Land and Watershed Management Program

Pacific Northwest Research Station Mission

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

Program Mission

The Land and Watershed Management Program mission is to increase understanding of terrestrial, aquatic, and riparian ecosystems and their linkages to inform management and policy options and develop tools to enhance or maintain the production of desired goods and services.

Research Problem Statements

Problem 1: Improve knowledge of terrestrial, aquatic, and riparian ecology and their linkages essential for managing these ecosystems.
Problem 2: Develop integrated management alternatives to provide for desired goods and services.
Problem 3: Create and refine models, databases, and tools to evaluate management alternatives.

Key Findings in 2011

New NetMap module facilitates climate change planning at the watershed level
The effects of climate change differ depending on local conditions such as topography and aspect, making it difficult for natural resource managers and decision-makers to plan ahead. To remove some of the guesswork, Forest Service scientists and collaborators developed NetMap, a tool to help users determine where a suite of ecological processes that influence aquatic ecosystems are likely to occur in a particular landscape. Now, researchers have added a feature to NetMap so users can further scale likely climate-change impacts to specific watersheds in national forests of the Pacific Northwest. Changes in the pattern and amount of streamflow, water temperatures, and wildfire frequency and magnitude are the main impacts considered. Results from this analysis can be exported to Google Earth to better show where changes are most likely to occur.

NetMap and the associated downscaled projections were shared with five national forests in the Pacific Northwest in 2011. National forest personnel are using the projections to help develop management strategies and programs to respond

to climate change and to develop more strategic monitoring plans. All national forests in the Pacific Northwest will have NetMap and the climate change module by September 2012. The Bureau of Land Management has contracted the PNW Research Station to make NetMap available for selected districts in Oregon, as has the Tongass National Forest in Alaska.
Contact: Gordon Reeves, greeves@fs.fed.us, Land and Watershed Management Program
Partners: Earth Systems Institute, University of Washington
How to get it: http://netmaptools.org/
Use: Five national forests use new projections to plan for climate change.

Geneticists make progress identifying genes responsible for climate tolerance in Douglas-fir and big sagebrush
Many forest and range plants are finely attuned to their local climate, making it necessary to match seed sources with planting locations. From ecological and economic perspectives, the adaptability of the plants is critical. Forest Service and university geneticists are working to identify genes that enable certain trees and plants to tolerate and adapt to climatic extremes. This knowledge will enable nursery managers to deliver locally adapted, genetically appropriate materials for restoration even as the climate changes.

Gene expression atlases have been developed for two subspecies of big sagebrush, which together include 21,000 genes. Similar efforts in Douglas-fir have identified over 38,000. These atlases are being used in conjunction with common garden studies to identify the relevance of differential gene expression and genetic polymorphism in climatic adaptation. Candidate adaptive genes will be targeted for detailed study so that the genes responsible for climate tolerance and adaptability can be identified and managed in future forests.
Contact: Rich Cronn, rcronn@fs.fed.us, Land and Watershed Management Program
Partners: Brigham Young University, Oregon State University, USDA Forest Service Rocky Mountain Research Station, Utah State University

In-stream restoration efforts benefit Chinook salmon and steelhead trout
Station scientists and cooperators evaluated the effectiveness of in-stream habitat restoration structures designed to enhance rearing habitat for juvenile salmonids. Habitat restoration structures consisted of engineered logjams and rock barbs extending from streambanks in the Entiat River watershed of the upper Columbia River basin. The researchers found that the number of juvenile fish from a threatened run of Chinook salmon were greater in microhabitats with restoration

structures compared to microhabitats without the structures. Steelhead trout, although less abundant in restored microhabitats, possibly because of competition from Chinook salmon, showed faster growth rates compared to steelhead trout in untreated microhabitats.

The information is being used by restoration planners and by a larger monitoring program to further inform the design and implementation of additional restoration structures in the same watershed and in other watersheds throughout the upper Columbia River basin.

Contact: Karl Polivka, kpolivka@fs.fed.us, Land and Watershed Management Program

Partners: Bonneville Power Administration; Cascadia Conservation District; National Marine Fisheries Service, Integrated Status and Effectiveness Monitoring Program

Soil respiration may influence carbon budgets as much as wildfire

Fire intensity influences how much soil carbon is released into the atmosphere. Researchers found that intense wildfire associated with high tree mortality induced losses of soil carbon about twice that of lower intensity wildfire and fires set as a backburn. Prescribed fire resulted in about half as much lost soil carbon when compared to intense and moderate wildfire.

