



risk-reduction work, taking over a county park that would have closed and starting weekend outdoor movies and developing nature trails, installing fish-friendly irrigation pipes on private land, regulating sand and gravel operations that affect river habitat, and expanding their mission to include local economic development.

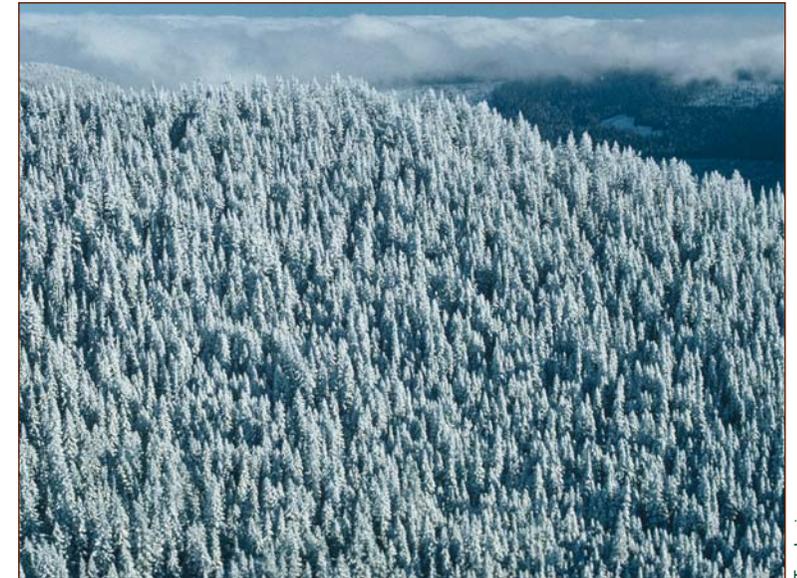
The scientists found that collaborative groups can be successful when there is an opportunity for providing evaluation and feedback, engaging needed participants, and responding to groups critical of the collaborative process.

Contacts: George Stankey, ghstankey@fs.fed.us, and Roger Clark, rnclark@fs.fed.us,
Human and Natural Resources Interactions Program
Partner: Applegate Partnership

Most forested counties in the United States have medium or high viability and adaptability

The Montréal Process for Sustainable Forest Management, an international process, recognizes that forest-dependent communities must be healthy for forest management to be truly sustainable. The Montréal Process calls for evaluation of the “viability and adaptability to changing economic conditions, of forest-dependent communities, including indigenous communities” as an indicator of well-being.

Scientists have developed a composite measure to evaluate forest community well-being at the national level; the analysis is published in PNW-GTR-567. The composite measure was developed from county-level data that combined population density (a proxy for civic infrastructure), lifestyle diversity (a proxy for social and cultural diversity), and economic resiliency. Counties with fewer than six people per square mile got the lowest rating on the population density measure; these have been called frontier counties.



Tom Iraci

Counties with both forests and large cities, such as Multnomah County, Oregon, generally are resilient in coping with social and economic changes.

Counties with 6 to 27 people per square mile are classified as rural counties; counties with 28 to 250 people per square mile are called intermix counties, and those with over 250 people per square mile are called interface counties, essentially urban areas.

The United States has a total of 3,110 counties (including some city-county and borough combinations). When ranked by the composite measure just described, 837 counties got a low rating; these counties represent 36 percent of the U.S. area but have less than 3 percent of the U.S. population. Low adaptability does not mean that the areas are economically distressed; it just indicates low resiliency to social and economic changes.

Of the 742 forest-dependent counties with a high proportion of forest land, only 102 were rated as having low viability and

adaptability. The other 640 heavily forested counties have medium or high rankings. Many of these are counties with both forests and large cities, such as Seattle, Portland, and Atlanta, and others have significant recreation areas such as Shenandoah and Olympic National Parks.

Contacts: Ellen Donoghue, edonoghue@fs.fed.us, and Richard Haynes, rhaynes@fs.fed.us, Human and Natural Resources Interactions

Logic-based system can organize expert judgments about sustainability

Many projects are underway to apply the Montréal Process to assess the sustainability of temperate and boreal forests. This year scientists described a logic-based system for evaluating the sustainability of forests at regional and national levels. Such a system can evaluate sustainability more consistently and transparently by providing a systematic way to organize expert judgment about ecological, economic, social, and institutional relationships, and by providing a policy framework that can be used to reveal decisions about values and what is meant by sustainability.

Contact: Keith Reynolds, kreynolds@fs.fed.us, Human and Natural Resources Interactions Program

Local watershed groups have become important part of management landscape

Scientists found that watershed groups established through government initiatives have become an important part of the natural resource management landscape in developed economies. For these groups to be successful they need to have broad stakeholder representation, and they need to be embedded within a supportive institutional framework that identifies realistic roles for private landowners, local organizations, and regional planning bodies. Success also requires that people within the group must have the commitment and skills to establish processes that build trust and competency among citizens and agencies.

Contact: Linda Kruger, lkruger@fs.fed.us, and George Stankey, gstankey@fs.fed.us, Human and Natural Resources Interactions Program

Nan Vance



Findings on the ecology of survey-and-manage plants such as the mountain lady's slipper are used by managers.

Progress is made on understanding the ecology of survey-and-manage plants

In 1996 the World Wildlife Fund cited the lady's slipper genus as one of the "10 most wanted" of threatened plants and animals on the planet. More locally, the Northwest Forest Plan, adopted in 1994, included survey-and-manage guidelines for a list of rare, little-known species associated with old-growth forests. Two lady's slipper species are on the survey-and-manage list in the Pacific Northwest. Station scientists are working on key questions about these two rare species. Two major concerns are the flowers' reproductive success and their response to disturbances such as thinning and fire.

Research on the clustered lady's slipper orchid has resulted in new information on its reproductive biology and response to fire and other disturbances. Early results of a 2-year study of the mountain lady's slipper indicate the flower associates with species common to dry forest types, helping to define habitat qualities associated with successful seed production for the species. These findings are being incorporated in the revised management recommendations for high-priority site management.

Contact: Nan Vance, nvance@fs.fed.us, Resource Management and Productivity Program

Study begins on genetic variation of antelope bitterbrush

Antelope bitterbrush is often used in restoration work because it is a primary winter food for antelope, deer, and elk. No guidelines exist on how far bitterbrush seed can be moved and still be "local." At times seed has been acquired from locations distant from the planting site.



Nancy Mandel

Seed from over 200 antelope bitterbrush populations is being tested for genetic variation, including seed from Potamus Canyon in eastern Oregon.

Scientists are studying genetic variation in antelope bitterbrush seed to establish guidelines for moving seed between locations. Over the past 2 years, seed was collected from over 200 populations of antelope bitterbrush in eastern Oregon. Preliminary analysis of the seed collection times supports previous findings that the date of seed shatter is strongly associated with the elevation. Seed shatter date could be explained even better with a regression equation using latitude, longitude, and elevation.

The seed collections will be used for a common garden study that explores patterns of genetic variation in adaptive traits and their relations to environment. Seed movement guidelines can then be designed to reflect patterns of genetic variation.

