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Forest Service

Pacific Northwest
Research Station

Recent Publications of the Pacific Northwest Research Station, First Quarter 1999

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April 1999

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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.

Insects

97-004

Mason, R.R.; Scott, D.W.; Loewen, M.D.; Paul, H.G.

1998. Recurrent outbreak of the Douglas-fir tussock moth in the Malheur National Forest: a case history. Gen. Tech. Rep. PNW-GTR-402. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 14 p.

Characteristics of an outbreak of the Douglas-fir tussock moth in 1991-95 in the Burns Ranger District of the Malheur National Forest (eastern Oregon) are given and compared with an earlier infestation in the same area in 1963-65. Results of monitoring with pheromone traps, evaluating populations by sampling larvae, and predicting trends in defoliation are reported in detail for the latest outbreak. Findings of this analysis, and the recurrent behavior of tussock moth outbreaks in general, reinforce the importance of maintaining a system for detection, evaluation, and prediction in the managing of Douglas-fir tussock moth populations in the future.

Keywords: Douglas-fir tussock moth, Orgyia pseudotsugata*, insect outbreaks, sampling insects, pheromone traps, population monitoring.*

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

Supply and Demand

98-332

Warren, Debra D.

1998. Production, prices, employment, and trade in Northwest forest industries, third quarter 1997. Resour. Bull. PNW-RB-229. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 130 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).

Wood Utilization

98-071

Leavengood, Scott; Swan, Larry

1998. Proceedings, western juniper forum '97: Proceedings of a meeting; 1997 April 21; Bend, OR. Gen. Tech. Rep. PNW-GTR-432. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 97 p.

This proceedings is a compilation of 30 articles on various aspects of the management and commercialization of western juniper. The topics are split between commercial and industrial topics, and science and management topics. Presenters were asked to provide abstracts, not full papers, and to include whom to contact for more information or a copy of the complete paper, or when and where the information or study was expected to be published.

Keywords: Western juniper, western juniper proceedings, western juniper marketing and utilization, western juniper biology and management.

Publications Available Elsewhere

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

Atmosphere

Henshaw, Donald L.; Bierlmaier, Frederick A.; Hammond, Hazel E.

1998. The H.J. Andrews climatological field measurement program. In: Michener, W.K.; Porter, J.H.; Stafford, S.G., eds. Data and information management in the ecological sciences: a resource guide. Albuquerque, NM: University of New Mexico, LTER Network Office: 117-122.

Research modeling in ecology and hydrology demands the collection of short time-step, spatially distributed, climatic measurements. Standardized sets of measured parameters with standard collection methods are critical for comparability of measurements. Standard data archival formats, quality assurance procedures, and good mechanisms for method documentation are essential for efficient handling of large quantities of electronic data. Web access to near real-time climatological data as well as long-term archives has proven invaluable to researchers.

Keywords: Meteorological measurements, data access, quality assurance, radio telemetry, climate data.

(See Corvallis order form A.)

Ecosystem Function

Bonin, Heather

1997. Fine benthic organic matter (FBOM) dynamics in low-order mountain streams: (1) methods evaluation and (2) the effects of stand age, season, and elevation on FBOM nutrient availability and microbiological characteristics. Corvallis, OR: Oregon State University. 78 p. M.S. thesis.

This study examined the relation between organic matter inputs and fine particulate organic matter in small streams with riparian zones of different ages. Streams with young riparian stands had lower carbon-nitrogen ratios and higher denitrification potentials, nitrogen fixation, phosphate activity, and B-glucosidase activity. Elevation also influenced the results.

Keywords: Nutrients, fine particulate organic matter.

(Available only through library or interlibrary loan.)

Cascade Center for Ecosystem Management

1998. Dead wood, bugs, fungi, and new forests: the log decomposition study. Corvallis, OR: Oregon State University; [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.

This project summary describes the log decomposition study that was initiated in 1985 with an experiment designed to last 200 years. It was designed to test the effect species and size of logs have on decomposition and nutrient cycling processes. The information about these processes is being incorporated into a computer simulation model used to predict the effects of species, size, and environment on the decomposition and nutrient cycling processes of woody detritus. Once the model is tested, it could become an important tool to predict how management affects this important habitat.

Keywords: Wood debris, ecosystem, fungi, invertebrates, technology transfer.

(See Corvallis order form A.)

Castleberry, S.B.; Ford, W.M.; Miller, K.V.; Smith, W.P.

1996. Herbivory and canopy gap size influences on forest regeneration in a Southern bottomland hardwood forest. In: Flynn, Kathryn M., ed. Proceedings of the Southern forested wetlands ecology and management conference. Clemson, SC: Clemson University, Consortium for Research on Southern Forested Wetlands:11-14.

The influence of gap size on herbivory rates of woody and herbaceous plant species and the influence of herbivory on the growth and survival of cherrybark oak seedlings were examined during the first postharvest growing season at a Savannah River site in the upper coastal plain of South Carolina. During the first growing season, factors such as soil disturbance may have influenced the vegetative response more than herbivory. The herbivory rates were relatively low for most species.

Keywords: Herbivory, browsing, white-tailed deer, Odocoileus virginianus*, species composition, cherrybark oak.*

(See Juneau order form.)

Hunter, Matthew G.

1998. Watershed-level patterns among stream amphibians in the Blue River watershed, west-central Cascades of Oregon. Corvallis, OR: Oregon State University. 97 p. M.S. thesis.

Most recent research on stream amphibians in the Pacific Northwest has focused on associations with reach-level or stand-level, rather than landscape-level, environmental features. A watershed-wide sample and logistic regression were used to develop models and maps of probability of occurrence of amphibians throughout the Blue River watershed stream network. The strength of association of abstract, large-scale variables in the presence of detailed instream variables in multiscale models indicated that some aspects of the environment that more directly affect the distribution of stream amphibians were not measured.

Keywords: Amphibians, Oregon, landscape ecology.

(Available only through library or interlibrary loan.)

Ohmann, Janet L.

1998. Washington's forest landscape management project–a pragmatic, ecological approach to small-landscape management [Book review]. Northwest Science. 72(1): 76-77.