In unburned Douglas-fir plantations, however, carbon lost over 11 years through soil respiration had an extrapolated rate equivalent to an intense wildfire every 30 years, suggesting that day-in, day-out vegetation effects on soil carbon are potentially as or more important than wildfire. Soil respiration is a key measurement in the carbon budget. Researchers have used this data to develop a conceptual model of effects of management on carbon stocks. This model also points out that shrubs have greater potential to increase soil carbon when leaf areas are similar to trees because shrubs have less capability to store carbon above ground.

Improved understanding of the effects of natural disturbance and forest management on carbon budgets will allow land managers to refine estimates of a forest's potential to mitigate climate change.

Contact: Bernard Bormann, bbormann@fs.fed.us, Land and Watershed Management Program

Partners: Oregon State University; USDA Forest Service Rogue River–Siskiyou National Forest, Siuslaw National Forest, Willamette National Forest; USDA Forest Service Pacific Northwest Region Regional Climate Change Program, Regional Ecology Program, Regional Soils Program; Washington Department of Natural Resources Olympic Experimental State Forest; Western Washington State University

Scientists synthesize knowledge of trees' responses to climate change

Several decades of research exist on the potential responses of trees and forests to climate-related stresses. Station scientists and colleagues at Oregon State University synthesized more than 400 research articles addressing physiological and ecological responses of trees and forests to variations in climate and associated stresses and disturbance agents. Although based on an international body of research, the synthesis highlights potential climate changes and responses from species and ecosystems in the Pacific Northwest. It is organized around key themes: elevated levels of atmospheric carbon dioxide temperature, precipitation, fire, pests, and their interactions, and discusses vulnerabilities and risks for a forestry management perspective. The authors identify options for silvicultural and genetic approaches to managing for forest adaptation.

The synthesis is a resource when conducting forest vulnerability and risk assessments and planning adaptation strategies. Researchers and modelers may also find it useful when developing and testing hypotheses or models of forest development and production under various future climatic conditions.

Contact: Paul D. Anderson, pdanderson@fs.fed.us, Land and Watershed Management Program

Partners: Oregon Department of Forestry; Oregon Forest Resources Institute; Oregon State University; Taskforce on Adapting Forests to Climate Change; USDA Forest Service Pacific Northwest Region; USDI Bureau of Land Management, National Park Service; Washington Department of Natural Resources

For more information: Chmuraa, D.J.; Anderson, P.D.; Howe, G.T. [et al.]. 2011. Forest responses to climate change in the northwestern United States: ecophysiological foundations for adaptive management. Forest Ecology and Management. 261: 1121–1142.

Additional Findings in 2011

Changing climates present new threats to the conservation of forest genetic resources

Conserving genetic resources is important for ensuring sustainability. It allows populations to continue to adapt to new environments, and ensures that traits of interest for genetic improvement programs are available. As climates change, populations of native trees may become maladapted and genetic diversity may be lost. Some losses may be minimized by managing stands to be more resistant to threats by using silvicultural treatments such as thinning and prescribed burning. Natural selection and adaptation to changed environments may be promoted in reserves by increasing genetic diversity and promoting gene flow by locating reserves in areas

of high environmental heterogeneity, minimizing fragmentation, and using assisted colonization. Collecting seeds, particularly from rare and isolated populations, is another important piece of genetic conservation efforts.

This research highlights the importance of identifying species and populations that are vulnerable to climate change and other threats. It also identifies steps that may help protect and conserve those species and populations. National forests in Oregon and Washington and the Washington Department of Natural Resources have begun working toward these goals by identifying stands for monitoring and seed collection.

