

Western Wildland Threats

Western Wildland Environmental Threat Assessment Center – Fall Update 2010

Western Wildland Threats is an update containing the latest information concerning the Western Wildland Environmental Threat Assessment Center's ongoing research, projects, and partnerships. With this update, we hope to inform a broad and diverse group of land managers and policymakers about current WWETAC staff, activities, and products.

About WWETAC

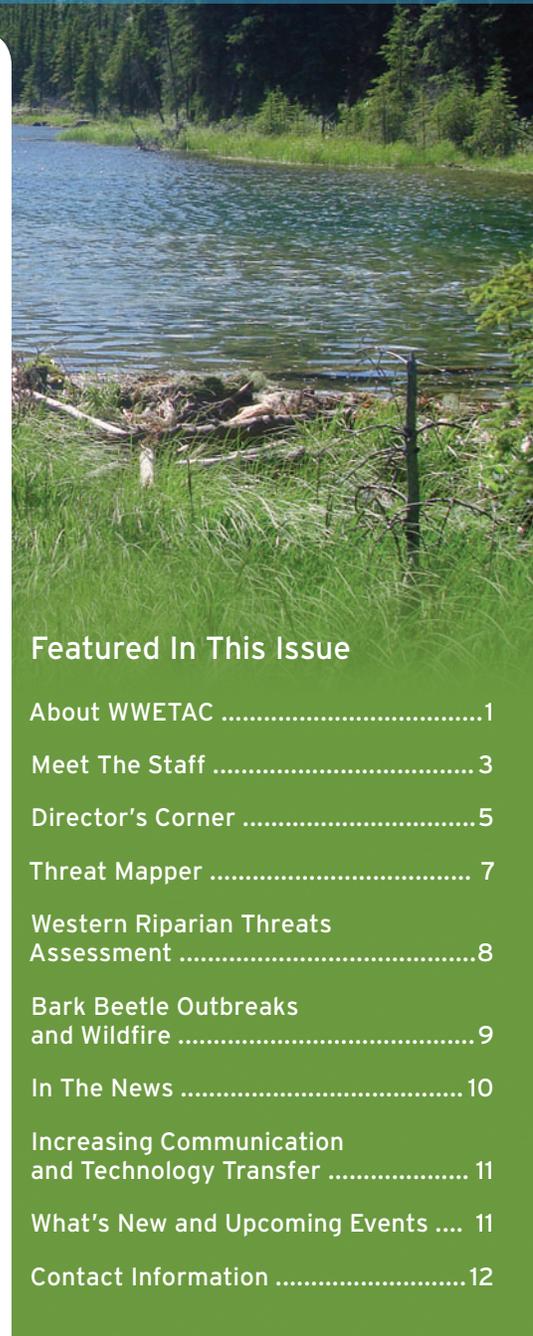
Western wildlands are subjected to disturbances such as fire, insect infestation, disease, invasive species, drought, and development. These stresses, alone or in combination, can significantly affect ecological and socioeconomic values and desired management outcomes. Wildland managers need state-of-the-art information and tools to help them anticipate and address a variety of land management issues and challenges.

What We Do

The Western Wildland Environmental Threat Assessment Center staff and funded external partners develop and distribute information about forest threats. These threats include fire, invasive plants, potential insect outbreaks, the appearance of invasive insects, the appearance of new pathogens (such as *Phytophthora ramorum*, the cause of sudden oak death), and climate change. WWETAC, a unit within the Pacific Northwest Research Station (PNW), is located in Prineville, Oregon, co-located with the headquarters of the Ochoco National Forest. A similar center in Asheville, North Carolina, the Eastern Forests Environmental Threat Assessment Center (EFETAC), addresses environmental threats in the Eastern United States.

The mission of the center is to generate and integrate knowledge and information to provide credible prediction, early detection, and quantitative assessment of environmental threats in the Western United States. The goal of WWETAC is to inform policy and support the management of environmental threats to western wildlands. The specific goals and objectives of WWETAC include:

- Evaluating the effects and consequences of multiple, interacting stresses on western wildland health.
- Increasing knowledge of the risks, uncertainties, and benefits of multiple environmental stresses on western ecological conditions and socioeconomic values.
- Providing science-based decision-support tools for policy formulation and land management in the Western United States.
- Providing land managers with credible predictions of potential severe disturbances in the West with sufficient warning for managers to take preventive actions.
- Reducing the likelihood of severe disturbances through better informed management strategies.



