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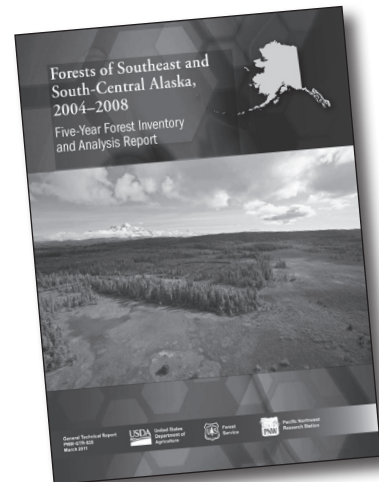
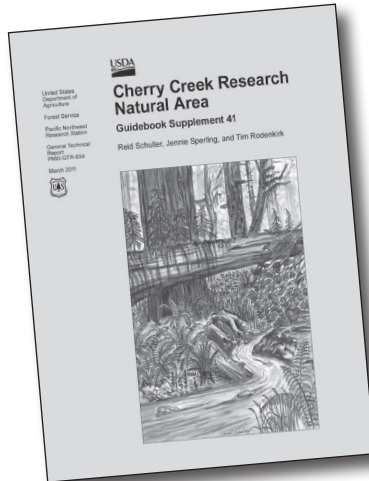
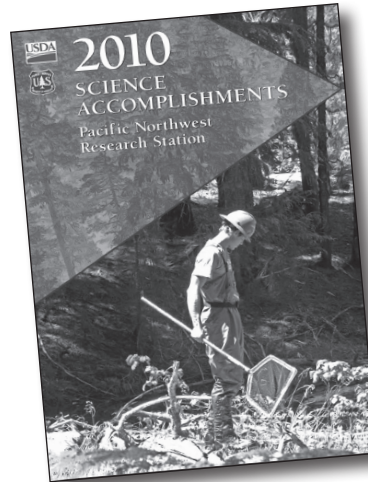
Forest Service

Pacific Northwest
Research Station



Recent Publications of the Pacific Northwest Research Station

First Quarter, 2011



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The Pacific Northwest (PNW) Research Station is one of 11 research units in the USDA Forest Service. The research units collectively conduct the most extensive and productive program of integrated forestry research in the world. The PNW Research Station was established in 1925. The station has its headquarters in Portland, Oregon; 11 research laboratories and centers in Alaska, Oregon, and Washington; and 11 active experimental areas (watershed, range, and experimental forests). The station also conducts research in more than 20 research natural areas.

Our mission is to generate and communicate scientific knowledge that helps people understand and make informed choices about people, natural resources, and the environment.

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- Quarterly List of Recent Publications
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- Fire
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- Geomorphology and Hydrology
- Invasive Plants and Animals
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What Is Treesearch?

Treesearch is an online system for locating and delivering publications by Research and Development scientists in the USDA Forest Service. Publications in the collection include research monographs published by the agency as well as papers written by our scientists but published by other organizations in their journals, conference proceedings, or books. Research results behind these publications have been peer-reviewed to ensure the best quality of science.

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The screenshot shows the Treesearch website interface. At the top, it says "USDA FOREST SERVICE" and "Forest Service National Links". The main heading is "Research & Development Treesearch". On the left is a navigation menu with options like "Treesearch Home", "About Treesearch", "Contact Us", "Research & Development", and "Help". The main content area has a search box with "(enter query)" and a "Search" button. Below this is a section for "USDA FS Research Publications" with a search form for on-line publications. The form includes fields for "Keywords:", "Author:", and "Title:", and a date filter for "Filter by date Starting: 1998 Through: 2008". To the right of the search form is a "Search for Station Series Publications" section with dropdown menus for "Any" and "Any" and a "Search" button. Below the search form is a section titled "20 Most Recently Added Publications By Station" with a list of stations: Forest Products Lab, International Institute of Tropical Forestry, Northern Research Station, Pacific Northwest Research Station, Pacific Southwest Research Station, Rocky Mountain Research Station, and Southern Research Station. On the far right is a "Listing of Publications in the Treesearch Database (number pubs on-line)" with a list of stations and their publication counts: FPL (1,454), IITF (13), NRS (7,225), PNW (2,791), PSW (2,563), RMRS (2,401), SRS (6,620), and All Publications (23,170). At the bottom, there are links for "top", "Disclaimers", "FOIA", "Privacy Policy", "Quality of Information", and "Print This Page".