Contact: Randy Johnson, randyjohnson@fs.fed.us
Partner: USDA Forest Service Pacific Northwest Region

Volunteer network collects data on Oregon white oak acorns

In Oregon, Washington, and British Columbia, volunteers have been helping scientists who are studying the factors influencing acorn production in Oregon white oak (also known as Garry oak). Once an oak tree is selected for the survey, the volunteers collect

information on tree and site characteristics and then code its acorn production each fall. Acorn production can only be coded during a fairly short period; if coded too early the green acorns are hard to see against the green leaves, and if coded too late the acorns have been eaten or fallen on the ground. So the volunteer network allows sampling many more trees than could be done otherwise.

The survey began in 1999, and so far more than 1,200 trees have been surveyed, some three or four times. Each year more volunteers have joined the survey and some of the early volunteers have added more trees to the group they survey. The number and geographic range of the surveyed oaks, as well as the repeat sampling, enable researchers to look at tree and site characteristics associated with acorn production, regional patterns in acorn production, and the consistency of production from year to year. Volunteers download instructions and survey forms from a Web site that also includes background information on the species, some survey results, and links to related sites. The Web site is <http://www.fs.fed.us/pnw/olympia/silv/oaksurvey/oak.htm>.

Contacts: David Peter, dpeter@fs.fed.us, and Connie Harrington, charrington@fs.fed.us, Resource Management and Productivity Program
Partners: U.S. Department of Defense, Fort Lewis, and many dedicated volunteers



Dave Peter

Oregon white oak, once common in western Oregon and Washington, has lost much habitat to conifers or to other land uses.

Goal 4: Communicate Science Findings and Enhance Their Application

Key Products:

- A synthesis report was developed on the influence of forest structure on wildfire behavior and effects. Research addressed the environmental benefits of active fuels management in reducing unwanted fire behavior. As science support for a healthy forests initiative, Station scientists are working on additional synthesis products about wildfire behavior and the economics of fuel planning.
- Four sessions were held to discuss significant science findings with regional and local managers on key topics: late-successional reserves, socioeconomic planning issues, the management implications of existing information about hydrologic function, and management scenarios for Oregon's Blue Mountains. The major findings discussed were documented in a report.
- A textbook, *Compatible Forest Management*, was published by Kluwer Academic Publishers. The book examines approaches to forest management that emphasize compatibility among various goods and services, shows ways that science can help, and discusses examples of Pacific Northwest forests already being managed to produce both diverse forests and wood products.
- Interior Columbia basin science findings are available on a set of five compact disks (CD-ROM set). The set includes all maps, databases, and metadata compiled during the Columbia basin research project.
- Station research on wetland soils went into a guide developed by the U.S. Army Corps of Engineers in collaboration with the Alaska Department of Environmental Conservation. The recently published guidebook is used to assess and rate southeastern Alaska wetlands, and it has already been used in training for land managers, planners, researchers, and private industry.
- Scientists developed a software application called FishXing that integrates elements of fish biology, hydrology, hydraulics, and engineering to evaluate road culverts for fish passage. FishXing has quickly become the standard tool in the West for evaluating fish passage in road culverts.
- The PNW Research Station Web site was converted to the USDA Forest Service template and new features were added. The site offers downloadable software, an extensive library of publications, and a wide range of information on Station research.
- Media reporters covered stories emerging from Station research, including stories on spotted owls, logging, and people; dam removal; smoke management; and other fire science research.



Tom Iraci



The Pacific Northwest forests demonstrate that a high degree of wood production is taking place without impairing other forest values.

Accomplishments

New report is a major synthesis of research on forest structure and wildfire behavior

Under the National Fire Plan, a national project has been developed to address four key areas of fuel planning in the dry forest types of the Western United States: wildland fire behavior and forest structure, wildland fire effects, economics and utilization of wood removed, and social science. The goal is to improve access and use of existing research information for fuel planning. Meeting this goal will require several delivery approaches to reach the intended audiences—in formats and styles understandable and useful to the field.

Scientists developed a synthesis report on the influence of forest structure on wildfire behavior and effects. The information was compiled from university and federal scientists throughout the Western United States whose research addressed the relation between fuel levels and fire behavior and severity. The report also addressed the environmental benefits of active fuel management in

reducing unwanted fire behavior. The report is a synthesis of 153 peer-reviewed articles and is available at <http://www.fs.fed.us/projects/hfi/2003/november/documents/forest-structure-wildfire.pdf>. As science support for the Healthy Forests Initiative, Station scientists are working on additional synthesis products about wildfire behavior and the economics of fuel planning.

Contacts for economics: Roger Fight, rfight@fs.fed.us, Human and Natural Resources Interactions Program; Jamie Barbour, jbarbour01@fs.fed.us, Focused Science Delivery
Contact for fire behavior: David L. Peterson, peterson@fs.fed.us, Managing Disturbance Regimes Program
Partners: Rocky Mountain and North Central Research Stations, USDA Forest Service Fire and Aviation Management (Washington Office)

Workshops held to discuss science findings with land managers

The Focused Science Delivery Program delivers science information through multiple formats to ensure various clients get useful information. Formats include workshops, conferences, briefing papers, client meetings, scientist-manager interactions, data analysis, client mailing lists, bibliography databases, and other specialty products on an ongoing basis.



Tom Iraci

In the Santiam Pass area, photos taken in different years show the same landscape before thinning, after thinning, and after the B and B Complex burned the area in 2003.



Tom Iraci

In the Oregon Cascade Range, the Blue River Landscape Study is testing a new approach to sustain native habitats and species, maintain ecological processes, and provide a sustained flow of timber.

A team of scientists held four sessions to discuss significant science findings with regional and local managers on key topics: late-successional reserves, socioeconomic planning issues, the management implications of existing information about hydrologic function, and management scenarios for Oregon's Blue Mountains. The major findings discussed were documented in a report.

Contact: Becky Gravenmier, bgravenmier@fs.fed.us, Focused Science Delivery Program

Book on compatible forest management gets international audience

Work was completed on the Wood Compatibility Initiative, a short-term research program that looked for approaches to forest management that emphasize the compatibility among various goods and services and that avoid counterproductive arguments about conflicting tradeoffs between timber, jobs, and ecological values in ecosystems.

Science can play a key role in finding ways to produce compatible goods and services. The challenge in this kind of cutting-edge, broad-scale science is that a fundamental uncertainty always remains. The answer "it depends" doesn't mean

"we don't know," but indicates that the answers depend on context, specifics, multiple variables, and possible pathways. The answers aren't in growth and yield tables, but depend on the complexities of trees, forests, animals, weather, and people's changing values.

Kluwer Academic Publishers published a textbook on the research as part of their Managing Forested Ecosystems series. The final book, *Compatible Forest Management*, was edited by Robert A. Monserud, Richard W. Haynes, and Adelaide C. Johnson, and included chapters by many PNW authors.

