2010 Research Accomplishments

Pacific Southwest Research Station

USDA

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Pacific Southwest Research Station

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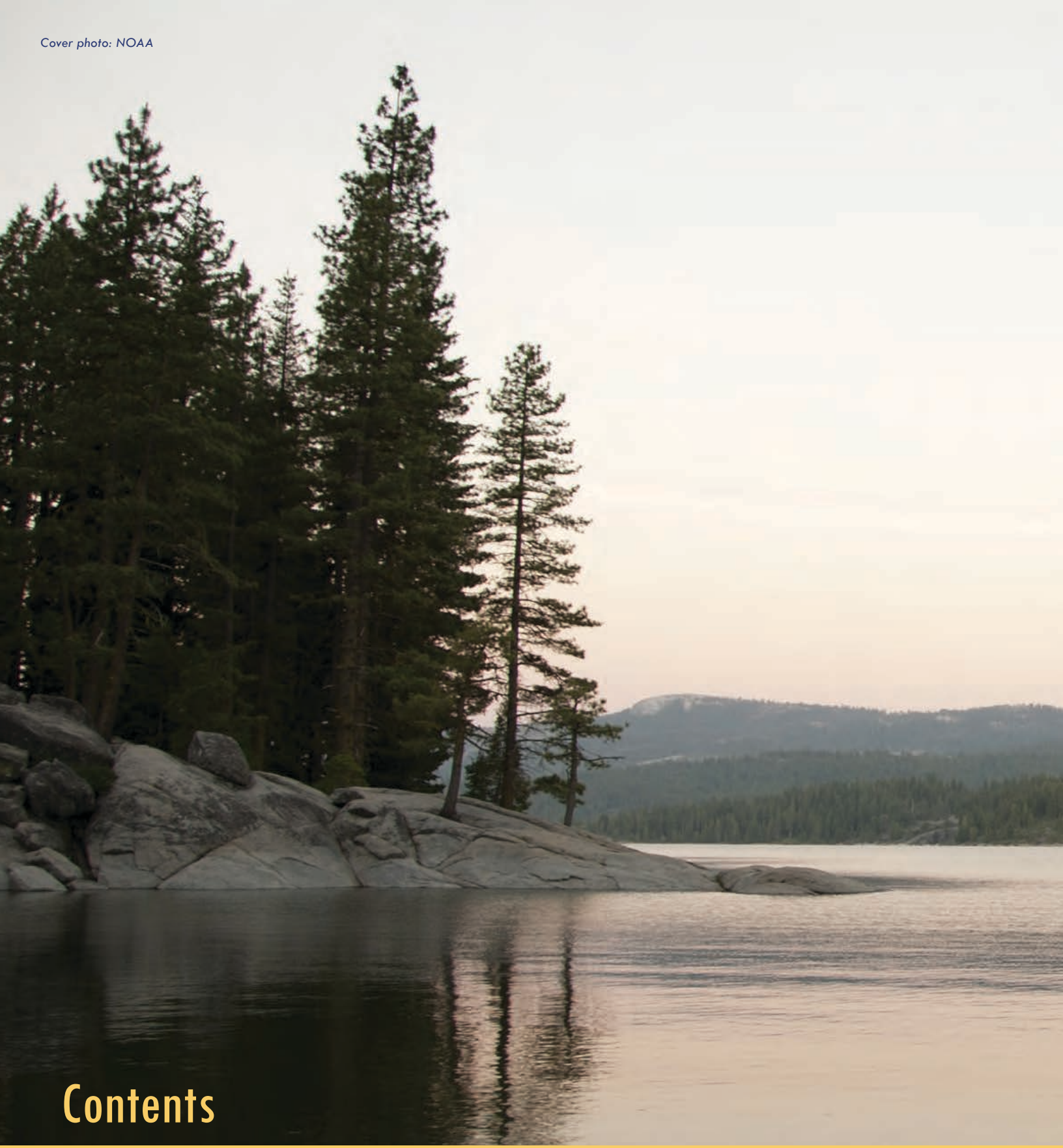

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Vision and Mission

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.

