

RESEARCH SUPPORTING SOUND DECISIONS



**2013
PROGRESS
REPORT**



Advancing Knowledge – Seeking Solutions



Over the last 15 years, the Joint Fire Science Program (JFSP) has funded discoveries and innovations that are used every day by wildland fire managers. The highest compliment for our work happens when research innovations are adopted and implemented and become standards for professional fire managers.

As an applied research organization seeking solutions to fire management issues, the JFSP is known for annual solicitation and

open competition for research funding. On average, less than 25 percent of submitted research proposals are approved. The ideas for solicitation come from scientists who have identified gaps in knowledge, our 14 regional Knowledge Exchange Consortia, fire managers across the country, and standing committees of the National Wildfire Coordinating Group. In 2012, the JFSP solicited 12 opportunities for research funding. In total, the JFSP received 236 proposals and funded 47 projects, as shown in table 1.

Table 1. 2012 research solicitation summary by task number

Task Number	Research Topic	Proposals Received	Proposals Selected	Total Funded
12-1-01	Remeasurement of prior studies – Effects of prescribed fire on vegetation, fuels, and soil	22	4	\$966,275
12-1-02	Nonforest and understory fuels growth, response, and succession	41	2	\$266,842
12-1-03	Fuel treatment effectiveness	23	5	\$1,399,969
12-1-04	Cultural resources and fire	12	1	\$507,488
12-1-05	Verification of fire weather forecasts	5	1	\$256,899
12-1-06	Compatibility of fuels and fire management with conservation of threatened and endangered fish and wildlife species	21	2	\$691,497
12-1-07	Assessment of fire emission inventory tools	2	2	\$634,914
12-1-08	Assessment of prescribed fire contributions to PM _{2.5} and PM ₁₀ air quality standards	6	2	\$702,682
12-2-01	New Science Initiative – social sciences	42	6	\$1,416,460
12-3-01	Graduate Research Innovation (GRIN) Award	40	6	\$127,090
12-4-01	Dataset archival	6	6	\$108,060
12-5-01	Conference support	16	10	\$90,553
Grand total		236	47	\$7,168,729

Local conferences with field demonstrations, such as the Tallgrass Prairie and Oak Savanna Regional Fire Conference, are a very low-cost and effective science delivery method specifically designed for local fire managers.



Of these selected projects, 23 were applicable at a national scale, and 4 involved international collaboration. See figure 1 for a breakdown of the areas that benefitted from JFSP research projects.

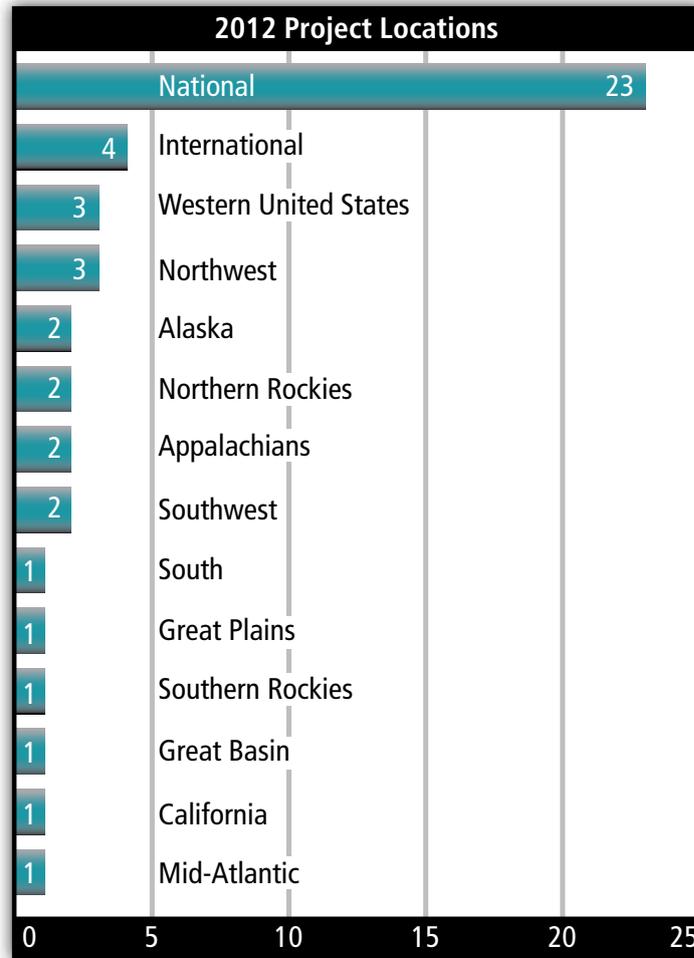


Figure 1. 2012 JFSP project locations

Figure 2 shows the distribution of funding by organization. Proposals from universities and the U.S. Forest Service account for 81 percent of the funding. In addition, more than \$4 million (61 percent) of the total funding was provided by organizations as in-kind support.