Contact: Brad St. Clair, bstclair@fs.fed.us, Land and Watershed Management Program

Partner: Oregon State University

Spring budburst model projects timing of budburst under different winter conditions

Many plant species and different populations within species have evolved so that their spring budburst coincides with environmental conditions conducive to growth. Plants sense cold and warm temperatures during winter so that they can tell when winter has passed and it is safe to burst bud. New growth that emerges too early in the spring, for example, could be killed by a later cold snap. Climate change has the potential to alter the signals that plants use, thereby changing the timing of budburst. Models are needed to predict the timing of budburst under different types of winter conditions. Because different populations have evolved to survive in different winter environments, the models need to be sensitive to how each population determines when it is safe to burst bud. Station scientists developed a model to predict the timing of budburst for populations of Douglas-fir, the major tree species in northwest forests.

The budburst model has been published so that it can be used by other scientists and land managers. It can be used to help assess climate impacts on scales ranging from individual trees to the entire range of coast Douglas-fir.

Contact: Peter Gould, pgould@fs.fed.us, Land and Watershed Management Program

Partners: Oregon State University, USDI Bureau of Land Management, Washington Department of Natural Resources

Postfire management influences later plant communities

Restoring burned forests on federal land in southwest Oregon may have multiple objectives, including protecting site productivity, maintaining diversity of species in the near and long term, and developing structurally complex mature stands. Station

scientists have monitored various reforestation methods that were applied to burned plantations following the 2002 Timbered Rock Fire. They observed that removing competing vegetation had a greater effect on the composition of plant communities than did planting conifer seedlings.

Woody shrubs were cut back repeatedly during the first 3 years following conifer planting. This did not remove shrubs from the sites, but the temporary reduction in their abundance resulted in the early development of different postfire vegetation communities, when compared to sites where woody shrubs were not cut back. Initial increases in the occurrence of nonnative invasive species were very small, suggesting that the reforestation treatments were not likely to directly lead to invasive species problems.

This information may be useful to land managers in southwest Oregon who are preparing postfire strategies for reforestation, vegetation, and fuel management. It can also be applied more broadly by modelers interested in predicting postfire vegetation and fuel dynamics at stand and landscape scales.

Contact: Paul D. Anderson, pdanderson@fs.fed.us, Land and Watershed Management Program

Partners: Oregon State University, USDI Bureau of Land Management

Seed transfer zones for mountain brome identified

Mountain brome (*Bromus carinatus*) is a grass commonly used in restoration efforts. This means that populations are regularly transferred from one place to another. This research addresses questions about how far populations may be moved and still adapt to the new environment.

Researchers used common garden studies at two contrasting test sites to evaluate mountain brome from a range of environments in the Blue Mountains. They found that plant traits varied significantly among populations and were frequently correlated to gradients of precipitation and temperature at source locations. The relationships between traits and climates were used to develop maps of genetic variation in multivariate adaptive traits, which were in turn used to delineate seed transfer zones for mountain brome in the Blue Mountains.

Seed transfer zones for mountain brome are being used by the Malheur, Ochoco, Umatilla, and Wallowa-Whitman National Forests to ensure that plant material used in restoration is adapted to the prevailing environmental conditions.

Contact: Brad St. Clair, bstclair@fs.fed.us, Land and Watershed Management Program

Partners: USDA Agricultural Research Service, National Forest System

Use: National forests in northeast Oregon and southwest Washington are using these newly identified seed transfer zones in restoration efforts.

Site quality indicators and maximum stand density calculated for western redcedar

Western redcedar is an ecologically and economically important tree species in the Pacific Northwest. Its ability to grow in deep shade makes it an important component in forest stands with multiple canopy layers. It is a species that most people can identify on sight, but surprisingly little information was available on its growth rates under various stand and management conditions and how environmental variables influence site quality. To remedy this, station scientists compiled data from more than 73,000 trees from several Western States and Canadian provinces to look at these relationships. They also examined data from research trials on thinning and fertilization and from a large network of ecology plots. They determined the climate variables most important for site quality of redcedar and calculated maximum stand density index—a parameter in many growth models. They also compared growth rates of western redcedar to Douglas-fir, a common tree associate, under different types of stand conditions.

Managers from the Washington Department of Natural Resources, Green Crow, and Starker Forests are using this information to identify areas to plant redcedar and stands that warrant thinning, and to evaluate the projected effects of alternative management scenarios.

Contact: Connie Harrington, charrington@fs.fed.us, Land and Watershed Management Program

Partners: British Columbia Ministry of Forests, Green Crow, Starker Forests, USDA Forest Service Pacific Northwest Region, Washington Department of Natural Resources

Use: Public and private forest use findings to manage western redcedar.