The Pacific Northwest has a rich legacy of forests managed for a variety of goods and services. These forests demonstrate that there is a high degree of wood production taking place without impairing other forest values. A history of deliberate forest management carried out by many landowners with diverse objectives has contributed to this rich legacy. Two watershed-scale case studies, including the Blue River Landscape Study in the Oregon Cascade Range, indicate that a variety of environmental indicators can be increased while producing wood. The key is to manage the entire watershed simultaneously, rather than in a piecemeal fashion.



FishXing has quickly become the standard tool in the West for evaluating whether or not culverts are currently accessible to fish and other aquatic life.

No single management regime will meet all of society's needs or desires. Diverse management regimes may help to achieve compatibility at a landscape scale, in terms of both diverse forests and diverse wood qualities. In one sense, compatible forest management merges our scientific understanding with changing societal values to shape the forest legacy for the next generation.

Contacts: Bob Monserud, rmonserud@fs.fed.us, and Richard Haynes, rhaynes@fs.fed.us, Human and Natural Resources Interactions Program

Redesigned Web site includes early results on alternative harvest strategies for mature forests

The Demonstration of Ecosystem Management Options study (DEMO) will provide data on alternative harvest strategies in mature Douglas-fir forests. DEMO studies the ecological effects and public perceptions of different levels of green-tree retention, and dispersed vs. aggregated patterns of green-tree retention, in harvest units. Study components include overstory and understory vegetation, breeding birds, forest-floor small mammals, amphibians, tree-dwelling rodents, canopy arthropods, fungi, and public perceptions of visual quality. Pretreatment sampling was completed in 1997, harvest treatments in 1998, and the first year of postharvest sampling in 2001. A new study began this year on interrelations of birds and bark-dwelling invertebrates.

The DEMO Web site was redesigned and updated this year. It now includes detailed information on the history, experimental design, and research results of DEMO. The Web site can be accessed at: <http://www.cfr.washington.edu/research.demo/index>.

Contacts: Charley Peterson, cepeterson@fs.fed.us, Resource Management and Productivity Program; Keith Aubry, kaubry@fs.fed.us, Ecosystem Processes Program

Partners: University of Washington; Oregon State University; University of Oregon; Louisiana State University; Cascadian, Inc.; Washington State Department of Natural Resources; Gifford Pinchot National Forest; Umpqua National Forest

Strategies for restoration of Puget Sound rivers have lessons for all

Station scientists offered insights on stream restoration principles in the book *Restoration of Puget Sound Rivers* published by University of Washington Press. The success of restoration strategies is likely to depend on careful consideration of a stream's physical environment, including local climate, topography, and geology, and common disturbances, such as fire. These factors control elements of habitat quality such as stream channel pattern and form, and size of streambed gravels.

Streams are embedded in watersheds, and the physical context limits the range in habitat quality that is likely to be sustainable. Not all things can be accomplished in all streams. Understanding these limits, the processes that control them such as landslides, and how upslope actions affect streams, will raise the likelihood that restoration work will succeed. Watershed context is critical in stream and watershed restoration.

Contact: Richard D. Woodsmith, rwoodsmith@fs.fed.us, Aquatic and Land Interactions Program

HydroDB—making hydrology data available

The Hydrology Database project (HydroDB) is a cross-site synthesis of long-term records of streamflow and meteorology from a network of USDA Forest Service experimental watershed sites and National Science Foundation-funded long-term ecological research sites. The assembled databases establish a baseline response of watersheds to climate variability for monitoring environmental change and assessing disturbance effects, and are widely used in intersite comparisons, modeling studies, and land management-related studies. The intersite HydroDB features a data harvesting



Tom Iraci

Station research on southeast Alaska wetlands contributed to a guide newly published by the U.S. Army Corps of Engineers.

system, a central cross-site database, and a Web interface to display, graph, and download data.

The HydroDB Web site is averaging over 500 hits per month. Additionally, over 120 separate computers have viewed, graphed, or downloaded data sets in the past 4 months, which resulted in the display of 750 data plots, 250 data views, and 215 data downloads.

Contact: Don Henshaw, dhenshaw@fs.fed.us, Ecosystem Processes Program

Science on wetland soils is used in guidebook on southeastern Alaska wetlands

Station soil scientists contributed to a guidebook on the assessment and rating of southeastern Alaska wetlands. Their research on wetland soils went into a guide developed by the U.S. Army Corps of Engineers in collaboration with the Alaska Department of Environmental Conservation. It is part of a national series on wetland characteristics. Guidebook users can determine if soils are truly wetland soil types, rate wetland functions objectively, assess the potential effects of proposed actions, and develop mitigation measures. The recently published guidebook has already been used in training for land managers, planners, researchers, and private industry, sponsored by the Society of Wetland Scientists, state of Alaska, and PNW Research Station.

Contact: Dave D'Amore, ddamore@fs.fed.us, Resource Management and Productivity Program

Partners: Alaska Department of Environmental Conservation, University of Alaska

Road culverts can be barriers to fish migration, with potentially devastating effects

Road culverts can act as barriers to migration of fish and other aquatic species, with potentially devastating effects on their conservation. Fish passage has become the priority activity for fisheries restoration and recovery in all Forest Service regions. Assessment of fish passage requires a broad knowledge of hydraulic engineering, fisheries biology, stream channel geomorphology, and hydrology.

Scientists have developed a software application called FishXing (pronounced "fish crossing") that integrates elements of fish biology, hydrology, hydraulics, and engineering to evaluate road culverts for fish passage. FishXing has quickly become the standard tool in the West for evaluating whether or not culverts are currently accessible to fish and other aquatic life. The software is now being adopted in the Eastern United States.

Contact: Michael J. Furniss, mfurniss@fs.fed.us, Aquatic and Land Interactions Program



*Every day
about 1,300
people visit the
PNW Research
Station Web
site. The Web
site is at
<http://www.fs.fed.us/pnw>.*

Visualization tools help interpret remote sensing data for complex forest landscapes

New remote sensing technologies can produce large quantities of unprecedented high-resolution information on forested environments. Some systems produce millions of data points per square mile, often making interpretation of data time consuming and difficult with existing GIS and image processing systems. Scientists have developed new visualization tools that allow researchers to combine data from many sensors and then filter, categorize, and display these large, complex data sets. These new visualization tools can help researchers and managers assess the accuracy and value of remotely sensed data for monitoring and communicating forest conditions.

Contact: Bob McGaughey, rmcgaughey@fs.fed.us, Resource Management and Productivity Program

Partners: Washington State Department of Natural Resources; USDA Forest Service Joint Fire Sciences Program; University of Washington; U.S. Department of Defense, Fort Lewis

Historical forest surveys from 1930s made available again after decades out of print

The first large-scale, complete forest surveys of Oregon and Washington were done in the 1930s by foresters from the Pacific Northwest Forest Experiment Station (now PNW Research Station). Survey reports and maps, difficult to find for decades, are now available in a new publication and CD-ROM from the Station; the CD-ROM also has the maps in digital format. The maps display forest composition and size classes for all forests in the two states at a scale of 1:253,440. County maps (at a scale of 1:63,360) were produced for all forested counties, but many are now missing; the history lists missing maps in the hope they will be found.