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USDA Forest Service



Pacific Northwest Research Station



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Focus Areas

WWETAC's work centers around the following focus areas.

UNDERSTANDING AND MANAGING WILDLAND THREATS

Wildlands of the Western United States are vulnerable to existing and newly emerging environmental threats (fire, insect and disease outbreaks, invasive species, and climate change), land-use change, and other stresses associated with human activities and land management. The West's natural resource assets can be sustainably managed in an effective manner by improved understanding and anticipation of environmental threats that impact natural resources. Work in this area includes a broad range of projects largely focused on both understanding and managing individual threat processes.

THREAT INTERACTIONS

Multiple interacting disturbances affect the structure and function of wildland ecosystems throughout the western United States. Although some disturbance processes and environmental change are integral to the function and evolution of ecosystems, their effects are often socioeconomically undesirable and perceived as threats to society at large. Furthermore, some disturbance regimes are being significantly modified through interactions with other threats such as climate change. Work in this area includes developing a suite of coordinated research to address an array of multiple threats.

Visit us at <http://www.fs.fed.us/wwetac/>

WILDFIRE RISK FRAMEWORK AND TOOLS

Federal land management agencies have been slow to adopt risk-based approaches to help analyze the potential resource impacts from wildfire and fuel treatments. This has been largely because the modeling tools and framework for wildfire risk analyses have heretofore been lacking. Work in this area includes developing a risk analysis framework and tools to employ risk analyses in land management planning, prioritization, project planning, and national assessments. The WWETAC Threat Mapper is a tool that can be useful in such analyses.

THREAT PROJECTIONS AND MAPPING

In the past, it has been difficult to find geographically comprehensive and spatially explicit data (i.e., maps) to inform national, strategic-level decisionmaking. Today, a lack of data is usually not the problem, but rather decisionmakers are faced with the daunting task of locating, analyzing and visualizing the many data types and themes in a comprehensive manner. Systems are needed in which forest and rangeland policymakers and managers, as well as scientists, can access maps or other forms of projections of vulnerabilities, threats, and risks to forests and rangelands from multiple competing or exacerbating stresses. These include fire, invasive species, disease, pest outbreaks, climate change, fragmentation, and land-use change. Work in this area includes developing a virtual globe viewer for interactively mapping the spatial co-occurrence of various environmental threats and values.

Our Partners

WWETAC is jointly funded by three branches of the Forest Service: the National Forest System, State and Private Forestry, and Research and Development. The center is administered through the Pacific Northwest Research Station.

Who Benefits:

- Federal, state, tribal, and private land managers
- Policymakers
- Landowners
- Communities
- Watershed and urban planning professionals

U.S. Forest Service search WWETAC

WWETAC
Western Wildland
Environmental Threat
Assessment Center

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I want to...

- Learn more about WWETAC
- Read featured publications
- Who we are
- See maps of my area
- Get current wildfire info
- See Insect & Disease Map

Information Resources

- TreeSearch
- Forest Encyclopedia

Research Stations

- Eastern Threat Center
- Pacific Southwest
- Pacific Northwest
- Rocky Mountain

Detection and Analysis of Emerging Wildland Threats

The mission of the Western Wildland Environmental Threat Assessment Center is to generate and integrate knowledge and information to provide credible prediction, early detection, and quantitative assessment of environmental threats in the western United States.

Our goals include

- Reducing the likelihood of severe disturbances through better informed management strategies
- Evaluating the effects and consequences of multiple interacting stresses on western wildland health
- Increasing knowledge and understanding of the risks, uncertainties, and/or benefits of multiple environmental stresses on western ecological conditions and socioeconomic values
- Providing science-based decision support tools for policy formulation and land management in the western United States
- Providing land managers with credible predictions of potential severe disturbances in the West with sufficient warning to take preventative actions

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CLIMATE CHANGE RESOURCE CENTER

Threats

- Invasive Species
- Wildfire
- Insects & Pathogens
- Climate Change
- Land Use Change
- Threat Interactions

What's New

Integrating Climate Change with Forest Vegetation Models Webinar - August 4, 2010

