2015 Accomplishment Report

WILDLAND FIRE MANAGEMENT RESEARCH DEVELOPMENT & APPLICATION

Integrating science, technology and fire management.

Wildland Fire Management RD&A

Contents

WFM RD&A Program Charter Summary

The Wildland Fire Management Research, Development, and Application (WFM RD&A) program was created to promote application of wildland fire scientific knowledge; develop decision support tools; and provide science application services to the interagency wildland fire community. The WFM RD&A serves as a primary point of contact for communication between scientists and participating field fire managers, as a liaison between research, wildland fire planning and operations, interagency wildland fire IT groups, and as an advisor to program administrators at local, regional, and national levels. The WFM RD&A was initially chartered in 2006 and re-chartered in 2011 for a five year period. The charter is recommended by the Directors of the Rocky Mountain Research Station, Forest Management Sciences, and Fire and Aviation Management and signed by the Deputy Chief of Research and Development, the Deputy Chief of State & Private Forestry as well as the Chief of the US Forest Service. The charter defines the areas the WFM RD&A will work and focus their attention. The focus areas are:

- Coordinate relevant and timely fire science applications.
- Develop and support a Wildland Fire Decision Support System (WFDSS).
- Coordinate technology and development efforts for hazardous fuels and vegetation management and support interagency training in this area.
- Develop applications, disseminate information and conduct training for existing and emergent research priorities.
- Participate in and manage the National Fire Decision Support Center (NFDSC).

Technology and Science are ever changing to reflect current and future direction in the interagency wildland fire community. In the fall of 2014 the WFM RD&A also took time to update their direction by revisiting their vison and mission statements. Below are those new statements.

Vision Statement

Promote fire management innovations through the integration of science and technology.

Mission

The Wildland Fire Management Research, Development, and Application program serves as leaders and role models within the interagency wildland fire community.

We serve as a primary point of contact for communication between scientists and participating field managers, and as an advisor to program administrators at local, regional, and national levels by:

- Mentoring practitioners,
- Supporting improved and informed decision making while tying fire management activities to land management goals,
- Supporting partnerships between agencies, and
- Finding creative solutions to fire management issues and processes.

We sponsor and guide the development and application of wildland scientific knowledge; develop decision support tools; and provide science application services through:

- Technology transfer,
- Developing fire science application,
- Exploring the application of new technologies, and
- Providing advice on best practices and standards in technology development and use.

Program Organization

The WFM RD&A is a virtual organization with staff members physically located throughout the country. The organizational chart (Figure 1) shows the title and location of each staff member. More information about the staff can be found on the WFM RD&A staff webpage: http://www.wfmrda.nwcg.gov/staff_bio.php