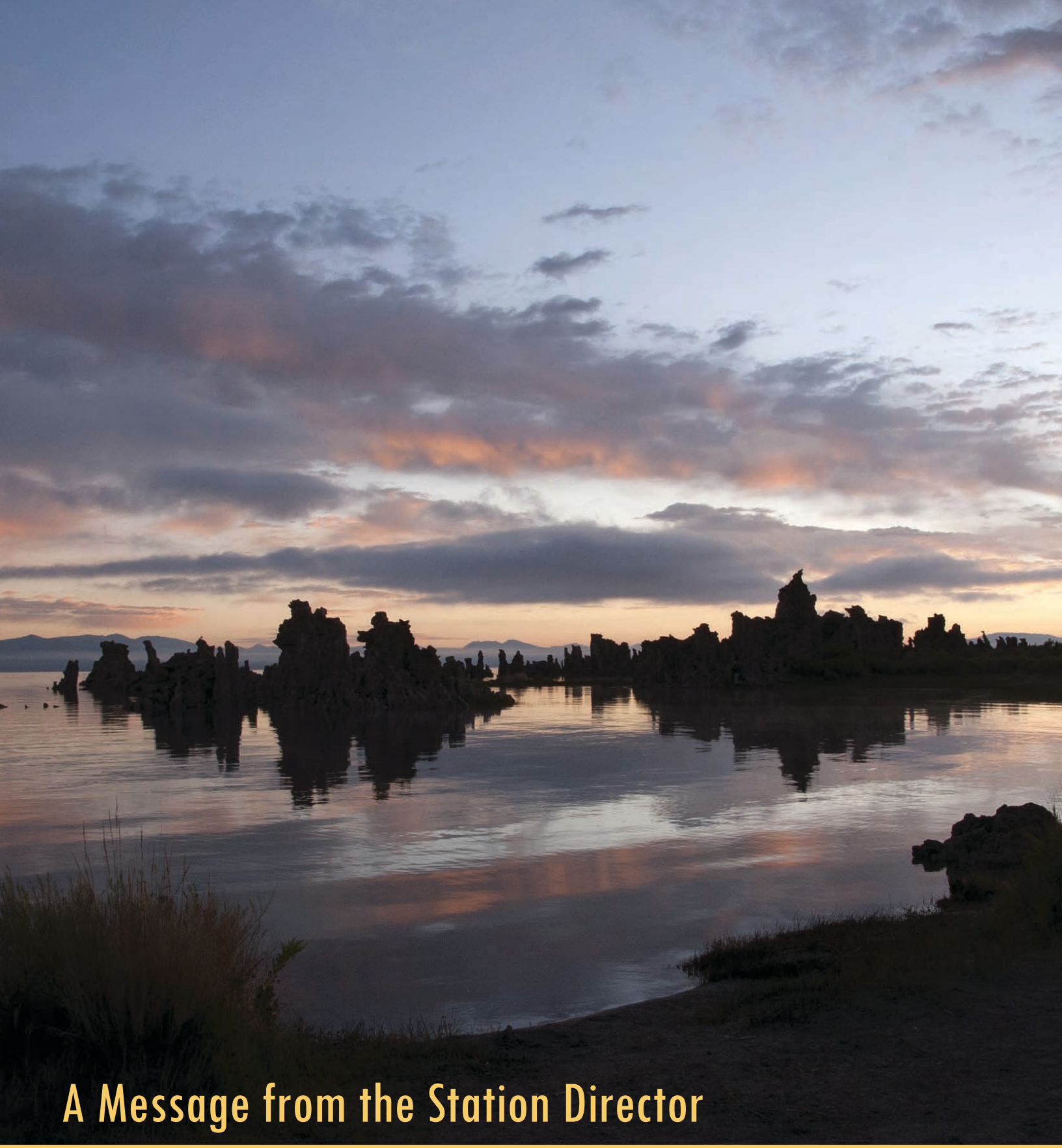
Our mission is to develop and communicate science needed to sustain forest ecosystems and their benefits to society.

About Us

The Pacific Southwest Research Station 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 highest elevations within the 48 contiguous States, and the wettest tropical forests. An abundant diversity of native plants and animals and nearly 50 percent 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.

Sherri Eng



A Message from the Station Director

Steve Dunsky

It is my distinct pleasure to present the Pacific Southwest Research Station's (PSW) 2010 Research Accomplishments. This report shares our key accomplishments and scientific advances and provides a glimpse at our successes and growing partnerships that contribute to our efforts. Our research and its findings are a critical element to the national dialogue on many diverse elements of the Forest Service's Strategic Plan, and we operate in full support of this agenda. Our discoveries and unbiased data assist a range of stakeholders making land management decisions regarding environmental stressors, land use change, wildland fire issues, recreation needs, invasive species, and other forest and enviromental health concerns. I am very proud of our scientific research and delivery over the years and am delighted to present this report.

