Sherri Eng

USDA Forest Service
Pacific Southwest Research Station

Serving California, Hawai'i, and the Pacific Islands

2011 Accomplishments Report

USDA

Forest Service U.S. Department of Agriculture

Pacific Southwest Research Station

Patricia Maloney

Vision and Mission

The Pacific Southwest Research Station is a world leader in natural resources research through our scientific excellence and responsiveness to the needs of current and future generations. Our mission is to develop and communicate science needed to sustain forest ecosystems and their benefits to society.

About Us

The Pacific Southwest Research Station (PSW) represents Forest Service Research and Development in California, Hawai‘i, and the U.S.-affiliated Pacific Islands. Our region has the lowest, driest desert in the country, the wettest tropical forests, and the highest elevations within the 48 contiguous States. An abundant diversity of native plants and animals and nearly half of the nation's threatened and endangered species live in this region. At PSW, we develop and deliver science to help inform decisions about natural resource management, conservation, and environmental protection. Much of our work is accomplished in cooperation with other research and development institutions, such as universities, and state and other federal agencies.

Science that makes a difference.

Sherri Eng

I am proud to present the Pacific Southwest Research Station's (PSW) 2011 Accomplishments Report. The past year was an exciting and dynamic period of change and growth for PSW as we implemented an overall station redesign. This process organized our 11 science research units into four programs, better aligning us with the Forest Service's Strategic Program Areas. In addition, our business support operations were consolidated into a One-Team Business Operations model, eliminating redundancies and ensuring that business processes and functions are consistent throughout the station.

Our natural resources research continues to be on the cutting edge across many disciplines as we strive to respond to the needs of current and future generations. Sound, innovative science helps restore forests across broad landscapes to stimulate rural and urban communities so they remain economically, socially, and environmentally stable. Our research helps save lives and property from wildfires. We reduce fire suppression costs by providing tools to assist in fire fighting and fire prevention. Science helps create and expand uses and markets for wood products, creating jobs that lead to economic prosperity across the United States. Our science transcends landscapes, watersheds, and tropical forests. Urban forestry, where the hardest working trees in America are found, is a critical and growing component of our body of work. The tools we develop enhance urban natural resources stewardship and lead to jobs, cleaner air, improved human health, and cleaner water. An estimated one in five Americans get their drinking water from a national forest, and 87 percent of all surface water in the United States crosses Forest Service lands. We partner with private industry, non-governmental organizations, state, local, and tribal governments to restore forest health and provide jobs and other economic benefits.

We could not be where we are today without the dedicated efforts of our researchers and support staff. Several of our members received national recognition for their work, contributions, and community service. We received two Wings Across the Americas awards, including the International Cooperation Award by C. John Ralph for his work in Costa Rica and the Research and Management Partnership Award by Kathryn Purcell, Jared Verner, and Sylvia Mori for their work in bird population trends in California. Chris Fettig received a USDA Merit Award for his research on bark beetles, and Armando González-Cabán and Kathie Jermstad both received Presidential Volunteer Service Awards for their community service.

I look forward to the challenges that lie ahead as we continue to provide sound science to use in helping managers plan for climate impacts, adaptation, and ecosystem health as we combat threats such as climate change, wildland fire, and invasive species. Thank you for your interest in the Pacific Southwest Research Station, and thank you for your continued support.

Alex

Alexander L. Friend, Ph.D.
Acting Station Director, Pacific Southwest Research Station

Climate Change, Urban Natural Resources Stewardship, Water, and Wildland Fire

Four strategic plans outline the Pacific Southwest Research Station's (PSW) direction over the next decade for climate change, urban natural resources stewardship, water, and wildland fire. In each of these areas, PSW's research, development, and technology will be interdisciplinary and collaborative. The strategies reach across PSW's research programs and are coordinated with the Forest Service Pacific Southwest Region, National Forests, other Research Stations, universities, and other government organizations. The plans focus on natural resources in California, Hawai'i, and the U.S.-affiliated Pacific Islands.

CLIMATE CHANGE

Sherri Eng

Our scientists work to enhance the nation's ability to store and manage carbon, facilitate adaptation of species and ecosystems, and improve management of climate change effects on the environment. Our climate change research serves as a foundation for policy and best management practices to sustain ecosystem health, adjust management for ecosystem services, and increase carbon sequestration (mitigation), all under changing climate conditions. Our strategic plan outlines seven elements: science, adaptation, mitigation, policy, sustainable operations, education and partnerships.

WATER

Sherri Eng

Approximately 87 percent of our country's fresh water supply originates from forests and agricultural lands. More than 200 million people rely on their drinking water from public and private forests and grasslands. PSW's research helps inform future management decisions to protect water-related goods and services, such as abundant and clean drinking water, fish and wildlife habitat, slowing of storm runoff, and water-related recreational opportunities. Our water strategy plan concentrates on four critical components: projecting the impacts of disturbance (i.e. climate change and air pollution on water and the resulting goods and services); understanding the watershed processes that will be impacted by these disturbances; identifying critical aquatic species at risk and developing appropriate tools and management practices to mitigate adverse impacts; and developing best management practices and tools to maintain watershed health in natural ecosystems and for urban areas to help mitigate the impact of a changing water supply.