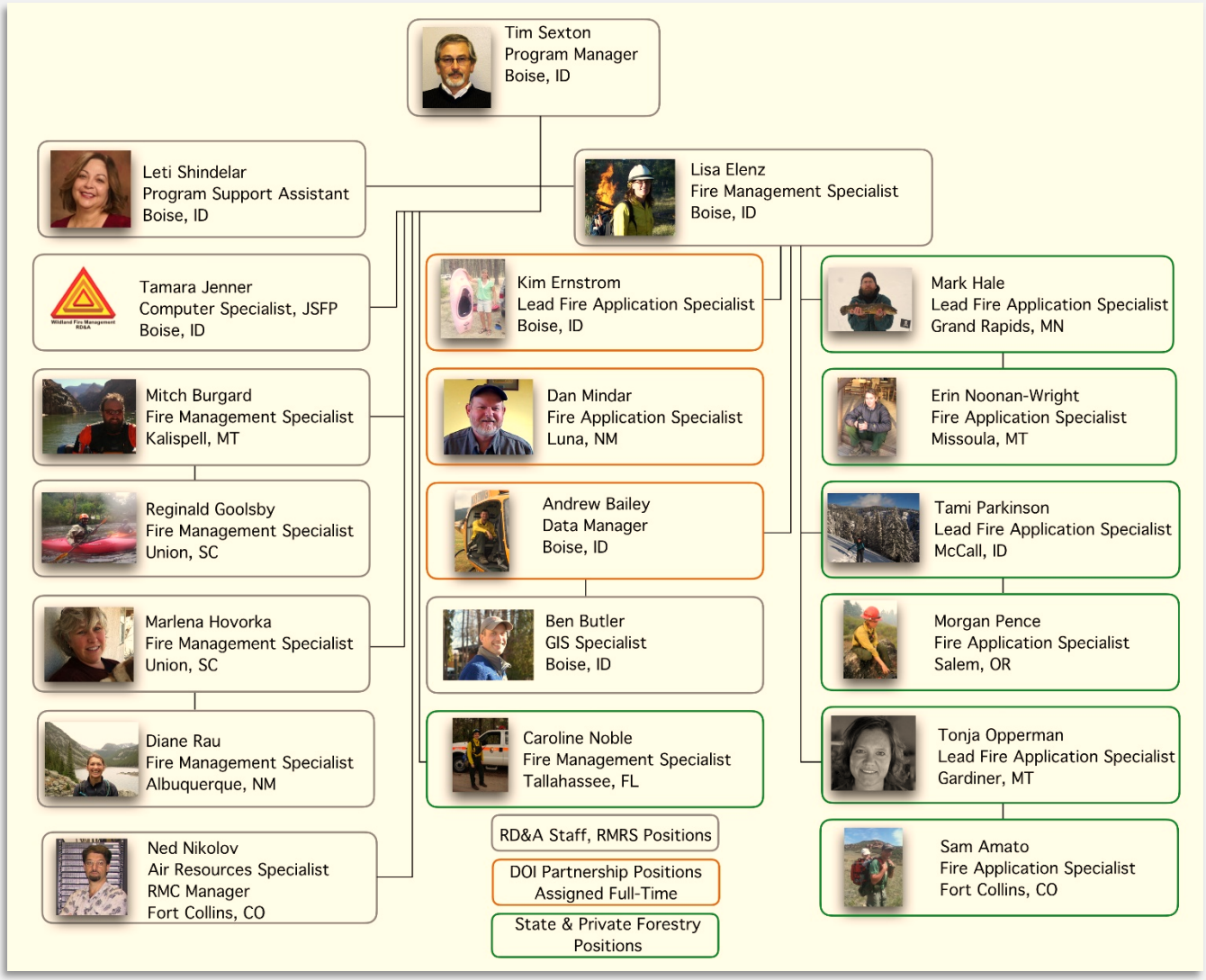

Figure 1 WFM RD&A Organizational Chart

Message from the Program Manager, Tim Sexton

The 2015 Fire Season provided significant challenges to land management agencies in Alaska, Washington, Oregon, California, Idaho and Montana. The Wildland Fire Management Research Development & Applications program provided support for real-time decision making on more than 100 wildfires through web-based applications, remote assistance and in-person analysis and advice. WFM RD&A staff also served as individual overhead on incident management teams, area command, and in support of geographic area MAC Groups.

We are developing partnerships with several organizations to assist in delivery of emerging science and new technology:

- Predictive Services - enhance and standardize products delivered to field users
- USDAs Innovation Lab - testing new ways of managing web-based applications including use of the Cloud
- NOAA - gridded weather project which holds promise for increasing accuracy and resolution of weather forecasting for wildland fire
- Fire planners - to implement Spatial Fire Planning in WFDSS which will better integrate Land and Resource Management Planning into decisions on wildfires

We continue to emphasize the need for improved objectives in planning for and responding to wildfires. We believe that sound objectives tiered to higher level planning will limit fire fighter exposure and improve outcomes on wildfires.

We are embracing social media to reach as many potential users of information and technology as possible. We continue to develop TwitterFire and have started development on the Wildfires Near Me prototype. Both applications integrate social media data mining with federal databases and applications to provide information to a wide range of users in the wildland fire management community and the general population.

Customer service is important to us and in 2015 one of our staff was honored with an Outstanding Customer Service Award. We continue to respond to user feedback to better inform all of our efforts.

The WFM RD&A continues to strive to provide field personnel with the best available science and technology to help them make better decisions about firefighter safety and effective and efficient wildland fire management. I encourage the reader to review our accomplishments during the past year to learn more about what we do and where we intend to focus in the future.

Awards and Recognition

Fire Management Specialist, Marlena Hovorka received the USFS Rocky Mountain Research Station “2015 Outstanding Customer Service Award.” Marlena has been working on the Wildland Fire Decision Support System (WFDSS) since 2007. She is involved in the training and documentation of the application. Marlena is responsible for enhancements in WFDSS such as the WFDSS Spatial Fire Planning process and the new simple Decision Editor. Currently she supports the field, contract administration, and the Tier 2 Help Desk. Congratulations Marlena on a job well done.

FY 2015 Accomplishments

The WFM RD&A organizes projects among three broad goals as distilled from the focus areas in the charter. This section highlights FY15 accomplishments that support these goals.

Goal 1: Foster fire management decision support systems that are risk-based, relevant, timely, and integrated, including planning (fuels) and incident response.

1.1 Objective: Integrate research and technology into decision support systems

New Application of Data and Technology

The WFM RD&A is committed to bringing new and innovative datasets into the decision support process to improve situational awareness for decision makers. In 2015, WFM RD&A staff began working towards the addition of two data sets that will do just that in the years ahead. The first of these is LandScan, an Oakridge National Laboratory- developed fusion of satellite remote sensing data, traditional geospatial infrastructure datasets, and US Bureau of Census demographic data. This innovative dataset will provide counts of population within wildfire planning areas or areas of modeled fire spread, as well as a current, nation-wide geospatial representation of populated areas that supplements the building cluster data available in WFDSS. The second area of data innovation focuses on delivering wildfire severity data for past wildfires to WFDSS users. These data, from the US Forest Service "Monitoring Trends in Burn Severity," or MTBS, project will allow fire analysts more insight into fire behavior and fuel model adjustments when working in areas where a fire is interacting with past wildfires. The addition of MTBS data is also an important step forward in the WFM RD&A goal of encouraging and demonstrating the use of web data services to improve data timeliness and reduce data management workload. The groundwork laid in these two projects will allow improved decision support in the upcoming fire season. Additionally, implementation of advanced data processing and automation software allowed the WFM RD&A to achieve a high level of service without bringing on more staff.

Innovations Project

In cooperation with the USDA CIO's Spatiotemporal Innovation Center the WFM RD&A has begun investigating more efficient and cost effective information technology solutions. The WFM RD&A is exploring the feasibility of expanding the Scientific Modeling Framework (SMF) currently being utilized by the Interagency Fuels Treatment Decision Support System as a cloud-based framework for the addition of stand-alone fire behavior models, fire effects models, and data services. Additionally solutions are being considered to develop a system for consolidating interagency datasets that can be provided to and easily updated by the interagency wildland fire community.

Amazon Web Services

In 2015, the WFM RD&A did extensive testing of Amazon Web Services (AWS) to determine if cloud services would be beneficial for prototyping and other research and development needs. Several prototype web applications were built entirely on AWS and leveraged the suite of services and tools offered by the platform. The scalability and robustness of the Amazon cloud proved valuable for short calculation-intensive analysis needs (on spatial data and fire and wind models). Access to cloud services has proven beneficial for innovation, tech transfer, prototyping, and collaboration with partners. Costs proved significantly cheaper than purchasing the hardware and no system administrator expenses were incurred. With most applications moving to the cloud, one of the most valuable benefits of the testing was the opportunity for staff to learn about this emerging technology. Continued use of the cloud services will allow the WFM RD&A to rapidly develop prototype applications and to continue to improve efficiencies in our existing applications.