This paper reviews "Washington's Forest Landscape Management Project–a Pragmatic, Ecological Approach to Small-Landscape Management," by Andrew B. Carey, Catherine Elliott, Bruce, R. Lippke [and others], published by the Washington Department of Natural Resources. That document is a report of a working group that developed forest management strategies to enhance biodiversity at the scale of the small landscape. The study provided information on some ecological and societal benefits that might be achieved, and costs that might be incurred, by public policy initiatives designed to stimulate management for conservation of biodiversity across all land ownerships.

Keywords: Landscape ecology, ecosystem management, forest policy, sustainable forestry, biodiversity conservation, Washington forests.

(See Corvallis order form.)

Schimel, David S.; Emanuel, W.; Rizzo, B. [and others]

1997. Continental scale variability in ecosystem processes: models, data, and the role of disturbance. Ecological Monographs. 67: 251-271.

This paper evaluates the model-generated patterns of spatial variability within and between ecosystems by using Century, TEM, and Biome-BGC and the relations among modeled

water balance, nutrients, and carbon dynamics. Evaluations of models are presented against mapped and site-specific data. The models simulated spatial variability in ecosystem processes in substantially different ways, thereby reflecting the models' differing implementations of multiple resource limitation of net primary productivity (NPP). The models were implicitly or explicitly sensitive to disturbance in their simulation of NPP and carbon storage.

Keywords: Disturbance, evapotranspiration, mode comparison and validation, nitrogen mineralization, NPP, remote sensing, soil carbon.

(See Corvallis order form B.)

Strzelczyk, Edmund; Pokojska-Burdziej, Aleksandra; Li, Ching Y.
1997. Effect of Cd_2^+, Zn_2^+, and Cu_2^+ on auxins production by *Azospirillum* strains. Acta Microbiologica Polonica. 46(3): 263-270.

Nitrogen-fixing and auxin-producing *Azospirillum* strains, isolated from Douglas-fir ectomycorrhizae and mycorrhizal fungi were tested for their sensitivity to heavy metals. Cd_2^+, Zn_2^+, and Cu_2^+ at 10 and 100 p/m reduced the bacterial growth but not the production of auxins. The heavy metals at 500 p/m completely inhibited the bacterial growth.

Keywords: Azospirillum*, heavy metals, auxins.*

(See Corvallis order form B.)

Fire

Baird, Maryan
1998. Wildfire effects on nutrient capitals in inland coniferous forests. Seattle, WA: University of Washington. 102 p. M.S. thesis.

A ponderosa pine-Douglas-fir forest (PP-DF) and a lodgepole pine-Engelmann spruce (LP-ES) forest on the eastern slopes of the Cascade Range in Washington were examined following severe wildfire to compare soil nutrient capitals with unburned control forests. One year after the fire in the PP-DF forest, average soil capitals were lower on burned than control sites by 30 percent for carbon, 46 percent for nitrogen, and 11 percent for sulfur. In the LP-ES forest, nutrient capitals were reduced on burned sites by 10 percent, 13 percent, and 27 percent for carbon, nitrogen, and sulfur, respectively. A bioassay of the study area soils showed an increase in plant productivity following low-severity fire in both forests. The results suggest that short-term soil productivity can be increased by low-severity fires and be unaffected or reduced by more severe fire in the type of forest soils studied.

Keywords: Wildfire effects, soil nutrient capitals, ponderosa pine, Douglas-fir, lodgepole pine, Engelmann spruce, growth rates, soil productivity.

(Available only through library or interlibrary loan.)

Van Norman, Kelli J.
1998. Historical fire regime in the Little River watershed, southwestern Oregon. Corvallis, OR: Oregon Stte University. 103 p. M.S. thesis.

This study examined the fire history of Douglas-fir forests in the Little River watershed in southwestern Oregon where fire has historically been one of the most prevalent disturbance elements in upland forests. The historic fire regime, including its temporal and spatial variability, are characterized within the Little River watershed.

Keywords: Landscape dynamics, fire history, disturbance history.

(Available only through library or interlibrary loan.)

*****Please note: In 1998 the Northwest Scientific Association published a special issue of Northwest Science dealing with large-scale fire disturbance. Six articles were funded by the Pacific Northwest Research Station and are described below. Two others dealt with heterogeneity in fire regimes and natural disturbance

rates and patch size distribution in northern British Columbia. Please direct requests for this special issue, preferably by email, to **wild@u.washington.edu** or by writing **David Peterson, College of Forest Resources, Box 352100, University of Washington, Seattle, WA 98195.**

Agee, James K.
1998. The landscape ecology of western forest fire regimes. Northwest Science. 72: 24-34.

Coarse-filter conservation strategies typically rely on knowledge of natural disturbance regimes to define appropriate forest structure goals, both at the stand and landscape scale, and these will differ by fire regime. Historical patch size increased across the low- to high-severity spectrum, but edge was maximized in the moderate-severity fire regime. Fire exclusion in the 20th century has caused two major types of landscape change: loss of openings in once patchy landscapes, and imposition of high-severity dynamics in areas where wildfires that escape suppression now burn. Effects of historical fire regimes may be in some cases either difficult to mimic or undesirable.

Keywords: Fire, fire regimes, fire exclusion.

(*To order, see note above.)

Alvarado, Ernesto; Sandberg, David V.; Pickford, Stewart G.
1998. Modeling large forest fires as extreme events. Northwest Science. 72: 66-75.

Large fires can have significant impacts on natural, social, and economic systems. Catastrophic wildfires are a major concern in public policy; however, these extreme events are not adequately addressed by standard statistics. This paper presents an approach, based on the statistics of extreme events for modeling large forest fires. This paper offers an analytical approach to model only the large fires that exceed an upper damage threshold. This approach could potentially improve the decisionmaking process in fire management.

Keywords: Fire, forest fire, fire modeling, extreme events, catastrophic fire.

(*To order, see note above.)

Keane, Robert E.; Long, Donald G.
1998. A comparison of coarse-scale fire effects simulation strategies. Northwest Science. 72: 76-90.

Development of management-oriented computer models for coarse-scale fire simulation is often problematic because of the tradeoff between prediction realism and model utility. This study compares three spatial modeling strategies of increasing complexity for simulating coarse scale succession and fire dynamics across the 80-million-hectare interior Columbia River basin. Results indicated that models of increasing complexity require additional parameterization and computer time but provide more realistic results.

