. Today technological advances allow a choice of several reliable stand simulation models that can forecast the development of all sample trees for a rotation.

Keywords: Mensuration, yield tables, stand simulation models.

(See Portland order form.)

Geomorphology and Hydrology

Kasahara, T.
2000. Geomorphic controls on hyporheic exchange flow in mountain streams, Oregon. Corvallis, OR: Oregon State University. 103 p. M.S. thesis.

Simulations of stream-subsurface water exchange were conducted by using a three-dimensional steady state groundwater flow model and a particle tracking model in unconstrained and constrained reaches of small and intermediate mountain streams. This was done to estimate the effects of geomorphic features on the extent, volume, and residence time of hyporheic exchange flow. Study sites were located in the Lookout Creek drainage on the west side of the

Oregon Cascade Range. Stream water and water table elevations and saturated hydraulic conductivity were collected from four field sites. Geomorphic controls on hyporheic exchange flow differed between the two stream sizes sampled. Second-order streams had a single key geomorphic feature influencing the hyporheic exchange flow, whereas multiple geomorphic features were important in fifth-order streams. Residence time distribution of hyporheic exchange flow was narrow in second-order streams and wide in fifth-order streams.

Keywords: Riparian ecosystems, hillslope-stream interactions.

(Available only through library or interlibrary loan.)

Plant Ecology

Clearwater, M.J.; Meinzer, F.C.
2001. Relationships between hydraulic architecture and leaf photosynthetic capacity in nitrogen-fertilized *Eucalyptus grandis* trees. Tree Physiology. 21: 683-690.

This study compared the effects of nitrogen fertilization on the shoot hydraulic architecture and leaf photosynthetic properties of *Eucalyptus grandis* in Hawaii. Average tree height, stem basal area, and total leaf area increased between the lowest and highest rates of fertilizer addition. When trees were compared on the basis of leaf nitrogen per unit area (N_{area}), light-saturated rates of photosynthesis on an area and mass basis and the maximum rate of electron transport all increased. Branch-specific conductivity (k_s) and leaf-specific hydraulic conductivity (k_l) increased with height in the crown. There was no change in branch k_l or the ratio of leaf area to sapwood area of the whole shoot in response to fertilization, and k_s and density of the sapwood were not related to N_{area}. Stomatal conductance did not respond to fertilization. It is proposed that when there are changes in leaf properties without any external change in water availability or evaporative demand, leaf photosynthesis, and stomatal conductance are at least partially constrained by the hydraulic architecture of the tree.

Keywords: Eucalyptus grandis*, isotope discrimination, hydraulic conductance, nitrogen photosynthesis, tree water transport.*

(See Corvallis order form.)

Marsh, A.S.; Arnone, J.A.; Bormann, B.T.; Gordon, J.C.
2000. The role of *Equisetum* in nutrient cycling in an Alaskan shrub wetland. Journal of Ecology. 88: 999-1011.

The objectives of this study were to (1) identify species that may play a significant role in the cycling of phosphorus and other essential (but nonlimiting) nutrients and (2) understand how various environmental and soil factors affect ecosystem productivity in order to provide information for the active management of wildlife (primarily grazers, such as moose, geese, and swans) within the Copper River delta.

Keywords: Biogeochemistry, decomposition, horsetail, phosphorus, potassium, root distribution.

(See Corvallis order form.)

Meinzer, F.C.; Clearwater, M.J.; Goldstein, G.
2001. Water transport in trees: current perspectives, new insights and some controversies. Environmental and Experimental Botany. 45: 239-262.

This review emphasizes recent developments and controversies related to the uptake, transport, and loss of water by trees.

Keywords: Plant-water relations, cohesion theory, soil water partitioning, hydraulic architecture, xylem cavitation, capacitance.

(See Corvallis order form.)

Youngblood, A.; Riegel, G.
1999. Reintroducing fire in eastside ponderosa pine forests: a long-term test of fuel treatments. In: Joint fire science conference and workshop: crossing the millennium–integrating spatial technologies and ecological principles for a new age in forest management. Moscow, ID: University of Idaho: 142-150.