Gridded Weather

Working with meteorologists from NOAA/National Weather Service National Centers for Environmental Prediction, scientists from the Missoula Fire Science Lab, and fire meteorologists, the WFM RD&A initiated a project to generate and store three decades of gridded weather. This mesoscale reanalysis of historical weather will provide a gridded weather product that can be used as inputs for the fire behavior models in WFDSS and other applications. Though forecast weather can be retrieved for the fire location itself, required historical observations are currently only available from the nearest weather stations, which can be quite distant from fires in terms of horizontal distance and elevation. A gridded weather product adds a second dimension to the weather inputs. This not only allows the models to retrieve weather from any fire location (instead of a limited set of weather station locations) but, in the near future, will also allow for the weather inputs to change as large fires move into locations with different weather conditions. The higher quality inputs should have a significant impact on producing more accurate results from all of the WFDSS fire behavior models. Work began on the re-analysis in 2015 and a subset of several years of data will be provided to the WFM RD&A in early 2016. Pending testing and validation, the WFDSS fire behavior models could be utilizing the new and improved gridded data for the 2017 fire season.

1.2 Objective: Maintain, test, identify, and suggest WFDSS application enhancements

WFDSS Website and Training Material Regular Updates

Needed upgrades and enhancements (Figure 2) for WFDSS were completed this year, many in response to the User Centered Design Review completed previously. The system received a new Decision Editor, designed to make creating and publishing a decision quicker and simpler. The new Decision Editor pulls more content in automatically to document the decision. It provides hyperlinks to sections to speed completion, provides checkboxes to quickly include content, makes adding sections and images more streamlined, and provides a checklist for requirements. The entire Editor has a new look and feel too, with sliding vertical tabs that allow quick movement between sections. Other user requested changes include removing the Validation tab and adding an Assessment tab with combined assessment tools in one location. An optional Strategy Slider bar and comment box was added to the Course of Action to allow users to indicate strategy on a scale of Monitor to Suppression. A KBDI (Keetch-Byram Drought Index) Landfire fuel model data layer was loaded for areas in the Southeast to provide an optional drought adjusted landscape for fire modeling. Fly-out menus were added to provide more screen space for users working in the system. Many upgrades were made to work toward meeting Section 508 to ensure the system will be accessible to those with enhanced accessibility needs.

The Organizational Needs Assessment was updated within WFDSS to reflect the new Risk and Complexity Analysis adopted by NWCG in 2014. These revisions align the paper system utilized by the field with the Organizational Needs Assessment in WFDSS. Changes also allow managers to select the organizational structure based on outcomes rather than the system indicating a team type.

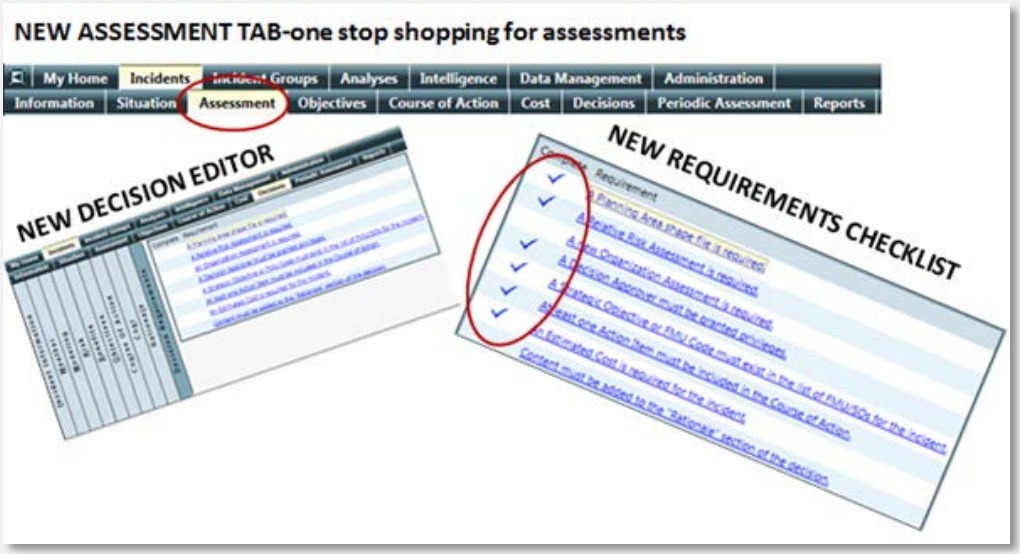

Figure 2 New features of WFDSS

Helpdesk Transition

The Interagency Incident Application (IIA) Help Desk contract was awarded to a new vendor in 2015. The IIA Help Desk provides support for the Wildland Fire Decision Support System (WFDSS). The WFM RD&A staff worked with the Fire and Aviation Management IT (FAM-IT) staff all year to prepare for the help desk transition. Staff developed transition plans, training plans and training materials for the new vendor. Additionally, staff helped test and trouble shoot the new ticket system, Remedy on Demand, in an effort to streamline the system for the needs of the fire community.

Spatial Fire Planning in Wildland Fire Decision Support Systems (WFDSS)

2015 saw an increase in the number of units converting to Spatial Fire Planning (SFP) in WFDSS. As of October, 46 units within the Forest Service and Department of Interior had converted to SFP. The WFM RD&A worked with a number of regions and units to put on virtual briefings and trainings, and consulted with units on SFP planning and implementation. Informational briefings were provided for Regions 4 and Region 8 of the Forest Service, and in April at the Forest Service National Fire and Fuels planning meeting held in Atlanta, GA. Several webinars for Data Managers were developed to help train Data Managers on implementing SFP within the Wildland Fire Decision Support System with over 100 attendees participating. The WFDSS Spatial Fire Planning Guide (Figure 3) was updated in late fall focusing on changes to the current FMU planning in WFDSS and provides information about how to complete the SFP process. The revised guide is located at http://wfdss.usgs.gov/wfdss/pdfs/WFDSS_SFP_Guide.pdf. Workload for SFP is expected to increase in 2016, with all Forest Service units mandated to switch to Spatial Fire Planning by fire season 2016.