Tom Iraci

Historical surveys again available show that in the 1930s, western Oregon and Washington already had large acreages of trees less than 60 years old, as well as over 3 million acres of Douglas-fir old growth.

The 1930s surveys are a valuable record of forest conditions in the early 20th century. A 1934 report noted that western Oregon and Washington had over 3 million acres of Douglas-fir old growth with trees over 40 inches diameter at breast height, and another 3½ million acres of old-growth Douglas-fir “of the 20- to 40-inch type.” The 1934 report further recorded that Oregon had large acreages in 30-, 40-, 50-, and 60-year age classes. These stands occurred largely in old burns and were established in 1870-1900, a period “coincidental with the era of intensive land settlement and the development of rail transportation that followed the Civil War.”

Contact: Connie Harrington, charrington@fs.fed.us, Resource Management and Productivity Program

Partner: Umatilla National Forest

Synthesis published on managing chanterelle mushrooms in Pacific Northwest

Chanterelles are globally renowned as one of the best edible forest mushrooms, and their international commercial value likely exceeds a billion dollars annually. A number of chanterelle species fruit plentifully in Pacific Northwest forests, and their abundance has spawned a significant commercial harvest industry during the last two decades. Because chanterelles grow symbiotically with the roots of forest trees, managing the fungi for sustainable harvests also means managing forest habitats.

Research results have been summarized in a major synthesis publication, PNW-GTR-576. Findings include the effects of thinning and related forest management on chanterelle productivity, DNA analysis that is refining species distinctions, and influence of high and low levels of coarse woody debris on chanterelles. The new synthesis publication is used by national forests and BLM districts to manage these valuable special forest products.

Contact: Randy Molina, rmolina@fs.fed.us, Ecosystem Processes Program

PNW Research Station Web site adds new features

The Station converted its Web site to the USDA Forest Service template in 2003, a format that is easy to use and offers enhanced features. The home page offers links to the Station newsroom, answers to “frequently asked questions,” research programs and teams, experimental forests, and a calendar of events.

These links are in addition, of course, to the extensive library of publications. A new feature called “TreeSearch” offers more convenient search choices, allowing Web visitors to search by author, title, and keywords, and to access publications from other research stations as well. Recent Station publications and public-domain journal articles are available electronically as well as in hard copy, and many classic publications are being scanned in so they too are available electronically.

Scientists and managers can access databases and software from the Web site. The databases include a bibliography on Oregon white oak and a database on insect damage to trees. Downloadable software offers free tools for biomass calculations, financial evaluation of ecosystem management, stand- and landscape-scale visualization, and smoke management, among other items. Instructions are available on system compatibility and software use.

With so much information available, it’s no surprise that on average 1,300 people visit the Station Web site every day. The Web site is at <http://www.fs.fed.us/pnw>.

Contact: Tiffany Dong, tdong@fs.fed.us, Communications and Applications Program





Media information

The story of how people use forests received attention from many angles. The release of the Resources Planning Act fifth timber assessment led to a front-page article in *The Oregonian*, and eventually to reports in other newspapers and radio stations. Richard Haynes, among others, was interviewed about the shift from the Pacific Northwest to the Southeast as the Nation's biggest timber-producing region.

KIRO-TV in Seattle did a sequel to their early 1990s "War in the Woods" documentary, on spotted owls, logging, and people. Oregon Field Guide, an Oregon Public Broadcasting program, covered red tree voles, a main food species for spotted owls. Several TV stations and newspapers did features on the status of spotted owl populations, the effects of barred owls, and implications for people; Eric Forsman was interviewed several times. Other stories on forest resources featured grazing and noxious weeds in Hells Canyon, the "humongous fungus" in the Blue Mountains, diversity in second-growth forests, and the big game and cattle grazing research of Starkey. The History Channel's "Modern Marvels" program did a show on cranes, from early cranes used to build the Egyptian pyramids to modern construction cranes, and the show included a segment on the Wind River canopy crane. In Alaska, Trish Wurtz was interviewed by several reporters about the spruce bark beetle outbreak on the Kenai Peninsula.

Water, salmon, and dams were featured in other stories. The Los Angeles Times and the Public Broadcasting System both interviewed Mark Wipfli on the story of how marine nutrients, brought upstream in the bodies of salmon, fuel freshwater and riparian food webs. Dam removal was a hot topic, with Gordon Grant interviewed by several reporters about how dam removal can affect rivers. KTOO in Juneau interviewed Mason Bryant about fish passage through culverts and effects on fish.



Tom Iracci

Station scientists shared their findings with the media as a contribution to public discussion of topics such as the spruce bark beetle outbreak on Kenai Peninsula and wild salmon issues.

The 25th anniversary of the 1980 Mount St. Helens eruption is in 2005, and media interest has already started, with German public television covering the ecology of a recovering landscape. Perhaps the most unusual request was the interview of Charlie Crisafulli, a Mount St. Helens scientist, for a BBC program on the plagues of Egypt. Historical evidence shows that a huge volcanic eruption occurred about the same time as the plagues of Egypt, and Egypt was in the depositional path of the volcanic plume. Although Crisafulli did not comment directly on Egyptian history, he did explain how the Mount St. Helens ash cloud darkened daytime skies and how frogs and grasshoppers responded in the posteruption landscape.



Tom Iracci

The 25th anniversary of the 1980 Mount St. Helens eruption is in 2005. Station scientists have studied the recovering landscape extensively.

In fire-related stories, Sue Ferguson was interviewed about the BlueSky program, a smoke management technology used on about 100 wildfires during the 2003 fire season. Japanese public television covered the Station's fire science research in interior Alaska as part of a report on forest fires and possible global warming. Finally, media traveled to southwest Oregon to see what scientists are learning about postfire recovery after the 2002 Biscuit Fire.

Educational videos produced

Michael Furniss produced videos that educate managers about the migrations of many aquatic organisms, not just anadromous fish. Also, Jack Piccolo and Jenny Grayson produced a video on the feeding ecology of juvenile coho salmon and steelhead in Alaska streams, in cooperation with the National Fish and Wildlife Foundation.