Keywords: Fire models, fire simulation, Columbia River basin.

(*To order, see note above.)

Lenihan, James M.; Daly, Christopher; Bachelet, Dominique; Neilson, Ronald P.
1998. Simulating broad-scale fire severity in a dynamic global vegetation model. Northwest Science. 72: 91-103.

MCFIRE is a broad-scale fire severity model that is being developed as part of the MAPPS-CENTURY dynamic global vegetation model. MCFIRE simulates the occurrence and impacts of relatively infrequent and extreme events historically responsible for the majority of fire disturbance to ecosystems. The occurrence of severe fire is strongly related to synoptic-scale climatic conditions producing extended drought, which is indicated in MCFIRE by the low moisture content of large, dead fuels.

Keywords: Fire, simulation, fire severity model, DGVM (dynamic global vegetation model), disturbance.

(*To order, see note above.)

McKenzie, Donald
1998. Fire, vegetation, and scale: toward optimal models for the Pacific Northwest. Northwest Science. 72: 49-65.

There is great variability in frequency, severity, and spatial scales of fire in the Pacific Northwest. Because of steep gradients in elevation and precipitation in mountainous regions, fire regimes change rapidly with geographic distance. Coarse-scale fire models must account for internal spatial heterogeneity of fire behavior and fire effects. Most research on the effects of fire on vegetation has been conducted at small spatial scales; thus large-scale models must address the problem of aggregation, or scale extrapolation. This paper reviews the types and quality of empirical data available for large-scale modeling and presents a classification of strategies for extrapolating models to broad scales.

Keywords: Fire models, fire behavior.

(*To order, see note above.)

Peterson, David L.
1998. Large-scale fire disturbance: from concepts to models. Northwest Science. 72: 1-3.

Assessing and predicting the effects of fire at large spatial scales are some of the most difficult, yet relevant, problems in fire science. The complexity of fire regimes in the Pacific Northwest and other regions is widely recognized, although information for addressing fire effects generally is available only at small spatial scales. Increased integration of fire-effects data and models in resource management and planning is improving the management of disturbance regimes as components of ecosystem dynamics.

Keywords: Fire disturbance, fire effects, fire regimes.

(*To order, see note above.)

Fish and Wildlife

Ballard, Warren B.; Van Ballenberghe, Victor
1998. Moose-predator relationships: research and management needs. Alces. 34(1): 91-105.

During the past 2 decades, several studies have identified the role of predation as either limiting or regulating moose population growth; however, confusion over misuse-use of terminology has hindered our understanding of these relations. Regulating factors are composed solely of density-dependent factors that keep populations in equilibrium or cause them to return to equilibrium. Whether a wolf functional response is, in fact, related to moose density has come under scrutiny. Whether predation regulates or limits moose population growth may be academic if reductions in predator numbers allow managers to increase moose populations and harvest yields.

Keywords: Moose, predator-prey relations, Alces alces*, population growth.*

(See Anchorage order form.)

Bowyer, R. Terry; Kie, John G.; Van Ballenberghe, Victor
1998. Habitat selection by neonatal black-tailed deer: climate, forage, or risk of predation? Journal of Mammalogy. 79(2): 415-425.

Habitat selection by neonatal (2-10 days of age) black-tailed *deer (Odocoileus hemionus columbianus*) was studied at Big Flat, Trinity County, California during June, July, and August, 1992-94. Even very young deer (2-3 days old) frequently were observed following their mothers and in social groups with other adult deer. Neonates selected south-facing slopes with gentle terrain and high variability in overstory and concealment cover. These deer also selected sites with herbaceous vegetation but avoided areas with browse (woody vegetation). Forage was more digestible at sites with neonates than random ones, but no difference occurred in nitrogen content of forage between those sites. Variables identified as important

components of habitat for young deer were more likely related to the thermal environment of the neonate and nutritional demands of lactating females than to the risk of predation.

Keywords: Odocoileus hemionus columbianus*, black-tailed deer, habitat selection, neonates, climate, forage, predation, hider-follower behavior, California.*

(See La Grande order form.)

Csuti, Blair; Kimerling, A. Jon; O'Neil, Thomas A. [and others]

1997. Atlas of Oregon wildlife: distribution, habitat, and natural history. Corvallis, OR: Oregon State University Press. [Pages unknown].

This book presents descriptions of wildlife habitat of Oregon, species maps, and natural history notes for amphibians, reptiles, breeding birds, and mammals and checklists of terrestrial breeding vertebrates and wintering birds.

Keywords: Wildlife habitat, Oregon, amphibians, reptiles, birds, terrestrial vertebrates.

(Available through bookstores and libraries.)

Eglitis, Andris; Hennon, Paul E.

1997. Porcupine feeding damage in precommercially thinned conifer stands of central southeast Alaska. Western Journal of Applied Forestry. 12(4): 115-121.

Feeding damage by porcupines is described from a sample of 641 trees in precommercially thinned young-growth stands of Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*) on Mitkof Island in central southeast Alaska. Four categories of feeding damage are described: complete girdling of the bole, partial girdling (bole scars), branch clipping, and "tasting wounds" (small basal bole scars). Sitka spruce sustained significantly higher damage than western hemlock, and feeding was greater on taller than shorter Sitka spruce. Although only 8 of 59 trees initially girdled in 1985 were killed, many later sustained additional feeding damage. Following the 1987 season, 3 years after thinning, nearly 30 percent of the spruce and 14 percent of the western hemlock crop trees had been partially or completely girdled. Issues deserving future attention include the role of thinning in predisposing stands to porcupine damage, methods of population assessment, and mechanisms of host selection by porcupines.

Keywords: Porcupines, Sitka spruce, Picea sitchensis*, western hemlock,* Tsuga heterophylla*, animal damage.*

(See Juneau order form.)