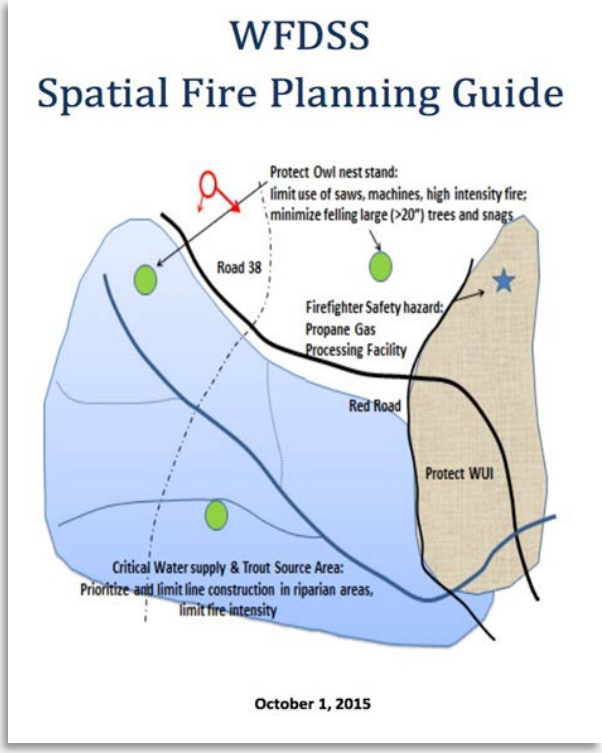

Figure 3 WFDSS Spatial Fire Planning Guide

WFDSS Contracting

WFDSS contract activity in 2015 was extensive. The WFM RD&A staff worked closely with FAM-IT staff to develop performance work statements (PWS) for both the WFDSS and FAMWEB contracts. Staff met with FAM-IT during several contracting officer representative workshops to provide input to critical contract language for Section 508 compliance, documentation, and training. The FAMWEB and WFDSS contract was awarded in late 2015.

WFDSS Line Officer Refresher

Figure 4 Recorded Line Officer Webinars

Line Officer/Agency Administrator webinars were again conducted to specifically target the interagency line officer community and their use of WFDSS. Topics included an overview of current risk management processes, findings from the Objectives Review in 2014, basic WFDSS navigation, decision focus areas, and how to support decision making using fire behavior models. The webinars (Figure 4) were recorded and posted to the Line Officer Resources page on the WFM RD&A website. http://www.RD&A.nwcg.gov/line_officer_resources.php

Incident Objectives Project

The WFM RD&A was approached in 2014 by the Washington Office of the Forest Service to examine Incident Objectives in WFDSS due to perceptions that many were written generically, providing little direction to the management of a specific wildfire. Published incident objectives were summarized and WFDSS users at several levels of the organization were interviewed during 2014: line officers, incident commanders, planning section chiefs, and local WFDSS experts to understand this issue. Findings were communicated through a white paper on the WFM RD&A website, reference documents, and a presentation to Regional Fire Directors. With input from several line officers and regional planners, a table was created to use as a "guide" for creating better WFDSS Incident Objectives. This table uses a "What, Where, Why" framework that to aid users in formulating meaningful objectives. This guide and the other documents provided will continue to be a work in progress through FY16 as users provide additional feedback when it is used during fire season.

Good Decision Examples

In an effort to continually provide references and materials to assist with decision making, the WFM RD&A developed decision examples as training aids to assist users in understanding how WFDSS can be used as a risk decision-making tool. The Gold Pan Fire of 2013 was an actual fire (located in WFDSS Production) that was a long duration event which varied in IMT organization throughout the life of the fire. The Salt Spring Fire of 2013 is a WFM RD&A created fire (located in WFDSS Training) and is an example of a short duration Type 3 fire. Both decision examples as well as other resources are available on the References & Guides page of the WFM RD&A website: http://www.wfmrda.nwcg.gov/reference_&_guidance.php.

1.3 Objective: Test, identify, and suggest developments to the IFTDSS application

Interagency Fuels Treatment Decision Support System (IFTDSS)

The WFM RD&A, in collaboration with the Office of Wildland Fire and Bureau leadership, continues to lead further development of the Interagency Fuels Treatment Decision Support System. While IFTDSS will remain in beta status until 2017, significant updates to functionality and user experience continue to occur including incorporation of treatment-based fuel model changes based on LANDFIRE Fuel Model Transition tables and interaction with the Fuels Treatment Effectiveness Monitoring (FTEM database) to facilitate end user identification of treatment and wildfire interactions. IFTDSS is currently under transition to a cloud-hosted environment and a new development contract will be awarded in February of 2016.

IFTDSS-Sage Grouse Project

In response to the Department of the Interior Secretarial Order 3336 regarding utilization of science-based strategies to reduce the threat of large-scale rangeland fire to Sage-grouse habitat, the BLM is investigating risk-based landscape-scaled approaches to assist in decision support for fuels management. To assist in this effort, in coordination with the BLM, WFM RD&A staff volunteered to test the Beta 2.0 version of IFTDSS to evaluate its capacity for decision support for fuels management with regard to Sage-grouse habitat. This pilot project (Figure 5) is evaluating pre and post treatment (fuel breaks and conifer removal) conditions on a 400,000 acre landscape with the least habitat loss characterized by the Fire and Invasives Assessment Tool (FIAT) resistance/resilience classifications. Three IFTDSS modeling approaches are being evaluated to identify areas at greatest risk for habitat loss and potential mitigation of loss through fuels treatments. Project deliverables include a guidebook for broader field implementation. Timing for guidebook release and potential field implementation is dependent upon BLM leadership review of the project findings. A final report will be released in February of 2016.