We describe a long-term study that used repeated burns at 5-, 10-, and 20-year intervals and was designed to develop a better understanding of reintroducing fire in fire-dependent ecosystems. Our work focused on stands within the 581-hectare Metolius Research Natural Area in central Oregon. Initial results compare horizontal and vertical structure components of trees in late-successional forests and how these components are modified by periodic fire, how underburns affect understory plant species diversity, and the relation between overstory canopy cover and understory species composition and cover. This study will add to understanding of how natural disturbances and human-caused manipulations can affect forest health over a long time and lead to new options for protecting old-growth structural characteristics.

Keywords: Research natural area, prescribed fire, fire restoration, fuel reduction, long-term study.

(See La Grande order form.)

Plant Pathology

Hessburg, P.F.; Goheen, D.J.; Koester, H.
2001. Association of black stain root disease with roads, skid trails, and precommercial thinning in southwest Oregon. Western Journal of Applied Forestry. 16(3): 127-135.

The incidence and severity of black stain root disease were evaluated in a two-stage sample of 500 precommercial-aged Douglas-fir plantations in the Medford District, Bureau of Land Management, in southwest Oregon. Black stain was widely distributed throughout the western half of the district. Nearly 19 percent of the susceptible-aged (10- to 30-year-old) plantations were infected with black stain, but mortality losses were low. The root disease was more often found in precommercially thinned plantations and occurred with greater frequency adjacent to roads and skid trails. Black stain incidence was higher than other root diseases but had minimal impact on precommercial stand management. The lack of widespread damage was associated with a lack of extensive tractor yarding and an apparent lack of precommercial thinning. Managers in areas having a high hazard of black stain root disease can maintain low mortality levels by minimizing site disturbance and tree injury associated with harvesting, road building, and road maintenance activities and by timing precommercial thinning to avoid vector insect emergence and flight periods.

Keywords: Thinning, Leptographium wageneri*, black stain root disease, tractor yarding.*

(See Wenatchee order form.)

Resource Inventory

Torgersen, T.R.; Bate, L.J.
2000. Sampling methods and parameters for characterizing log resources. In: Ross, D.W., comp. Proceedings of the 51st annual meeting of the western forest insect work conference. Corvallis, OR: Oregon State University, Department of Forest Science: 69-70.

Descriptors of log resources are discussed in relation to needs for information about this important stratum for inclusion in planning documents and for adherence to management guidelines. Five major descriptors of log resources are proposed: number of logs, percentage of ground covered by logs, combined length of qualifying logs, volume, and weight of logs per unit area. Two common methods of conducting log inventories, line-intercept sampling and strip-plot sampling, are compared.

Keywords: Forest inventory, coarse woody debris, CWD, logs, log resources, log sampling.

(See La Grande order form.)

Silviculture

Cascade Center for Ecosystem Management
2001. Management in young forests. Corvallis, OR: Oregon State University, Department of Forest Science; [U.S. Department of Agriculture, Forest Service], Pacific Northwest Research Station; [U.S. Department of Agriculture, Forest Service], Willamette National Forest, Blue River Ranger District. 27 p.

In this communiqué we highlight some new developments in young stand management and research since 1993, take a look at possible pathways to the future, and offer some resources for connecting with other people who also are learning more about management in young forests.

Keywords: Stand management, harvest, biodiversity.

(See Corvallis order form.)

Hurd, P.D.; DeBell, D.S.
2001. Growth and early stand development of intensively cultured red alder plantings. New Forests. 21: 71-87.

This study evaluated performance of *Alnus rubra* in three square spacings, two irrigation regimes, and two preplanting fertilization treatments. Initial survival and growth were excellent, and differences among various cultural treatments were apparent by the end of the second growth season. At age 10, mean tree sizes in specific regimes ranged from 4.8 to 11.5 centimeters in diameter and 7.7 to 13.1 meters tall, with largest trees produced in regimes having wide spacing and high irrigation. Beneficial effects of fertilizer were minimal and limited primarily to enhanced early survival during the first 2 years in the closest spacing. Growth of the plantings was greater than that estimated for fully stocked, natural stands of the same age and site index. Data from our study provided general confirmation of the level and slope of the tree size-stand density lines currently used in density management guidelines for alder, except that mortality in the densest spacing occurred at diameters smaller than those assumed to indicate the threshold for intertree competition. This difference, however, was lessened by irrigation.