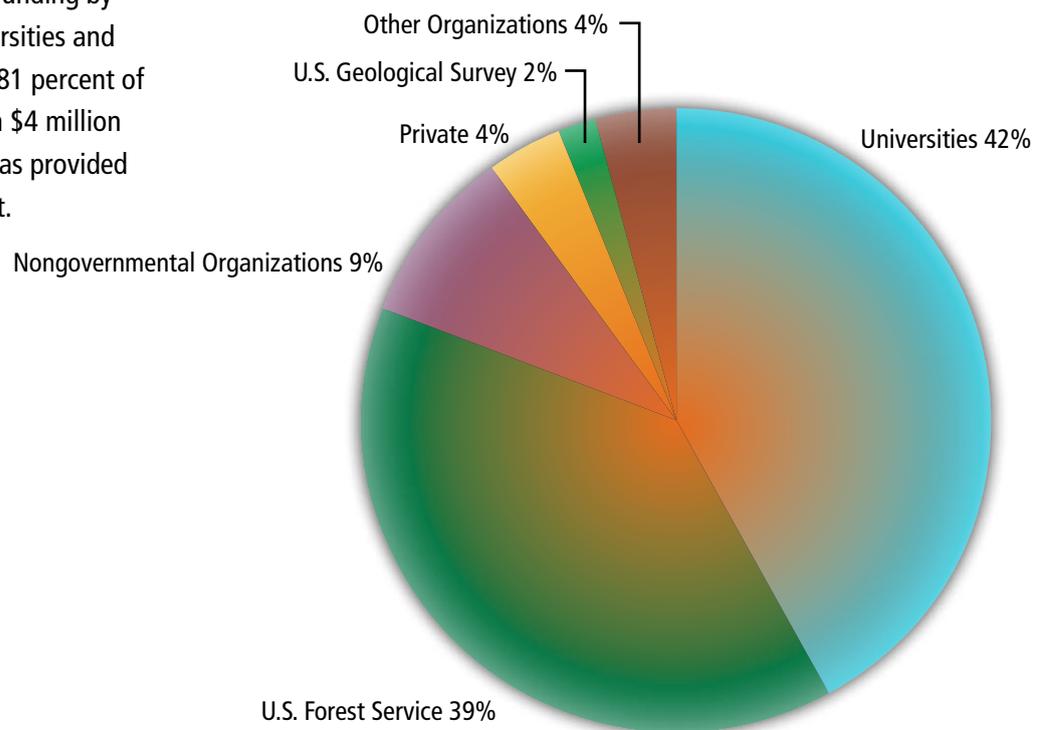


Figure 2. 2012 funding percentage by organization

Leadership in Sharing Knowledge



The foundation of each consortium is the establishment of relationships and trust necessary for effective science delivery, adoption, and implementation.

The JFSP sponsors 14 regional Knowledge Exchange Consortia across the United States as depicted in figure 3. The consortia were created by the same open solicitation and competitive peer review process as research proposals. Areas in white did not submit proposals to form a consortium. The foundation

of each consortium is the establishment of relationships and trust necessary for effective science delivery, adoption, and implementation. Every consortium is focused on establishing relationships and discovering the priorities of stakeholders interested in wildland fire and fuel management in their territory.



Figure 3. JFSP regional Knowledge Exchange Consortia



Las Conchas Fire Learning – Seeing is Believing

In the last decade, there has been an explosion of scientific information related to wildland fire. Each Knowledge Exchange Consortium strives to provide land managers with the information most relevant to their region. The Southwest Knowledge Exchange Consortium hosted a conference for managers focused on the 2011 Las Conchas Fire in New Mexico.

During the conference, attendees learned about the fire’s background, heard testimony from local experts, and saw effects from the fire in the field. This conference provides an example of how our consortia work toward successful knowledge exchange, adoption, and implementation.



Images from the Las Conchas Fire Learning Conference hosted by the Southwest Knowledge Exchange Consortium.

Consortia Evaluation Highlights

The following key points and figure 4 depict the breadth of clients engaged with the regional Knowledge Exchange Consortia.

- The Knowledge Exchange Network has 6,585 clients (members).
- Participation ranges in each consortium from 102 to 1,514 clients.
- The National Forest System has 1,409 participants, with states closely behind at 1,021.
- Counties and cities are also represented with 146 and 117 participants respectively (19 percent).
- Participating university scientists (825) surpass federal scientists by a 4 to 1 margin.