Garrott, Robert A.; Cook, John G.; Bernoco, Marietta M. [and others]

1998. Antibody response of elk immunized with porcine zona pellucida. Journal of Wildlife Diseases. 34(3): 539-546.

Immunocontraception using porcine zona pellucida (PZP) vaccines is being explored as a nonlethal method of solving the problems of locally overabundant wildlife populations. This study characterized the immunological response of captive elk (*Cervus elaphus nelsoni*) to PZP challenge by using eighteen 3-year-old cows and was conducted from September 14, 1994, to December 13, 1995. Immunological response was assessed by measuring anti-PZP antibody levels in the serum. All animals demonstrated a strong immune response with no evidence that a booster enhanced antibody levels. These results indicated that immunocontraception using PZP vaccines is possible for elk. Carefully controlled population experiments will be required to assess the potential and limitations for management applications of this technique.

Keywords: Adjuvants, Cervus elaphus*, contraception, fertility control, immunocontraception, porcine zona pellucida antibody, reproduction, Rocky Mountain elk, vaccine.*

(See La Grande order form.)

Garrott, Robert A.; Monfort, Steven L.; White, P.J. [and others]

1998. One-sample pregnancy diagnosis in elk using fecal steroid metabolites. Journal of Wildlife Diseases. 34(1): 126-131.

Recent research has demonstrated the potential of pregnancy diagnosis in elk (*Cervus elaphus nelsoni*) through immunoassays of fecal steroid concentration. Multiple samples are required, however, to ensure accurate results, thereby limiting its utility for free-ranging animals. The authors attempted to develop an accurate one-sample pregnancy diagnosis by using 153 fecal samples collected from free-ranging, radio-collared, adult female elk in Yellowstone National Park and from captive elk maintained at the Starkey research facility, La Grande, Oregon, February through April, 1992 and 1997. The results indicated that fecal progestagens radio-immunoassay provides a reliable method of noninvasive pregnancy diagnosis using single fecal samples collected from elk during late gestation. Independent validation of suggested discrimination criteria should be performed before routine application.

Keywords: Cervus elaphus*, physiology, radio-immunoassay, reproduction, techniques.*

(See La Grande order form.)

Hanley, T.A.

1997. Black-tailed deer (*Odocoileus hemionus*) and forest management in Alaska: practical lessons from the pursuit of foraging theory. In: Milne, J.A., ed. Recent developments in deer biology: Proceedings of the 3d international congress on the biology of the deer; 1994 August 28-September 2; Edinburgh, United Kingdom. Aberdeen, United Kingdom: McCaulay Land Use Research Institute: 401-409.

Results of a 10-year research program are reviewed. Focus was on foraging theory and its implications for forest management and deer habitat in southeastern Alaska. Foraging theory provided theoretical basis and structural approach to understanding the interactions between deer and their habitat. The effects of forest management were related to deer through effects on overstory-understory relations, overstory-snowpack relations, forage availability and quality, energy intake, energy expenditure, and ultimately foraging efficiency. Foraging theory focused and integrated research over a broad array of factors and helped identify new insights that otherwise would not have been recognized.

Keywords: Wildlife habitat, Sitka black-tailed deer, nutrition, energy balance, southeastern Alaska.

(See Juneau order form.)

Hilderbrand, Grant V.; Farley, Sean D.; Robbins, Charles T.

1998. Predicting body condition of bears via two field methods. Journal of Wildlife Management. 62(1): 406-409.

Bioelectrical impedance analysis (BIA) and isotopic water dilution were used to estimate body composition of brown bears (*Ursus arctos*) and black bears (*U. americanus*) of known body composition. Water dilution was a more precise predictor of body fat content than was BIA. The magnitude of error for either method was not significantly related to body mass, lipid content, or animal age. Achievement of accurate, repeatable BIA estimates requires extensive training and experience. Isotopic water dilution had fewer sources of error but required laboratory analysis.

Keywords: Body composition, body condition, grizzly bear, brown bear, Ursus arctos*, black bear,* Ursus americana*.*

(See Juneau order form.)

Keech, Mark A.; Stephenson, Thomas R.; Bowyer, R. Terry; Van Ballenberghe, Victor; Ver Hoef, Jay M.

1998. Relationships between blood-serum variables and depth of rump fat in Alaskan moose. Alces. 34(1): 173-179.

The authors studied the relation between maximum depth of rump fat determined from ultrasound measurements and 22 blood values for Alaskan moose (*Alces alces gigas*) by

sampling 38 pregnant, adult females. In March 1996, moose were immobilized, and blood was drawn simultaneously with the determination of depth of rump fat. Multiple-regression models were used to detect relations between blood-serum variables and depth of fat. These blood variables may provide insights into the predicted condition of moose and the response of moose to environmental conditions. A model using blood variables thought to be indicators of physical condition (protein, phosphorus, and calcium) did not explain significant variation in maximum depth of rump fat.

Keywords: Alaskan moose, Alces alces gigas*, blood values, condition, rump fat.*

(See Anchorage order form.)

MacCracken, James G.; Van Ballenberghe, Victor; Peek, James M.

1997. Habitat relationships of moose on the Copper River delta in coastal south-central Alaska. Wild. Monogr. 136. [Place of publication unknown]: The Wildlife Society. 52 p. Supplement to Journal of Wildlife Management 61(4): 1997 October.

River deltas have been presumed to provide high-quality habitats for moose (*Alces alces*). Moose were introduced to the Copper River Delta, Alaska, in the 1950s, but little was known about their habitat relations. This study was conducted from 1987 to 1989 to characterize and evaluate moose habitat quality and moose ecology on a large river delta.

Keywords: Alaska, Alces alces gigas*, calf survival, carrying capacity, disturbance, habitat selection, moose, scale effects.*

(See Anchorage order form.)

Noyes, James H.; Sasser, R. Garth; Johnson, Bruce K. [and others]

1997. Accuracy of pregnancy detection by serum protein (PSPB) in elk. Wildlife Society Bulletin. 25(3): 695-698.

Blood sera from 225 Rocky Mountain elk (*Cervus elaphus nelsoni*) were tested for presence of pregnancy-specific protein-B (PSPB) and compared to pregnancy results from uterus examinations. Lowering the criterion used to indicate pregnancy from 95 to 93 percent binding of elk antiserum to bovine PSPB improved overall pregnancy detection accuracy from 94 to 96 percent and reduced the rate of false positive tests from 15 to 3 percent. No relation was observed between percentage of binding and day of gestation.