Keywords: Alnus rubra*, red alder, self-thinning, spacing, irrigation, fertilization, stand density.*

(See Olympia order form.)

Keyes, C.R.; Acker, S.A.; Greene, S.E.
2001. Overstory and shrub influences on seedling recruitment patterns in an old-growth ponderosa pine stand. Northwest Science. 75(3): 204-210.

Seedling recruitment in an old-growth ponderosa pine stand at the Metolius Research Natural Area in central Oregon was studied to determine its relation with overstory trees and nearby shrubs and to identify spatial patterns. Regeneration is most sensitive to adjacent vegetation in early stages, and this diminishes with age. Aggregations of seedlings early on transform to a more regular pattern as stand development progresses.

Keywords: Spatial analysis, regeneration, old-growth forest, research natural area.

(See Corvallis order form.)

Wurtz, T.L.; Zasada, J.C.
2001. An alternative to clear-cutting in the boreal forest of Alaska: a 27-year study of regeneration after shelterwood harvesting. Canadian Journal of Forest Research. 31: 999-1011.

We present 27-year results from a comparison of clearcutting and shelterwood harvesting in the boreal forest of Alaska. Three 1.3-hectare clearcut and three 2.3-hectare shelterwood units were harvested in 1972; about 100 dispersed white spruce leave trees per hectare were retained in the shelterwoods. The shelterwood trees were removed after 15 years. Units were

mechanically scarified immediately after harvest; a seed crop of more than 400 white spruce seeds per square meter was dispersed that year. After 27 years, overstory treatment had no effect on the density or growth of any species we studied, but scarification had a number of highly significant effects. In 1999, scarified areas still were densely populated with white spruce seedlings and saplings. Unscarified areas had far fewer stems but were well stocked. Initially, spruce grew best on scarified surfaces, but by 27 years, both height and diameter of the tallest spruce saplings were significantly greater on unscarified surfaces. Because criteria for evaluating forest management practices have changed since this study was begun, partial overstory retention systems for the management of Alaska's boreal forests deserve further study.

Keywords: Alternatives to clearcutting, partial overstory retention, Bonanza Creek Long-Term Experimental Reserve, boreal forest, scarification, shelterwood, harvesting, white spruce, paper birch, Calamagrostis canadensis*, moose.*

(See Fairbanks order form.)

Social Science

Kruger, L.
2001. What is essential is invisible to the eye: understanding the role of place and social learning in achieving sustainable landscapes. In: Sheppard, S.R.J.; Harshaw, H.W., eds. Forests and landscapes: linking ecology, sustainability and ethics. Wallingford, United Kingdom: CABI Publishing: 173-187. Chapter 12.

This paper explores the importance of conceiving of landscapes as places with which people develop relations and to which they ascribe meaning and significance beyond the meaning and significance associated with ecological and aesthetic values. Landscapes are the product of multiple perspectives. Therefore, various stakeholders must be engaged in management decisions. Civic engagement in social learning, stewardship activities, and other collaborative processes represent strategies that promote shared learning and informed action and serve to bring people together to explore options and potential outcomes.

Keywords: Landscape, aesthetics, social learning, place, collaboration, sustainability.

(Available in libraries and bookstores.)

Soil

Homann, P.S.; Bormann, B.T.; Boyle, J.R.
2001. Detecting treatment differences in soil carbon and nitrogen resulting from forest manipulations. Soil Science Society of America Journal. 65(2): 463-469.

This study determined if pretreatment soil carbon and nitrogen can be used to detect differences between forest treatments. The treatments were overstory species and woody debris manipulations in a newly established, large-scale, long-term experiment in a Pacific Northwest Douglas-fir forest. To ascertain the statistical sensitivity of this experiment, we combined statistical simulation and pretreatment data to determine (1) how minimum detectable differences differ among different approaches of quantifying soil carbon and nitrogen and (2) how minimum detectable differences change when pretreatment data are combined with future posttreatment measurements versus using posttreatment values only.

Keywords: Soil carbon, nitrogen, forest treatments.

(See Corvallis order form.)

Kramer, M.G.
2000. Maritime windstorm influence on soil processes in a temperate rainforest. Corvallis, OR: Oregon State University. 124 p. Ph.D. dissertation.