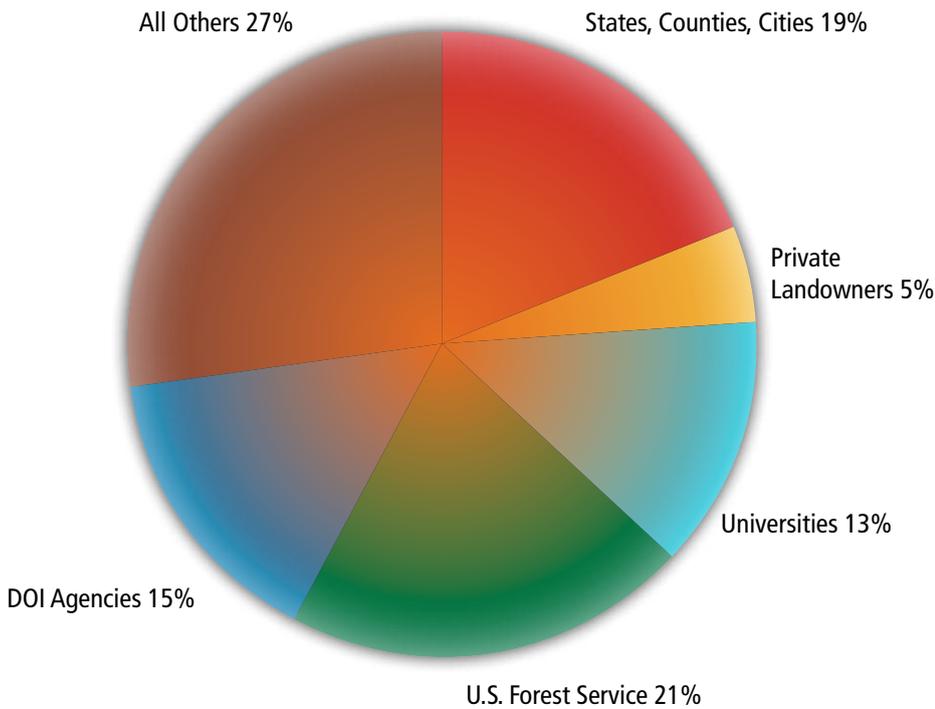
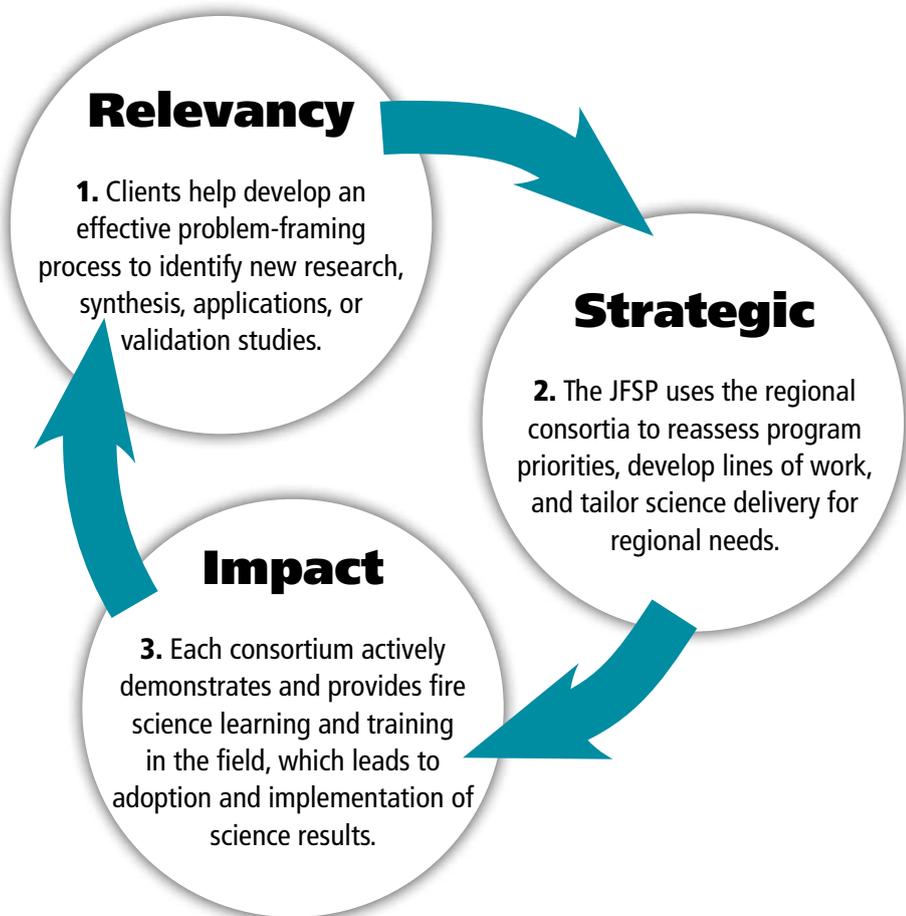


Figure 4. 2012 consortia client affiliations

The JFSP has a goal of increasing consortia membership by 10 percent over the next 2 years and offering a minimum of 140 local learning events, such as field trips, tours, demonstrations, road shows, field consultations, expert cadres, and training sessions, all in the context of the local landscape and conditions, with a minimum participation of 3,000 clients. Figure 5 describes the process we use to achieve relevancy and impact.

Our mission is to develop new knowledge, build applications that are useful to fire and fuel managers, validate existing research through field trials, and integrate management needs and research discoveries. First and foremost, the Knowledge Exchange Consortia were created to demonstrate and teach these discoveries so they can be implemented by management or inform policy decisions.



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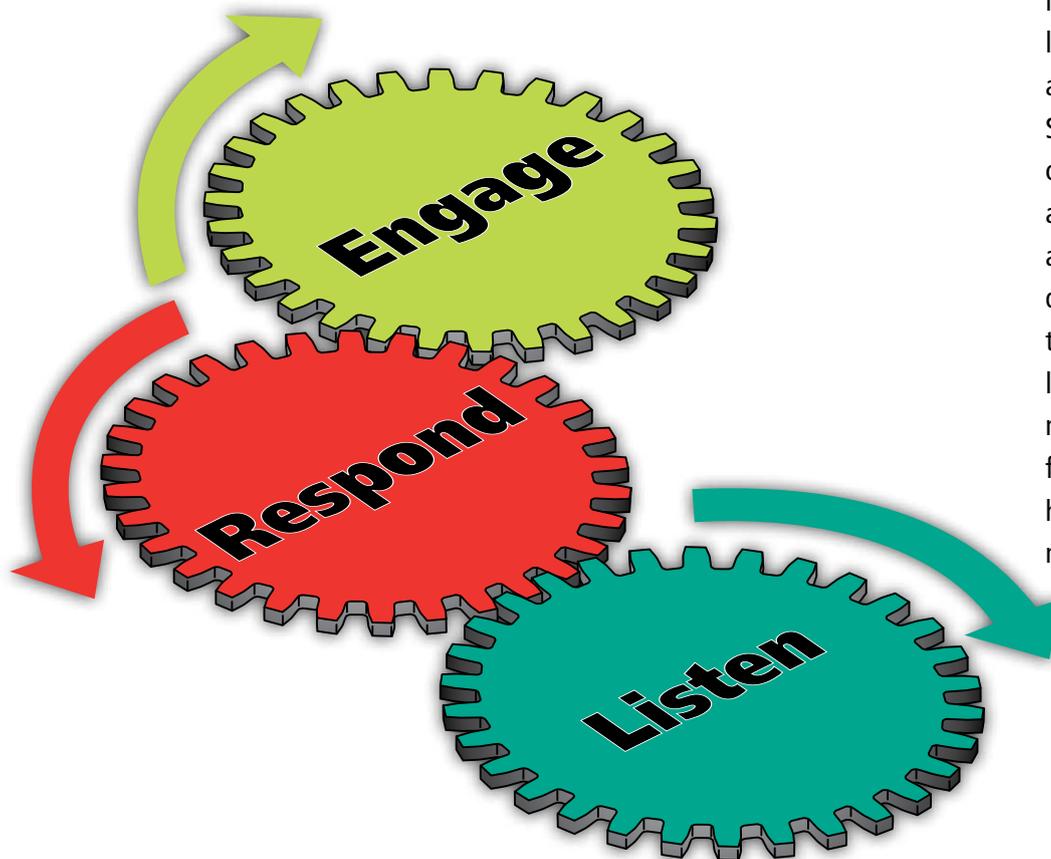
Figure 5. Science delivery impact and relevancy process



Fact:

Few managers travel to national fire ecology and fire behavior conferences.