URBAN NATURAL RESOURCES STEWARDSHIP

Paula Peper

More than 80 percent of the U.S. population lives in urban areas, cities and suburbs. Forest Service Research and Development strives to foster the proper care of natural resources and the advancement of ecosystem services in urban landscapes. PSW and its partners continue to develop tools that will assist the citizenry in making appropriate planning and management decisions on creating healthy and sustainable urban ecosystems for their communities. Focus areas include: urban water, green infrastructure, humans and fire, and environmental justice.

WILDLAND FIRE

Steve McKelvey

The mission of PSW's wildland fire research is to provide the knowledge and tools that managers need to reduce negative impacts and enhance beneficial effects of fire and fire management on society and the environment. Our science will guide land management practices so they reflect an understanding of the diverse impacts of fire and fuels management, and of fire's role as a disturbance on a regional, as well as global scale; assist individuals and communities to recognize their options and accept their responsibilities regarding fire safety when living in fire-affected ecosystems; and provide fire managers with state-of-the-art, science-based knowledge and decision support tools.

Pacific Southwest Research Station Overview

Research is organized into four science programs:

1) Conservation of Biodiversity

Station scientists conduct research on genes, species, habitats, landscapes, and the biological processes necessary to maintain diversity of organisms and functioning ecosystems. Research focuses on enhancing the conservation, ecology, and evolution of species and habitats, and the restoration and maintenance of degraded ecosystems.

2) Ecosystem Function and Health

Station scientists examine forest function and conduct research to protect and preserve water, air, and soil resources while considering the effects of climate change, unpredictable precipitation, air pollution, and growing threats from pests and pathogens.

3) Fire and Fuels

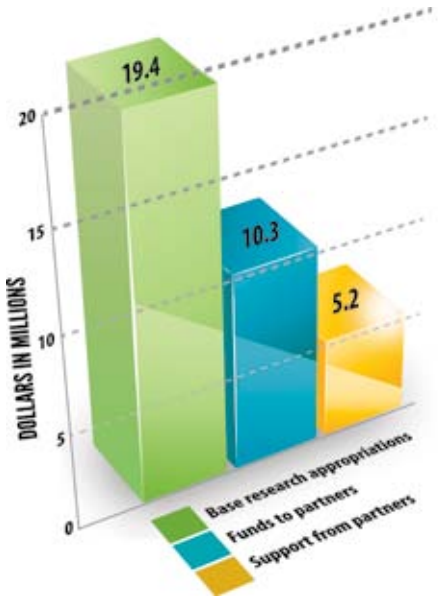
Station scientists conduct research on how fire behavior affects fuel types and conditions and how physical properties of fuels influence fire severity and intensity. Research includes decision-support models that analyze risk, resource allocation economics, and fire danger forecasting.

4) Urban Ecosystems and Social Dynamics

Station scientists examine the interconnections of people and natural resources. Research focuses on developing knowledge and tools in natural resource management to better serve the public, and to connect urban dwellers with public lands through urban forestry and social science research.

- Headquarters in Albany, California
- 8 laboratories in California and Hawai'i
- 14 active Experimental Areas (range, watershed, and experimental forests)
- Research also conducted in more than 90 research natural areas (RNAs)
- Pacific Southwest Research Station is one of five research stations in the U.S. Department of Agriculture, Forest Service
- 169 permanent employees, of which 47 are research scientists.

Pacific Southwest Research Station at a Glance:



Funding

- Total funding: **$22.3 million**
  - Base research appropriations: **$19.4 million**
  - Granted to partner organizations : **$10.3 million**
  - Support from clients awarded to PSW scientists: **$5.2 million**

Workforce

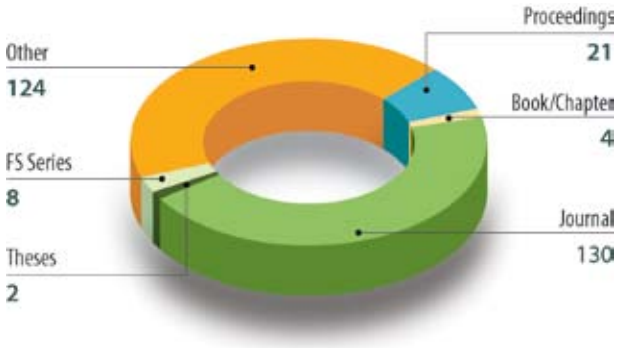
- Total number of PSW employees: **252**
  - Permanent employees: **169**
    - Science staff: **108**
    - Operations staff: **44**
    - Administrative staff: **17**
  - Temporary employees: **83**