Maritime cyclonic windstorms cause widespread disturbance to forested ecosystems in southeast Alaska. The consequence of this disturbance process on the movement, storage, and quality of soil carbon, forest hydrology, and stream water chemistry was studied along a windthrow chronosequence. The results suggested that catastrophic windthrow disturbance smoothes

hydrograph response to storm events and increases the chemical interaction of rainwater with mineral horizons by increasing rainwater infiltration and storage in deeper soil profiles. The changes in concentrations and characteristics of organic carbon in mineral soil that result from soil-mixing disturbances can strongly influence the hydrology, chemical properties of catchments, and rate of nutrient cycling.

Keywords: Windthrow, soil development, biogeochemistry.

(Available only through library or interlibrary loan.)

Wildlife

Bull, E.L.; Heater, T.W.; Wertz, T.L.
2001. Black bear habitat in northeastern Oregon. Western Black Bear Workshop. 7: 82-91.

Habitat use was compared among adult male, adult female, and subadult female black bears (*Ursus americanus*) in northeastern Oregon. Use of forest type, structural stage, logging, landform, stem density, log density, and canopy differed by sex and reproductive classes and activities of bears. Adult males used the most diversified habitats; adult females more consistently used a high percentage of grand fir (*Abies grandis*), old multistory, and unlogged stands. Sites used for bedding and moving had a high degree of security. Sites used for foraging on logs were in more harvested stands and higher on the slope than for other activities. Sites used for foraging on fruit were in more open stands, lower on the slope, closer to roads, and lower in log density than those used for other activities. Dead wood used for foraging on insects was comprised of 82 percent logs, 17 percent stumps, and 1 percent snags. Bears selected for large-diameter logs with partial or advanced decay. Western larch (*Larix occidentalis*) and Douglas-fir (*Pseudotsuga menziesii*) logs were used more and lodgepole pine (*Pinus contorta*) logs were used less than expected based on availability. Black bear habitat in northeastern Oregon can be enhanced by management practices that (1) retain stands with old multistory structure with no logging activity, particularly in grand fir forest types, (2) produce fruit-bearing plants, and (3) retain logs greater than 38 centimeters in diameter.

Keywords: Black bear, Ursus americanus*, habitat, northeastern Oregon.*

(See La Grande order form.)

Carey, A.B.
2000. Ecology of northern flying squirrels: implications for ecosystem management in the Pacific Northwest, USA. In: Goldingay, R.L.; Scheibe, J.S., eds. Biology of gliding mammals. Fürth, Germany: Filander Verlag: 45-66.

Northern flying squirrels in the Pacific Northwest are keystone species that disseminate the spores of ectomycorrhizal fungi symbiotic with Pinaceae and that are preyed upon by many vertebrate predators. Substantial research has shown that the squirrels tend to be most abundant in naturally regenerated forests more than 100 years old, whereas abundance in second-growth forests is highly variable and often quite low. Flying squirrels vary in life history attributes from north to south. Flying squirrel ecology provides practical insights for forest ecosystem management and conservation of biodiversity in Pacific Northwest forests.

Keywords: Northern flying squirrels, Glaucomys sabrinus*, Pacific Northwest, Pinaceae, ectomycorrhizal fungi, biodiversity.*

(Available in libraries and bookstores.)

Forsman, E.D.; Giese, A.R.
1997. Nests of northern spotted owls on the Olympic Peninsula, Washington. Wilson Bulletin. 109(1): 28-41.

We examined 116 spotted owl nests on the Olympic Peninsula, Washington. All nests were in trees, and 90.5 percent were in cavities. Nests were typically in large trees with large holes in the side of the trunk or in broken tops of the

trunk. Owls changed nests between successive nesting events in 80 percent of the cases. We hypothesize that the high proportion of nests in cavities on the peninsula compared to other regions is a response to heavy precipitation.

Keywords: Northern spotted owl, Olympic Peninsula, nests.

(See Corvallis order form.)

Hanley, T.A.; Russell, D.E.
2000. Ecological role of hunting in population dynamics and its implications for comanagement of the Porcupine caribou herd. Rangifer. Spec. Iss. 12: 71-78.