Station Publications

These publications are available for download at the Web site listed under each abstract. To order a printed station publication, circle its five-digit number on the inside back cover, cut out the order form, place in an envelope, and send it to the address indicated. Please do not remove the label containing your name and address. It is used to send your publications. If there is no label, please fill in your name and address.

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Atmosphere

11-177M

- ▶ Oliver, M. 2011.

Canaries in a coal mine: using lichens to measure nitrogen pollution. Science Findings 131. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

In Pacific Northwest forests, lichens provide essential winter forage for deer and elk and also nesting materials and habitat for rodents, birds, and invertebrates. Although lichens are often the first organisms to populate a landscape and many species can survive in the most barren environments, lichens with the greatest ecological value tend to be the most sensitive to excess atmospheric nitrogen.

In areas with high levels of human-generated nitrogen, ecologically beneficial lichen species are disappearing and “weedy” species are thriving. Because lichens are innately sensitive to nitrogen, scientists use lichen community composition as an early indicator of encroaching nitrogen pollution. A recent Forest Service lichen study in the Pacific Northwest establishes numeric benchmarks called “critical loads” that quantify the amount of nitrogen

pollution-sensitive lichen species can tolerate before sustaining harm. Critical loads provide valuable information that policymakers can use to establish air pollution controls and also help land managers assess ecosystem health and prioritize recovery projects. After the model for the lichen study was completed, for example, the Forest Service began applying it to evaluate watershed health across the Nation. The model will predict where nitrogen critical loads in each watershed are becoming dangerously high, and will be combined with other ecosystem health indicators to score watershed condition on all National Forest System lands.

Keywords: Pacific Northwest, lichen, nitrogen pollution, critical loads.

<http://www.fs.fed.us/pnw/sciencef/scifi131.pdf>

Bibliographies

11-298M

- ▶ Pacific Northwest Research Station. 2010.

Recent publications of the Pacific Northwest Research Station, fourth quarter, 2010. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 16 p.

<http://www.fs.fed.us/pnw/pubs/4q10.pdf>

Climate Change

10-364S

- Roos, J.A.; Barber, V.; Brackley, A.M. 2011.

Cap and trade: offsets and implications for Alaska. Gen. Tech. Rep. PNW-GTR-836. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 27 p.

The Environmental Protection Agency (EPA) has formally declared that greenhouse gases (GHG) pose a threat to public health and the environment. This is significant because it gives the executive branch the authority to impose carbon regulations on carbon-emitting entities. United States GHG emissions have increased by approximately 17 percent between 1990 and 2007, and the EPA now has the authority to design regulation to reverse this trend. One of the regulatory tools being considered is a cap and trade system, whereby a ceiling is set for allowable carbon dioxide emissions and emitters are allowed to purchase offsets if they exceed their allowable emissions. Forests are major carbon sinks, and reforestation or projects to avoid deforestation are considered an offset with a monetary value under a majority of cap and trade systems. Alaska has vast forest resources, including the largest national forest in the Nation. Alaska's forest accounts for 17 percent of all U.S. forest land. This paper provides an overview of a cap and trade system, the role of offsets, and the potential impact on Alaska's forest stakeholders.

Keywords: Forests, carbon, carbon trading offsets, Alaska, climate change.

http://www.fs.fed.us/pnw/pubs/pnw_gtr836.pdf

Economics

10-365S

- Alig, R.J., tech. coord. 2011.

Effects of climate change on natural resources and communities: a compendium of briefing papers. Gen. Tech. Rep. PNW-GTR-837. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 169 p.