Figure 5 Carson City, NV, IFTDSS Pilot Project

1.4 Objective: Test, identify, and suggest development to emerging risk and decision making applications

Development of the Incident Risk Console (RisC)

Refinement and adjustments continued to be made to the Incident Risk Console (RisC) in FY 2015 (Figure 6). Adjustments were made to ensure incidents within a complex remained visible in the system. Denotations for fires in which the Planning Area encompassed sage grouse habitat were added. Future work includes adding a fire growth chart and time stamped data to improve user comprehension of fire information, in addition to ensuring the site is Section 508 compliant. The RisC application is a collaborative project with WO-FAM, Forest Service Research (Economics and Fire Spread), and FAM-IT. The Incident Risk Console is a 'dashboard' style application that provides a quick glimpse of risk related elements for large and emerging wildland fires. Requested by the USFS Washington Office (WO-FAM) and released to initial users in 2014, this tool is accessed through the Enterprise Geospatial Portal (EGP), https://egp.nwcg.gov.

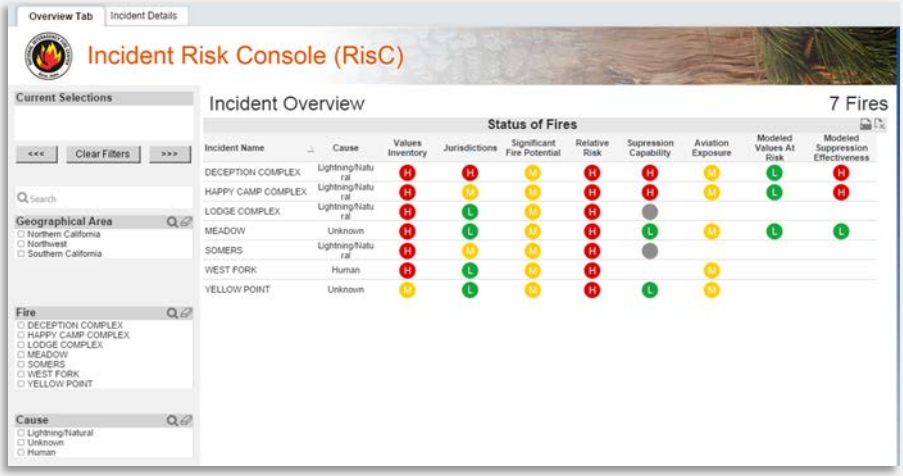

Figure 6 Incident Risk Console (RisC) user interface

TwitterFire

WFM RD&A staff has been mining tweets about wildfires from Twitter's enormous pool of data to develop an early warning system for new and emerging wildfires. Staff and contractors have built a web app called TwitterFire to support this concept. Every 15 minutes TwitterFire relies on a custom built search algorithm to examine an average of 5,250,000 tweets and narrow the data down to only those likely to be talking about a wildfire in the United States. The tweets are then mapped using Yahoo's Placemaker Application Program Interface (Figure 7) and used to drive a notification system which sends emails and/or text messages to registered users when a threshold is met for a specific geographic location. View the TwitterFire Web App from the Threat News Explorer here: http://wwetac.us/tne/tne.html.

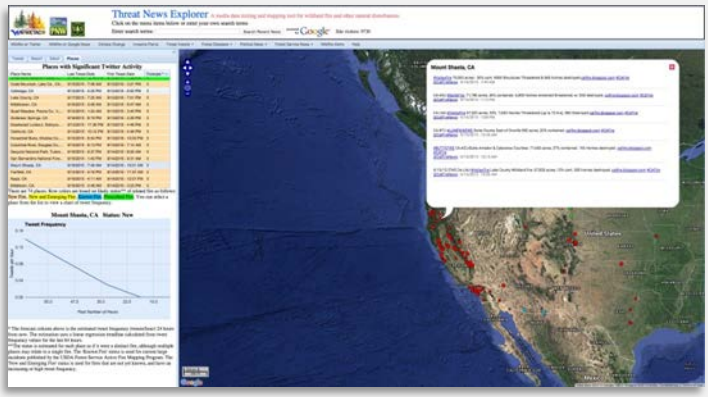

Figure 7 TwitterFire user interface

Wildfires Near Me

In 2015, the WFM RD&A laid the groundwork to prototype a wildfire monitoring application that would provide real-time incident information to users. Similar to current weather forecasting and monitoring applications in use today, Wildfires Near Me (WFNM) monitors the landscape for wildfires and notifies the user if a wildfire is reported within the user's specified notification distance. Once the user begins "monitoring" a specific incident for information, the application notifies the user of any incident changes that occurs. Notifications are generated via browser, emails and text-messages. The application will beta during the 2016 wildland fire season. More information can be found at http://www.wildfiresnearme.wfmrda.com.

Integrated Reporting of Wildland-Fire Information (IRWIN)

The WFM RD&A continues its significant partnership with the interagency fire data community through the Integrated Reporting of Wildland Fire Information (IRWIN) project, building upon the transformative data delivery capabilities achieved last year. For 2015, IRWIN added integration capability to nearly all of the federal units in the western US, facilitating the exchange of real-time fire information from computer aided dispatch (CAD) systems, financial systems, operational fire reporting systems, and decision support systems. WFDSS received fire information for the entire year over a much larger area of the country, and as a result, more than 92% of the fires entered into WFDSS were delivered automatically from sources such as CAD systems, eliminating the need for field personnel to enter nearly 13,000 fires.

The feedback provided following the 2014 season, much of which was consolidated from the WFDSS user community, substantially improved data quality this year. While wildfire incident records from IRWIN increased 64% year over year, the proportion of incidents necessitating manual review declined from 5% to 3%, reducing demands on the WFM RD&A data management staff. The work of the WFM RD&A was recognized consistently by the IRWIN management team for excellence in data management, developing and supporting data standards, engagement, and fire community support. Work continues in 2016 to integrate with additional computing and CAD systems, better handle complexes of incidents, implement QA/QC procedures, and refine data standards.