- One way the JFSP provides awareness of new knowledge is the use of social media and instruction through webinars and distance learning. In 2012, our partnership with the Wildland Fire Lessons Learned Center (LLC) and the International Association of Wildland Fire produced 19 webinars viewed by a minimum of 3,095 clients. We estimate another 1,000 people viewed archived webinar recordings at their convenience. Future webinars will be archived and available on the LLC YouTube channel (www.youtube.com/user/WildlandFireLLC). The Knowledge Exchange Consortia produced an additional 54 webinars, and 11 academic courses and 7 short courses were offered through consortia sponsorship. Distance learning opportunities are expected to grow significantly in the next few years.
- After conducting a web usability analysis, Firescience.gov was completely redesigned in January 2012. As a result, the number of visitors grew 8 percent, pages viewed increased 18 percent, visit duration was up 13 percent, and access via mobile devices increased 200 percent!
- Our electronic newsletter has almost doubled to 2,000 subscribers in the past year.
- Twitter is an amazing success story with our content reaching more than 635,000 Twitter users in the past year. All of our content is also posted on Facebook where we have an audience of 500 and growing.
- To meet the 21st century demand for digital and mobile-ready content, we launched a public, online multiplatform library in early November 2012. This allows our audience to easily read our Fire Science Digests and research syntheses on smartphones and tablets or view them as electronic publications on desktop and laptop computers without having to download large documents. The response to ePubs is amazing! Within 48 hours of launch, our publications had been read more than 4,000 times, and we were featured as a favored publisher on the homepage of the service, which hosts millions of documents.



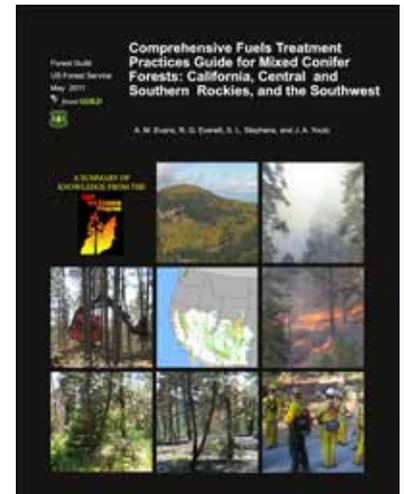
Synthesis – Black Series Publications

The JFSP's black series publications are comprehensive summaries of the latest science information specifically designed for managers and provides context for how the information can be used and implemented. Over the

years, the JFSP has produced more than 30 knowledge summaries for managers on fire-related issues and, in 2012, produced 6 new publications as shown in table 2.

Table 2. Completed black series publications in FY 2012

JFSP 2012 Black Series Projects Completed for Managers				
Category	Project Title	Principal Investigator	Organization	JFSP Project Number
Synthesis Climate Change	Fire History and Climate Change Synthesis	William T. Sommers	George Mason University	09-2-01-9
Synthesis Climate Change	Fire and Climate Change in the Western US: A New Synthesis for Land Management	Thomas W. Swetnam	University of Arizona-Tucson	09-2-01-10
Synthesis Fire and Aquatic Ecosystems	Fire and Aquatic Ecosystems in the Context of Climate Change: A Synthesis for Improved Management	Charles H. Luce	U.S. Forest Service	08-2-1-15
Synthesis Firefighter Safety	Extreme Fire Behavior State-of-the-Science Synthesis	Paul A. Werth	Weather Research and Consulting Services, LLC	09-2-01-11
Synthesis Great Lakes Fuel Treatments	Fuel Treatments in Mixed-Pine Forests in the Great Lakes Region: A Comprehensive Guide to Planning	Eric L. Toman	Ohio State University	09-2-01-22
Ten Years of Discovery	JFSP Fire Synthesis and Review of the First Ten Years of JFSP Research	Robert A. Mickler	Alion Science and Technology Corporation	10-C-01-06



Black series fuel treatment guide for mixed conifer forests.



A recent state-of-the-science summary of social sciences and wildland fire.