This report is a compilation of four briefing papers based on literature reviews and syntheses, prepared for USDA Forest Service policy analysts and decisionmakers about specific questions pertaining to climate change. The main topics addressed here are effects of climate change on wildlife habitat, other ecosystem services, and land values; socioeconomic impacts of climate change on rural communities; and competitiveness of carbon offset projects on nonindustrial private forests in the United States. The U.S. private forest offset projects tend to be less costly than European projects but more expensive to implement than those in tropical forests in developing countries. Important policy considerations involving any mitigation actions include effects on other ecosystem services, such as wildlife habitat, and determining baselines and additionality. Stacking of ecosystem services payments or credits with carbon offset payments may be crucial in improving the participation of private forest owners. Potential social impacts of climate change are discussed in terms of health effects on rural communities and climate change sensitivity of indigenous communities. Potential economic impacts on rural communities are discussed for agriculture, forestry, recreation and tourism, fisheries, water resources, and energy. Salient findings from the literature are summarized in the synthesis of the literature, along with identified research needs.

Keywords: Climate change, wildlife habitat, land values, ecosystem services, vulnerability, rural communities.

http://www.fs.fed.us/pnw/pubs/pnw_gtr837.pdf

Economics

10-360S

- ▶ Daniels, J.M. 2011.

Stumpage market integration in western national forests. Res. Pap. PNW-RP-586. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 27 p.

This study presents results of statistical tests for stumpage market integration on 62 national forests in the Western United States. Quarterly stumpage prices from 1984 to 2007 obtained from cut and sold reports for USDA Forest Service Regions 1, 4, 5, and 6 (Northern, Intermountain, Pacific Southwest, and Pacific Northwest, respectively) were analyzed to establish the presence and extent of national forest timber markets. Statistical evidence suggests that prices from the Beaverhead-Deerlodge and Salmon-Challis Forests and the Kootenai and Idaho Panhandle Forests are linked and that only these two sets of forests can be modeled as integrated stumpage markets. Aside from these four forests, there is no evidence that the law of one price holds for national forest timber markets in the West.

Keywords: Stumpage prices, national forest timber, timber markets, cointegration, stationarity, arbitrage, integration.

http://www.fs.fed.us/pnw/pubs/pnw_rp586.pdf

Monitoring

10-279S

- ▶ Barrett, T.M.; Christensen, G.A., tech. eds. 2011.

Forests of southeast and south-central Alaska, 2004–2008: five-year forest inventory and analysis report. Gen. Tech. Rep. PNW-GTR-835. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 156 p.

This report highlights key findings from the most recent (2004–2008) data collected by the Forest Inventory and Analysis program across all ownerships in southeast and south-central Alaska. We present basic resource information such as forest area, ownership, volume, biomass, carbon sequestration, growth, and mortality; structure and function topics such as vegetation and lichen diversity and forest age distribution; disturbance topics such as insects and diseases, yellow-cedar decline, fire, and invasive plants; and information about the forest products industry in Alaska, the potential of young growth for timber supply, biofuels, and nontimber forest products. The appendixes describe inventory methods and design in detail and provide summary tables of data and statistical error for the forest characteristics sampled.

Keywords: Coastal Alaska, temperate rain forests, boreal forests, climate change, carbon accounting, mistletoe, yellow-cedar, Kenai Peninsula, invasive species, timber volume, timberland, wood products.

http://www.fs.fed.us/pnw/pubs/pnw_gtr835.pdf

Plant Ecology

10-255S

- Schuller, R.; Sperling, J.; Rodenkirk, T. 2011.

Cherry Creek Research Natural Area: guidebook supplement 41. Gen. Tech. Rep. PNW-GTR-834. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 24 p.