During fiscal year 2010, we set the groundwork for a significant shift in how we are organized. We planned the transformation of PSW's focus from 11 research work units into four science-based program areas, setting the stage for a thematic-based organization. We also consolidated our business operations into a one-team model, eliminating redundancies and increasing efficiencies throughout PSW. We continue to strengthen the communications staff to better position them to support the research and development outcomes. These moves will facilitate greater science integration, maximize strategic alliances, and leverage Forest Service Research and Development resources.

The redesign allows us to effectively focus our research on the Forest Service Research and Development strategic programs and emerging research areas.

Strategic Program Areas

- Wildland Fire and Fuels
- Invasive Species
- Outdoor Recreation
- Resource Management and Use
- Water, Air, and Soil
- Wildlife and Fish
- Inventory and Monitoring

Emerging Research Areas

- Climate Change
- Biomass and Bioenergy
- Urban Natural Resources Stewardship
- Nanotechnology
- Water Management and Restoration

This report provides an overview of the Station, showcases our recent work and key research findings, and highlights the strong effort by our world-class scientists, dedicated technicians, and skilled support staff. Thank you for your interest in our work. Please feel free to contact me with comments or suggestions.

Deanna J. Stouder
Director, Pacific Southwest Research Station

Pacific Southwest Research Station Overview

In FY10, PSW completed planning an organizational restructuring, to move from 11 research work units to four science-based program areas conducting research at eight labs and facilities in California and Hawai´i. The Station also reorganized its Business Operations and Communications functions. The redesigned model will improve the Station's ability to integrate science across disciplines and locations, more effectively address complex large-scale issues, and align operational processes and procedures for its delivery of science.

Four Science Programs

1) Conservation of Biodiversity

Protection, conservation, and preservation of wildlife, fish, and rare plants; genetic research to understand how plants and animals adapt to changing environmental conditions; and invasive species and sudden oak death research.

2) Ecosystem Function and Health

Forest function and research protect water, air, and soil resources considering the interactive effects of climate change, unpredictable precipitation, air pollution, and the growing threats to ecosystems from pests and pathogens.

3) Fire and Fuels

Fire behavior, forecasting and evaluation research; understanding ecosystem effects of fire; development of fire management strategies; and science to understand the effects of fuel management strategies on fire.

4) Urban Ecosystems and Social Dynamics

Knowledge and tools in natural resource management to better serve the public and open space to connect urban dwellers with public lands through urban forestry and social science research.

Business Operations

PSW reorganized its Business Operations to ensure that the right person is in the right place to effectively and efficiently support the Station's business processes and functions. The new organization provides:

- Common levels of support;
- Improved workforce depth;
- Targeted business-operations communication;
- Timely and accurate service; and
- Active employee development planning.

Communications

PSW restructured its Communications Group to better meet the needs of the Station's scientists by ensuring the timely, efficient, and effective delivery of special science products that communicate PSW science findings to technical and non-technical audiences. The Communications Group synthesizes and proactively distributes PSW science products and knowledge through diverse venues and ensures solid media contacts and a strong web presence.

PSW Laboratory Locations

Arcata	Albany
Redding	Fresno
Placerville	Riverside
Davis	Hilo

PSW Experimental Forests and Ranges

1. Redwood
2. Blacks Mountain
3. Swain Mountain
4. Caspar Creek
5. Challenge
6. Sagehen
7. Onion Creek
8. Stanislaus-Tuolumne
9. San Joaquin
10. Teakettle
11. San Dimas
12. North Mountain
13. Hawaii Experimental Tropical Forest

- 8 laboratories in California and Hawai´i
- 13 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 5 research stations in the U.S. Department of Agriculture, Forest Service
- Headquarters in Albany, California

Experimental Forests and Ranges

One of the greatest assets that the USDA Forest Service manages is its national network of 81 Experimental Forests and Ranges. Thirteen of these Experimental Forests and Ranges are located in California and Hawai´i. Pacific Southwest Research Station (PSW) Experimental Forests and Ranges have a long legacy of significant research ranging from the establishment of two of the newest Experimental Forests in the United States (Hawai´i Tropical and Sagehen) to research on other PSW Experimental Forests dating back to the 1930s. Long-term experiments and datasets collected and maintained in close partnerships with the states and with universities make the system of Experimental Forests and Ranges unique.