Nancy Grulke named new Director of Western Wildland Environmental Threat Assessment Center

Meet the Staff

Nancy Grulke

Nancy Grulke is the new incoming Director of WWETAC; she comes to the position from the Pacific Southwest Research Station. Nancy has worked in a variety of capacities for state and federal governments, universities, nonprofits, and in the private sector. She was a science coordinator for the Pacific Northwest and Pacific Southwest Research Stations' Climate Change Program in Corvallis, Oregon; worked at Montana State University; and was adjunct faculty at the University of Alaska Fairbanks and Oregon State University. She also worked as a consultant in Washington state on a variety of projects and for The Nature Conservancy in the eastern Montana grasslands. Over the years, Nancy has worked on a number of environmental threats across the Western United States, with a focus on national forests. She received her undergraduate degree in ecology at Duke University and a Ph.D. in botany from the University of Washington.



Charles "Terry" Shaw

Charles G. "Terry" Shaw is Chief Scientist at WWETAC. Previously, Terry was the national program lead for forest pathology research in the Forest Service Washington office. Terry has had a long career as a scientist and project manager in Alaska and Colorado and has served in many capacities, including the science review team leader for the Tongass National Forest plan. Terry's field of expertise includes research in the areas of Armillaria root disease, dwarf



mistletoes, and forest pest modeling/risk assessment. Terry graduated from Oregon State University in 1974 with a Ph.D. in plant pathology and spent time with the research sector of the New Zealand Forest Service.

Alan A. Ager

Alan Ager is an operations research analyst. He has worked on a wide range of research and management projects since starting with the Forest Service in 1987. His current interests include stress detection in forest trees, spatial modeling of wildfire, risk analysis, and a variety of operations research problems related to forest management. Alan received a



Ph.D. in forest genetics at the University of Washington, an M.S. in plant genetics at the University of Wisconsin-Madison, and a B.S. in forest science and forest management from the University of Washington.

Judy Haigler

Judy Haigler is the program assistant for WWETAC. Judy has 23 years of experience working with the Forest Service in numerous administrative positions. Judy's duties at WWETAC include financial management, procurement, grants and agreements, contracting, and other technical and administrative tasks. She received a Business



Management Certificate in 1972 from Lane Community College in Eugene, Oregon, and continued with administrative work throughout her career.

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Jeffrey Hicke

Jeff Hicke is a visiting scientist at WWETAC and an assistant professor of geography and environmental science at the University of Idaho (UI). He studies global environmental change issues across a range of spatial and temporal scales. In particular, Jeff's research addresses the interaction of climate, forests, and disturbances such as wildfire and insect outbreaks. Jeff received his Ph.D. from the University of Colorado at Boulder and held a

research scientist position at the Natural Resource Ecology Laboratory at Colorado State University before coming to UI in August 2006.



Michelle Buonopane

Michelle Buonopane works as a biological science technician specializing in botany for the PNW Research Station. Michelle works for WWETAC helping with database management, statistical analysis, geographic information system (GIS) support, field logistics, and botanical expertise. She has also worked as a botanist with The Nature Conservancy, the Bureau of Land Management, Oregon State University, and with the

Jornada Basin Long-Term Research Station. Michelle received her M.S. in botany and plant pathology at Oregon State University, completing a project on the application of GIS technology to herbarium database management.



Nicole Vaillant

Nicole Vaillant is a fire ecologist who joined WWETAC in April 2010. Nicole has worked for the Forest Service since 2001. Prior to joining WWETAC, Nicole worked as a seasonal wildland firefighter, including a season with the Redding Hotshots. She was also a fire ecologist with the Adaptive Management Services Enterprise Team. Her current interests include characterizing

fire behavior at multiple scales, fuel treatment effectiveness, and risk analysis. Nicole received her B.S. (evolution and ecology) at the University of California-Davis and her M.S. and Ph.D. (environmental science policy and management) at the University of California-Berkeley. Nicole's research focused on forestry and fire.