Web Metrics

- People visiting the PSW web site, www.fs.fed.us/psw: **51,458**
- Number of visits to the PSW web site: **75,419**
- Countries or territories web site visits originated from: **187**
- Followers on Twitter (since launch in May 2011): **100+**
- Page views of PSW publications through Treesearch: **17,448**

Publications

- Total publications: **289**
  - Refereed Publications: **135**
  - Peer-reviewed publications: **51**
  - Other publications: **103**



Community Service

RICHMOND EDIBLE FOREST

For the past two years, PSW has partnered with Urban Tilth, a Richmond, California-based non-profit community organization aimed at building a more sustainable, healthy, and just food system. On January 17, 2011—Martin Luther King, Jr. National Day of Service—Station employees helped "green" a section of the Richmond Greenway, which will serve as a location for the future planting of an edible forest. The community event was part of the Richmond Edible Forest Project, which the Station helped fund with a U.S. Forest Service More Kids in the Woods program grant. The project is a partnership between the U.S. Forest Service, Urban Tilth, the City of Richmond, and the West Contra Costa Unified School District. The More Kids in the Woods program's goal is to work with community partners to help America's youth learn more about their local environment and careers in natural resources.

The partnership engages 700 underserved youth in education programs to learn how to install "edible forests" in Richmond parks and school areas. The edible forests are also environmental education sites where Station scientists and Forest Service land managers can teach kids about the benefits of trees and forested landscapes. After the

Hao Tran

first edible forest garden is installed, the project will offer a series of edible forest garden workshops for school and community gardeners and parks and recreation department staffs from across the Bay Area. The Richmond Edible Forest Project continues to provide invaluable resources and training to employ youth to create, maintain and use gardens at multiple sites on public lands throughout the greater Richmond area.

STARTS WITH A SEED

In 2011, the USDA Forest Service awarded $33,000 through its More Kids in the Woods initiative to the Pacific Southwest Research Station and Pacific Southwest Region to launch the Starts with a Seed program with the goal of providing children of Hawai'i Island greater opportunities to experience the great outdoors, learn about nature, and build a lasting commitment to conservation and land stewardship.

Station and State and Private Forestry staff based at the Institute of Pacific Islands Forestry in Hilo, Hawai'i, in collaboration with community partners, have developed a program aimed at boosting environmental literacy for K-12 students attending public schools on the east side of Hawai'i Island. Station and watershed partners contribute scientific knowledge, access to forests, and forest restoration sites.

Through the program, more than 150 students in the past six months have learned about native plants, ecological restoration and environmental sustainability. Students will continue taking field trips during the school year to experience Hawaiian forests, grow native plants, help restore native bird habitats and learn about Hawai'i's rich ecology and culture through

Cheyenne Perry

traditional storytelling. To facilitate these experiences, greenhouses have been purchased and assembled at two Hawai'i Island public charter schools, which will provide a working classroom for the students and a source of native planting materials for future restoration efforts. Educator workshops are designed to provide teachers with the background and support to expand curricula to include Starts with a Seed material.

The program has demonstrated the value of a "grow" literacy for participants through field-based learning, and workshops which reinforce and integrate current forest restoration practices with Hawaiian culture.

Recent activities and achievements on PSW's Experimental Areas:

Hawaii Experimental Tropical Forest (HETF)
HETF is a unique representative of native forests that contain many of Hawai'i's rare plants, but also our worst invasive species. Researchers are focusing their efforts on multiple density plots within the HETF initially and will continue a broader inventory over the years to come. The data collection team witnesses and documents first-hand the changes occurring in our Hawaiian landscapes, presenting a snapshot of the degree of invasive encroachment that will serve as a benchmark for trends in future species adaptations and/or extinctions. This allows scientists and managers to access the data collected to see the changes in forest species composition, carbon storage, and disturbance as the data is collected. This long-term inventory will provide many opportunities to students for future crew positions and to policy makers and land managers as a resource for answering critical conservation questions.

Kings River Experimental Watershed (KREW)
The Forest Health and Research Project is designed to conduct thinning and prescribed fire treatments at a watershed scale. These treatments are intended to improve forest health in a financially viable way, reduce the risk of catastrophic fire, and ultimately benefit water production and quality for downstream users. The research will lead to information that will be instrumental in future land management planning for Sierra Nevada forests.

San Joaquin Experimental Range (SJER)
Station scientists are currently in the process of examining avian population trends and predicting the effects of climate change using long-term data. The Monitoring Bird Population Trends in California Oak Woodlands project, conducted on the SJER, was selected as a "Wings Across the Americas" Research and Partnership Award winner in 2011.

Caspar Creek Experimental Watershed (CCEW)
Over a 20-year period, much of the second-growth redwood and Douglas-fir forests within the CCEW were either selectively tractor-logged or partially cable clear-cut. Land use treatments influence hydrologic processes, watershed recovery timeframes, and restoration responses. Examination of long-term CCEW sediment records provided insight to the relative magnitudes and durations of sediment production from differing management practices. Ongoing erosion assessments indicate that much of the eroded sediment mobilized in the watershed originates along tractor and truck routes and delivers to streams during high flows—even decades after tractor-logging. Forest managers can use this legacy effect data and improved understanding of hydrologic response when designing future harvests and prescribing watershed rehabilitation treatments to restore natural drainage and hydrologic function.