Eric La Price

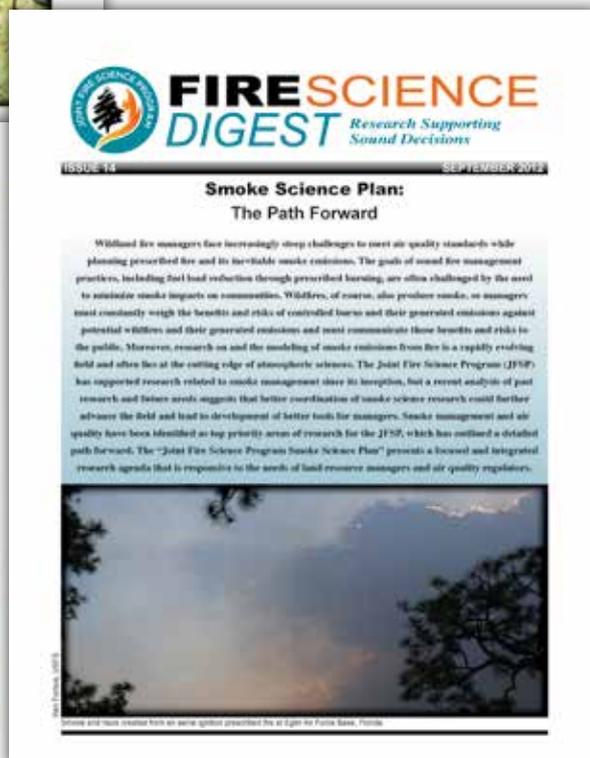
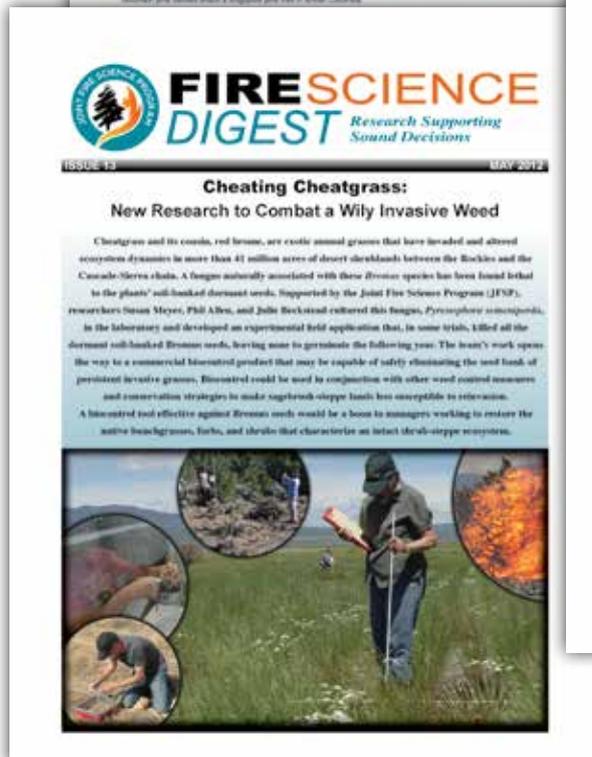
An example of underburning in California mixed conifer forests.

These publications are a quick and easy read about major issues confronting fire managers and highlight the most current research results.

In addition, the program asked Jane Kapler Smith, from the Fire Effects Information System of the Rocky Mountain Research Station, to evaluate and improve both the relevance and usefulness of our synthesis publications for managers. In a soon-to-be published paper (JFSP Project No. 11-S-2-4), she provides insight and suggestions to providing high-quality fire management information.

Fire Science Digests

The JFSP published three Fire Science Digests in 2012 on bark beetles, cheatgrass, and our Smoke Science Plan. These publications are a quick and easy read about major issues confronting fire managers and highlight the most current research results. Future stories will focus on economics and risk of wildland fire, ecosystem tipping points, fire at the water's edge, fire and salvage logging, and a look at two areas of the U.S., prairie fire and chaparral fire.



The 2009 FLAME Act and Cohesive Strategy



In October 2009, President Obama signed into law the Federal Land Assistance, Management, and Enhancement (FLAME) Act. The act was designed to deal with the dramatic increases in emergency costs of wildfire suppression and the ongoing problems of “fire borrowing.” One of the key objectives is to reduce borrowing from nonfire accounts to support suppression expenditures. The act also requires the Departments of Agriculture and Interior to develop a cohesive wildland fire management strategy. According to the FLAME Act, the cohesive strategy is required to include the following seven elements:

- Identification of the most cost-effective means for allocating fire management budget resources.
- Reinvestment in nonfire programs.
- Appropriate management response to wildfires.
- Assessing the level of risk to communities.
- Priority allocation of hazardous fuels reduction projects.
- Assessing the impacts of climate change on the frequency and severity of wildfire.
- Studying the effects of invasive species on wildfire risk.

The executive summary of “A National Cohesive Wildland Fire Management Strategy” (Cohesive Strategy), written by an intergovernmental committee convened by the Secretaries of Interior, Agriculture, and Homeland Security, identifies three primary factors as presenting both the greatest challenges and the greatest opportunities for making a positive difference in addressing wildland fire problems and costs.

They are:

- **Restoring and maintaining resilient landscapes.** The strategy recognizes the current lack of ecosystem health and the variability from geographic area to geographic area. Because landscape conditions and needs vary depending on local climate and fuel conditions, among other elements, the strategy addresses landscapes on a regional (more localized) scale, instead of a single model.
- **Creating fire-adapted communities.** The strategy offers options and opportunities to engage communities and work with them to become more resistant to wildfire threats.
- **Wildfire response.** This element considers the full spectrum of fire management, from preparedness to full suppression to managing fire for multiple objectives. The strategy recognizes differences in missions among local, state, tribal, and federal agencies and offers collaboratively developed methodologies to move forward.

As shown in figure 6, science is the unifying element of the Cohesive Strategy. For 15 years, the JFSP has been producing the highest quality science information to inform both management actions and policy strategies—**Research Supporting Sound Decisions.**

The act was designed to deal with the dramatic increases in emergency costs of wildfire suppression and the ongoing problems of “fire borrowing.”



Figure 6. Elements of the Cohesive Strategy

The program has consistently led the nation to find solutions to the fire issues managers have deemed important for the past decade and a half. . .

Then

In 1998, the first year of funding for JFSP, 19 projects were selected. From the very beginning, the program funded projects such as:

- A Risk Based Comparison of Potential Fuel Treatment Trade-off Models
- Risk Assessment of Fuel Management Practices on Hillslope Erosion Processes
- Development of a Flexible, Standardized Methodology for Optimizing Fuel Treatments over Space and Time
- Assessing Values at Risk in the United States from Wildfire
- Assessing Values of Air Quality and Visibility at Risk
- Fuel Characterization System
- National Fire Effects Prediction Model
- Fire Regime and Condition Class

- Photo Series for Fuels Managers
- Fire Emissions Production Models
- Fuels Management and Wildlife Habitat
- The Fuels and Fire Extension to the Forest Vegetation Simulator

The program has consistently led the nation to find solutions to the fire issues managers have deemed important for the past decade and a half and is ready to support tomorrow's management needs as described in the Cohesive Strategy. In fact, three JFSP board members are actively involved in the continual development of the strategy.

And Now

While it is important to understand the JFSP has been working on these issues for a long time, table 3 highlights projects completed in fiscal year 2012 that provide the highest quality peer-reviewed research in support of Cohesive Strategy goals.