Goal 2: Conduct technology transfer activities that foster innovation, improve risk based decision making, and promote the use of these tools by the interagency wildland fire community.

2.1 Objective: Train the wildland fire community in utilization of the products we create/sponsor

S-495 Geospatial Fire Analysis, Interpretation, and Application Course

WFM RD&A staff work as mentors, coaches, instructors, steering committee members, and as Co-Chair of S-495 Geospatial Fire Analysis, Interpretation, and Application. Many staff members that don't directly assist with teaching the course work behind the scenes coordinating and communicating WFDSS updates and computational needs with course leaders to ensure the course is a success. All of the fire behavior models used in WFDSS are taught in S-495: Short Term Fire Behavior, Near Term Fire Behavior, and FSPro. Students must learn what model to use for what purpose, how to calibrate, and how to interpret, and not interpret, the results. Passing the course qualifies them as Geospatial Fire Analysts (GSAN) who can then pursue the full fire modeling qualification of Long Term Fire Analyst (LTAN). The online portion of this NWCG course covers several foundational topics regarding fire behavior models, two-dimensional geospatial modeling, weather data, limitations and assumptions in modeling, and risk. Students who pass all online coursework are admitted to the final 40-hour in-residence unit taught at the National Advanced Fire and Resource Institute (NAFRI) in Tucson, AZ, which was the week of April 13, 2015.

Advanced Fire Environment Lessons Unit

Members of the WFM RD&A continue to be involved with the Advanced Fire Environment Learning Unit that was recently vetted under the NWCG Fire Environment Working Committee. 2015 was a busy year for this group, who strives to provide continuing education for advanced topics regarding fire behavior. At the 2015 International Association of Wildland Fire, "Managing Fire, Understanding Ourselves" Conference, the unit facilitated a half day workshop that focused on the interaction between line officers and fire behavior specialists and their role and collaboration during wildfire risk assessments. The workshop, "Improving Risk Assessment through Fire Behavior Analysis" was attended by over 20 participants. In the fall, the group facilitated a webinar that focused on sharing lessons learned regarding fire behavior analysis during the 2015 fire season. The two-hour webinar, "Sharing Fire Behavior Practices and Lessons Learned: Fire Season 2015" was attended by 120 participants and focused on case study discussions regarding spatial fire analysis in the Pacific Northwest, Alaska, and the Northern Rockies.

Detailer and Mentee Programs

The WFM RD&A's mentee program provides field practitioners an opportunity to improve their analysis skills and work virtually with the WFM RD&A on on-going projects. The WFM RD&A provided training opportunities to three mentees this fire season: Bill Coates (FS), William Basye (NPS), and Jennifer Barnes (NPS). Each mentee worked in two-week increments from July 19th through August 29th, and were supported as needed by staff while working for incidents and completing day to day work. Mentees supported 36 different incidents in six geographic areas with fire behavior analysis and decision support. While not supporting incidents, mentees helped assess the Incident Risk Console (RisC) and Fire and Fuels Planning Portal, but spent most of their time expanding their knowledge and skills with WFDSS decisions and analysis. Over the last five years the WFM RD&A has hosted twenty-four mentees from five agencies.

The WFM RD&A also supports a detailer program that simultaneously allows for critical work to be accomplished while providing training and experience to field personnel on a variety of unique and diverse projects. Three detailers were utilized from 90 to 120 days each. Brianna Schueller (FS) worked with the WFM RD&A on help content and technology related to the Interagency Fuel Treatment Decision Support System (IFTDSS). Liz Struhar (NPS) worked on content and technology transfer of the Fire Planning and Fuels Management Portal. Wes Hall (FS) supported WFDSS Help documentation and content.

Learning from Our Users

The Wildland Fire Management RD&A website (www.wfmrda.nwcg.gov) is one of our primary communication tools. The website is a wealth of knowledge and continues to grow and expand. As with any website it is important for us to know if people are finding what they need and the site is being used. This year Google Analytics were enabled on the website to help gain understanding of what content users are viewing and how frequently they are viewing it. Since enabling Google Analytics the WFM RD&A has been able to quantitatively measure the user base and insure that the content posted is engaging and useful.

2.2 Objective: Increase customer awareness of the Rocky Mountain Center and integrate their products into wildland fire management systems

Rocky Mountain Center (RMC)

The RMC Steering committee moved into its second year in 2015. The RMC steering committee added Ed Delgado, National Predictive Services Manager, in an effort to offer more and improved services to the field and land management agencies in general. Ed will give the steering committee a better perspective on what products and services will assist predictive service in filling existing and potential future needs of the field. The steering committee, RMC, and the WFM RD&A have also been coordinating with other meteorological and climate research groups, to streamline efforts and reduce potential overlap. Learn more about the RMC at http://fireweather.sc.egov.usda.gov/info/about_us.htm.

2.3 Objective: Seek opportunities to learn from and collaborate with domestic and international entities that produce and disseminate science and technology that has the potential to benefit the wildland fire community

International Programs

Mark Hale, Lead Fire Application Specialist, traveled to Palangkaraya, Indonesia assisting International Programs in collaboration with United States Agency for International Development (USAID), to develop and deliver a course in Fire Management Plan Development. Over the years, peatland fires have been increasing in Indonesia and Malaysia where five percent of the world's carbon is stored. Land use practices and human ignitions have contributed to large fires resulting in lack of peatland ecosystems and health issues. Although fire management is slowly being incorporated in the region there has been a lack of management planning to develop sustainable fire programs. In an effort to increase capacity in fire management, a three day course was developed and delivered to fire managers from Malaysia, Vietnam,

and Indonesia (Figure 8). A shortened one day version of the course was also presented to government officials and fire managers from Palangkaraya, using simultaneous translation, and translators.