Keywords: Elk, pregnancy, PSPB.

(See La Grande order form.)

Reeves, Gordon H.; Bisson, Peter A.; Dambacher, Jeffrey M.

1998. Fish communities. In: Naiman, Robert J.; Bilby, Robert E., eds. River ecology and management: lessons from the Pacific coastal ecoregion. New York: Springer-Verlag: 200-234. Chapter 9.

This book chapter examines the structure and composition of fish communities at different spatial scales–regional, watershed, reach, and habitat unit.

Keywords: Community ecology, fish communities, Pacific coastal ecoregion, watershed, reach.

(Available from bookstores and libraries.)

Smith, Winston P.; McGuiness, Joseph H.

1997. Estimating clutch size in wild turkey by eggshell mass. Proceedings of the Louisiana Academy of Sciences. 60: 30-35.

Eighty-three eggs from 15 abandoned nests of wild turkey (*Meleagris gallopavo*) were collected to derive a standardized estimate of eggshell mass that could be used to estimate clutch size from shell fragment remains of undisturbed successful nests. Dry mass of eggshells differed considerably, especially among nests of different regions. There also was appreciable variation in egg width and length and shell thickness. Regional variation required a large sample (at least 40 nests) to provide unambiguous estimates of clutch size. Mean eggshell

mass obtained from as few as four nests in the same vicinity could be used to provide an objective estimate of clutch size for local populations.

Keywords: Clutch size, eastern wild turkey, Meleagris gallopavo*, Louisiana, Florida.*

(See Juneau order form.)

Smith, Winston P.; Twedt, Daniel J.; Hamel, Paul B. [and others]

1998. Increasing point-count duration increases standard error. Journal of Field Ornithology. 69(3): 450-456.

Data from point counts of differing duration in bottomland forests of west Tennessee and the Mississippi alluvial valley were examined to determine if counting interval influences sampling efficiency. Estimates of standard error increased as point-count duration increased for cumulative number of both individuals and species in both locations. Although point counts seem to yield data with standard errors proportional to means, a square root transformation of the data may stabilize the variance. Using long point counts (greater than 10 minutes) may reduce sample size and increase sampling error, both of which diminish statistical power and thereby the ability to detect meaningful changes in avian populations.

Keywords: Bottomland hardwood forest, forest landbirds, monitoring, point counts, sampling efficacy.

(See Juneau order form.)

Stephenson, Thomas R.; Hundertmark, Kris J.; Schwartz, Charles C.; Van Ballenberghe, Victor

1998. Predicting body fat and body mass in moose with ultrasonography. Canadian Journal of Zoology. 76: 717-722.

Lipids are the primary energy store of the body, and estimating these reserves provides an indication of nutritional status in moose (*Alces alces*). Estimates of total body fat enhance our understanding of reproductive potential, survival rate, energy balance, and nutritional carrying capacity. Predictive equations were developed of total body fat and body mass from ultrasonographic fat measurements for application in live animals. A strong linear relation was detected between ingesta-free body fat and rump fat thickness as measured by ultrasonography. Rump fat thickness was measurable over a range of body fat levels (5.8 to 19.1 percent). Rump fat mass and kidney fat mass were curvilinearly related to ingesta-free body fat level. For adult females, total length and chest girth were not related to body mass. Ingesta-free body fat, however, explained 81 percent of the variability in body mass, and ultrasonically measured rump fat thickness predicted body mass.

Keywords: Moose, Alces alces*, body fat, ultrasonography, nutritional status.*

(See Anchorage order form.)

van de Wetering, Stan J

1998. Aspects of life history characteristics and physiological processes in smolting Pacific lamprey, *Lampetra tridentata*, in a central Oregon coast stream. Corvallis, OR: Oregon State University. 59 p. M.S. thesis.

Despite its widespread distribution, little is known about the life history of the Pacific lamprey. The first portion of this study provides information examining aspects of the life history characteristics of Pacific lamprey in an entire basin on the Oregon coast. The second portion examines the changes in a number of physiological parameters in wild Pacific lamprey that had attained sizes necessary for metamorphosis.

Keywords: Pacific lamprey, smolt.

(Available only through library or interlibrary loan.)

Weixelman, David A.; Bowyer, R. Terry; Van Ballenberghe, Victor

1998. Diet selection by Alaskan moose during winter: effects of fire and forest succession. Alces. 34(1): 213-238.

Forage available to and used by Alaskan moose (*Alces alces gigas*) during winter 1988-89 on the Kenai Peninsula, Alaska, was studied to test the hypothesis that changes in the

quality and abundance of browse during winter affected selection of diet. Patterns of selection did not differ between periods of winter even though abundance of forage did. Selectivity of diet declined with increasing distance from cover, indicating risk of predation played a role in the foraging dynamics of moose. The use of fire holds the potential to improve habitat for moose, but the population dynamics of this large herbivore also need to be considered for such management to be effective.

Keywords: Alaskan moose, Alces alces gigas*, diet selection, fire, forest succession, optimal foraging, snow depth, winter.*

(See Anchorage order form.)

Wipfli, Mark S.; Hudson, John; Caouette, John
1998. Influence of salmon carcasses on stream productivity: response of biofilm and benthic macroinvertebrates in southeastern Alaska, U.S.A. Canadian Journal of Fisheries and Aquatic Sciences. 55: 1503-1511.

A study was conducted in 1996 to determine if salmon carcasses (from spawning adults) increased biofilm mass and benthic macroinvertebrate abundance in streams in southeastern Alaska. Salmon carcasses lost 60 percent of their dry mass in the experimental streams by the end of the 3-month experiment. Biofilm dry mass was about 15 times higher in carcass-enriched reaches of the creek. Total macroinvertebrate densities were up to 8 and 25 times higher in carcass-enriched areas of experimental and natural streams, respectively. The increased biofilm and macroinvertebrate abundance suggests that salmon carcasses elevate freshwater productivity. This mechanism may be crucial to sustain aquatic-riparian ecosystem productivity and long-term salmonid population levels.

Keywords: Anadromous fishes, salmon, stream, freshwater, biofilm, benthic macroinvertebrates, aquatic productivity.

(See Juneau order form.)