Table 3. JFSP 2012 research in support of Cohesive Strategy goals

JFSP 2012 Research in Support of "Restore and Maintain Resilient Landscapes" Goal				
Category	Project Title	Principal Investigator	Organization	JFSP Project Number
Climate Change and Fire Severity/ Intensity	Can Climate Change Increase Fire Severity Independent of Fire Intensity?	Phillip J. van Mantgem	U.S. Geological Survey	09-3-01-68
Climate Change and Grazing	Influences of Large Herbivore Grazing on Succession, Fuels, and Fire Dynamics in a Changing Climate	Martin Vavra	U.S. Forest Service	09-3-01-20
Climate Change Tipping Points	Estimating Critical Climate-Driven Thresholds in Landscape Dynamics Using Spatial Simulation Modeling: Climate Change Tipping Points in Fire Management	Robert E. Keane	U.S. Forest Service	09-3-01-17
Fire Effects on Sagebrush	Vegetation Impacts of Recurring Fires on Sagebrush Ecosystems in Washington: Implications for Conservation and Rehabilitation	Jonathan D. Bakker	University of Washington	08-1-5-20

Fire Effects Post-Fire	Variable Intensity Salvage Logging After Fire: Effects on Fuel Accumulation, Regeneration, and Understory Diversity	Martin W. Ritchie	U.S. Forest Service	07-2-2-09
Fire History	Fire Regimes of Montana Grasslands of the Valles Caldera National Preserve, New Mexico	Donald A. Falk	University of Arizona-Tucson	06-3-1-27
Fuel Treatment Effectiveness	Landscape Analysis of Fuel Treatment Longevity and Effectiveness in the 2006 Tripod Complex Fires	Susan J. Prichard	University of Washington	09-1-01-19
Fuel Treatment Effectiveness	Quantifying the Effects of Fuels Reduction Treatments on Fire Behavior and Post-Fire Vegetation Dynamics	Scott T. Rupp	University of Alaska-Fairbanks	06-2-1-39
Invasive Species Management	Management Options to Control Exotic Invasive Plant Species in Association with Fuel Reduction Treatments in Wildland Urban Interface	Becky K. Kerns	U.S. Forest Service	05-2-1-05
Invasive Species Management	To Burn Or Not To Burn Oriental Bittersweet: A Fire Manager's Conundrum	Noel B. Pavlovic	U.S. Geological Survey	08-1-2-10
Invasive Species Management	Using Native Annual Plant Species to Suppress Weedy Invasive Species in Post-Fire Habitats	Mark W. Paschke	Colorado State University	07-1-3-18
Post-Fire Erosion	Evaluating the Effectiveness of Wood Shreds on Post-Fire Erosion	Peter R. Robichaud	U.S. Forest Service	07-1-1-01
Black Carbon Effects on Climate Change	Masticated Fuels and Carbon Storage: Effects of Particle Size and Fuel Moisture on Black Carbon Production	Alistair M. Smith	University of Idaho	11-3-1-30
JFSP 2012 Research in Support of "Fire-Adapted Communities" Goal				
Category	Project Title	Principal Investigator	Organization	JFSP Project Number
Risk	Unpacking the Risk Assessment Processes in Firefighting Crews	Anne E. Black	U.S. Forest Service	10-3-01-4
Risk Tradeoffs in the Wildland-Urban Interface	Tradeoffs in Fire Hazard vs. Societal Benefits in Wildland-Urban Interface Communities	Christopher A. Dicus	California Polytechnic State University	07-1-6-11
Smoke and Air Quality	Identification of Necessary Conditions for Arctic Transport of Smoke from U.S. Fires	Narasimhan K. Larkin	U.S. Forest Service	10-5-02-1
Smoke and Air Quality	Predicting Prescribed and Wildland Fire Smoke, Emissions, and Fire Characteristics in Deep Organic Soils	Robert A. Mickler	Alion Science and Technology Corporation	08-1-3-03
Smoke and Air Quality	Creation of a Smoke and Emissions Model Intercomparison Project (SEMIP) and Evaluation of Current Models	Narasimhan K. Larkin	U.S. Forest Service	08-1-6-10
Wildland-Urban Interface and Suppression Tradeoffs	Wildland Fire Suppression and Land Development in the Wildland/Urban Interface	Sheila M. Olmstead	Resources for the Future	10-3-01-33



The Next Generation – Small Investments Yield Big Results

The JFSP estimates that more than 2,400 students have benefited by working on JFSP projects as undergraduate and graduate students.

“It doesn’t take much money to get a poor, starving student excited, and the benefits will be immeasurable. Students will gain contacts, new information, the chance to network with professionals and peers—they’ll get a taste of a world they otherwise couldn’t afford to be part of. The JFSP will get a lot of bang for its buck.” **Professor Chris Dicus, Cal Poly San Luis Obispo**

The JFSP estimates that more than 2,400 students have benefited by working on JFSP projects as undergraduate and graduate students. We know from surveys that 33 percent of those with master’s degrees and 22 percent of those with doctoral degrees have gone on to work for state or federal agencies. We believe our investments in the next generation are an essential bargain, directly training the next generation of professionals and scientists. The following sections highlight our 2012 student support.

Graduate Research Innovation (GRIN) Awards

In partnership with the Association for Fire Ecology, the JFSP invited current graduate and doctoral students in the fields of wildland fire and related human dimensions and ecological sciences to apply for a Graduate Research Innovation (GRIN) Award. Proposals addressed one of the following topics:

1. Climate change and fire.
2. Fuel management effectiveness and effects.
3. Smoke or emissions assessments focused on social issues and fire.

In all, 6 students, representing 5 universities, successfully competed for the awards of \$25,000 each: Georgia Institute of Technology (1), Oregon State University (1), University of Alaska-Fairbanks (2), University of Idaho (1), and University of Wisconsin-Madison (1).