USDA Forest Service

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Teakettle Experimental Forest (TEF)

Western forest managers use fuel treatments to reduce the risk of high-severity wildfire and restore forests to a more open, fire-resistant structure. Fuel treatments often employ thinning and/or prescribed burning. Effective treatments lower the risk of large carbon loss from high-severity fire, and can increase available resources for leave trees, accelerating growth, and carbon sequestration. Station scientists quantified the carbon consequences of different levels of thinning and burning treatments immediately and seven years after treatment at TEF. Although removing larger trees in overstory thinning treatments increased fire resistance, carbon cost was substantially higher. From measured growth rates, Station scientists estimate that understory thin and burn treatments will re-sequester all the carbon removed and emitted in as few as 15 years after treatment, whereas overstory thinning treatments will continue to have net negative carbon balance for many more years because of the removal of many large trees.

Stanislaus-Tuolomne Experimental Forest (STEF)

Station scientists are working collaboratively with the Stanislaus National Forest to implement a study of forest management and treatments that mimic historic forest structure. Historically, forests were more spatially heterogeneous than they are today, and the STEF structure fosters replication and the ability to study these exceptional characteristics in a unique environment.

Sagehen Experimental Forest (SEF)

The National Forest System, PSW, and UC Berkeley have partnered at SEF since 1951, hosting hundreds of scientific studies over the last 60 years. The earliest studies were groundbreaking fisheries and wildlife studies. Currently, a unique combination of collaboration, science, and forest management are working together in an interactive and novel way. The proposal is the result of an extensive, 16-month collaborative effort to design an integrated, innovative approach for applying the most recent science to enhance marten habitat, restore forest stand ecological conditions, and manage fire and fuels on national forest lands within the Sagehen Experimental Forest and adjacent Tahoe National Forest.

Ecosystem Function and Health

Our forests and wildland ecosystems are exceedingly diverse and provide a wide array of societal goods and services. From clean water, timber and non-timber products, and carbon sequestration to recreational use, aesthetic beauty, and native biodiversity, these ecosystems are national treasures that contribute to the prosperity of current and future generations. A growing list of environmental pressures, including climate and land-use change, water scarcity, and an increasing human population, threaten the health and integrity of these ecosystems.

The Ecosystem Function and Health Program focuses on the interactions among changes in or brought about by biotic and abiotic factors, such as temperature and precipitation, invasive species, air pollution, insects, pathogens, and past and current land management actions. Station scientists conduct research that provides an integrated understanding of the biophysical conditions that threaten ecosystem resilience, including how environmental changes are initiated and progress, what thresholds are associated with these changes, and what the consequences are of crossing identified thresholds.

Sherri Eng

Rich Mackenzie

Research focuses on the following areas:

- **Determine how biophysical factors influence the function and productivity of tropical, subtropical and temperate ecosystems;**
- **Quantify and predict ecosystem responses and adaptation to environmental stressors;**
- **Define and measure the impacts of biotic and abiotic stresses on hydrological and atmospheric systems; and**
- **Develop models and tools, and evaluate management options for restoring, sustaining and enhancing ecosystem function and productivity.**

2011 Research Highlights

Scientists study bark beetles in attempt to control infestations

Since the 1990s, bark beetles have killed billions of conifers and hardwoods from Alaska to Mexico. Station scientists are conducting extensive research on several species of beetle, in an effort to predict, prevent and mitigate outbreaks in North American forests. Station scientists were able to isolate and chemically determine an attractant pheromone that can be used to detect walnut twig beetle populations in the wild. This beetle is a vector of a fungus that can cause tree mortality in one to three years. They also identified several behavioral chemicals that appear to deter the beetles from flying and landing. Station scientists used genetic markers to discover that a novel form of blue-stain fungus is causing Chinese pines to release more attractants for red turpentine beetle, which is a vector for this fungus and was introduced from North America. There are concerns of a "boomerang effect," meaning that the new fungus may find its way back to North America and contribute to more severe red turpentine beetle outbreaks in North American forests. Station scientists developed a novel assay to determine the toxicity to the mountain pine beetle of two new insecticides, and a third holds promise for control of another insect, the ambermarked birch leafminer in interior Alaska.

Koa reforestation in Hawai'i

Planting in Hawai'i's Hakalau Forest National Wildlife Refuge has produced a network of Acacia koa tree corridors in otherwise deforested grasslands. Koa root-suckering has the potential to enhance reforestation efforts. At the recent 2011 Hawaii Conservation Conference, Station scientists provided managers with the first information on koa clonal stand structure, sucker survival, growth rates, and rates of encroachment into grassland. Their findings indicated that grasslands between planted corridors will eventually be colonized by root suckers, despite grass competition.