General

Gray, Andrew N.; Spies, Thomas A.
1998. Ecosystem management. In: Calow, P., ed. Encyclopedia of ecology and environmental management. Oxford, United Kingdom: Blackwell Science: 222-224.

Ecosystem management is the science and art of directing human activities to sustain or restore the desired diversity and productivity of terrestrial and aquatic ecosystems in an area. The essence of ecosystem management lies in its systematic approach and its multiscale spatial and temporal views, and not in the use of specific management practices. Implementation of ecosystem management requires many areas of expertise, including ecology, economics, sociology, and political science. Alternative viewpoints and approaches to practicing ecosystem management are discussed.

Keywords: Ecosystem management, multiscale.

(Available from bookstores and libraries.)

Hartmann, Lawrence A.
1997. The Blue Mountains Natural Resources Institute: putting science to work. In: Proceedings: 1997 SAF national convention; 1997 October 4-8; Memphis, TN. Bethesda, MD: Society of American Foresters: 293-298.

The Blue Mountains Natural Resources Institute is funded and staffed by the Pacific Northwest Research Station and the Pacific Northwest Region, USDA Forest Service, and is located in La Grande, Oregon. The institute has a 20-member Board of Directors and more than 80 partner organizations who work together to identify and address the natural resource issues of that area. The institute coordinates adaptive research projects, serves as a neutral forum for discussion of environmental issues, and conducts technology transfer programs.

Keywords: Blue Mountains Natural Resources Institute, natural resource issues.

(See La Grande order form.)

Genetics

Johnson, G.R.; Sniezko, R.A.; Mandel, N.L. 1997. Age trends in Douglas-fir genetic parameters and implications for optimum selection age. Silvae Genetica. 46(6): 349-358.

Trends in genetic variation were examined over 51 progeny test sites throughout western Oregon. Optimum selection age was calculated for a 60-year rotation by using two measures of efficiency: gain per year and discounted gain. The optimum selection age for height tended to be 2 to 3 years earlier than for diameter. Gain per year was maximized at age 10 for height and 13 for diameter.

Keywords: Forest genetics, Douglas-fir, heritability, age-age correlation, selection, breeding.

(See Corvallis order form B.)

Insects

McCullough, Deborah G.; Werner, Richard A.; Neumann, David 1998. Fire and insects in northern and boreal forest ecosystems of North America. Annual Review of Entomology. 43: 107-127.

Fire and insects are natural disturbance agents in many forest ecosystems, often interacting to affect succession, nutrient cycling, and forest species composition. Literature was reviewed that pertained to effects of fire-insect interactions on ecological succession, use of prescribed fire for insect pest control, and effects of fire on insect diversity from northern and boreal forests in North America.

Keywords: Succession, fire ecology, fire suppression, bark beetles, spruce budworm, biological diversity.

(Available only through library or interlibrary loan.)

Mitchell, Russel G.; Preisler, Haiganoush 1998. Fall rate of lodgepole pine killed by the mountain pine beetle in central Oregon. Western Journal of Applied Forestry. 13(1): 23-26.

In central Oregon, lodgepole pine killed by mountain pine beetle began falling 3 years after death in thinned stands and 5 years after death in unthinned stands. In thinned stands, 50 percent were down in 8 years and 90 percent in 12 years. In unthinned stands, 50 percent were down in 9 years and 90 percent in 14 years. No particular calendar year had tree fall that was significantly greater than average.

Keywords: Lodgepole pine, mountain pine beetle.

(See La Grande order form.)

Ross, Darrell W.; Daterman, Gary E. 1998. Pheromone-baited traps for *Dendroctonus pseudotsugae* (Coleoptera: Scolytidae): influence of selected release rates and trap designs. Forest Entomology. 91(2): 500-506.

Several different pheromone release rates and trap designs were evaluated for trapping the Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins. The highest beetle catches occurred at frontalin:seudenol release rates of 20:10 and 10:5 milligrams per day. Percentage of males captured increased significantly with increasing frontalin:seudenol release rates up to a plateau of 80:40 milligrams per day. Catches of a clerid predator beetle, *Thanasimus undatulus*, increased with higher release rates across the range of pheromone release rates tested. Multiple funnel traps caught significantly more Douglas-fir beetles than slotted-panel traps, based on both total numbers and numbers per unit area of trapping surface. These results will contribute to the development of more efficient trapping programs to reduce the impact of Douglas-fir beetle outbreaks on multiple resource management objectives.

Keywords: Douglas-fir, pheromone, bark beetles, forest insects, trapping, attractants.

(See Corvallis order form B.)

Mycorrhizae

Molina, Randy; Pilz, David
1998. Commercially harvested edible forest mushrooms: opportunities for ecosystem management. In: Meeting in the middle: Proceedings of the 1997 Society of American Foresters national convention; 1997 October 4-8; Memphis, TN. Bethesda, MD: Society of American Foresters: 173-177.

Edible mushrooms of many forest fungi are highly prized by different cultures. The decline of favorite edible species in some countries, however, has created a market demand for these wild fungi from countries where they remain plentiful. These economic forces have led to development of a multimillion dollar industry of wild mushroom harvest from the extensive forests of western North America; about 1 800 000 kilograms were harvested in 1992. This paper discusses ecological and management implications of this commercial harvest on forest fungi and focuses on current research and monitoring aimed at developing management guidelines for protecting the mushroom resource and ensuring a sustainable harvest.

Keywords: Special forest products, nontimber forest products, fungi.

(See Corvallis order form B.)

Pilz, David; Molina, Randy
1998. A proposal for regional monitoring of edible forest mushrooms. Mushroom: the Journal of Wild Mushrooming. 16(3): 19-20, 23.

Declines in edible mushroom production have been noted in European forests, and factors causing the decline are beginning to influence forests in the Pacific Northwest. Extensive Federal forest land in the Pacific Northwest provides an opportunity to systematically and statistically monitor edible mushroom production throughout the region. This paper describes a proposed regional monitoring and research plan that would include the participation of interested publics and commercial mushroom harvesters. Feedback was solicited from the journal readership concerning the merit and design of the monitoring plan.

Keywords: Edible forest mushrooms, commercial harvest, monitoring, regional, sampling, collaboration, volunteers.