We modeled potential sensitivity of caribou population dynamics to hunting and used that relation as a basis for a herd monitoring system. Maximum number of adult cows that could be harvested without causing a subsequent decline in herd size was calculated as a function of total number of adult cows and recruitment of calves to yearling age class. Maximum cow harvest, therefore, is a threshold above which hunting has destabilizing effects on herd dynamics. Actual harvest in relation to theoretical maximum harvest provides a basis for prediction of herd sensitivity to hunting. Maximum harvest is a linear function of recruitment. Herd dynamics are especially sensitive to low recruitment when combined with low herd size. The two relations involving recruitment and herd size provide the basis for predicting herd dynamics and sensitivity to hunting. The population model and monitoring system can operate on the Internet and be accessible to all users in villages within the range of the Porcupine caribou herd.

Keywords: Caribou, comanagement, population dynamics, population model, monitoring, Alaska, Yukon, wildlife habitat.

(See Juneau order form.)

Haveri, B.A.; Carey, A.B.
2000. Forest management strategy, spatial heterogeneity, and winter birds in Washington. Wildlife Society Bulletin. 28(3): 643-652.

Ecological management of second-growth forest holds great promise for conservation of biodiversity, yet little experimental evidence exists to compare alternative management approaches. Wintering birds are one of several groups of species most likely to be influenced by forest management activities. We compared species richness and proportion of stand area used over time by wintering birds in 16 second-growth Douglas-fir (*Pseusdotsuga menziesii*) stands to determine effects of management strategy and experimental variable-density thinnings. Management strategies were retention of legacies (large live, dead, and fallen trees from previous old-growth stands) with long rotations and management for high-quality timber with multiple thinnings and removal of defective trees.

Keywords: Biodiversity, birds, conservation, forest management, Pacific Northwest, silviculture, variable-density thinning, Washington, winter.

(See Olympia order form.)

Kie, J.G.
1999. Optimal foraging and risk of predation: effects on behavior and social structure in ungulates. Journal of Mammalogy. 80(4): 1114-1129.

Optimal foraging theory predicts that an animal will either attempt to maximize energy gained or minimize the time spent to obtain a fixed amount of energy. A time-minimizing approach implies that an animal is attempting to minimize its exposure to temperature extremes, predators, or some other factor in the environment while foraging. The use of simple, linear programming models of dietary choice has been successful in predicting classes of forages consumed by ungulates and other generalist herbivores and indicates they often follow an energy-maximization strategy, but overwhelming evidence indicates that ungulates modify their behavior in the

presence of predators. I suggest that decisions about when and how to forage are being made at different scales, and these differences may account for observed discrepancies between the models and empirical evidence. New analytical techniques, such as stochastic dynamic programming, may allow the development of more realistic models of foraging behavior and better incorporate observed behaviors in ungulates.

Keywords: Ungulates, foraging behavior, optimal foraging theory, optimization, linear programming, stochastic dynamic programming, predation risk.

(See La Grande order form.)

Kie, J.G.; Bowyer, R.T.
1999. Sexual segregation in white-tailed deer: density-dependent changes in use of space, habitat selection, and dietary niche. Journal of Mammalogy. 80(3): 1004-1020.

We examined patterns of sexual segregation among white-tailed deer (*Odocoileus virginianus*) at the Welder Wildlife Refuge in south Texas at moderate and high population densities during 1974-77. At moderate density, females with young made greater use of chaparral-mixed grass habitat with dense cover than did males, when preferred herbaceous forage was less abundant, presumably for reasons of predator avoidance. At high density, which was a result of predator control, sexual segregation between males and females decreased during all seasons. Males that otherwise used more open habitats increased their use of the chaparral-mixed grass as levels of intraspecific competition increased. The outcomes suggested that females were not driving patterns of spatial segregation by being better able to compete with males for closely-cropped forages. Rather, predator avoidance by females with young related to the reproductive-strategy hypothesis best explained patterns we observed, and competition between sexes was rejected as a cause of sexual segregation.

Keywords: White-tailed deer, Odocoileus virginianus*, sexual segregation, social organization, population density, competition, niche, habitat selection, south Texas.*

(See La Grande order form.)

Mills, L.S.; Doak, D.F.; Wisdom, M.J.
2001. Elasticity analysis for conservation decision making: reply to Ehrlén et al. Conservation Biology. 15(1): 281-283.