PSW's Experimental Forest and Range system includes ecotones sensitive to such natural and anthropogenic factors as climate change and diminished air quality. With a long history of data collection and replicated experiments, they also constitute the nation's western-most extension of long-term manipulative studies that can address matters of concern to the United States and the world. Because of these assets, several of our installations are core sites of the National Ecological Observatory Network, a continental-scale research platform for discovering and understanding the impacts of climate change, land-use change, and invasive species on ecosystems.

Experimental Forests and Ranges were originally created to represent the major forest types of the United States so that they could serve as "outdoor classrooms" for land managers to learn how to better manage their forests. These important functions—research, education, and demonstration—continue to this day.

Hawai´i Experimental Tropical Forest

PSW Experimental Forest Locations

- Blacks Mountain
- Caspar Creek
- Challenge
- Hawai'i
- North Mountain
- Onion Creek
- Redwood
- Sagehen
- San Dimas
- San Joaquin
- Stanislaus-Tuolumne
- Swain Mountain
- Teakettle

Interdisciplinary Strategies:

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

Four strategic plans outline the Pacific Southwest Research Station's 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 foundational programs and are coordinated with the National Forests, the Forest Service Pacific Southwest Region, other Research Stations, universities, other government organizations. The plans focus on natural resources in California, Hawai´i and the U.S.- affiliated Pacific Islands.

Climate Change

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.

Urban Natural Resources Stewardship

More than 80 percent of the U.S. population lives in urban areas, cities and suburbs, with an increasingly large proportion of new construction occurring in the urban-wildland interface. Urban dwellers are inextricably linked with natural environments and their urban ecosystems. The concept of "urban natural resources stewardship" links environmental health with community health and well-being. FS R&D plays a significant role in the development of science and technology transfer for the proper care of natural resources and the advancement of ecosystem services in urban landscapes. Scientific tools developed by

George Gonzalez

PSW and its partners 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.

Water

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 provides the necessary research upon which to base 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, especially 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.

Amy Lind

Joey Chong

Wildland Fire

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 at regional, as well as global scales; assist individuals and communities to recognize their options and accept their responsibilities with regards to fire safety when living in fire-affected ecosystems; and provide fire managers with state-of-the-art science-based knowledge and decision support tools.

Conservation of Biodiversity Program

Biological diversity, defined simply as the dynamic variety of life and its processes, is threatened globally as a result of a myriad of natural disturbances and human stressors. The Conservation of Biodiversity Program conducts research on genes, species, populations, communities, and the processes necessary to conserve and restore biodiversity and functioning ecosystems. Biodiversity is important because it is essential to the long-term sustainability of native ecosystems and the services they provide.

About the Program

Containing a vast diversity of ecosystems and high levels of endemism (species found nowhere else in the world), California, Hawai´i and the U.S.-affiliated Pacific Islands comprise of the most biologically diverse environments on Earth.

In California, National Forest System lands occupy 20 percent of the land base, represent all major forest ecosystem types, and support the majority of terrestrial and freshwater biodiversity in the state. As the most isolated archipelago on Earth, 90 percent of Hawai´i's 10,000 native species are endemic. Within this geographic area reside thousands of oceanic islands, elevational clines from coastal to alpine ecosystems in temperate and tropical ecosystems, some of the tallest mountains in the world, the oldest trees in the world, and a broad diversity of governments and cultures.

Ecologists and land managers recognize that the conservation of biological diversity is vitally important to the long-term sustainability of nature, culture and economies. Through the Conservation of Biodiversity Program, the Pacific Southwest Research Station will conduct research to enhance the conservation of species and habitats, and the restoration and maintenance of degraded ecosystems.

Conservation of Biodiversity research focuses on four 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.

Katie Moriarty

Pictured: Humboldt marten (*Martes americana humboldtensis*).

2010 Research Highlights

Restoration of endangered tropical forest ecosystems using a "hybrid" community approach

Invasive plant species have become so pervasive in the endangered lowland tropical forests of Hawai'i that it is not cost-effective or practical to eradicate them. Our scientists are studying how to stabilize and restore native ecosystems through hybrid communities of native and non-invasive exotic species.

Climate change may substantially change hydrology and aquatic biota in tropical stream ecosystems

Our scientists are studying variation in hydrology and aquatic species along a precipitation gradient in Hawai'i to learn how species are likely to respond to predicted declines in precipitation from climate change.