(See Corvallis order form B.)

Plant Ecology

Gerson, Elizabeth A.; Kelsey, Rick G.
1998. Variation of piperidine alkaloids in ponderosa (*Pinus ponderosa*) and lodgepole pine (*P. contorta*) foliage from central Oregon. Journal of Chemical Ecology. 24(5): 815-827.

The authors quantified 2,6-disubstituted piperidine alkaloids in ponderosa and lodgepole pine needles from three forest sites in April, June, August, and December. Alkaloids were detected in 71 percent of the ponderosa and in 29 percent of the lodgepole pine. Pinidine was the major alkaloid in ponderosa, and euphococcinine was predominant in lodgepole pine. For ponderosa pine, total alkaloids were very low at two sites and substantially higher at the third site on all dates. Total alkaloid concentrations in previous-year foliage from the third site were highest in April, then significantly lower from June through December. Current-year foliage had higher alkaloid concentrations than previous-year foliage. Variation in foliar nitrogen concentrations accounted for some of the alkaloid variation in current-year foliage. No diurnal changes in alkaloids were detected.

Keywords: Piperidine alkaloids, foliar chemistry, secondary chemicals, Pinus *spp., soil-available nitrogen.*

(See Corvallis order form B.)

Gerson, Elizabeth A.; Kelsey, Rick G.; McComb, William C.; Ross, Darrell W.

1998. Palatability of *Coloradia pandora* (Lepidoptera: Saturniidae) eggs to a rodent predator: contributions of physical and chemical characteristics. Physiological and Chemical Ecology. 27(3): 709-716.

Golden-mantled ground squirrels (*Spermophilus lateralis*) consume adult pandora moths (*Coloradia pandora*) but reject nutritionally valuable eggs from gravid females. Nutritional analyses indicated that *C. pandora* moths and eggs are of comparable food quality. Randomized two-choice feeding trials with captive *S. lateralis* were conducted to identify the mode of egg protection. These bioassays indicated that *C. pandora* eggs are not protected chemically; however, the egg shell does significantly inhibit *S. lateralis* consumption.

Keywords: Pandora moth, egg defense, predator-prey, natural enemies, forest insects, rodent consumption.

(See Corvallis order form B.)

Hennon, Paul E.; Shaw, Charles G., III

1997. The enigma of yellow-cedar decline: what is killing these long-lived, defensive trees? Journal of Forestry. 95(12): 4-10.

Yellow-cedar is a defensive, long-lived tree that has been experiencing a high mortality rate in southeast Alaska since the 1880s. Investigations of biotic causes indicated that insects and pathogens are not the primary cause of decline. Epidemiological and site factors suggest several abiotic hypotheses to explain tree mortality, including soil toxicity and freezing damage. Climatic warming coincided with the onset of decline and may have triggered one or more of these processes.

Keywords: Yellow-cedar, Alaska-cedar, forest decline, climate.

(See Juneau order form.)

Moore, Darrin J.; Nowak, Robert S.; Nowak, Cheryl L.

1998. Photosynthetic acclimation to temperature and drought in the endemic Chelan rockmat, *Petrophytum cinerascens* (Rosaceae). American Midland Naturalist. 139: 374-382.

Petrophytum cinerascens (Piper) Rydb. (Rosaceae) is a highly restricted endemic found on steep rocky outcrops and sandy soils along the Columbia River in eastern Washington. Plants collected from the field were subjected to three sets of day-night growth temperatures and two different watering regimes to examine the plant's ability for photosynthetic acclimation to increased growth temperature. Data from the study suggested that *P. cinerascens* is not able to acclimate to increased global temperature and therefore may serve as a sensitive indicator species of global warming.

Keywords: Petrophytum cinerascens*, global climate change, indicator species, rare plants, growth temperatures, photosynthetic acclimation, drought response.*

(See Wenatchee order form.)

Schrader, Barbara A.

1998. Structural development of late successional forests in the central Oregon Coast Range: abundance, dispersal, and growth of western hemlock (*Tsuga heterophylla*) regeneration. Corvallis, OR: Oregon State University. 175 p. Ph.D. dissertation.

Patterns of western hemlock regeneration were studied in relation to forest structural development and environment in the Oregon Coast Range. Density of western hemlock seedlings was examined across the climatic gradient from cool, moist coastal areas to the seasonally hot and dry Willamette Valley margin.

Keywords: Structural diversity, landscape ecology, dispersal, old-growth forest.

(Available only through library or interlibrary loan.)

Plant Pathology

Cimon, Norm

1997. Budworms and chaos. Wild Earth. Fall: 39-41.

This article presents a discussion of the state of the forests in the Blue Mountains of northeast Oregon and southeast Washington. In the last few decades, these forests have weathered a series of insect outbreaks and have become the focus of a debate over forest health.

Keywords: Forest health, budworms, Blue Mountains.

(See La Grande order form.)

Hennon, Paul E.; Shaw, Charles G., III; Hansen, Everett M.

1998. Reproduction and forest decline of *Chamaecyparis nootkatensis* (yellow-cedar) in southeast Alaska, USA. In: Laderman, Aimlee D., ed. Coastally restricted forests. New York: Oxford University Press: 54-69. Chapter 3.

This book chapter reviews the resource and silvics of Alaska yellow-cedar and summarizes information from recent research studies. Yellow-cedar is an ecologically important and highly valuable tree species in coastal Alaska, but it is dying on over 200 000 hectares of forest in southeast Alaska, thus representing the most severe case of forest decline occurring in North America. The tree has limited successful reproduction in many declining and healthy unmanaged forests in Alaska. Forest managers are particularly concerned because frequently the tree is not regenerating on sites harvested by logging. The key areas covered in this chapter include value and uses of the tree, its natural distribution, its reproduction, the forest decline situation, and factors associated with the decline.

Keywords: Alaska yellow-cedar, forest decline, regeneration, forest values.

(See Juneau order form.)

McDonald, Kent A.; Hennon, Paul E.; Stevens, John H.; Green, David W.

1997. Mechanical properties of salvaged dead yellow-cedar in southeast Alaska: phase I. Res. Pap. FPL-RP-565. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 9 p.