Figure 8 Mark Hale meets with course participants

Additionally, Mark Hale was supported by International programs and the Singapore government, to assist the Singapore National Environment Agency and the Director of the Asia Pacific Spatial Informatics Group to develop and facilitate an ASEAN (Association of Southeast Asian Nations) workshop on Peatland Fire Management under the Regional Haze Training Network (Figure 9). There has been limited collaboration of known information on peatland fires and haze issues in the region therefore this workshop was created in an effort to education countries dealing with these issues. The workshop consisted of several presentations and table facilitation of 10 ASEAN countries over a two day period. Countries learned and shared information on peatland fire management, with the Singapore National Environment Agency taking the lead to compile and distribute information and lessons learned.

Figure 9 Workshop attendees, Mark Hale bottom right

2.4 Objective: Improve technical transfer mechanisms for broader audiences in the following categories: 1) Promote solutions that lead to broad use and sharing of interagency wildland fire data, 2) Promote the most current science and research in operational products, 3) Software and hardware technologies

Technology Transfer of Quantitative Risk Framework Information to the Field

Numerous WFM RD&A staff participated in and attended a workshop on Quantitative Risk Framework, January 27-29 2015, in Missoula, MT (Figure 10). The workshop, Wildfire Risk and Fuel Treatment Analysis, represented a collaborative effort from the Washington Office Fire and Aviation Management (WO-FAM) Fuels and Fire Ecology staff and the Rocky Mountain Research Station Wildland Fire Management Research, Development, and Application (WFM RD&A) group, Human Dimensions Laboratory, Fire Sciences Laboratory, Fire Modeling Institute, Pyrologix, Forest Service Regions 1 and 5 staff, TEAMS enterprise team, and the Pacific Northwest Research Station Western Wildland Environmental Threat Assessment Center (WWETAC) to develop and present the current state of knowledge regarding the Wildfire Risk Assessment Framework.

Figure 10 Workshop attendees breakout session

The goal of the workshop was to build capacity by introducing the risk framework concepts, steps, and recent applications at all scales in order to help forests and regional staffs support their own local wildfire risk assessments. A recording of the workshop is available to interested parties at the Northern Rockies Fire Science Network website: http://nrfirescience.org

Application Data Management

2015 saw the data management staff at WFM RD&A update 39 major data layers aiding wildfire decision support activities in WFDSS. Highlights include an update to the NWCG standards-based interagency fuel treatments dataset first produced in 2014, new geographic area boundaries data reflecting the merger of the Eastern and Western Great Basin centers, an unprecedented seven Fire Management Unit/Strategic Objective Shape update opportunities as the Forest Service transitions to Spatial Fire Planning, and updates to ten datasets depicting critical man-made infrastructure. Additionally, the transfer of the Interagency Fuel Treatment Decision Support System (IFTDSS) from Joint Fire Science Program (JFSP) management to the WFM RD&A allowed data management staff to begin supporting fuels treatment decision support activities. Fuel Treatment perimeters and Threatened and Endangered species critical habitat were among the first datasets added to IFTDSS under WFM RD&A support.

Risk Synthesis Workshop

July 7-9, 2015, a small group of staff from the WFM RD&A, the Fire Modeling Institute (FMI), RMRS Human Dimensions, TEAMS Enterprise Unit, & Pyrologix attended a workshop facilitated by the Pacific Southwest Regional Fire Planners (Phil Bowden, Jennifer Anderson, and April Brough), Figure 11. Two days were spent introducing concepts of quantitative risk and using conditional Net Value Change information to create strategic management zones for land and resource management plan revisions. A subset of the data from the Southern Sierra Risk Assessment was used to create strategic management zones. These four zones are being proposed as Strategic Objectives in WFDSS Spatial Fire Planning and present a succinct way to communicate a risk based strategic response to wildfire ignitions. After two days of geospatial analysis, the final day was for discussion about how to collectively involve various groups to advance the communication of fire management planning direction in WFDSS via spatial fire planning.

Figure 11 Cadre at the Risk Synthesis Workshop

Fire Planning and Fuels Management Resource Portal

The prototype Fire Planning and Fuels Management Resource Portal (https://www.frames.gov/partner-sites/nwcg-fpfm/home/) was developed beginning in 2014 as part of a joint effort with the NWCG Interagency Fire Planning Committee and the Fuels Committee (Figure 12). This Resource Portal assembles information for Fuels Specialists and Fire Planners related to planning challenges as well as "toolboxes" and career development information to aid in keeping up with changing technology and management practices. The web portal continued under limited development through 2015 with a few added links to the Interagency Fuels Treatment Decision Support System (IFTDSS) as well as additional information related to spatial fire planning and fire behavior modeling. Development of the portal will continue in 2016 as partnerships with the National Advance Fire Resource Institute (NAFRI) are established. It is anticipated that the web portal will be tied to a Fuels Center of Practice at NAFRI in the coming years.

Figure 12 Fire Planning and Fuels Management Resource Portal

Line Officer Desk Reference

WFM RD&A continues to work closely with the National Line Officer Team (NLOT) to update and revise the desk reference guide (Figure 13). This past year considerable time and effort was put into revising and developing the Forest Service Agency Administrator Certification program, including the training plan, guidance and national direction. The Coach/Shadow program has evolved substantially from what was known as the "coaching/mentoring" program; shadowing opportunities are essential for preparing Line Officers to successfully perform as Agency Administrators during wildland fires or other critical incidents. The Coach-Shadow program provides Agency Administrators lacking fire experience the opportunity to perform as an Agency Administrator, with the oversight of a coach as an advisor. More information can be found at: http://www.wfmrda.nwcg.gov/line_officer_resources.php.