Scientists develop cost-effective method for identifying genetic markers in threatened and endangered conifer species

Conserving and managing natural populations require accurate and inexpensive genotyping methods to identify parentage, movement and migration, estimates of effective population sizes, and rates of inbreeding. Microsatellites are among the most popular genetic markers because they are easy to use, simple to analyze, and clearly identify genetic differences. Microsatellite development has historically been prohibitively expensive, and has been sparingly applied to domesticated species and species of the highest conservation concern. By adapting multiplexed massively parallel sequencing—an approach pioneered by Pacific Northwest Research Station geneticists—station scientists developed a cost-effective method for identifying thousands of microsatellite markers from any organism. They used this approach to identify more than 1 million genetic markers for 30 conifer and bird species.

These markers are helping to guide *Phytopthora*-resistance breeding in Port-Orford cedar in the Pacific Northwest, and to characterize genetic variation in yellow-cedar in the Alaska Region. Genetic markers are available for threatened whitebark pine and torrey pine, charismatic giant sequoia, and landscape dominants like ponderosa pine. These genetic tools are available without restriction at http://openwetware.org/wiki/Conifermicrosat.

Contact: Rich Cronn, rcronn@fs.fed.us, Land and Watershed Management Program

Partners: Oregon State University; USDA Forest Service Special Technology and Development Program, Dorena Genetic Resource Center; U.S. Geological Survey

Use: PNW and Alaska Regions use genetic markers in efforts to conserve Port-Orford cedar and yellow-cedar.

Scientists develop sampling and modeling tools to characterize microclimates in riparian areas

Providing high-quality habitat for fish, amphibians, and other aquatic and riparian organisms is one management objective for headwater forests in the Pacific Northwest. The compatibility of timber harvest or other vegetation manipulations with quality riparian and aquatic habitat is often contingent on the effects these disturbances may have on microclimate. Microclimate changes with distance from the streams. The ability to predict this variation and the influences of upslope harvesting and riparian buffers is important when designing management and monitoring strategies that will provide quality aquatic and riparian habitats while affording opportunities for the production of wood and other ecosystem services.

Microclimate data can be difficult and expensive to collect, so in this study, efficient sampling strategies were developed to account for the spatial variation in riparian forest structure and its influence on microclimate. Understory air temperature was then modeled based on topographic and forest structure. With increasing availability of remotely sensed forest structure data, this type of modeling may prove an efficient way to indirectly monitor microclimate attributes and to incorporate those attributes into forest management planning tools.

The modeling efforts have yielded insights to the relative accuracy and bias of alternative modeling approaches. Near-term utility is emerging in discussions among land managers and regulatory entities about the width of riparian buffers needed to mitigate potential effects of upslope harvest on the warming of air near streams and stream temperatures.

Contact: Paul D. Anderson, pdanderson@fs.fed.us, Land and Watershed Management Program

Partners: Oregon State University, USDI Bureau of Land Management, U.S. Geological Survey

Practical management actions can minimize the effects of climate change on amphibians

Leading the world campaign to develop practical tools to guard species from the adverse effects of climate change, an ad hoc group of international amphibian experts have compiled innovative examples of habitat protection and mitigation to preserve amphibian species across habitats in several nations. These examples fall into three categories: installation of microclimate and microhabitat refugia, enhancement of breeding sites, and manipulation of water or hydroperiods. Water and temperature management approaches are critical for this taxon. Microclimate mitigation tools include creating riparian buffers, restoring stream and pond habitat, and managing for down wood. The group's products aim to bridge science and management, resulting in "adaptation management" approaches for amphibians and climate change.

Research and management agencies around the world are using these practical conservation ideas to take action. To share this information widely, the group maintains a Web page that includes a showcase of innovations and a list of new programs for conserving the rarest species.