Feral pigs impact native Hawaiian forests

Hawaiian native forests are undergoing substantial change due to invasion by nonnative, feral pigs (*Sus scrofa*), but few studies have quantified how pigs impact forest function and processes. Focusing on changes in soil biogeochemistry, Station scientists found that the presence of nonnative, feral pigs strongly influences soil respiration, which in turn has the potential to substantially alter terrestrial carbon-cycling in native forests.

Dr. Runzhi Zhang

Paul Scowcroft

Andrzej Bytnerowicz

New approach sheds light on how streamflow shifts impact aquatic ecosystems

Station scientists are incorporating a Distributed Hydrology, Soils, and Vegetation Model in a three-tiered approach to examine how climate change, invasive species, and their potential interactions impact the hydrological and ecological function of Hawaiian streams. This approach is expected to yield diverse and robust data sets for understanding how stream ecosystems will respond to shifts in streamflow resulting from multiple stressors, including climate change and invasive species.

Air pollutant measuring at high elevation sites in White Mountains

Station scientists took the first measurements of surface ozone concentrations in California's White Mountains, including the two highest sampling elevations ever reported for a North American study. These normally pristine, remote, high altitude sites have recorded elevated ozone concentrations related to a number of regional and long-range transport events of pollutants. These repeated measurements will help in understanding long-term trends in changes of ozone concentrations in North America, as well as long-range transport of air pollution across the Pacific from Asia. approach to examine how climate change, invasive species, and their potential interactions impact the hydrological and ecological function of Hawaiian streams. This approach is expected to yield diverse and robust data sets for understanding how stream ecosystems will respond to shifts in streamflow resulting from multiple stressors, including climate change and invasive species.

Fire and Fuels

Steve McKelvey

Managing fire and the vegetation conditions that fuel fire is a paramount challenge to land managers throughout most of California, Hawai'i and the U.S.-affiliated Pacific Islands. The mission of the **Fire and Fuels Program** is to provide scientific findings that will improve management actions intended to enhance resiliency and sustainability of wildland ecosystems affected by fire, and reduce the potential for adverse effects resulting from wildland fire, including loss of life and property.

Joey Chong

Research focuses on the following areas:

- **Improve measurement, modeling, and prediction of wildland fire and weather phenomena in complex landscapes and fuels;**
- **Determine the ecological effects of fire and fire removal on landscapes throughout California, Hawai'i, and the U.S.-affiliated Pacific Islands;**
- **Evaluate the short and long-term outcomes of fuels, fire, and post-fire management strategies;**
- **Determine and quantify the interactions between climate, vegetation, and fire in the face of climate change and improve our understanding and predictability of these interactions in order to manage forests and wildlands more effectively; and**
- **Describe and quantify uncertainty and risk in a science-based decision-making framework for fire and land management planning.**

2011 Research Highlights

Scientists examine trends in Northern California wildfires

Station scientists compared current forest structure in recently-burned and unburned areas to early 20th century forest structure. They found that in the areas burned recently under moderate-severity, tree density and canopy-cover was similar to that based on Forest Service timber surveys conducted in 1911. Low-severity burned areas and areas not recently burned had higher tree density and canopy cover than the 1911 estimates. Results emphasize an important distinction with regard to using fire to restore forests, and can be used by managers and ecologists in restoring Sierra Nevada mixed conifer systems.

Pollen and charcoal records shed light on the effects of climate change on Klamath Mountain vegetation

Station scientists sought to examine the long-term influence of soil nutrient constraints on vegetation distribution in subalpine forests. They studied Klamath Mountain pollen and charcoal records dating back 15,000 years, and found that trees and shrubs growing in more fertile soil were less stable (i.e., more responsive to changing climatic conditions than vegetation growing in nutrient-limited soil). The combination of these dynamics may help explain high levels of plant diversity in the Klamath Mountains, and may provide insights for conservation strategies and management of complex ecosystems.

Hydromulch serves as effective method for controlling erosion

Wildfires can make chaparral watersheds susceptible to accelerated erosion. Hydromulch, a mixture of paper that dries to a crust, is a relatively new erosion-control treatment. Station scientists compared sediment fluxes and the impact on vegetation regrowth on plots treated with aerial hydromulch (delivered by helicopter) versus untreated controls for three wildfires in Southern California. They found that aerial hydromulch treatment did reduce bare ground, and at least some of this cover persisted through the first postfire winter rainy season. Aerial hydromulch reduced hillslope erosion from small and medium rainstorms. Hydromulch also had no effect on seedling density, regrowing plant cover, or species richness. Hence, in chaparral watersheds, aerial hydromulch can be an effective stabilizer for postfire erosion control.

Brandon Collins

Prescribed burns may reduce forest health

Station scientists examined annual changes in forest structure in old-growth plots immediately before, and up to eight years after prescribed fire at Sequoia National Park. They found fire-induced reductions in stem density, reductions in live stem biomass, and preferential survival of large trees. Mortality rates also remained significantly above background rates up to six years after the fires. The results bear witness to the need to consider long-term fire effects in prescriptive treatments.