Contact for migrations video: Michael Furniss, mfurniss@fs.fed.us,
Aquatic and Land Interactions Program

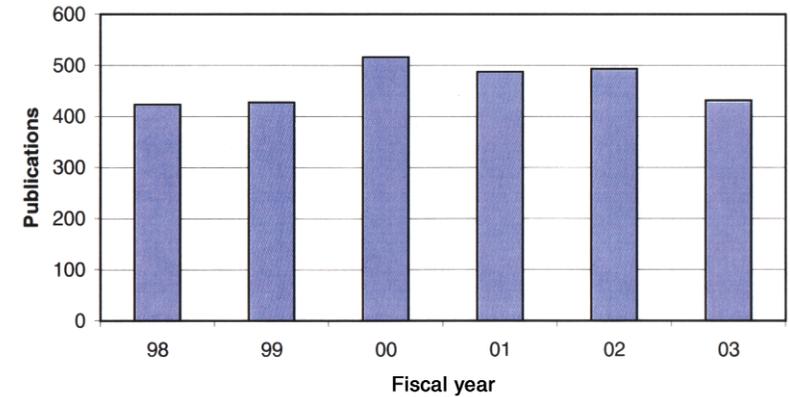
Contact for feeding ecology video: Brenda Wright, bwright01@fs.fed.us,
Aquatic and Land Interactions Program



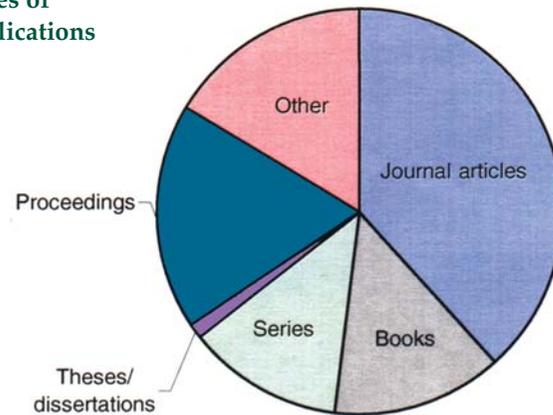
Publications

- 431 publications total.
- 230,000 copies of Station series publications distributed.
- 9,000-13,000 journal article reprints distributed by scientists in response to requests.
- 586 publications are available in electronic format. All new Station publications are placed online, and scanned versions of journal articles and older Station publications are being added.
- 10 issues of *PNW Science Findings* published; about 9,500 copies distributed each issue.
- 3 issues of *PNW Science Update* published; about 8,000-10,000 copies distributed each issue.
- 2 CD-ROM sets published.

Total Publications



Types of Publications



Tom Iracci

2003 Technology Transfer Events

Event	Number of participants
Workshops and symposia	1,620
Field tours	1,750
Conservation education	7,450

Symposia, Workshops, and Tours

Alaska Region, USDA Forest Service, forest management workshop. A total of 40 people attended this workshop in Juneau, Alaska. Station scientists gave presentations on silvicultural options, growth-and-yield studies, and forest health topics to national forest personnel.

American Birding Association field trips. Eric Forsman and the owl crew led field trips to northern spotted owl sites in the Oregon Coast Range for people at the American Birding Association annual meeting in Eugene, Oregon. About 200 birders were able to see spotted owls and other native forest birds.

Applied forest ecological experiments. PNW Research Station cosponsored this International Union of Forestry Research Organizations (IUFRO) meeting in Davos, Switzerland, in August 2003. The conference presented state-of-the-art research results and techniques for the management and analysis of applied forest ecological experiments. The Switzerland conference was a building block for the international symposium on sustainable forestry being hosted in 2004 by PNW Research Station. "Large-Scale Experiments for Sustainable Forestry: Balancing Ecosystem Value" is planned for August 15-20, 2004, in Portland, Oregon.

BlueSky workshop. A total of 57 people attended this workshop in Seattle, Washington. Scientists and managers from several states, universities, and federal land management agencies met to discuss progress to date on the BlueSky smoke management program and discuss research needs in smoke modeling.

Capitol State Forest silvicultural options tours. In separate groups (38 people total), students from the University of New Brunswick and the University of Washington and staff from the Cedar River watershed, city of Seattle, visited the studies of silvicultural options on Capitol State Forest outside Olympia, Washington.

Cascade Center for Ecosystem Management. The center hosted its annual public forum on young stand management. Over 100 people attended the conference in Springfield, Oregon, and field trips. The Cascade Center is sponsored by the PNW Research Station, Willamette National Forest, and Oregon State University.

Density management and riparian buffer study field tours. In six separate field trips, over 200 people visited density-management and riparian-buffer study sites in western Oregon. The field trip groups were from the 2003 North American



Tom Iraci

Group learns about spruce bark beetle outbreak, Kenai Peninsula, Alaska.



Forest Ecology Workshop, Bureau of Land Management (BLM) National Science Review Board, the Levels-of-Growing-Stock committee, and federal and state agencies. The BLM and Oregon State University were partners in organizing the tours.

Forest ecosystem study. Andrew Carey led a field trip to Fort Lewis, Washington, for people interested in ecological and collaborative forest management. The 10 participants included representatives from Northwest Ecosystem Alliance, Northwest Old-Growth Campaign, and the Washington Department of Fish and Wildlife.

Forest inventory and analysis meetings and technology transfer workshops. Scientists from the Forest Inventory and Analysis Program held their annual meeting with FIA clients from Washington, Oregon, and California, with about 75 people attending. Along with Station presentations about our research, clients presented results from research they have done based on inventory data.



Frank Yanni

Old growth, young stands, and landscape management are just a few of the research topics being studied at the H.J. Andrews Experimental Forest in the Oregon Cascade Range.

The FIA scientists conducted 21 technology transfer events, such as workshops, and made 11 presentations to layperson organizations.

Genomics of Douglas-fir. A total of 50 people attended this workshop in Corvallis, Oregon. Scientists, policymakers, and tree breeders met to learn about the field of genomics and to discuss how genomics may be used to increase forest productivity and promote gene conservation in the Pacific Northwest.

H.J. Andrews Experimental Forest. Over three dozen field tours were conducted at the Andrews in the Oregon Cascade Range, bringing more than 1,000 scientists, land managers, students, media, and other visitors to discuss science and management issues. Featured field stops included new research on air flow in small watersheds and implementation of the Blue River Landscape Study.

Hungry Bob Fire and Fire Surrogate study. A total of 65 people attended this conference in La Grande, Oregon. Station scientists made presentations on the economics and ecological consequences of fire and fire surrogate treatments in a ponderosa pine forest.

Identifying barriers to aquatic organism passage at road-stream crossings workshops. Scientists developed two courses on inventory and assessment procedures for identifying barriers. One course was given in Boise, Idaho, for the USDA Forest Service Intermountain Region, and in Rutland, Vermont, for the Eastern Region. The other course was given in four locations in Oregon and Washington for the Pacific Northwest Region. Total attendance for all workshops was about 130 people, all involved in stream crossing design for the remediation of fish migration.



Frank Yanni

Staff explain the ungulate ecology research on Starkey Experimental Forest and Range in northeastern Oregon.

Innovations in species conservation. Held in Portland, Oregon, in April, 2003, this symposium focused on approaches to conserving rare, little-known species of plants and animals. Many of these species could face extirpation because of habitat loss. Participants discussed the social, economic, and legal issues, as well as the biological issues, in species conservation. A theme emerged that multiple-species approaches seem more efficient and essential, but their outcome is yet untested. About 200 people attended.

Invasive plants research tours. A total of 35 people, on two separate tours, looked at invasive plant infestations in northeastern Oregon. The scientists and land managers saw sulfur cinquefoil and yellow hawkweed, and they discussed research needs and management options.

Late-successional reserve meeting. A group of 12 people met in Portland, Oregon, to discuss key findings related to late-successional reserves and information needs for revising forest plans. Attendees were from the USDA Forest Service Pacific Northwest Region and PNW Research Station.