Ehrlén et al. disagree with our 1999 conclusion that "elasticities of population growth are accurate only under a very constrained scenario." They further contend that elasticities should be used to evaluate the actual change in population growth rather than measuring the rankings of elasticity values. We agree on these points but argue that appropriate uses of elasticities for species conservation is more complex than approaches advocated by these authors. We emphasize analytical approaches that use simulation modeling and that rely on empirical and hypothesized variation in vital rates as a means of testing all plausible effects of vital rates on population growth. We further emphasize the point that elasticities are mathematically correct, but that applications are often incorrect owing to characteristics of real-world data that often violate assumptions associated with elasticity analysis. Consequently, a variety of analytical approaches can be used to complement classical elasticity analysis.

Keywords: Elasticities, elasticity analysis, life-stage importance, population growth, species conservation.

(See La Grande order form.)

Olson, D.H.; Hagar, J.C.; Carey, A.B. [and others]
2001. Wildlife of westside and high montane forests. In: Johnson, D.H.; O'Neil, T.A., eds. Wildlife-habitat relationships in Oregon and Washington. Corvallis, OR: Oregon State University Press: 187-212.

Broad- and fine-scale patterns of western forest wildlife assemblages are reviewed. Abiotic and biotic drivers of geographic distributions and diversity patterns are synthesized, and forest habitat associations are presented for birds,

mammals, reptiles, and amphibians. The changing role of forest management in maintaining wildlife species persistence is summarized.

Keywords: Wildlife, forest, Oregon, Washington, habitat, diversity.

(Available in libraries and bookstores.)

Peffer, R.D.

2001. Small mammal habitat selection in east slope Cascade mountain riparian and upland habitats. Cheney, WA: Eastern Washington University. 45 p. M.S. thesis.

Small mammal populations and habitat correlates were compared by pitfall trapping in riparian and upland habitats on three stream reaches on the east side of the Cascade Range in north-central Washington. Small mammal species richness and evenness were greater in riparian than upland habitat, but species diversity did not differ. Abundance of small mammals in general and of specific species was greater in riparian habitats. Shrew-mole, forest mouse, water shrew, Trowbridge shrew, vagrant shrew, and western jumping mouse were associated with riparian habitats. The deer mouse was the only species associated with upland habitat. Insectivores comprised 69.1 percent and rodents comprised 30.5 percent of all species captured. Forest and wildlife management plans should consider the species found in a given drainage of east slope forest environments where the ecosystem can change rapidly owing to the rain shadow effect.

Keywords: Riparian, small mammals, riparian buffers, corridors.

(Available only through library or interlibrary loan.)

Raphael, M.G.; Wisdom, M.J.; Rowland, M.M. [and others]

2000. Status and trends of habitats of terrestrial vertebrates in relation to land management in the interior Columbia River basin. Forest Ecology and Management. 5502: 1-25.

We analyzed effects of three land management alternatives on 31 terrestrial vertebrates of conservation concern within the interior Columbia River basin. To evaluate effects of the alternatives, we developed Bayesian belief network (BBN) models, which allowed empirical and hypothesized relations to be combined in probability-based projections of conditions. We used the BBN models to project abundance and distribution of habitat to support potential populations for each species across the entire basin. Our results suggest that all three management alternatives will substantially improve conditions for most forest-associated species but provide few improvements for rangeland-associated vertebrates.

Keywords: Bayesian modeling, conservation, ecosystem management, models, terrestrial vertebrates, interior Columbia River basin, population viability, wildlife habitat.

(See Olympia order form.)

Rose, C.L.; Marcot, B.G.; Mellen, T.K. [and others]

2001. Decaying wood in Pacific Northwest forests: concepts and tools for habitat management. In: Johnson, D.H.; O'Neil, T.A., eds. Wildlife-habitat relationships in Oregon and Washington. Corvallis, OR: Oregon State University Press: 580-623.

This chapter of a recent book discusses ecological importance of decaying wood, current regional patterns of decaying wood, and management ramifications of snag and down wood abundance.

Keywords: Decaying wood, snags, down wood, habitat management.

(Available in libraries and bookstores.)