An intensive decline and mortality problem is affecting yellow-cedar trees in southeast Alaska. Yellow-cedar snags (dead trees) could be important to the economy in southeast Alaska, if some high-value uses for the snags could be established. Due to the high decay resistance of yellow-cedar, the rate of deterioration is so slow that snags may remain standing for a century or more after death. Obtaining information on wood products from these snags is necessary to correctly assess the utilization potential of the yellow-cedar. Initial property analyses, phase I, showed no evidence that even the oldest snags have low strength. Black stain in the heartwood of live yellow-cedar may have an effect on strength, which will be analyzed through additional study.

Keywords: Yellow-cedar, snags, cedar decline, bending strength, stiffness, modulus of rupture, modulus of elasticity, specific gravity, age, salvage.

(See Juneau order form.)

Range Management

Stillings, Amy M.

1997. The economic feasibility of offstream water and salt to reduce grazing pressure in riparian areas. Corvallis, OR: Oregon State University. 104 p. M.S. thesis.

This thesis examined the economic impacts of providing offstream water and salt in pastures to influence cattle distribution between riparian and upland areas. When a cattle dispersion method was employed, cattle were distributed more evenly across pastures and consumed

more upland forage. Consumption of additional upland forage allowed the long-run equilibrium herd size to remain at traditional numbers.

Keywords: Riparian areas, grazing, range management, economic feasibility.

(Available only through library or interlibrary loan.)

Research Information Management

Henshaw, Donald L.; Stubbs, Maryan; Benson, Barbara J. [and others]

1998. Climate database project: a strategy for improving information access across research sites. In: Michener, W.K.; Porter, J.H.; Stafford, S.G, eds. Data and information management in the ecological sciences: a resource guide. Albuquerque, NM: University of New Mexico, LTER Network Office: 123-127.

To facilitate intersite research among the network of long-term ecological research sites, information managers are exploring strategies for linking individual site information systems. A prototype to provide climatic summaries dynamically has been developed and serves as one model for improving access to data across sites. Individual sites maintain local climate data in local information systems while a centralized site continually updates and provides access to data for all sites through a common database. Common distribution report formats have been established to meet specific needs of users of climate data.

Keywords: Data exchange, data access, intersite studies, climate data.

(See Corvallis order form A.)

Porter, John H.; Henshaw, Donald L.; Stafford, Susan G.

1997. Research metadata in long-term ecological research. In: Paper index: 2d IEEE metadata conference; 1997 September 16-17; Silver Spring, MD. [Online]: www.computer.org/conferen/proceed/meta97/list_papers.html [1997 December 8].

Long-term ecological research (LTER) sites manage a diverse array of ecological information resulting from research on ecological succession, disturbance, landscape ecology, elemental cycling, trophic structure, biodiversity, organic matter, and primary productivity. Since its inception in 1980, the LTER network has evolved from a primarily site-based research focus to a network and cross-site focus. Coincident with this evolution has been the development of metadata standards. Site-specific metadata standards and systems are being integrated through the development of metadata exchange standards and the revolution in network information servers.

Keywords: Metadata standards, data exchange.

(Available only online.)

Soil, Site, Geology

Bachelet, D.; Brugnach, M.; Neilson, R.P.

1997. Sensitivity of a biogeography model to soil properties. Ecological Modeling. 109: 77-98.

This paper presents the changes in vegetation distribution and hydrological balance resulting from a change in soils input data to the biogeography model MAPSS. The model was run for the conterminous United States by using three different sets of soil characteristics: (1) all soils were assumed to be sandy loam; (2) soils characteristics from the Food and Agriculture Organization soils map of the world; and (3) soils characteristics from the Natural Resource Conservation Service national soil geographic database. Resulting changes in vegetation distribution appear small on a countrywide basis, but large changes in simulated runoff in savannas, shrublands, and deserts reflect the importance of using the best available soils dataset.

Keywords: Simulation, soil texture, soil depth, rock fragment, vegetation distribution, MAPSS.

(See Corvallis order form B.)

Tiedemann, A.R.; Mason, R.R.

1998. Forest floor and soil nutrients five years after urea fertilization in a grand fir forest. Northwest Science. 72(2): 88-95.

Five years after thinning and fertilization with 350 kilograms per hectare of nitrogen (N) as urea in a grand fir forest, concentrations of total carbon (C), N, phosphorus (P), sulfur (S), and potassium (K) in the forest floor and upper 30 centimeters of soil were measured. Bioassay availabilities of N, P, K, and S were determined for the soil. Where the forest was not thinned, the forest floor retained a substantial portion of applied N. Concentrations of soil total C, N, P, K, and S were not influenced by thinning or fertilization. Availability of S was reduced by N-fertilization, but availabilities of N, P, and K were not affected. Application of a large quantity of N at this site with extant low levels of soil S further depressed S-availability. Fertilization with N should be supplemented with S in sites with low soil S-levels.

Keywords: Fertilization, soil nutrients, thinning.

(See La Grande order form.)

Timber Management

Doyal, James A.

1997. The Limber Jim case study: production and economics of a skyline system in a thinning/fuels reduction setting of a mixed conifer stand in the Blue Mountains of northeastern Oregon. Corvallis, OR: Oregon State University. 112 p. M.S. thesis.

Forest managers in the Blue Mountains of northeastern Oregon are faced with vast areas of forests with health problems and high fuel loadings, conditions that resulted from a combination of insect infestations, past management practices, and the elimination of fire from the ecosystems. These forests are now overstocked and diseased and contain vast amounts of dead woody debris on the forest floor. This paper presents an analysis of the economics and production of using a cable system to reduce fuel loading and stand density and to minimize soil impacts.

Keywords: Skyline logging, fuels reduction, thinning.

(Available only through library or interlibrary loan.)

Watershed Management

Johnson, Cedar

1998. Temporal comparison of stream temperature of three basins located in the Cascade Range of Oregon, USA. [Place of publication unknown]: Lester B. Pearson College of the Pacific. 12 p.

The long-term data on stream water temperature and relevant environmental data for watersheds 1, 2, and 3 in the H.J. Andrews Experimental Forest were compiled and analyzed.

Keywords: Water temperature, experimental watershed studies, water quality.

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