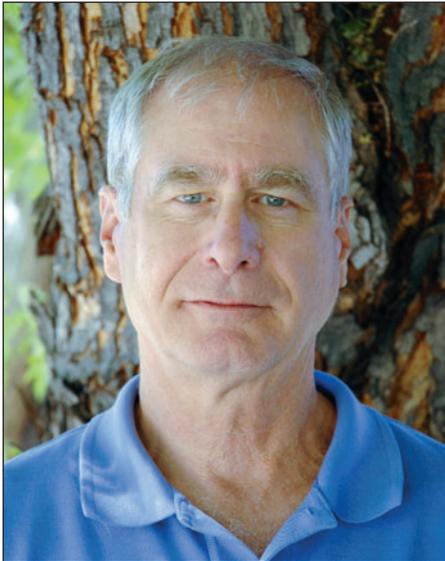


A. Paige Fischer

Paige Fischer joined WWETAC in the summer of 2010 to help the center better address the human dimensions of environmental threats. Since she began working with the PNW Research Station in 2007, Paige's research interests have included social and cultural influences on how people, particularly private landowners, approach wildfire risk, global climate change, and

ecological restoration. She is particularly interested in how people build and share ecological knowledge and cooperate across ownership boundaries to address landscape-scale environmental threats. Paige received a B.A. (anthropology) from Hampshire College in Amherst, MA, and an M.S. and Ph.D. (social science/forestry) from Oregon State University in Corvallis.

An interview with WWETAC's outgoing Director, Jerry Beatty



WWETAC's outgoing Director, Jerry Beatty

What were WWETAC's biggest challenges during your 5-year tenure?

Staffing the center was most challenging, primarily due to several unique components associated with the Western Center. A second major challenge was that we had a brand new charter that included a mission statement, goals, and objectives, but it was all very broad-based. The challenge was to translate those broad concepts into findings, products, and services.

What has WWETAC accomplished and excelled at? What skill sets are unique to the scientists who work for WWETAC?

WWETAC has started the process of a new type of work that focuses on the interactions of environmental threats; we've started a quantitative risk analysis of threat interactions. Ideally, WWETAC scientists not only have research backgrounds, but also the experience that facilitates an understanding about stakeholders' concerns and needs, and an ability to transfer that understanding into useful products.

What do you feel is important for WWETAC to contribute in the future?

Our 5-year review offered several recommendations for improvement. WWETAC is in the process of coming up with a strategic implementation plan that includes:

- Focusing WWETAC's work.
- Increasing technology transfer.
- Establishing a user advisory group.
- Incorporating the social science element.
- Increasing internal and external communications.

Are there any words of wisdom you would offer the incoming director?

One of the greatest challenges has been to establish the center as a west-wide institution. Although we are physically located close to the Pacific Northwest Research Station (PNW), it is important that stakeholders outside of PNW know who we are, what it is we do, and that WWETAC works for them, as well.

What have you enjoyed most about your career in land management?

The best thing about my Forest Service career was the opportunity to work in three deputy program areas; when I was in State and Private Forestry, I worked in Forest Health Protection as a field forest pathologist, a group leader in the Regional office, and a Deputy Director of the national program in the Washington office. In the National Forest System, I was an acting District Ranger on the Mount Hood National Forest for 6 months; and finally, when I was part of PNW and WWETAC, it was a fun and interesting time for me. I am grateful for those collective experiences, as it made for an interesting and engaging career.

Would you care to add anything else?

I believe WWETAC has the potential to be a template for how the Forest Service can accomplish integrated work into the future. I hope it continues to be supported, and successful, in its endeavors.

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An interview with WWETAC's incoming Director,

Nancy Grulke



WWETAC's incoming Director, Nancy Grulke

Tell us a little bit about yourself...

My academic experience has played a big role in where I am today. I received my undergraduate degree in ecology at Duke University; studying ecology has greatly influenced the way I approach my work. I received a Ph.D. in botany from the University of Washington, which I believe has made me more flexible throughout my Forest Service career. Over the years, I've worked on a number of environmental threats across the Western United States, with a focus on national forests.

How would you describe your management style?

My management style is flexible and collaborative.

Do you have a guiding vision for WWETAC into the future?

I want to continue the great work of Jerry Beatty, the former Director, and Terry Shaw, the acting Director. I have several ideas that I want to explore with the WWETAC team. I believe we have great potential for improving the communications of our findings while maintaining and expanding our partnerships, improving our visibility, and testing strategies that facilitate healthy forests and wetlands.