For more information: http://parcplace.org/news-a-events.html
http://www.fs.fed.us/pnw/lwm/aem/news/climate_change_and_herpetofauna.html
Contact: Dede Olson, dedeolson@fs.fed.us, Land and Watershed Management Program
Partners: Department of Climate Change, Canberra ACT, Australia; James Cook University of North Queensland, Australia; University of Queensland, Australia; Griffith University, Gold Coast Campus, Australia; The University of Newcastle, Australia; University of Kent, Canterbury, United Kingdom; Universidade do Estado do Rio de Janeiro, Brazil; University of Helsinki, Finland; Pontificia Universidad Católica del Ecuador; University of Otago, New Zealand; EcoGecko Consultants, New Zealand; Florida International University; University of Washington; USGS, Aldo Leopold Wilderness Research Institute

Stream gravel bars can be a nitrate source or sink depending on time it takes for water to move through them

Excess nitrogen stemming from human activities is a common water pollutant. Fertilizer runoff, sewage, and fossil fuel emissions all contain nitrogen that often ends up in streams. But aquatic systems are natural filters, able to process and remove

some nitrogen. Fully understanding the denitrification process will help efforts to improve water quality.

Station scientists used a stable isotope tracer to track the movement and transformation of nitrate nitrogen in stream water flowing through a 14-foot gravel bar of an upland agricultural stream in the Willamette Valley, Oregon. Dissolved organic carbon and oxygen were used up quickly by micro-organisms where stream water entered the head of the gravel bar, leading to initial increases in nitrate and ammonia concentrations. Further into the gravel bar, where travel times exceeded 7 hours, the scientists observed a net loss of nitrate to denitrification. This suggests that gravel bars could be net sources of nitrate to streams wherever travel times were short, but with longer travel times, denitrification will make gravel bars net sinks of nitrate to streams.

This study provides detailed understanding of the processes that control water quality, especially the processes that remove nitrate from nitrogen-polluted streams.
Contact: Steve Wondzell, swondzell@fs.fed.us, Land and Watershed Management Program
Partner: Oregon State University

Hillslope hydrologic connectivity controls riparian ground-water turnover
Hydrologic connectivity between uplands and near-stream riparian zones is essential for the export of water, nutrients, and other solutes from watersheds. However, our current understanding of the role of riparian zones in buffering watershed-scale export of water and solutes is limited. To learn more about these processes, station scientists and collaborators compared the turnover time for shallow ground water in riparian areas along four well transects in the Tenderfoot Creek Experimental Forest, Montana. They found that where hillslopes were large and riparian areas were small, hillslope water flowed through the riparian zone so that hillslope and riparian zone water were chemically similar. Conversely, where riparian zones were large relative to the size of the adjacent hillslope, water in the riparian zone was chemically distinct from hillslope-source water. These observations suggest that the relative sizes and spatial arrangement of hillslopes and riparian zones along a stream network is a primary control on the export of water and solutes from watersheds.

This export vs. retention of solutes is critically important to stream ecosystem processes determining attributes such as ecosystem productivity and the ability of riparian zones to buffer streams from inputs that could alter water quality.

Contact: Steve Wondzell, swondzell@fs.fed.us, Land and Watershed Management Program
Partners: Montana State University, Pennsylvania State University, U.S. Geological Survey

Novel modeling effort links land use, disturbance, and riparian and aquatic habitats across large landscapes

Interactions between land use and ecosystem change are complex, especially in riparian zones. To date, few models are available to project the influence of alternative land use practices, natural disturbance, and plant succession on the likely future conditions of riparian zones and aquatic habitats across large landscapes.

Station researchers used a state-and-transition framework to model the effects of various management and restoration practices on conditions of riparian forests, channel morphology, and salmonid habitat. These models incorporate the effects of plant succession, natural disturbances such as fire or native ungulate browsing, management, and restoration practices. Researchers used the models to analyze habitat suitability rankings for two watersheds: the upper Middle Fork John Day River and the Wilson River, Oregon. They found that efforts to improve habitat for anadromous fish in the Middle Fork John Day Basin will likely require considerable work on in-stream conditions, not just management of the adjacent terrestrial and riparian vegetation.