This guidebook describes Cherry Creek Research Natural Area, a 239-ha (590-ac) area that supports old-growth Douglas-fir-western hemlock (*Pseudotsuga menziesii*-*Tsuga heterophylla*) forest occurring on sedimentary materials in the southern Oregon Coast Range. Major plant associations present within the area include the western hemlock/Oregon oxalis (*Oxalis oregana*) plant association, the western hemlock/evergreen huckleberry (*Vaccinium ovatum*) plant association, and the western hemlock/rhododendron-Oregon grape (*Rhododendron macrophyllum*-*Berberis nervosa*) plant association. A northern spotted owl population (*Strix occidentalis caurina*) also uses the area.

Keywords: Research natural area, area of critical environmental concern, riparian vegetation, old-growth Douglas-fir (*Pseudotsuga menziesii*), western hemlock/Oregon oxalis plant association, western hemlock/evergreen huckleberry plant association, western hemlock/rhododendron-Oregon grape plant association, *Tsuga heterophylla*/*Oxalis oregana*, *Tsuga heterophylla*/*Vaccinium ovatum*, *Tsuga heterophylla*/*Rhododendron macrophyllum*-*Berberis nervosa* plant association, northern spotted owl, *Strix occidentalis caurina*.

http://www.fs.fed.us/pnw/pubs/pnw_gtr834.pdf

Science Accomplishments

11-159S

- Mazza, R. 2011.

2010 Science Accomplishments: Pacific Northwest Research Station. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 88 p.

In 2010, station researchers provided land managers and policymakers with critical information related to ecological processes, environmental threats, forest management, and use of natural resources. The station also capitalized on opportunities to expand its research in these arenas. The station remains a leader in climate change research within the agency. The station cosponsored the Forest Service's first national workshop on climate change for national forest leadership and managers. Putting science into practice, our scientists have worked with the Olympic National Park and Olympic and Okanogan-Wenatchee National Forests to develop climate mitigation strategies. On a related front, the Climate Change Resource Center, initiated by the station in 2008, is now the agency's official Web site for climate change research and includes information from all Forest Service research stations. The year 2010 marked the 30th anniversary of Mount St. Helens' eruption. The ecological research accomplished on the flanks of the volcano has yielded information and methods adopted around the world.

Keywords: Climate change, community sustainability, fire, forests, watersheds, wildlife.

<http://www.fs.fed.us/pnw/pubs/2010-science-accomplishments.pdf>

Social Sciences

11-097M

► Oliver, M. 2011.

Watershed councils: it takes a community to restore a watershed. Science Findings 129. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

Regulation alone cannot solve complex ecological problems on private lands that are managed for diverse uses. Executing coordinated restoration projects at the watershed scale is only possible with the cooperation and commitment of all stakeholders. Locally organized, nonregulatory watershed councils have proven to be a powerful method of engaging citizens from all interest groups in planning and implementing solutions to improve water quality and fish and wildlife habitat. However, guidance on how to keep science at the forefront in these community-based decisionmaking councils has been largely unavailable until now. Using the success of the Long Tom Watershed Council in Oregon's Willamette Valley as a research model, a PNW Research Station scientist defined the key elements of an effective social infrastructure that can facilitate integrated, science-based watershed management. Elements include using data collection as an education and outreach tool, developing neighborhood peer networks to engage private landowners, and initiating project implementation at the subwatershed scale. Sharing technical expertise with partner organizations and maintaining a transparent process in collecting, interpreting, and reporting data makes a watershed council a valuable regional resource that can inform land management practices and policy beyond the watershed.

Keywords: Long Tom Watershed Council, watershed management, private landowners.

<http://www.fs.fed.us/pnw/sciencef/scifi129.pdf>

Wildlife

11-118M

► Wells, G. 2011.

Clark's nutcracker and whitebark pine: Can the birds help the embattled high-country pine survive? Science Findings 130. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 6 p.