Levels-of-growing-stock (LOGS) tour. About 30 people from Oregon and Washington toured LOGS research sites in western Oregon. The studies are investigating management of stand structure for multiple objectives, early spacing control, and management of riparian buffers.

North American forest ecology workshop. Over 300 scientists and managers from North America and other continents attended the “Ecosystems in Transition” conference in Corvallis, Oregon, in June 2003. People looked at research about forest ecosystems, including new ideas about nonequilibrium, chaos, complexity, and uncertainty. A symposium within the conference examined silviculture for changing objectives including conservation, restoration, and intensified timber production. As part of the forest ecology workshop, Station scientists led field trips to places such as the Biscuit Fire, the Metolius Research Natural Area, old-growth forests, the young stand thinning and diversity study, and the H.J. Andrews Experimental Forest.

Olympia Forestry Sciences Laboratory seminars. Scientists at the Olympia Lab give monthly presentations on natural resource topics. The seminars are well attended by natural resource professionals from the south Puget Sound area.

Olympic Peninsula silvicultural studies tours. A group of 25 people visited the Olympic Habitat Development study and Clearwater Young Stand Management study. Participants were from the Makah Indian Nation, Cedar River Watershed, Olympic National Forest, Tacoma Power, Washington State Department of Natural Resources, and the University of Washington.

Riparian restoration density management field tour. A 20-person Chinese delegation on restoration and forest health visited Corvallis, Oregon, in July 2003. The delegation was headed by China’s Deputy Directorate General of Afforestation, State Forestry Administration, and included scientists and managers. In collaboration with the USDA Forest Service Washington Office, BLM, and the U.S. Fish and Wildlife Service, PNW Research Station hosted a field trip on restoration projects and studies that develop structurally and biologically diverse riparian



and upland forests. The visit evolved after the Chinese State Forestry Administration and the USDA Forest Service signed a memorandum of understanding in 2002. This field trip sets the stage for collaboration in China.

Second International Precision Forestry Symposium. A total of 80 people met in Seattle, Washington, to discuss precision operations and equipment; remote sensing and measurement of forest lands and vegetation; terrestrial sensing, measurement, and monitoring; and design tools and decision-support systems.

Small hydrology and management implications workshop. A group of 21 people met at the H.J. Andrews Experimental Forest in Oregon to identify future research needs and discuss management implications relating to small hydrology research in the Pacific Northwest. Attendees were regional and forest hydrologists from BLM and the USDA Forest Service, technology transfer staffs, university scientists, and Station scientists.

Socioeconomic planning issues meeting. A group of 20 people met in Portland, Oregon, to discuss socioeconomic information needed for forest plan revisions. Attendees were from BLM, USDA National Forest System, universities, and PNW Research Station.

Starkey Experimental Forest and Range. Several tours were conducted on the Starkey Experimental Forest and Range in the Blue Mountains of northeastern Oregon, with over 60 people visiting. Groups included the Rocky Mountain Elk Foundation project advisory committee, Oregon Congressional staffers, the Oregon State Parks and Recreation Commission committee on all-terrain vehicles, and all-terrain vehicle riding clubs in Union and Wallowa Counties.

Starkey Project symposium. A full-day symposium was held on the Starkey Project at the Rocky Mountain Elk Foundation annual meeting in Reno, Nevada. A total of 76 people learned about the first 10 years of the long-term research project on deer, elk, cattle, grazing, and forests. Future research directions also were discussed.

Sustainable wood production issue client meeting. A group of 25 people met in Portland, Oregon, and developed a list of key topics that the sustainable wood production issue should address. Participants represented universities, state and federal agencies, industry, and private landowners.

Wildland fire workshops. Three workshops on the 2002 fire season were held in collaboration with Oregon State University, the Joint Fire Science Program, the Bureau of Indian Affairs, and the Pacific Southwest Research Station. At workshops in Oregon, Arizona, and Colorado, a total of about 265 managers, researchers, educators, community groups, and others identified research topics based on manager needs. Workshop recommendations will be used by the Joint Fire Science Program board to evaluate its current program and report to Congress on needed research. Recommendations also will be published.

Wind River canopy crane. About 50 people attended a science conference on research done from the canopy crane, at the Wind River Experimental Forest, June 10-11, 2003.

Wind River Experimental Forest silvicultural studies tours. A group of 35 people attended the summer field trip and meeting of the Stand Management Cooperative.

Conservation Education

Expanding Your Horizons (EYH) Workshop. At this workshop in Seattle, Washington, a Station scientist introduced 90 girls to tools and procedures used in fire weather forecasting during three hands-on sessions, and all 600 girls at the workshop visited a booth where a Station scientist showed equipment used in fire weather research. One girl from the workshop is now volunteering at the Pacific Wildland Fire Sciences Laboratory as a research assistant in atmospheric sciences. The workshop gives girls in 9th through 12th grades a chance to meet adults with careers in mathematics, science, and technology; get hands-on experiences in these fields; and learn about careers in these fields. The workshop is cosponsored by the Women's Math and Science Network and Shoreline Community College.



Teenager learns about stream hydrology and ecology, near Alsea Falls, Oregon.

Edna Mo

Forest camp outdoor school. Six Station employees taught modules on disturbance, ecosystem management, and the web of life to over 120 sixth-grade students from the Corvallis area at the Alsea Forest Camp. Station scientists were also involved in similar outdoor schools in Corvallis, Lebanon, and Astoria, all in Oregon.

Girls in Science. Station staff participated in this all-day session, sponsored by Eastern Oregon University, to introduce seventh and eighth-grade girls to career opportunities in the sciences.

H.J. Andrews Experimental Forest. Andrews staff hosted several educational activities, including the Teachers in the Woods program sponsored by Portland State University and the Science and Math Investigative Learning Experiences program (SMILE) sponsored by Oregon State University and attended by about 200 young people.

Hispanic Association of Colleges and Universities National Internship Program (HNIP). An intern hired through the HNIP program spent the summer of 2003 at the Corvallis Lab. The student worked on a conservation education project about watershed management, and she also participated in field, laboratory, and analytical experiences related to research on restoration ecology, plant biology, managing forests for diversity, riparian area ecology, and management. The intern also assisted with the Inner-City Youth Institute summer camp.

Inner-City Youth Institute (ICYI). The Station continued its support to ICYI, which encourages underrepresented youths to learn about the environment and related careers. The program sponsors ecology clubs in inner-city middle and high schools, and it also sponsored a summer program called Alberta Nature Teams (ANTS), geared for elementary school children from inner-city communities. Station scientists also helped with this year's summer camp program for high school students, held in Corvallis. A total of 200 students participated in this year's ICYI programs. ICYI is a collaborative effort among the USDA Forest Service, Oregon State University, the Audubon Society of Portland, and the Bureau of Land Management.

Juneau Science Fair. Scientists and staff from the Juneau Forestry Sciences Laboratory mentored several students participating in the Juneau Science Fair. One student placed second with her project on using lichens as bioindicators of air quality, and she qualified for the national competition in Cleveland. Another student mentored by Station scientists won a spot in the top 10 at Juneau, and yet another student won two special awards at Juneau.