Contact: Steve Wondzell, swondzell@fs.fed.us, Land and Watershed Management Program; Miles Hemstrom, mhemstrom@fs.fed.us, Focused Science Delivery Program

Tools

Tool: Modeling the effect of fire on aquatic systems
Description: These models predict the potential of fire to alter critical in-stream salmon habitat by modeling a fire's potential to facilitate delivery of fine sediments and large wood to stream channels. They are based on the geomorphology of stream channels combined with complex models of fire behavior and fire intensity across the landscape.
Use: Natural resource managers
How to get it: http://earthsystems.net/
Contact: Rebecca Flitcroft, rflitcroft@fs.fed.us, Land and Watershed Management Program
Partner: Earth Systems Institute

Tool: Virtual Trail for Olympic Habitat Development Study
Description: This interactive Web site features photos, maps, and original artwork. Visitors can explore a study site on the Olympic Peninsula and learn about some of the silvicultural techniques that have been suggested for use in accelerating the development of structures and ecological communities associated with old-growth forests.
Use: Natural resource professionals are using it to learn more about variable-density thinning, an experimental technique being used to accelerate development of old-growth characteristics. It will also be of interest to anyone wanting to learn more about the plants and animals found in conifer forests on the Olympic Peninsula.
How to get it: http://www.fs.fed.us/pnw/olympia/silv/ohds.
Contact: Connie Harrington, charrington@fs.fed.us, Land and Watershed Management Program

Tool: Seedlot Selection Tool
Description: The Seedlot Selection Tool is a geographic information system mapping program designed to help forest managers match seedlots with planting sites based on climate information. The tool can be used to map current climates, or future climates based on selected climate change scenarios.
Use: Although the Seedlot Selection Tool is tailored for matching seedlots and planting sites, it can be used by anyone interested in mapping present or future climates defined by temperature and precipitation. Forest geneticists in the Pacific Northwest and the Eastern United States have begun to use this tool to map climates corresponding to specific seed zones of interest, explore the ranges of climates within seed zones, and indicate how the locations of those climates change in the future.
How to get it: http://sst.forestry.oregonstate.edu/pnw/
Contact: Brad St. Clair, bstclair@fs.fed.us, Land and Watershed Management Program
Partner: Oregon State University

Tool: Center for Forest Provenance Data
Description: The Center for Forest Provenance Data is a centralized data and information management system designed to archive data from long-term provenance tests and seedling genecology studies and make those data available to facilitate collaboration among researchers. A provenance test is a planting where population samples from different geographical areas are grown together in one or more locations.

Use: The Center for Forest Provenance Data promotes national and international collaboration among researchers studying the genetics of adaptation, as well as natural and managed responses to climate change. Over the past century, numerous provenance studies of forest trees have been established around the world, resulting in considerable long-term field data and seedling genecological information. These data are invaluable for developing and refining seed transfer guidelines, testing forest growth models, and understanding how trees will respond to climate change, as well as other uses yet to be determined. Researchers have begun to archive data in the database and make it available for collaboration.
How to get it: http://cenforgen.forestry.oregonstate.edu/index.php
Contact: Brad St. Clair, bstclair@fs.fed.us, Land and Watershed Management Program
Partner: Oregon State University

Tool: Riparian Management Explorer
Description: This tool is used to explore the implications of different riparian management options for future wood recruitment and abundance of in-stream wood. The Riparian Management Explorer illustrates how differences in riparian-management buffer widths and thinning prescriptions within each buffer affect expected recruitment rates and abundances of large wood.

The tool is flexible, accommodating different stand-growth models, topography, bole-taper equations, and bank erosion rates. Results, using either wood volume or number of pieces, can be viewed graphically for (1) recruitment rate and in-stream abundance over time, or (2) the amount of wood accumulated as a function of distance from the channel edge at a specific future date. Results can be formulated in terms of wood-piece diameter, the diameter of the source trees, and by source-tree species classes (hardwood or conifer).
Use: Riparian Management Explorer was designed specifically for the U.S. Forest Service and the National Oceanic and Atmospheric Administration to aid in discussions of riparian management options and potential effects on future fish habitat. It may be used by public and private forest managers to explore the effects of riparian management alternatives.
How to get it: http://www.netmaptools.org
Contact: Gordon Reeves, greeves@fs.fed.us, Land and Watershed Management Program