Mastication and prescribed burns together may improve forest resiliency

Mechanical mastication is the process of converting ladder fuels, such as shrubs and small trees, into compact surface fuels. Prescribed burns in masticated fuels were used at two sites to study effects on fire behavior and residual trees. Based on observations from these burns, Station scientists created custom computer fuel models, which allowed for computer simulation of potential wildfire conditions in masticated stands. These simulations showed that masticating in combination with prescribed burning may be a useful tool for moderating fire behavior. This work also shows managers that further reducing masticated material with prescribed burns could help better achieve the objectives of reducing wildfire hazard while improving resilience of the remaining stand to wildfire.

Urban Ecosystems and Social Dynamics

Paula Peper

The interconnection between humans and nature is complex and enduring. People need and yearn for the resources that only nature can provide: clean water, clean air, natural scenic beauty, and a connection to the land and wildlife. The Pacific Southwest Research Station strives to maintain forests, sustain functioning ecosystems in urban and wildland areas, enhance and protect quality of life, and ensure benefits to society through interdisciplinary research that examines urban ecosystems and social dynamics of natural resources conservation, management, and restoration.

The Urban Ecosystems and Social Dynamics Program conducts research and communicates science needed to understand and enhance the interconnections among ecosystems, people, and societies.

Research focuses on the following areas:

- **Determine the relationships among human uses, human values, ecosystem services, and management;**
- **Ascertain the roles of changing demographics, urbanization, socioeconomics, and technology on use and sustainability of natural resources; and**
- **Examine the impacts of public policies on ecological and social patterns and processes along rural-to-urban gradients.**

2011 Research Highlights

One million trees for L.A.

The day after Antonio Villaraigosa was elected mayor of the City of Los Angeles, he announced his plan to plant 1 million trees over the next several years. The Mayor called upon Station scientists to help determine if space exists for 1 million additional trees, identify potential tree planting sites, and estimate future benefits from planting. Using geographic information systems, aerial photographs, and remote sensing data, Station scientists found 2.4 million potential tree sites. They also estimated that over 35 years, 1 million new trees could capture 14-21 billion gallons of stormwater, reduce air pollution by up to 10,000 tons, and save about 1 million mega-watt hours of electricity. Based on these factors, total economic benefits from this project are estimated at $1.3 to $1.9 billion. "Million Trees LA" has planted more than 300,000 trees to date, and the Station has helped the program target residential neighborhoods and commercial areas with the least tree canopy cover.

Collaboration with Spain yields new modeling system to estimate fire suppression costs

Historically, forest fire budgets in Spain have not been subjected to rigorous economic analysis indicative of the returns on investments in fire management protection programs. New economic realities are forcing agencies with fire protection responsibilities to formally justify their fire protection budget requests. To assist with this effort, Station scientists partnered with Spain's National Forest System to develop a modeling system called SINAMI (Sistema Nacional de Analisis para el Manejo de Incendios or National Fire Management Analysis System). SINAMI uses analyses to determine the most efficient fire management program and budget level for fire protection for a simulated fire season by providing information on the number of fires and area affected by fire intensity level, as well as the number and type of firefighting resources used through the simulated fire season. This work helps managers make informed decisions on how to allocate firefighting resources, potentially reducing fire suppression costs.

George Gonzalez

Building public trust important in influencing conservation-related behaviors

Through a synthesis of multiple studies, Station scientists and a collaborator revealed the influential role of public trust in specific areas for the Forest Service. Influences of trust are shown in perception of agency messages designed to guide recreationist behavior; acceptance of management actions to reduce environmental risk; and attitudes and behaviors related to conservation. Conservation-related organizations, natural resource management agencies, and related entities can benefit from the findings by ensuring that their efforts address trust-building and trust-maintenance as a part of their ongoing interactions with publics and endeavors to foster conservation-related behaviors.

New tool helps improve air quality

Urban trees can produce a number of benefits, among them improved air quality. However, biogenic volatile organic compounds (BVOCs) emitted by some species are ozone precursors; therefore, air management districts have a need to modify plans for tree-planting to favor species that emit lower levels of BVOCs. Station scientists developed a Tree BVOC Index, a prescriptive approach that provides an estimate of projected and actual emission reductions and gives users a realistic target and a method to monitor progress.

Conservation of Biodiversity

Ted Weller

Our geographic area includes oceanic islands, elevational clines from coastal to alpine ecosystems in temperate and tropical ecosystems, and species and communities that occur nowhere else in the world. The area faces significant species extirpations and extinctions, with remaining natural areas continuing to be threatened.

The Conservation of Biodiversity program provides high-quality, relevant information across the conservation continuum: status, threats, vulnerable components, response of organisms and ecosystems to threats, tradeoffs in desired management outcomes, efficacy of management approaches through adaptive management, restoration and recovery techniques and tools, and effectiveness monitoring and evaluation techniques.