Travel, Research, and Educational Experience (TREE) Grants

The Association for Fire Ecology began managing the JFSP's student travel assistance project in 2011. The TREE grant program provides funding that enables graduate and undergraduate students to travel to fire conferences, symposia, workshops, and laboratories. The objectives of the TREE grant program are to nurture student research through active participation in conferences and laboratories and to encourage student researchers to interact and network with other researchers and managers so they develop opportunities for future employment, internships, and/or collaboration on research and management projects.

In 2012, a total of 45 students received TREE grants, representing 21 different universities from 11 states and 5 countries. Eleven of the students were undergraduates, 16 were in graduate programs, and 18 were in

doctoral programs. TREE grants thus represent an investment in the next generation of professional fire researchers, educators, and managers.

Comment from a TREE recipient:

"Thanks to a TREE grant of \$700, I was able to travel to Portland for the 5th International Fire Ecology and Management Congress where I presented my research in the FireTrek special session. Attending this conference was a fantastic opportunity for me to learn about other research, make contacts, and present my own research. This was the first time I had ever presented at a conference. I gained invaluable experience in learning how to prepare and present in a professional setting....The TREE grant allowed me to travel from Mexico City to Portland, OR (\$438), which without the grant would not have been possible on a Peace Corps salary."

In 2012, a total of 45 students received TREE grants, representing 21 different universities from 11 states and 5 countries.



TREE recipients at an Association for Fire Ecology conference in Utah.

Data for Tomorrow's Fire Behavior Models – RxCadre



This G2R drone is being prepared for flight.



This helicopter drone was used for data collection.

During the first 3 weeks in November 2012, one of the world's largest, collaborative prescribed fire research projects, called RxCadre, was successfully completed at Eglin Air Force Base located on the Florida Panhandle. More than 90 scientists and technicians, representing almost 20 federal agencies and universities, converged at the base and set up hundreds of scientific ground and air experiments. Their goal was to capture

meteorology, fuel consumption, fire behavior, heat release, smoke, and fire effects data during six small and three large prescribed burns with grass, grass and shrub, and long-leaf pine fuels. These were the most intensely monitored prescribed burns ever in the United States, and the data that was gathered will be used for testing the next generation of physics-based fire spread models.



Burns conducted on Eglin Air Force Base in both grass and long-leaf pine forests.



Smoke emissions and plume dynamic instruments were deployed on the ground and from balloons.

Powerful Partnerships

Such a comprehensive effort is only successful because of the dedication and determination of many individuals and their respective institutions. This partnership provided logistic support and organization capability and doubled the resources and instrumentation available for the RxCadre research campaign. For example, the Environmental Protection Agency provided its aerostat balloon sampling apparatus to measure smoke in the smoke column downwind of the fire. Major collaborators included:

Department of Defense, Eglin Air Force Base and the 96th Test Wing

Eglin Natural Resources Branch (Jackson Guard)

Environmental Protection Agency

JFSP (Department of Agriculture and Department of the Interior)

NASA Goddard Space Flight Center

National Oceanic and Atmospheric Administration

Rochester Institute of Technology

San Jose State University

U.S. Forest Service Research and Development (Northern, Pacific Northwest, Pacific Southwest, Rocky Mountain, and Southern Research Stations)

U.S. Forest Service Remote Sensing Applications Center

University of Alaska-Fairbanks

University of Idaho

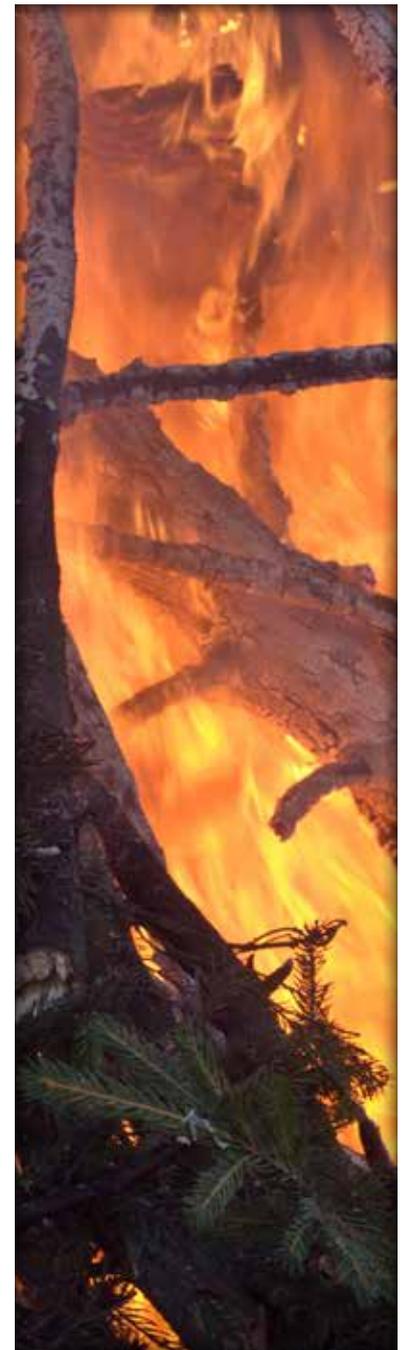
University of Montana

University of Rochester

University of Washington

Data Exchange and Depository

Peer-reviewed results from the experimental RxCadre fires will provide a comprehensive assessment of fire as a physical process. An informational exchange website will be established, and the scientific results will be published in technical papers in a special issue of the International Journal of Wildland Fire. All data from the RxCadre research will be quality-assured by internal peer review and stored in the U.S. Forest Service Research and Development Data Archive for access by all. The development of physics-based fire spread models is a challenge the JFSP is supporting through projects such as RxCadre to develop tomorrow's predictive fire behavior models and tools. The Department of Defense intends to use this storehouse of data in the research solicitations they offer next year. Collaboration is an efficient and effective method of conducting fire-related research and determining conclusions from the data.