Tool: A geographic information system (GIS)-based tool for linking field and digital stream data
Description: This tool based on a GIS matches stream-survey data to digitally produced stream layers created with NetStream software. The output is a shapefile of survey reaches with both the survey data and attributes associated with the digitally produced stream layer (e.g., drainage area, gradient, and valley width). It enables users to extrapolate survey results to unsurveyed streams by using GIS to estimate habitat abundance, potential fish abundance, or fish carrying capacity, for example.
Use: This tool was collaboratively funded and is being used by the U.S. Forest Service, Kalispel Tribe, Oregon Watershed Enhancement Board, and Arctic Yukon Kuskokwim Sustainable Salmon Initiative.
How to get it: http://www.netmaptools.org
Contact: Kelly Burnett, kmburnett@fs.fed.us, Land and Watershed Management Program

Tool: Aquatic and riparian state and transition models for the Blue Mountains of northeastern Oregon and the northern Oregon Coast Range.
Description: These state and transition models simulate the effects of plant succession, natural disturbance, land use and restoration practices on conditions of riparian forests, channel morphology, and salmon habitat. State classes in the models are defined by channel morphology and riparian vegetation. Transitions are defined by plant succession, natural disturbances (floods, debris flows, wildfires, native ungulate browsing), land use activities (fuels treatments, timber harvests, livestock grazing), and restoration practices (planting riparian hardwoods, exclusion of domestic livestock or native ungulate browsing). Habitat suitability rankings for anadromous salmonids (migration, spawning, winter rearing, summer rearing) are derived from channel and vegetation attributes associated with each state in the models.

The models were specifically designed for two watersheds: the upper Middle Fork John Day River in the interior Columbia River basin and the Wilson River in the Oregon Coast Range. The model structure and the suite of factors simulated in the models are designed for portability so that these models should be reasonably easy to modify and apply to other areas in the Blue Mountains or Coast Range. Further, the models will serve as a template for developing new models for more distant regions.
Use: The models are designed for landscape planners.
How to get it: http://www.fs.fed.us/pnw/lwm/aem/projects/ar_models.html
Contact: Steve Wondzell, swondzell@fs.fed.us, Land and Watershed Management Program

Tool: Global *Bd* Mapping Project database
Description: *Batrachochytrium dendrobatidis* (*Bd*) is a disease-causing fungus that is devastating amphibian populations worldwide. This Web-based mapping project facilitates communication between scientists and natural resource managers as they try to learn more about the fungus and assess risk to local amphibian populations.
Use: Scientists and managers use the Web site to determine locations of *Bd* worldwide. Scientists have used this information to determine where to conduct surveillance for *Bd* or learn who to contact for information from an area. Managers use this information to assess risk to populations and make strategic decisions about reintroducing amphibian species or conducting surveillance or disinfection activities. In 2011, the database was updated with more than 2,000 new records.
How to get it: http://www.Bd-maps.net
Contact: Dede Olson, dedeolson@fs.fed.us, Land and Watershed Management Program
Partners: Imperial College, London, United Kindgdom; Partners in Amphibian and Reptile Conservation

Symposia, Workshops, and Tours

Amphibian Disease Workshop: About 60 people attended this workshop in Gig Harbor, Washington, as part of the annual meeting of the northern regional working group of partners in amphibian and reptile conservation.
American Fisheries Society Symposia: A station scientist played a key role organizing this 4-day annual meeting for more than 5,000 participants. It was held in Seattle, Washington.
Classrooms for Climate: This symposium, jointly held by the Forest Service and University of Alaska, highlighted research associated with climate change. About 200 people attended the event held at the University of Alaska-Anchorage.
First International Ranavirus Symposium: Twenty-three scientists from nine countries gave presentations that synthesized world knowledge of the pathology, immunology, genetics, and ecology of *Ranavirus*, a virus that is killing amphibians around the world. About 100 participants attended the event held in Minneapolis, Minnesota.
Green Peak Study Site Tour: Eight journalism students from the University of Oregon toured the study site as part of a science media project funded by the American Recovery and Reinvestment Act.

H.J. Andrews Experimental Forest: This research site near Blue River, Oregon, hosts numerous events throughout the year. The annual HJA Day attracted more than 140 visitors. The scientists, students, federal and state land managers, utility managers, and interested public who attended learned about ongoing research in the forest. The Oregon Board of Forestry tour brought together state and federal foresters, private timber managers, and the public to discuss forestry practices. As part of its humanities program, the forest hosted seven writers, the Blue River Writers Gathering, and a 2-day long-term ecological research humanities workshop. In total, more than 1,500 people attended events at H.J. Andrews.