How do you envision the Director's role strengthening the tie between Research and Development, the National Forest System, State and Private Forestry, and external stakeholders?

I am looking to facilitate two-way communications with the people we serve. I envision "replicating" our small number of scientists by potentially recruiting forestry students to help us bridge communications and possibly to provide training for the new tools we are developing.

Are there some specific applications that you plan to pursue?

I would like to use existing treatments to help test our models and make sure they are correct; that we are adequately capturing ecosystem responses. The recent recruitment of a social scientist to the WWETAC team adds a social component that better integrates the values at risk associated with environmental threats. We have recently hosted two well-attended Webinars, and we'll be looking for additional opportunities to utilize technology transfer for information-sharing purposes.

What role might the National Forest System and State and Private Forestry assume to support the application of WWETAC research findings on the ground?

I think it is vital for the people we serve to communicate their needs to us. They have the local, on-the-ground knowledge that helps us test the effectiveness of our tools. Sharing that knowledge with WWETAC is essential.

Threat Mapper BY ALAN A. AGER

The WWETAC Threat Mapper project allows us to explore several new technologies for wildland threat detection, mapping, and assessment. A major focus area of the project is building an online mapping system that integrates risk maps generated by the Forest Service and other land management agencies. The mapping system provides an interactive system to examine spatial patterns of multiple threats and the human and ecological values they potentially affect.

A second focus of the project is to build a spatial data mining application that can search for spatial data posted on Internet GIS servers. Systematic data mining of geospatial and other data on the Internet may provide a novel means for early detection and assessment of ecosystem change and impending natural disturbances.

There are over 30,000 Internet map servers and an estimated 1 million spatial data sets available online. The potential value of these data in wildland threat assessments is largely unknown,

although Webcrawlers to locate, assess, and connect to online spatial data are beginning to appear in the research domain. As part of the Threat Mapper project, we built a spatial data search engine to explore online geospatial data for wildland threat assessments. The system provides keyword-based searches and display of spatial data posted on Internet map servers.

A third component of the threat mapping project is the application of cloud computing for hosting geospatial data servers and mapping applications. Cloud computing is an inexpensive and relatively simple solution for federal agencies to build and host online mapping systems for internal and external users. The applications described above, including the online mapping system and geospatial search engine, are hosted on an "Amazon EC2" elastic cloud computer. To our knowledge, these are the first applications in the Forest Service to employ cloud computing.

The Threat Mapper project is available at:

http://www.fs.fed.us/wwetac/threat_map

Using GeoServer and OpenLayers, the cloud map displays in your Web browser without software installation required.

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Western Riparian Threats Assessment BY DAVID M. MERRITT, DAVID M. THEOBALD, AND TERRY SHAW

Riparian ecosystems are of high conservation priority because they provide a disproportionate quantity of ecosystem services relative to their occurrence on the landscape. In the arid Western United States, riparian ecosystems and wetlands occupy from 0.8 to 2 percent of the landscape, yet they provide habitat, water, and other resources to greater than half the wildlife species in the region, and harbor the highest plant, bird, insect, reptile-amphibian, and mammal biodiversity of any terrestrial ecosystem.

There is a large and rapidly increasing human demand on resources associated with rivers throughout the Western United States. Human activities and extraction of natural resources on the landscape affect the physical processes that support many of the values provided by riparian ecosystems. Activities such as road building, residential development, logging, ski area expansion, and mining influence the hydrologic cycle and affect the timing and rate of sediment yield and volume entering stream channels.

In addition to the uncertainties associated with climate change (see fig. 1), an evaluation of the services, threats, tradeoffs, and alternative approaches to utilization of riparian resources is timely. There is a need to assess threats to ecosystem function and to develop risk management strategies to minimize or adapt to threats in order to maintain ecosystem function.

In our report, we examined historical, current, and future threats to streams and riparian areas in the Western United States. Threats and associated causes included changes in flow owing to diversion, climate change, and land use; channelization as a result of bank hardening and structural changes to the channel; invasive species introduction and spread; changes in sediment delivery owing to off-road vehicle use; roads; livestock trampling and mechanical impacts; herbivory threats as a result of domestic and wild herbivores; wildfire and fuels threats caused by fuel buildup from invasive species; fire suppression activities; decadent vegetation; and flood suppression or lack of flooding. Examples of the effects of these threats to riparian ecosystems include a shift in plant species composition, displacement of native species, modified soil characteristics, changes in channel and flood-plain form and processes, compaction of vegetation, increase in the frequency and intensity of fires, and changes in habitat quality and distribution.