Old habits die hard: Sierra Nevada yellow-legged frog's faithful habits lead to decline

Our scientists have found that the Sierra Nevada yellow-legged frog, recently designated as a candidate endangered species, consistently returns to previously occupied habitats despite their condition—good or bad. The species has disappeared from 90 percent of its historic localities.

Ryan Peek

Pictured: Foothill Yellow-legged frog (*Rana boylii*).

Threading the needle: Reducing fire risk while maintaining habitat needs of old-forest associates

Management of fire-suppressed forests brings the challenge of risk of loss from fire and loss of habitat for dependent species. Our scientists are studying the habitat requirements of the fisher, a species restricted to the southern Sierra Nevada, to help guide management practices that will promote forest health and biodiversity.

Evidence of Sierra Nevada subspecies of the great gray owl

Our scientists and colleagues studied the genetic diversity of the great gray owl (*Strix nebulosa*) in western North America and found that the isolated Sierra Nevada population is genetically distinct.

Historic Critchfield Memorial Herbarium goes digital: Believed to be the largest collection of pine specimens in the world

The USDA Forest Service's Pacific Southwest Research Station, Institute of Forest Genetics, Placerville, CA, has released the online version of its historic Critchfield Memorial Herbarium. The website includes collection information, as well as a photograph of each specimen. With over 4,000 specimens, it is believed to be the largest collection of pines in the world.

Awards

Dr. Tracy Johnson received the 2010 NFS Invasive Species Program Award for his outstanding leadership in developing an invertebrate biocontrol agent to control strawberry guava, an invasive plant.

Sherri Eng

Whitebark pine seedlings sprout in the greenhouse at the Pacific Southwest Research Station's Institute of Forest Genetics in Placerville, CA. They are used to test for resistance to white pine blister rust, an invasive fungal pathogen that threatens survival of high-elevation white pines throughout California.

Selected Publications

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Ecosystem Function and Health Program

Native forests, including upland forests, forested riparian areas, wetlands, and alpine and tropical ecosystems, provide critical goods and ecosystem services to local communities and society, such as clean water, atmospheric carbon sequestration, recreation, and aesthetic beauty. The health and function of forests, watersheds, and landscapes are threatened by changing climate, past management practices, air quality, invasive species, human pressures, and changing land use.

About the Program

Research at the Pacific Southwest Research Station (PSW) addresses these critical issues in California, Hawai´i, and the U.S.-affiliated Pacific islands. PSW's Ecosystem Function and Health Program provides scientific information and science applications to natural resource managers, policymakers, and the public to protect water, air and soil resources and to benefit human health and welfare. The research is especially important because impacts, due to changes in temperatures and precipitation, invasive species, air pollution, forest pests and pathogens, and their cumulative effects, must be fully understood to inform management decisions. The roles of the nation's forests in storing and sequestering carbon may be very important in combating the threats due to climate change.

Andrzej Bytnerowicz

Ecosystem Function and Health research focuses on four 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.

2010 Research Highlights

Invasive species prevention, management and mitigation

Entomologists and plant pathologists are developing management strategies and treatments for recently introduced pests, including goldspotted oak borer, thousand cankers on walnut, and sudden oak death. New detection methods and the understanding of spread rates, impacts and distribution combined with education and outreach for federal, state and other partners is allowing rapid response to these destructive invasive species.

Dr. Runzhi Zhang

High-resolution forest biomass mapping in Hawai´i

Researchers have developed and tested an integrated mapping approach, a tool that could support measurement of forest carbon, which supports high-resolution biomass monitoring of tropical forest regions. By combining free-satellite monitoring technology with aircraft-based Light Detection And Ranging (LiDAR) mapping, research demonstrates that high-resolution forest carbon monitoring can be cost effective. The approach makes possible accurate, rapid biomass mapping across a wide diversity of environmental and forest conditions.

Adaptation tools developed to address environmental adaptation and mitigation

Western resource managers urgently need conceptual frameworks and management strategies to address changes in the environment. In a collaborative effort, our scientists developed a guidebook and set of strategic, tactical, and reference tools to assist managers as they incorporate climate change considerations in management and planning. Information is available at: http://www.fs.fed.us/ccrc/.