Tracy Johnson

Amy Lind

Research focuses on the following areas:

- **Determine environmental conditions needed for terrestrial species persistence;**
- **Identify conditions that can support aquatic biodiversity and ecosystem services;**
- **Determine the genetic origins of traits that can enhance tree adaptability and utility; and**
- **Develop innovative approaches to reduce ecological impacts of non-native species.**

2011 Research Highlights

Forest management: Effect of landscape practices on the fisher

The fisher (*Martes pennant)* lives primarily in forests in the Sierra Nevada, which are typically susceptible to high-intensity wildfire. Station scientists characterized important vegetation attributes within the home ranges of 16 female fishers and used their distribution as a baseline against which the effects of forest management options can be compared. They used statistical analysis to identify individual and composite environmental conditions that best defined their home ranges and then used these as a reference for evaluating landscape change (i.e. forest thinning), fire, and no treatment.

Assessing California golden trout vulnerability to climate change

The California golden trout (*Oncorhynchus mykiss aguabonita)* is one of the few native high-elevation fishes in the Sierra Nevada. Their native stream habitat is being impacted by cattle grazing through reduced streamside vegetation and widened channels with shallow stream depths, which commonly leads to warmer water temperatures. They have also been threatened by exotic trout, genetic introgression, and degraded habitat, and now face further stress from climate warming. One important management response to climate warming will be to ensure that habitats are more resilient to predicted changes in water temperature, flow, and snow pack. Station scientists are identifying which stream areas in the Golden Trout Wilderness are most vulnerable to warming and will prioritize sites for restoration.

Going with the flow: Creating habitat for amphibians in regulated rivers

In regulated rivers, relicensing of hydropower projects can provide an opportunity to change flow regimes and reduce negative effects on sensitive aquatic biota. The volume of flow, timing and ramping rate of spring spills, and magnitude of aseasonal pulsed flows have potentially negative effects on the early life stages of amphibians. Station scientists and collaborators used two-dimensional hydrodynamic modeling to model habitat suitability under several pulsed flow scenarios to evaluate potential effects of flow variation. They conducted analyses on usable habitat area, as well as measured the risk of scour or stranding, to quantify potential loss under different flow scenarios.

Rebecca Green

Kathleen Matthews

Brazilian scale insect used as biocontrol of invasive strawberry guava

Over the last two decades, Station scientists in Hawai'i, along with researchers in Florida and Brazil, have researched biological control as a new tool for managing strawberry guava, an invasive tree in Hawaiian forests. Station scientists discovered that a Brazilian scale insect, *Tectococcus ovatus*, could be used to serve as a natural control of strawberry guava. The insect will slow the spread of the trees, but will not harm any native plants or insects. After completing an environmental assessment of the biocontrol, the State of Hawai'i issued an initial release in late 2011.

Green energy, kind energy: How to reduce bat fatalities at wind energy facilities

Fatalities of migratory bats at wind energy facilities have become a frequent occurrence. An interactive tool developed by Station researchers helps wind energy facility operators make informed decisions on efficient ways to reduce impacts on migratory bats. Station researchers found that certain combinations of wind speed, temperature, time of day, and season were good predictors of bat presence. Their tool allows users to visualize how changes in date and weather conditions affect the probability of bat presence.

Genetic mapping of trees aids in developing bioenergy feedstocks

Station scientists successfully identified the genes that control the formation of cambium, direct the patterning of woody tissues derived from the cambium, and regulate how the cells derived from the cambium differentiate. Together, these genes give fundamental insights into how the woody growth of tree stems is regulated, and provide specific targets for tailoring woody growth for applications including bioenergy feedstocks.

Funding Partners for 2011

Cooperators Who Received Funding for Studies From PSW

2nd Nature, LLC.
BMP Ecosciences
Brigham Young University
California Conservation Corps (Americorps)
California Polytechnic State University, San Luis Obispo
California Tahoe Conservancy
Carnegie Institution of Washington
Centre for Agricultural Bioscience International
Clemson University
Colorado State University
Coral Reef Research, Palau
Desert Research Institute
Eco-Ascension Research and Consulting
EcoLayers, Inc.
EcoStats LLC
El Dorado County, California
Em Consulting, LLC
Forest Research Agency, United Kingdom
Hawaii Wildfire Management Organization
Humboldt State University
Integral Ecology Research Center
Klamath Bird Observatory
Kupu - Americorps
Northern Arizona University
Oregon State University
Phytosphere Research
Portland State University
PRBO Conservation Science
Riverside-Corona Resource Conservation District
Smithsonian Institution
Southern California Coastal Water Research Project
The Nature Conservancy
Three Sisters Farm
University of Alabama, Huntsville
University of California Cooperative Extension, Humboldt/Del Norte
University of California Cooperative Extension, Marin
University of California, Berkeley
University of California, Davis
University of California, Merced
University of California, Riverside
University of California, San Diego
University of California, Santa Barbara
University of Colorado
University of Hamburg, Germany
University of Hawaii Center for Island Climate Adaptation and Policy
University of Hawaii, Hilo
University of Idaho
University of Maryland, College Park
University of Montana
University of Nevada, Reno
University of North Carolina
University of Tuscia, Italy
University of Utah
University of Washington
Urban Tilth
U.S. Department of Agriculture - Agricultural Research Service
U.S. Department of Agriculture - Animal and Plant Health Inspection Service
U.S. Department of Health and Human Services - Federal Occupational Health
U.S. Department of the Interior - U.S. Geological Survey
U.S. Department of the Interior - Bureau of Land Management
U.S. Department of the Interior - National Park Service
Virginia Polytechnic Institute & State University
Washington State University
West Virginia University