A draft of the full report is available at:

<http://www.fs.fed.us/wwetac/projects/theobald.html>

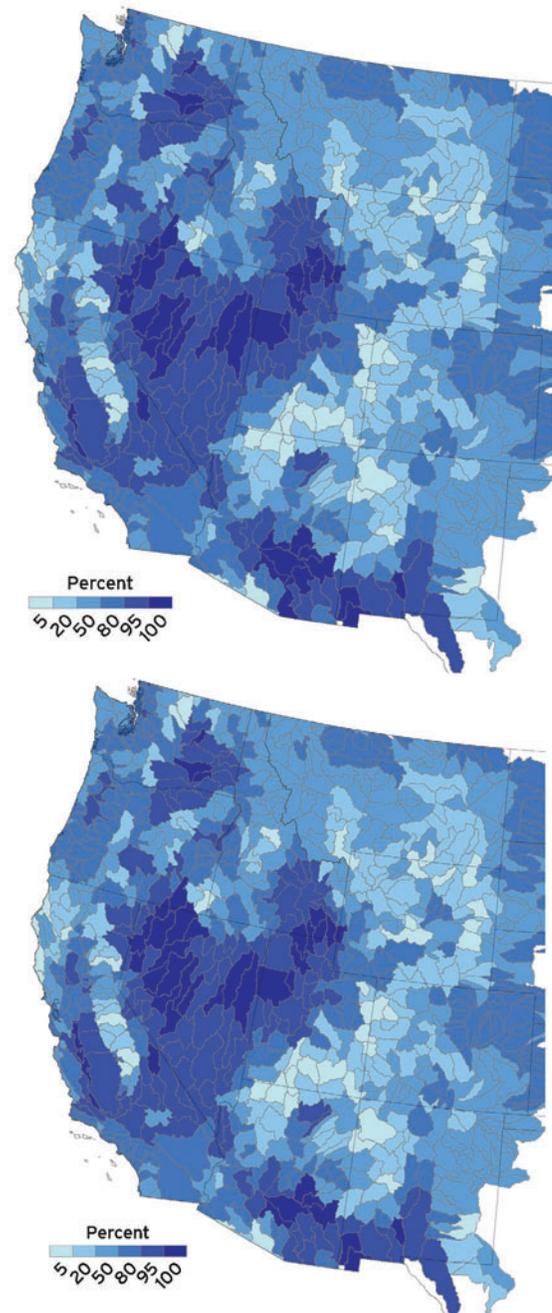


Figure 1—The riparian threats score for the past-to-current climate scenarios (top) and current-to-future climate scenarios (bottom). The score was normalized to show the highest threat level (dark blue) through the lowest threat level (light blue) using percentiles.

Interactions Between Bark Beetle Outbreaks and Wildfire in the West BY JEFFREY A. HICKE

Bark beetles and wildland fire are two natural disturbances occurring across much of the western landscape. Forest managers in the Western United States are confronted with larger and more severe wildland fires, and insect outbreaks are killing trees across millions of acres of forest in the West. Potential interactions between these disturbances exist as insect-killed trees modify fuels and fires kill or weaken trees. Weakened trees can be more susceptible to drought, pathogens, and again insects.

WWETAC has funded several research activities to gain insights regarding these interactions and to identify any associated implications for forest managers. Simard and others reported that some beetle species (Ips, wood borers, Douglas-fir beetle) have higher attack rates on fire-injured trees. Conclusions about effects on mountain pine beetle are mixed or unknown, and more research is required on many other tree and beetle species.

The authors also reviewed studies addressing the effects of beetle-caused tree mortality on subsequent wildfire. They reported that time-since-disturbance was an important consideration because of the dynamics of fuel distributions and that many findings are mixed or conclusions nonexistent for important forest types. In response to stakeholder inquiry, WWETAC convened a team to review the literature of the effects of bark beetle outbreaks on wildfire characteristics (occurrence, extent, behavior). Multiple types of studies that address different fire characteristics have been published, from field measurements to statistical analyses to fire behavior modeling. The team is developing a conceptual framework based on the published literature that identifies changes in fuels and fire probability, extent, and behavior. The WWETAC review team is also considering effects on firefighters and operations. The team's synthesis, which will also provide a summary of knowledge gaps and note ongoing projects, will be available in the near future.