Smith, W.P.; Harke, V.L.
2001. Marbled murrelet surveys: site and annual variation, sampling effort, and statistical power. Wildlife Society Bulletin. 29(2): 568-577.

Because the marbled murrelets, *Brachyramphus marmoratus*, reputedly nests in late-seral coniferous forests of the upper Pacific coast, there is a need to document its inland distribution and habitat use in southeast Alaska. We conducted dawn surveys during mid-July 1991-96 at fixed-point-count stations along two segments of roadways. Our results provide preliminary estimates of sampling effort required to detect meaningful differences among habitats or local population declines in portions of southeast Alaska.

Keywords: Marbled murrelets, Brachyramphus marmoratus*, southeast Alaska, dawn surveys, detecting trends, habitat use, inland activity, point counts, sampling effort.*

(See Juneau order form.)

White, T.H., Jr.; Bowman, J.L.; Jacobson, H.A.; Smith, W.P.
2001. Forest management and female black bear denning. Journal of Wildlife Management. 65(1): 34-40.

Most habitats available to black bear (*Ursus americanus*) in the Mississippi alluvial valley consist of seasonally flooded commercial forests where lack of suitable dens may limit population growth. We studied interactions between forest management and flooding relative to female black bear denning. Denning behavior differed between commercial and noncommercial forests. Females used tree dens exclusively in noncommercial forests, whereas in commercial forests, 83 percent were ground dens. Variations in ground den elevation resulted in differing inundation probabilities, thereby altering survival probabilities for neonates. In commercial forests, ground dens with similar inundation probabilities as tree dens allowed successful reproduction to occur. Management practices that enhance suitable cover in areas of minimal inundation probability may mitigate for lack of den trees in flood-prone landscapes.

Keywords: Black bear, Ursus americanus*, batture, denning, elevation, flooding, forest management, Mississippi alluvial valley, reproduction, topography.*

(See Juneau order form.)

Zollner, P.A.; Smith, W.P.; Brennan, L.A.
2000. Microhabitat characteristics of sites used by swamp rabbits. Wildlife Society Bulletin. 28(4): 1003-1011.

We studied microhabitat characteristics of sites associated with specific behaviors of the swamp rabbit, *Sylvilagus aquaticus,* a species indigenous to bottomland forests of the Southeastern United States. Our results demonstrate that microhabitat features of a forest, such as canopy gaps, may be associated positively with certain activities and associated negatively with other behaviors. Microhabitat analyses for swamp rabbits and possibly other wildlife species can be improved by stratifying observations according to activity or specific behaviors prior to analysis.

Keywords: Bottomland forests, browse sites, habitat selection, microhabitat, latrines, resting sites, swamp rabbit, Sylvilagus aquaticus*.*

(See Juneau order form.)

Wood Utilization

Lowell, E.C.
2001. Look at CTL. Journal of Logging and Sawmills. 26(7): 12.

This guest editorial deals with small-diameter trees and the National Fire Plan (NFP) funded by Congress in 2001. The NFP is designed to increase the use of cost-share activities to promote utilization of small-diameter trees and promote research that focuses on seeking new uses and markets for byproducts of forest restoration.

Keywords: Forest restoration, National Fire Plan, small-diameter trees.

(See Portland order form.)

Lowell, E.C.; Green, D.W.
2001. Lumber recovery from small-diameter ponderosa pine from Flagstaff, Arizona. In: Vance, R.K.; Edminster, C.B.; Covington, W.W.; Blake, J.A. Ponderosa pine ecosystems restoration and conservation: steps toward stewardship. Proc. RMRS-P-22. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 161-165.

Thousands of acres of densely stocked ponderosa pine forests surround Flagstaff, Arizona. These stands are at risk from a forest health point of view (insect and disease) and also are susceptible to uncharacteristically severe fires. Stand density management activity can be expensive, but product recovery from the thinned material could help defray removal costs. This project evaluated the yield and economic return of lumber recovered from small-diameter, suppressed ponderosa pine. Volume recovery was slightly higher for dimension lumber, yet the lumber from the logs sawn for appearance grade was worth significantly more.

Keywords: Lumber recover, ponderosa pine, value-added products.

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____ V.H. Dale, L.A. Joyce, S. McNulty, and R.P. Neilson
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