Whitebark pine inhabits some of the most pristine high-elevation areas of the West. Despite being protected from direct human influence, the tree is declining from indirect effects of fire suppression and climate change. As a keystone species, its decline has widespread ramifications. Successful restoration requires understanding the behavioral ecology of Clark's nutcracker, a bird that plays a key role dispersing whitebark pine seeds. Until now, little quantitative information existed about the nutcracker's home ranges, seed transport habits, and caching behaviors. A team led by Teresa Lorenz, a master's degree student at Utah State University, and collaborators Martin Raphael and Carol Aubry of the USDA Forest Service, used radio telemetry to track the movements of 54 Clark's nutcrackers in the Olympic and Cascade Mountains over three seasons. They found that about half of the birds gathered seeds from outside their home ranges and that some flew up to 20 miles to forage, much farther than previously reported. Most seed was cached in microsites where it could not germinate. Nutcrackers also collected ponderosa pine seeds and were more effective in dispersing these to suitable sites than they were in dispersing whitebark pine seeds. This information can be used to focus restoration efforts, and may help managers refine seedzone boundaries and identify the likeliest regeneration sites.

Keywords: Clark's nutcracker, whitebark pine, regeneration.

<http://www.fs.fed.us/pnw/sciencef/scifi130.pdf>

Journals and Other Publications

The following publications were not published by the Pacific Northwest (PNW) Research Station, although the work was supported by the station. These publications may be viewed online at the USDA Research and Development Treesearch Web site listed under each article. If you would like a hard copy, you may print the articles from this Web site. For more information about Treesearch, see page 3 of this report. You may also obtain hard copies through university libraries or from the publisher; some outlets may charge for these services. Forestry libraries in the Northwest receive proceedings volumes and subscribe to the journals in which PNW authors publish. Some forestry libraries in the Northwest are:

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Seattle, WA 98195-2900
(To visit only)

University of Alaska Library

3211 Providence Drive
Anchorage, AK 99508
(Visit or request article from the
Interlibrary Loan section)

Climate Change

- Spies, T.A.; Giesen, T.W.; Swanson, F.J.; Franklin, J.F. [et. al]. 2010.

Climate change adaptation strategies for federal forests of the Pacific Northwest, USA: ecological, policy, and socio-economic perspectives.

Landscape Ecology. 25(8): 1185–1199.

Keywords: Landscape management, disturbances, regional planning, adaptive management, environmental laws.

<http://www.treesearch.fs.fed.us/pubs/38292>

Ecosystem Structure and Function

- Waldrop, M.P.; Wickland, K.P.; White, R., III; Berhe, A.A. [et. al]. 2010.

Molecular investigations into a globally important carbon pool: permafrost-protected carbon in Alaskan soils. Global Change Biology. 16(9): 2543–2554.

Keywords: Carbon cycling, enzymes, methanogenesis, microbial communities, permafrost, respiration.

<http://www.treesearch.fs.fed.us/pubs/38300>

Ecosystem Structure and Function

- ▶ Walsh, M.K.; Pearl, C.A.; Whitlock, C.; Bartlein, P.J.; Worona, M.A. 2010.
An 11 000-year-long record of fire and vegetation history at Beaver Lake, Oregon, central Willamette Valley. *Quaternary Science Reviews*. 29: 1093–1106.

Keywords: Fire, variability, temporal, paleoecology, paleoclimate, disturbance history.

<http://www.treesearch.fs.fed.us/pubs/38301>

- ▶ Zimov, N.S.; Zimov, S.A.; Zimova, A.E.; Zimova, G.M. [et. al]. 2009.
Carbon storage in permafrost and soils of the mammoth tundra-steppe biome: role in the global carbon budget. *Geophysical Research Letters*. 36: L02502. 6 p.

Keywords: Permafrost, carbon, thaw, steppe-tundra.

<http://www.treesearch.fs.fed.us/pubs/38305>

Fire/Fuels

- ▶ Reynolds, K.M.; Hessburg, P.F.; Keane, R.E.; Menakis, J.P. 2009.
National fuel-treatment budgeting in US federal agencies: capturing opportunities for transparent decision-making. *Forest Ecology and Management*. 258: 2373–2381.

Keywords: Decision support, landscape analysis, planning, fire danger, fuels management, forests restoration.