The full report is available at:

http://www.fs.fed.us/wwetac/publications/WWETAC_Fire-BB_InterX_25Feb2008.pdf



Lodgepole pine killed by mountain pine beetle in Grand County, Colorado.

Photo by Jeff Hicke.

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In the News: **WWETAC Scientists Alan Ager and Nicole Vaillant Receive 2010 PNW Science Findings Award**

Each month, the Pacific Northwest Research Station selects noteworthy science findings submitted by station scientists for publication. *Science Findings* helps communicate research findings that have important implications for decisionmaking in management and associated policy, contributes research to scientific literature, and demonstrates collaboration. WWETAC scientists Alan Ager and Nicole Vaillant's topic, "The wildland fuels policy paradox: finding common ground between restoring fire-adapted landscapes and protecting the public interface" was recently selected for a 2010 Science Findings award. In addition to having their work published, Alan and Nicole's program receives a cash award.

Ager and Vaillant's study used wildfire simulation modeling to examine whether forest restoration and community wildfire protection programs were competing or compatible from a management and policy perspective. Fuel treatment scenarios were simulated that targeted protection of structures in the wildland-urban interface (WUI) and compared with simulations of restored overstocked stands in adjacent federal lands. Model runs suggest that treatments on a relatively minor percentage of federal lands (10 to 15 percent) could result in a 70-percent reduction in the potential wildfire loss of large, fire-resilient trees. Most importantly, a substantial reduction in burn probability was observed around structures within the WUI where fuel treatments were simulated 5 to 10 kilometers distant.

Management implications as a result of this study indicate that fuel treatments on federal lands outside of WUIs can potentially reduce wildfire threats within WUIs. This study also indicates that increasing focus on forest restoration activities does not necessarily compromise protecting private property in the WUI, although management of fuels adjacent to homes and in the surrounding landscape are both important risk mitigation measures. The findings can be used by planners and policymakers to justify forest restoration objectives as part of WUI protection programs and to allocate funding sources targeted for WUI protection to meet broader ecological restoration goals with respect to wildfire, biodiversity conservation, and overall forest health.

Increasing Communication and Technology Transfer Capacity Within the Center

WWETAC recently began developing a Communication and Technology Transfer Plan that targets its many current and potential clients and user groups. A team of Forest Service research and development experts, communications professionals, and university extension specialists held several meetings with WWETAC staff to help identify audience needs for products as well as appropriate communication/technology transfer tools and technologies. The following plan goals are now in place:

- Deliver accessible, audience-tailored information about environmental threats to land managers, policymakers, and the general public.
- Increase recognition of WWETAC among stakeholders and clearly establish its role in addressing threats at a landscape level across the West.
- Develop networks and communication channels with selected stakeholders to improve awareness of their information needs.
- Continue to communicate internally with staff and funded cooperators about the importance of communications and technology transfer.

Although overall plan implementation will involve input from the new WWETAC Director, several short-term activities have been initiated. These include creation of this new update, the deployment of Webinars, and a review of current and potential WWETAC technology transfer products. The plan also includes strategies for working closely with the Eastern Forest Environmental Threat Assessment Center (EFETAC) to engage a national-level technical user group.