Human Influence on Connectivity and Population Structure For River Fishes: A station scientist was the co-coordinator and sponsor for this session of the annual meeting of the 2011 American Fisheries Society. About 50 people attended.

Juneau Icefield Research Program Briefing: Twenty students and faculty from the Juneau Icefield Research Program summer program learned about rain forest ecology, the impact of global warming on glaciers, and the hydrology of glacial streams in southeast Alaska.

North Cascadia Adaptation Partnership Climate Change Fish Workshop: This partnership, organized by station scientists and the University of Washington's Climate Impacts Group, four resource-specific workshops on climate change vulnerability assessment and adaptation planning for the North Cascadia region. About 45 participants from national parks and forests in the region attended.

Conservation Education

2011-Year of the Turtle: Station researchers helped organize this worldwide event to raise awareness for turtle conservation, research, and education. For example, activities by fifth graders at Copper Mill Elementary School in Zachary, Louisiana, and by eighth graders at Jane Goodall Environmental Middle School in Salem, Oregon, were featured in a monthly newsletter.

BioBlitz: About 30 students from Jane Goodall Elementary and Middle School in Salem, Oregon, learned from station researchers how to conduct a fauna census in and around ponds at the Luckiamute State Natural Area.

Douglas Indian Association Elders and Students Summer Program: Nine participants toured the Forestry Sciences Laboratory in Juneau, Alaska, and learned about job opportunities and research programs. Participants also went on a field trip to the Héen Latinee Experimental Forest, where they learned about natural resource management, hydrology, and the role of the experimental forest in regional studies. They discussed opportunities for Native American students in natural resource management and education.

Ferry Interpreter Training Workshop: Station researchers taught 12 summer interns about rain forest ecology and geology and the natural history of southeast Alaska to prepare them as interpreters.
Forest Camp 2011: Station staff taught 200 sixth-graders about the Web of Life and the importance of fungi in the forest ecosystem. The camp, hosted by the Siuslaw National Forest, was held at Camp Tadmor in Lebanon, Oregon.
Forestry Days: About 300 sixth graders from the Clatsop County school district learned about forest ecology from station staff. The event was done in collaboration with Oregon Department of Forestry.
It All Starts With Plankton: The Marine Food Chain: A station scientist led activities for Earth Day for 10 kindergarteners at the Corvallis Montessori School.
Kids in the Creek: This 1-day event provided 200 high school students from Wenatchee School District in Chelan County Washington, a hands-on opportunity to learn about basic aquatic ecology and conservation.
Knotweed Management Efficacy: Twenty elementary and middle school students in Aberdeen, Washington, learned from a station scientist about controlling an invasive weed during a trip organized by the Chehalis Basin Education Consortium.
Terrestrial Amphibians and Road Effects: Station researchers taught 30 students in an eighth grade conservation biology class at Jane Goodall Elementary and Middle School in Salem, Oregon, about this management challenge.
The *Investi-gator*: Station scientists and their research were highlighted in the climate change edition this Forest Service publication that is distributed to elementary school children nationally.

Honors

Excellence in Science

Dede Olson, a research ecologist with the Land and Watershed Management Program, was honored by the Society for Northwestern Vertebrate Biology for her service to the society as both its president and vice-president.

Research Spotlight

Steve Wondzell, a research ecologist with the Land and Watershed Management Program, was a contributing author of the article "Zooming in on aquatic denitrification hot spots," which was featured as a Research Spotlight in EOS, the American Geophysical Union's weekly publication of transactions.

USDA Honor Award

Charlie Crisafulli, an ecologist with the Land and Watershed Management Program, was honored for his personal and professional excellence in communicating the significance of long-term research at the Mount St. Helens National Volcanic Monument to the scientific community, policymakers, and the public.

USDA Secretary's Award

Brad St. Clair and **Randy Johnson**, research geneticists with the Land and Watershed Management Program, were recognized for their work with the Conifer Translational Genomics Network Coordinated Agricultural Project.

Land and Watershed Management, Program Manager

John A. Laurence
Forestry Sciences Laboratory
P.O. Box 3890
Portland, OR 97208-3890
Phone: 503-808-2119
E-mail: jalaurence@fs.fed.us