Clients Who Provided Funding for Studies to PSW

Bat Conservation International
California Department of Forestry & Fire Protection
California Department of Parks & Recreation
California Energy Commission (CEC)
California Forestry Association
Carnegie Institute for Science
Colorado State University
Conservation Biology Institute
Denver Department of Parks & Recreation
Forest Research and Management Institute, Romania
Green Mountain College
Hawaii Department of Land & Resource
ICF Jones & Stokes
Lang, Railsback & Associates
Los Angeles Department of Water & Power
Montana State University
National Fish and Wildlife Foundation
New York Botanical Garden
Oregon Department of Forestry
Pacific Island Climate Change Cooperative
Sacramento Tree Foundation
San Francisco Public Utilities Commission
Sierra Nevada Public Lands Management Act
Stanford University
The Nature Conservancy
University of British Columbia, Canada
University of California, Davis
University of Maryland
University of Nevada, Reno
U.S. Department of Agriculture - Animal and Plant Health Inspection Service
U.S. Department of Agriculture - National Institute of Food and Agriculture
U.S. Department of Defense Strategic Environmental Research and Development Program (SERDP)
U.S. Department of the Interior - Bureau of Land Management
U.S. Department of the Interior - National Park Service
U.S. Department of the Interior - U.S. Fish & Wildlife Service
U.S. Department of the Interior - U.S. Geological Survey
U.S. Environmental Protection Agency
Wood Buffalo Environmental Association, Canada

Sherri Eng

Awards

Wings Across the Americas

C. John Ralph, a research wildlife biologist and team leader of the Wildlife Team, won the International Cooperation Award for his "Establishment of a Network of Bird Monitoring in Costa Rica" project.

Research wildlife biologist **Kathryn Purcell**, project leader **Jared Verner**, and statistician **Sylvia Mori** were selected for the Research and Management Partnership Award for their "Monitoring Bird Population Trends in California Oak Woodlands" project.

Benchmark Paper

Geologist **Leslie Reid's** paper, "Sediment production from forest road surfaces," was selected as one of 29 Benchmark Papers in Forest Hydrology to be featured in a new volume published by the International Association of Hydrological Sciences. Reid's paper, which she co-authored with University of Washington geology professor Thomas Dunne, evaluated the effect of traffic levels on sediment production from gravel-surfaced logging roads.

USDA Merit Award

Chris Fettig, a research entomologist and team leader of the Invasives and Threats Team, received a USDA Merit Award in recognition of his exceptional productivity and impact of his research on bark beetles.

Business Operations Deputy Chief's Award

The PSW Business Operations Design Team was awarded the Excellence in Business Operations Support Award for creating a more effective, efficient, and streamlined operations function that stands as a model for implementation throughout the Agency. The one-team approach created a reporting structure from Station headquarters to field locations to align the business processes with research programs. The critical element to success is a primary, unwavering focus on customer service in the areas of office services, workforce, procurement, engineering, facilities management, and budget tracking. Group members are **Christine Hansen**, **Rochelle Selvin**, **Christine Aldrete**, **Christine Nelson**, **Jacey Goddard**, **Pam Holton**, **Jean Hitz**, **Debbie Tarantino**, **Elnora Porter**, **Ella Whitfield**, **Rochelle Mullins**, **Warren Hanna**, **Joe F. Brown**, and **Chris Fettig**.

President's Call to Service Award

Armando González-Cabán, a research economist, received the prestigious President's Call to Service Award in 2011 for his extensive volunteer contributions to the Concilio for the Spanish Speaking at the Centro de Niños, a Riverside, California-based non-profit dedicated to providing childcare services and bilingual instruction to children of underserved and financially needy families in the area. González-Cabán held many positions on the organization's board of directors, including board member, secretary, treasurer, and three terms as board chair. During his tenure as board chairman, he directed the expansion of the Concilio from two to four centers and saw an increase of children served nearly triple from 45 to 120. He also helped launch a holiday food basket program, and food and toy drives.

Presidential Volunteer Service Award

Kathie Jermstad, a research biologist, earned the Presidential Volunteer Service Award for her contributions to the Adult Community Volunteer Program at Marshall Medical Center in Placerville, California.

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The Forest Service of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the national forests and national grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation. The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal equal opportunity provider and employer.

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