Northwest Science Expo. The PNW Research Station sponsored awards for middle and high school students at the 2003 Northwest Science Expo in March at Portland State University. A high school and a middle school student were each awarded with “Outstanding Science Project About Forests” plaques.

Old-growth forest posters and activity guides. The Station helped develop posters of Pacific coastal old-growth forest and distributed about 1,500 posters with a Station-developed student activity guide to school teachers, organizations, and interested people in the Pacific Northwest.

Oregon High Desert Museum. Station scientists worked with the Oregon High Desert Museum and several federal agencies to release two juvenile spotted owls into the wild. The young owls, born in captivity at the museum, were placed into nests of wild spotted owls near Roseburg, Oregon. Both owls were accepted by their foster parents and were raised along with their wild siblings. This is the first case where captive-bred spotted owls have been fostered into nests of wild owls. Station scientists gave presentations about spotted owls at the museum to over 200 people.

Oregon Saturday Academy apprenticeships in science and engineering (ASE) program. The ASE program pairs promising high school students with science or engineering professionals as mentors, to help students learn about careers in those fields. As part of the program, a Station scientist mentored an apprentice in summer 2003.

School presentations. Station scientists gave presentations at several schools. In northeastern Oregon, a Station scientist taught students from two high schools how to teach younger students about insects and spiders, as part of the “whole ecosystems in balance” (WEB) program. A scientist also taught elementary and high school students in Cove about insects and spiders. In La Grande, scientists

took children ages 7 through 12 outside to learn what roles insects have in stream and agricultural ecosystems, as an activity with the Think Link Children’s Museum.

Sciences and Tribes Educational Partnership (STEP). The STEP program brought 60 high school students from Native American tribes in the Pacific Northwest to the Big Beef Creek Research Station near Seabeck, Washington, in June 2003. The teenagers studied fisheries biology in the field with instructors including one Station scientist. Partners were University of Washington, Yakama Nation, Colville Nation, and Quileute, Muckleshoot, Quinault, and Lummi Tribes.

Starkey Experimental Forest and Range conservation education. Staff from Starkey hosted four educational trips to the forest with 155 participants. Groups included students from Echo, Oregon, and from Eastern Oregon University, and Rocky Mountain Elk Foundation volunteers. Students learned about the 10-year-old Starkey Project and toured the facilities and research sites.

Watershed Stewardship Education Program (WSEP). Station scientists taught classes and led field trips in several Oregon counties on riparian area ecology and management as part of the WSEP. Participants included agency people, local landowners (farmers and woodlot owners), fishermen, interested residents, school teachers, and even OMSI representatives, who took the class to be certified as watershed stewards. These watershed stewards then become local experts who work with other landowners on restoration projects. Indirectly, over 1,000 people benefit from this program.

Wolfree. Station employees served as mentors in ecology programs with Portland and Vancouver area middle and high schools. Over 3,000 students participate in Wolfree activities annually, with 45 percent from primarily low-income, inner-city, and rural populations that have little or no access to high-quality science or outdoor programs. The Station also contributed funds for supplies and equipment.

Honors and Awards

Savery and Outstanding Master's Student Award

Shannon Claeson, of the Station's Aquatic and Land Interactions Program, won the Savery Award at Oregon State University in recognition of her public service, leadership, research capability, and research that benefits Oregon natural resources. She also won an outstanding master's student scholarship from the Oregon Chapter of the American Fisheries Society, a research scholarship from the Department of Fisheries and Wildlife, and the Thomas G. Scott Award, also from the Department of Fisheries and Wildlife at Oregon State University.

Society of American Foresters Golden Member Award

Robert Curtis, mensurationist emeritus, received this award in recognition of his half-century of SAF membership and his contributions to the forestry profession.

USDA Forest Service New Century of Service Award

Dean DeBell, research forester emeritus, received this award. As part of the 100th anniversary of the Forest Service in 2005, the agency is recognizing employees such as Dean DeBell who epitomize what the agency stands for: service, excellence, relationships, and innovation.

Best Technology Transfer Tool Award

Sue Ferguson, team leader and research atmospheric scientist, received this award given annually by the Joint Fire Science Program. She was cited for her exemplary efforts in creating the brochure and Web site for the ventilation climate information system (VCIS) and her leadership in promoting use of VCIS.

Gold Medal for Innovation

Team leader **Sue Ferguson** and the atmosphere and fire interactions research and engineering team and collaborators from the University of Washington and the Environmental Protection Agency (EPA), received the gold medal for innovation, awarded annually by the EPA. The team was cited for developing BlueSkyRAINS, a technology that allows incident command teams and smoke managers to use one Web site to manage smoke from planned fires and wildfires.

John Wesley Powell Award for 2002

Michael J. Furniss, hydrologist, received this award from the Watershed Management Council. The lifetime award honors an individual providing outstanding contributions to watershed management in the Western United States.

Wildlife Publications Award for Outstanding Article

John Kie, team leader and research wildlife biologist, received this award from the Wildlife Society for his article "Landscape Heterogeneity at Differing Scales: Effects on Spatial Distribution of Mule Deer," published in *Ecology* 83: 530-544.

Merit Award for Outstanding Contribution

Jim Lenihan, **Ray Drapek**, and **Lisa Balduman** (USDA Forest Service) and **Dominique Bachelet** (Oregon State University) received this award in recognition of their outstanding dedication and contribution to the U.S. national assessment of the ecological impacts of global warming and the production of a world-class,



Tom Iraci



peer-reviewed legacy in support of the assessment. They are members of the Mapped Atmosphere-Plant-Soil Systems (MAPSS) Team.

Secretary of Agriculture's Honor Award for Maintaining and Enhancing the Nation's Natural Resources and Environment

Ronald P. Neilson, team leader and bioclimatologist, received this award for outstanding contributions to understanding the potential impacts to ecosystems, water resources, and fire regimes under climate change at regional, national, and global scales.

Chief's Award for Natural Resource Stewardship

Gordon Reeves, research fish biologist, received this award for helping to build a strong foundation for management and conservation plans in aquatic ecosystems and for contributions to conservation biology and natural resource management.

USDA Forest Service Exemplary Volunteer Service Award

Roy Silen, research geneticist emeritus, received this national award for his contributions as a volunteer since his retirement in 1985. He was cited for his contributions in measuring, maintaining, documenting, and publishing results from long-term studies, and for work that has made an important difference in advancing forest genetics research as well as maintaining a historical record of forestry research in the Pacific Northwest.

Chief's Honor Award for Global Stewardship

Robert Szaro, Deputy Station Director, received this award in recognition of his sustained efforts in contributing to the improvement of global forest stewardship, promoting U.S. foreign policy objectives, contributing to the improvement of international forestry, and establishing innovative and effective partnerships to further international objectives.

Certificate of Appreciation

Martin Vavra, Starkey Project team leader, received this certificate from the American Society of Animal Science in recognition of his 6 years as editor of the contemporary issues section in the *Journal of Animal Science*.