Development of critical loads and critical load exceedance maps for protecting California ecosystems from atmospheric nitrogen deposition

More than 50,000 km^2 of the land area in California receive atmospheric deposition inputs of at least 10 kg N/ha/yr. Many ecosystems are negatively affected by these elevated N inputs. The purpose of this research was to develop critical loads (CLs) as a management tool for reducing the impacts of chronic N deposition. In this work, CLs for nitrogen (N) deposition were developed for seven major vegetation types in California.

Research determines carbon costs and benefits of fuels treatments

In the western United States, nearly a century of fire suppression has increased tree densities and fuel accumulations. Fuel treatments are being widely implemented to reduce this risk and restore forests to a more open, fire-resistant structure. These treatments carry a near-term carbon cost because standing tree biomass is reduced to lower the risk of future high-severity fire and its large carbon emission. Our scientists found that carbon stocks were reduced and emissions increased with increasing thinning intensity. Given the measured

2010 Research Highlights (cont.)

growth-rates, they estimated that the understory thin and burn treatments will re-sequester all of the carbon removed and emitted during treatment in as few as 15 years after treatment, whereas overstory thin treatments will continue to have net negative carbon balance for many more years because of the removal of many large trees.

Selected Publications

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Inman-Narahari, F.; Giardina, C.; Ostertag, R.; Cordell, S.; Sack, L. 2010. Digital data collection in forest dynamics plots. Methods in Ecology and Evolution 1(3): 274-279.

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Preisler, H.K.; Zhong, S.; Esperanza, A.; Brown, T.J.; Bytnerowicz, A.; Tarnay, L. 2010. Estimating contribution of wildland fires to ambient ozone levels in National Parks in the Sierra Nevada, California. Environmental Pollution 158(3): 778-787.

Scowcroft, P.G.; Friday, J.B.; Haraguchi, J.; Idol, T.; Dudley, N.S. 2010. Poor stem form as a potential limitation to private investment in koa plantation forestry in Hawai'i. Small-scale Forestry 9: 243-262.

Fire and Fuels Program

With densely stocked forests often untreated and more people living and recreating in forested areas, large portions of the California and the Pacific Islands are at risk for catastrophic fires. Managing fire and the vegetation conditions that fuel it is an ongoing challenge for our society. Innovative and high quality science plays a pivotal role in guiding crucial management decisions to prevent fires and protect people and natural resources.

About the Program

Fire is a driving ecological force that influences the structure, function, and composition of the vegetation and habitat in many ecosystems in California, Hawai´i, and the U.S.-affiliated Pacific islands. The Fire and Fuels Program increases our understanding about how fire behavior affects fuels and conditions and how physical properties of fuels influence fire severity and intensity.

These fire characteristics consequently foster our understanding of ecological responses to fire and its effects on the natural and human environment. The Program's mission is to conduct research and present scientific findings that will help land managers make informed decisions about how to best protect people, property and ecosystems from wildland fires.

Research includes decision-support models that analyze risk, resource allocation economics, and fire danger forecasting. We conduct real-time remote sensing of large fires to support operations and provide data for model validation. Following fires, our research helps analyze post-fire rehabilitation practices and their effectiveness. On the ground, researchers study how different silvicultural treatments reduce fuels loading and restore the landscapes to more resilient conditions that help managers achieve short- and long-term ecological and social goals.

Fires and Fuels research focuses on five areas:

- Fire and weather. Improve fire and fuel measurement and modeling, to better predict wildland fire and weather phenomena in complex landscapes and fuels;
- Fire's ecological effects. Improve our ability to describe and predict the ecological effects of fire and fire suppression on landscapes throughout California, Hawai´i, and the Pacific Islands;
- Fire management. Improve our ability to predict the short- and long-term outcomes of fuels, fire and post-fire prescriptive management strategies;
- Interactions. Improve our knowledge of and ability to quantify the interactions between climate, vegetation, and fire in the face of climate change and improve our ability to predict these interactions in order to manage forests and wildlands more effectively; and
- Managing uncertainty and risk. Improve our ability to describe and quantify uncertainty and risk in a science-based decision-making framework for fire and land management planning.

2010 Research Highlights

Assistance in the aftermath of the Station Fire, Angeles National Forest

The 2009 Station Fire was the largest fire in Los Angeles County's history, burning more than 161,000 acres—25 percent—of the Angeles National Forest. Researchers characterized fire behavior for the "Station Fire Initial Attack Review" conducted for the USDA FS, Fire and Aviation Management, Washington Office. Our scientists are also providing guidance on resource damage assessment and possible mitigation measures to protect threatened and endangered species, and improving models that predict amounts of streamflow and sediment production following fire.