What's New

Climate Change Webinar

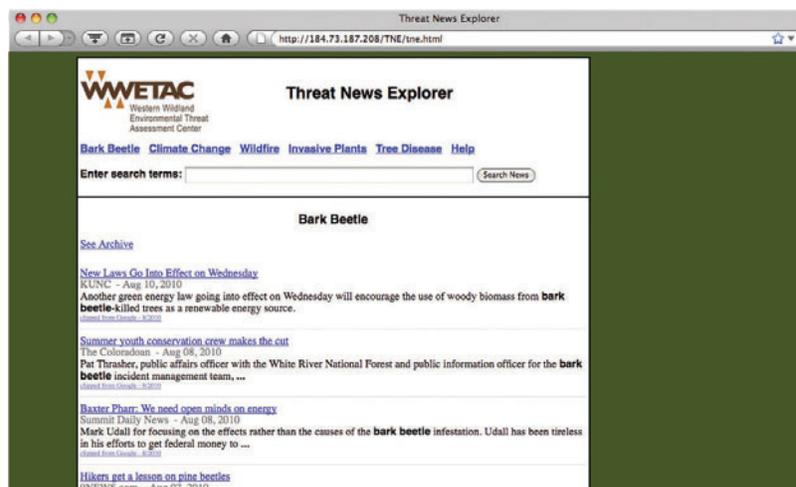
WWETAC has recently partnered with the University of Washington to deliver a Webinar titled "Integrating Climate Change With Forest Vegetation Models for Adaptation Planning: A Webinar for Managers, Planners, Vegetation Modelers, and Climate Change Coordinators." It was delivered live on July 27, 2010, and August 4, 2010. Archived versions are available at:

<http://www.fs.fed.us/wwetac/workshops/index.html>

WWETAC News Webcrawler

This tool automatically finds, lists, and updates news articles related to wildland "threats". It is available at:

<http://184.73.187.208/TNE/tne.html>



Upcoming Events

What?	When?	Where?	More Info
ArcFuels Training	September 27–29, 2010	Northern Arizona University	For more information, contact Nicole Vaillant at nvaillant@fs.fed.us
Global Change and the World's Mountains	September 26–30, 2010	Perth, Scotland	http://www.perth.ac.uk/specialistcentres/cms/conferences/perth2010/pages/default.aspx
FIA Symposium 2010: Monitoring Across Borders	October 5–7, 2010	Knoxville, Tennessee	http://www.fia.fs.fed.us/symposium
International Association of Wildland Fire Conference	October 25–29, 2010	Spokane, Washington	http://www.iawfonline.org
ArcFuels Training	October 25, 2010	Spokane, Washington	For more info, contact Nicole Vaillant at nvaillant@fs.fed.us
The 2010 Restoring the West Conference	October 26–27, 2010	Logan, Utah	http://restoringthewest.org/
Predicting Behavior of Forest Diseases as Climate Changes: A WWETAC Webinar	November 3 and December 2, 2010	online	To register, visit http://ucanr.org/wwetac_registration
American Geophysical Union Fall Meeting	December 13–17, 2010	San Francisco, California	http://www.agu.org/meetings/fm10/

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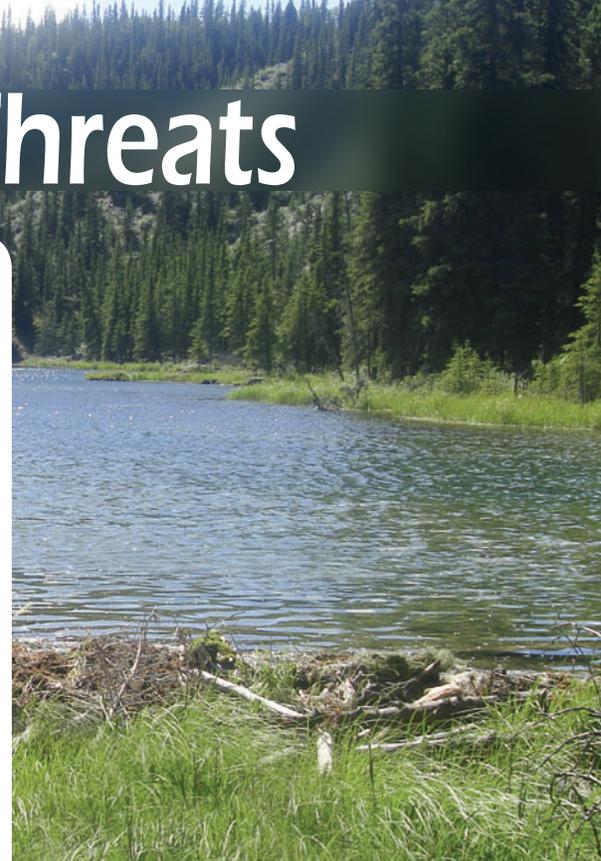
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Lodgepole pine trees recently attacked by mountain pine beetle. Photo by Jeff Hicke.



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