<http://www.treesearch.fs.fed.us/pubs/38309>

- ▶ Spies, T.A.; Miller, J.D.; Buchanan, J.B.; Lehmkuhl, J.F. [et. al]. 2009.
Underestimating risks to the northern spotted owl in fire-prone forests: response to Hanson et al. *Conservation Biology*. 24(1): 330–333.

Keywords: Fire, remote sensing.

<http://www.treesearch.fs.fed.us/pubs/36938>

- ▶ Wright, C.S.; Ottmar, R.D.; Vihnanek, R.E. 2010.
Critique of Sikkink and Keane’s comparison of surface fuel sampling techniques. *International Journal of Wildland Fire*. 19: 374–376.

Keywords: Fuel inventory techniques, photo series.

<http://www.treesearch.fs.fed.us/pubs/38318>

Forest Management

- ▶ Pabst, R.J.; Goslin, M.N.; Garman, S.L.; Spies, T.A. 2008.

Calibrating and testing a gap model for simulating forest management in the Oregon Coast Range. *Forest Ecology and Management*. 256(5): 958–972.

Keywords: Vegetation modeling, ecosystem modeling, forest management, forest structure, gap model.

<http://www.treesearch.fs.fed.us/pubs/38306>

Genetics

- ▶ Parks, M.; Liston, A.; Cronn, R. 2010.
Meeting the challenges of non-referenced genome assembly from short-read sequence data. *Acta Horticulturae*. 859: 323–332.

Keywords: Next-generation sequencing, massively parallel sequencing, *Pinus*, Illumina.

<http://www.treesearch.fs.fed.us/pubs/38295>

Geomorphology and Hydrology

- ▶ Payn, R.A.; Gooseff, M.N.; McGlynn, B.L.; Bencala, K.E.; Wondzell, S.M. 2009.

Channel water balance and exchange with subsurface flow along a mountain headwater stream in Montana, United States. *Water Resources Research*. 45. W11427: 14 p.

Keywords: Hyporheic, stream-tracer experiments, headwater streams, baseflow.

<http://www.treesearch.fs.fed.us/pubs/38307>

Invasive Plants and Animals

- ▶ Progar, R.A.; Markin, G.; Milan, J.; Barbouletos, T.; Rinella, M.J. 2010.

Inundative release of *Aphthona* spp. flea beetles (Coleoptera: Chrysomlidae) as a biological “herbicide” on leafy spurge in riparian areas.

Journal of Economic Entomology. 103(2): 242–248.

Keywords: *Aphthona*, leafy spurge, biological control, riparian area, inundative release.

<http://www.treesearch.fs.fed.us/pubs/38276>

- ▶ Vaclavik, T.; Kanaskie, A.; Hansen, E.M.; Ohmann, J.L.; Meentemeyer, R.K. 2010.

Predicting potential and actual distribution of sudden oak death in Oregon: prioritizing landscape contexts for early detection and eradication of disease outbreaks. Forest Ecology and Management. 260: 1026–1035.

Keywords: Invasive species, Maxent, *Phytophthora ramorum*, species distribution model.

<http://www.treesearch.fs.fed.us/pubs/38296>

Invertebrates

- ▶ Progar, R.A.; Rinella, M.J.; Fekedulegn, D.; Butler, L.G. 2010.

Nuclear polyhedrosis virus as a biological control agent for *Malacosoma americanum* (Lepidoptera: Lasiocampidae). Journal of Applied Entomology. 134(8): 641–646.

Keywords: Tent caterpillar, viral pesticide.

<http://www.treesearch.fs.fed.us/pubs/38277>

- ▶ Salinas-Moreno, Y.; Ager, A.; Vargas, C.F.; Hayes, J.L.; Zuniga, G. 2010.

Determining the vulnerability of Mexican pine forests to bark beetles of the genus *Dendroctonus* Erichson (Coleoptera: Curculionidae: Scolytinae). Forest Ecology and Management. 260: 52–61.

Keywords: Vulnerability, distribution, richness.

<http://www.treesearch.fs.fed.us/pubs/38280>

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