Joey Chong

High resolution weather models elucidate fire behavior and risk in Hawai´i

PSW Research Station and collaborators in Hawai´i and California have developed high resolution weather forecasts for Hawai´i that provide weather information at a much finer scale than is done on the Mainland. This high-resolution weather data has been used to estimate fire risk in U.S. Department of Defense training areas, estimate fire danger statewide in the Hawai´i Fire Danger Rating System, and determine the effects of islands on winds.

Safety of fuels reduction treatments demonstrated

Our scientists, funded through the Southern Nevada Public Lands Management Act (SNPLMA) Science Program, found that burning hand-built slash piles results in minimal impacts to surface water and soil quality in riparian areas. These findings are encouraging regulatory agencies in the Tahoe Basin to relax restrictions on this forest fuel treatment, which will help the Forest Service and other land managers to reduce dangerously high fuel loads more cost-effectively while safeguarding Lake Tahoe.

Selected Publications

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Urban Ecosystems and Social Dynamics Program

Natural resources are managed by and for people; their social dimensions are inescapable. In order to maintain forests, sustain functioning ecosystems in urban and wildland areas, enhance and protect quality of life, and ensure benefits to society, the Pacific Southwest Research Station (PSW) provides an interdisciplinary research program that examines urban ecosystems and social dynamics of natural resources conservation, management, and restoration.

About the Program

The Urban Ecosystems and Social Dynamics Program integrates and examines how people affect and impact natural resources. The program is especially important for California, Hawai´i, and U.S.-affiliated Pacific Islands characterized by tremendous cultural diversity, large urban centers, complex natural resources issues, and biologically diverse landscapes.

The research explores many relationships and interdependencies between society and ecosystems that are constantly evolving in the wake of societal and environmental change. Providing insight to help natural resource managers make decisions, the research enhances the delivery of ecosystem services to growing urban populations and promotes high-quality outdoor experiences.

Our scientists assess the economic and non-economic benefits that urban forests provide to communities, linking research on environmental stressors, water, fire and fuels, and especially urban-natural resources stewardship. We work collaboratively, across disciplines and organizational levels to tackle questions about how best to manage urban-based resources and services.

Urban Ecosystems and Social Dynamics Program research focuses on three areas:

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

George Gonzales

Mature trees along this Los Angeles street provide valuable ecosystem services.

2010 Research Highlights

Trees pay us back. What is the true value of a tree?

The value of urban forests to provide ecosystem services, increase community attractiveness and livability, and foster civic pride has been estimated for 16 climate zones across the U.S., available as online brochures. The simple act of planting trees provides opportunities to connect residents with nature and with each other. Neighborhood tree plantings and stewardship projects stimulate investment by local citizens, business, and government in the betterment of their communities.

Park management frameworks are being adapted to assist other countries

A PSW social scientist is assisting Taiwan with developing management frameworks for parks and forest reserves that facilitates appropriate visitor use and sustains natural and cultural resources. Local cultural differences and community-based governance is stressed to protect and utilize resources of local and global significance.

Geographic and risk analysis tools used to optimally plan firefighting strategic and tactical operations

Tools are being developed to enable managers to evaluate risk, and reposition their fire suppression forces based on the probability of fire occurrence. These tools also incorporate economic and ecological values. This improves fire management decision making, thereby improving firefighter and public safety, and ensuring wise use of federal, state and local resources.

Effective treatments for eradication of sudden oak death pathogen (*Phytophthora ramorum*) in nursery soils

Researchers at the University of California, Davis, funded via a grant from PSW's competitive Sudden Oak Death Research Program, determined that several registered fumigants and heat treatments are effective for the eradication of the sudden oak death pathogen in nursery soils.

Multiple studies improve understanding, measurement, and transfer of knowledge of recreation, quality of life, and health

Our scientists contributed to an increased understanding of the link between recreation, quality of life, and health. They explored visitor constraints to physical activity in park and recreation areas, with a focus on underserved communities. Implications for visitor health were derived from this work.

Selected Publications

Baerenklau, K.A.; González-Cabán, A.; Paez, C.; Chavez, E. 2009. Spatial allocation of forest recreation value. Journal of Forest Economics 16(2): 113-126.