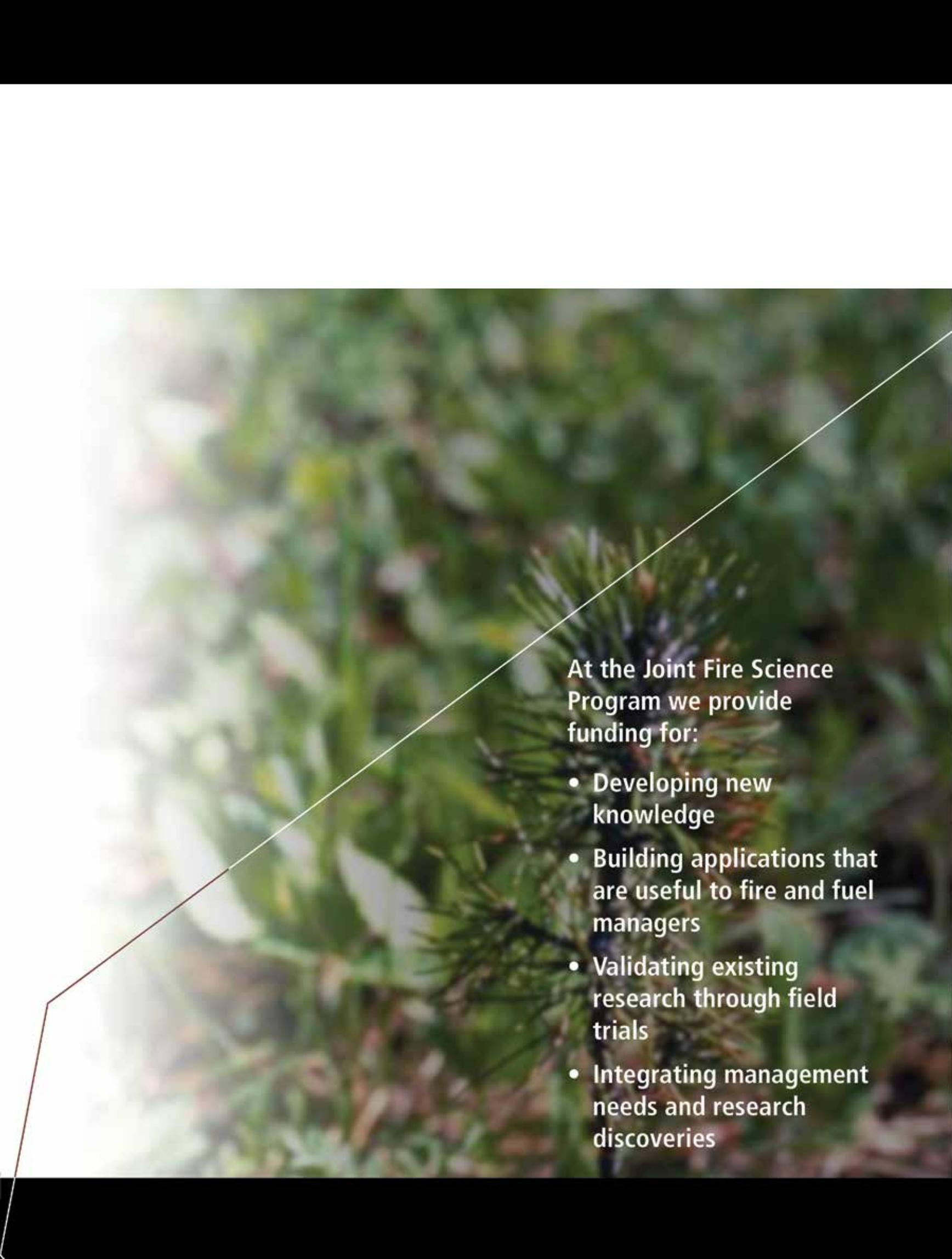
Collaboration is an efficient and effective method of conducting fire-related research and determining conclusions from the data.

In the Words of the 2013 Program Review Team...

Every 5 years, the JFSP conducts an independent review of the program. The JFSP Governing Board is reviewing the recommendations of the review team and will provide a response in the near future. The program review team offered the following thoughts after their examination of the JFSP.

“What sets the JFSP apart from other fire research funding entities is the emphasis on addressing manager-driven questions. With annual funding that has ranged from \$8 million to \$16 million over the years, the JFSP has provided support to 651 projects at nearly 100 colleges and universities often in collaboration with federal scientists. Although JFSP funds are not used to support federal salaries, the operating expenses of these projects often seed collaborative activities that are extensively leveraged by other sources. With projects selected through open solicitation and peer review, the JFSP has established significant credibility for the research it supports. The role that the JFSP plays in the fire science arena is much larger than its direct funding of projects. Its investment strategy and research questions to be addressed set the agenda for other fire science programs.”

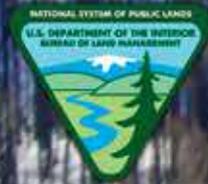




At the Joint Fire Science Program we provide funding for:

- Developing new knowledge
- Building applications that are useful to fire and fuel managers
- Validating existing research through field trials
- Integrating management needs and research discoveries

AN INTERAGENCY RESEARCH, DEVELOPMENT, AND APPLICATIONS PARTNERSHIP



Learn more about the Joint Fire Science Program at

www.firescience.gov

John Cissel, Program Manager

(208) 387-5349

National Interagency Fire Center

3833 S. Development Ave.

Boise, ID 83705-5354

BLM/FA/GI-13/003+9270

Front cover photo: Smoke columns from the 2011 Las Conchas Fire in New Mexico. Photo by Kari Greer, National Interagency Fire Center.

Back cover photo: Terrain about 18 months after the 2011 Las Conchas Fire in New Mexico. Photo by Marjie Brown.

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