Toward a Multicultural Organization Award

Tammy Verhunc, administrative officer for the Portland Forestry Sciences Laboratory, received this award from the Station for her leadership in bringing cultural diversity to the lab through presentations, coordinating national civil rights observances, and creating an atmosphere of cohesiveness in the lab environment.



Tom Iracci

Finances and Workforce

The PNW Research Station is supported by two funding sources. The largest part of our funding comes from federal appropriations. Our other funding source is direct client support, which comes from organizations needing scientific information.

2003: PNW Research Station Finances and Workforce, by the Numbers

Fiscal year 2003: October 1, 2002, to September 30, 2003

Incoming Funding

- Base research appropriations \$39.2 million
- Direct client support* \$11.9 million
- Total funding \$51.1 million

* Includes national fire research funds (\$2.8 million), National Forest System monitoring funds (\$3.8 million), state and private research funds (\$1.1 million), and nonfederal sources (\$4.2 million).

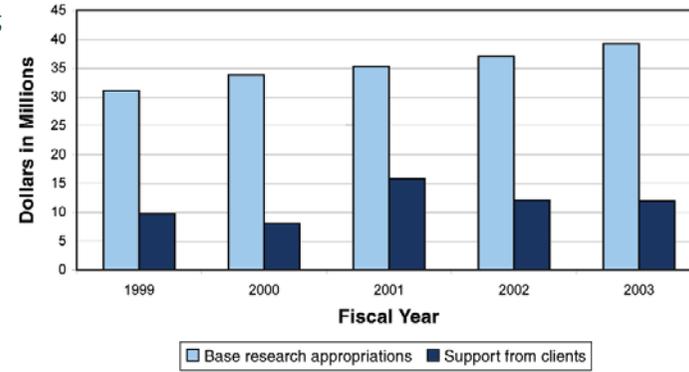
Distribution of Funds

- Employee costs 53 percent
- Support and operations 33 percent
- Distributed to cooperators 14 percent
- Of \$8.4 million to cooperators . . . 85 percent went to educational institutions

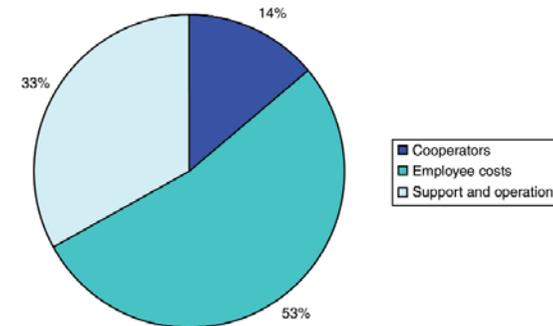
Workforce Statistics

- Permanent workforce 288 employees
- Of the permanent workforce 32 percent or 91 employees are scientists
- Temporary workforce 261 employees
- Station total workforce 549 employees

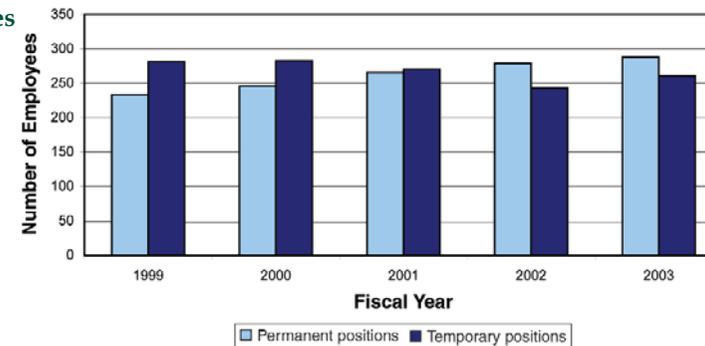
Incoming Funds



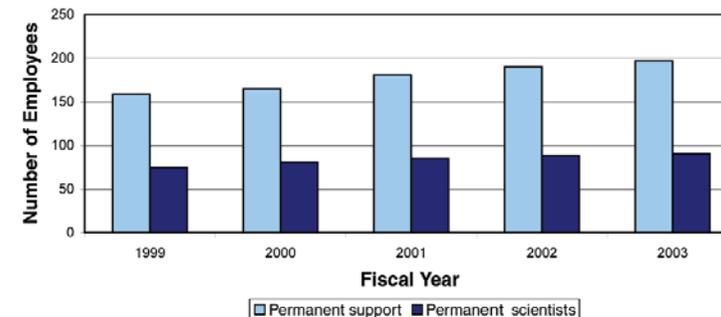
Distribution of Funds



Employees



Types of Positions





Cooperators Who Receive Funding for Studies from the PNW Research Station

In 2003, the PNW Research Station distributed about \$8.4 million to its cooperators. The list below includes all cooperators who currently have agreements and partnerships with the Station.

Educational Institutions

Colorado State University
Eastern Oregon University
Humboldt State University
Michigan State University
Michigan Technological University
Ohio State University
Oregon State University
Pennsylvania State University
Saint Louis University
Southern Oregon University
University of Alaska (Anchorage, Fairbanks, and Juneau)
University of Arizona
University of California (Berkeley and Davis)
University of Georgia
University of Idaho
University of Minnesota
University of Montana
University of Washington
University of Wisconsin
University of Wyoming
Utah State University
Washington State University

Other Federal Agencies

U.S. Department of Agriculture, Agricultural Research Service
U.S. Department of Energy
U.S. Department of the Interior, Bureau of Land Management
U.S. Department of the Interior, Geological Survey, Biological Sciences Division
U.S. Department of the Interior, National Park Service

State Agencies

Oregon Department of Agriculture, Plant Division

Government Agencies in Other Countries

Forest Research (New Zealand)
University of Leeds (United Kingdom)

Indian Tribes

Confederated Tribes of Grand Ronde

Nongovernment Organizations

Alaska Manufacturers Association
Earth Systems Institute
Institute for Applied Ecology
Institute for Culture and Ecology
Wildlife Conservation Society

Private Industry

National Council for Air and Stream Improvement
Sealaska Corporation

Clients Who Provide Funding for Studies to the PNW Research Station

In 2003, the PNW Research Station received about \$2.7 million in support from clients other than the National Forest System, State and Private Forestry, and other research stations. The list below includes all clients who currently have agreements and partnerships with the Station.

Educational Institutions

Montana State University
Oregon State University
Washington State University

Other Federal Agencies

Bureau of Land Management
Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Geological Survey
National Aeronautics and Space Administration
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
U.S. Department of Defense, Fort Lewis

State Agencies

California Resources Agency
Oregon Department of Forestry
Oregon Parks and Recreation Department

Nongovernment Organizations

Columbia Basin Fish and Wildlife Foundation
National Council for Science and the Environment

Private Industry

Northwest Power and Conservation Council





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Publications mentioned in this report can be requested by calling (503) 808-2138 or e-mailing pnw_pnwpubs@fs.fed.us. Many publications can be downloaded from the PNW Research Station Web site at: <http://www.fs.fed.us/pnw>.

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*Science Accomplishments
of the Pacific Northwest Research Station*