Frankel, S.J.; Kliejunas, J.T.; Palmieri, K.M., tech. coords. 2010. Proceedings of the Sudden Oak Death Fourth Science Symposium. Gen. Tech. Rep. PSW-GTR-229. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 378 pp.

Kyle, G.T.; Theodori, G.L.; Absher, J.D.; Jun, J. 2010. The influence of home and community attachment on firewise behavior. Society and Natural Resources 23: 1-18.

McPherson, E. G. 2010. Selecting Reference Cities for i-Tree Streets. Arboriculture & Urban Forestry 36(5): 230-240.

PSW Research Station at a Glance

In 2010:

- the PSW web site, www.fs.fed.us/psw, was visited by 69,281 people for a total of 104,556 visits. Pages were viewed in 187 countries or territories.
- over $4.8 million was awarded to PSW scientists and the station issued over $6.9 million in grants and agreements to partner organizations.
- PSW scientists produced over 230 publications in peer-reviewed outlets.

Sherri Eng

Ricardo Hernandez, a bioscience lab technician at the National Forest Genetics Laboratory at PSW's Institute for Forest Genetics in Placerville, explains to visitors the effects of liquid nitrogen on various objects.

Research Partners

PSW depends on its many partners and collaborators to develop and deliver cutting-edge, practical science to the public. The Station would like to thank the following organizations for their support and cooperation:

Bat Conservation International
Bedoukian Research, Inc.
Brigham Young University
California Conservation Corps
California Dept. of Fish and Game
California Dept. of Forestry and Fire Protection
California Energy Commission
California Native Plant Society
California Polytechnic State University, San Luis Obispo
California State Parks
California State University, Fresno
California State University, Humboldt
California Tahoe Conservancy
Cambridge University
Caribbean Conservation Corps
Carnegie Institute, Museum of Natural History
CH2M Hill
City of Arcata Parks Division
City of Eureka Parks and Recreation
Claremont Graduate University
Clemson University
Colorado State University
Conservation Biology Institute
Department of Land and Natural Resources – Hawai´i
Desert Research Institute
DeVine Consulting, Inc.
EcoLayers, Inc.
EcoStats, LLC
El Dorado County, Department of Transportation
Federal Biological Research Center for Agriculture, Germany
Federal Occupational Health
Forest Research Agency, UK
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Hawai'i Department of Agriculture
Integral Ecology Research Center
Integrated Environmental Restoration Services, Inc.
J. J. Mauget Company
Joint Fire Science Program
Jones and Stokes
Lang, Railsback and Associates
LandCare Research
Malama O Puna
Montana State University
National Park Service
New York Botanical Garden
NPS – Hawai´i Volcano National Parks
Oregon State University
Pandion Systems, Inc
Phytosphere Research
Point Reyes Bird Observatory Conservation Science
Portland State University
Riverside – Corona Resource Conservation District
San Bernardino Valley Water Conservation District
San Francisco Public Utilities Commission
Scripps Institute of Oceanography, University of California, San Diego
Student Conservation Association
Syngenta Crop Protection
Tahoe Institute for Natural Science
The Nature Conservancy
Three Sisters Farm
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University of Arizona
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University of California, Riverside
University of California, Santa Barbara
University of California, Cooperative Extension, Davis
University of California, Cooperative Extension, Berkeley
University of California, Cooperative Extension, Humboldt and Del Norte County
University of California, Cooperative Extension, Marin County
University of Hamburg
University of Hawai´i
University of Idaho
University of Montana
University of Nevada, Reno
University of North Carolina, Charlotte
University of Puerto Rico
University of Tuscia, Italy
Urban Tilth
U.S. Army
USDA Animal and Plant Health Inspection Service
USDA Agricultural Research Service
USDA National Institute for Food and Agriculture
U.S. Department of Commerce, National Oceanic and Atmospheric Association
U.S. Department of Defense – Strategic Environmental Research and Development Program
USDI Bureau of Land Management
USDI Geological Survey
USDI National Park Service
U.S. Fish and Wildlife Service
Washington State University
Watershed Professionals Network, LLC
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Andrey Shcherbina

The Pacific Southwest Research Station is one of seven regional units that make up the USDA Forest Service Research and Development organization—the most extensive natural resources research organization in the world. We maintain eight field laboratories in California and Hawai'i. The Station also conducts research on 13 experimental forests and ranges. We employ a diverse workforce of approximately 159 full-time employees, of which 43 are research scientists.

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