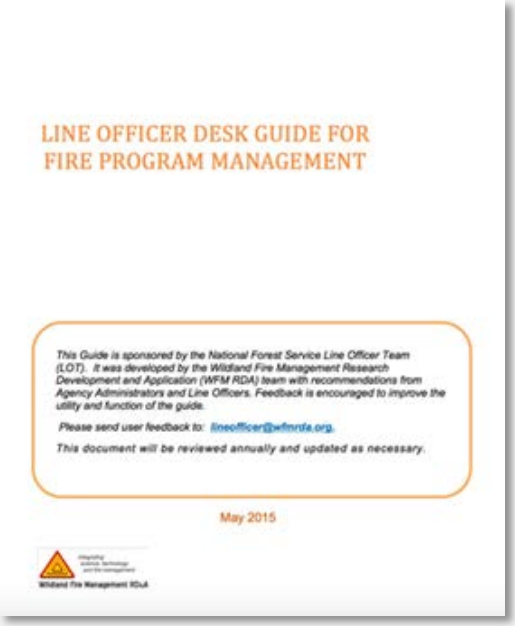

Figure 13 Line Officer Desk Reference Guide

WFDSS Refresher Training Recommendations

Training recommendations for Agency Administrators were developed by the WFM RD&A to clarify what was needed to meet the recommended 2 hour refresher training requirement as documented within the Interagency Standards for Fire and Fire Aviation Operations (Red Book). This information is intended to help guide the refresher coordinators by providing topics and materials. The Agency Administrator recommended training is not new information, instead it highlights the important concepts and materials Agency Administrators should become familiar with prior to the fire season. The recommendations can be found at: http://www.wfmrda.nwcg.gov/line_officer_resources.php.

Fire Extremes Project

The WFM RD&A funded Fire Extremes Project, was a two-part project which used both quantitative and qualitative methods to assess if wildfire behavior has become more extreme over previous decades or if fire fighters' perceptions of wildfire behavior have shifted over time. Using a narrative-based data method, the final project included 237 stories collected between July 2014 and June 2015. In summary, there are indications from the analysis of this data that imply that in the study participants 1) perceptions of unpredictable or erratic wildfire behavior are not dependent on when the event occurred; however, the broader sense in the fire community on fire behavior becoming more extreme in recent years is supported by fire danger indices and observed changes in climate; 2) fire fighter perceptions of unpredictable fire behavior is based on experience, with the exception of fire fighters with 1-3 years of experience, who tend to lean towards following orders; and 3) those with the most current experience recounted events where they felt too much risk was taken and resources were unavailable. A final report of this project will be available in FY 2016.

Fire Season Ending Event Project

The Fire Season Ending Event Project is a coordinated effort between the Desert Research Institute, RMRS Fire Lab and the WFM RD&A. The summary information is preliminary as this research project is ongoing into the 2016 fiscal year. At this time the research has conveyed that there is no scientific consensus on what season length is because there is no agreed upon definition of what a "season" is, and there are numerous season definitions depending on what aspect of fire is being described. Fire seasons are not continuous, and there are several caveats i.e.: changes in fire management implementation have created inconsistencies in fire records, variations in season ending events exist due to reporting not necessarily physical conditions. Additionally, however fire season is defined, it varies geographically. Final results from this project will be available in FY 2016.

National Line Officer Team Webpage

The WFM RD&A has assisted the National Line Officer Team (NLOT) in standing up a public facing webpage (Figure 14); the intention of the site is to provide tools and contacts for fellow line officers to be successful in meeting their fire management responsibilities and expectations. In addition, the NLOT is the FS conduit for agency administrators to raise awareness on emerging issues and ensure perspectives are shared with the National Fire Leadership. More information on who the NLOT is and what they do can be found at: http://www.wfmrda.nwcg.gov/national_line_officer_team.php.

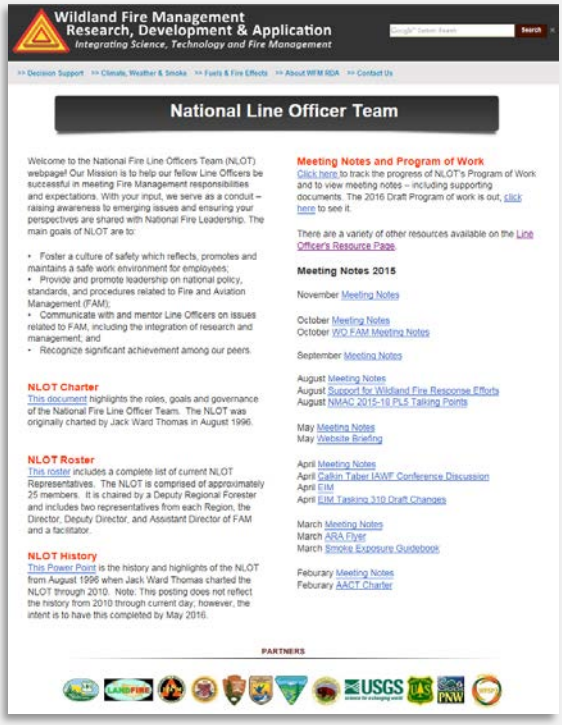

Figure 14 NLOT page on the WFM RD&A website

Monthly Seminar Series

The WFM RD&A hosts an internal Seminar Series to advance knowledge sharing among fire scientists and the WFM RD&A. The WFM RD&A has the resources to aid in development of tools for field users by providing technical transfer expertise and assistance to the research community. This year presentations from several researchers and experts included Larry VanBussum (NOAA) regarding a weather observation database, Matt Jolly (USFS RMRS) and Jon Wallace (USFWS) about NFDRS updates, Jim Riddering (University of Montana) about the University of Montana Fire Center activities, Karen Short (USFS RMRS) regarding bias in wildfire activity data, Zach Holden (USFS R1) about his TOPOFIRE climate mapping efforts, and Miriam Rorig and Susan O'Neill (USFS PNWRS) about AirFire and the BlueSky framework. The Seminar Series has been a great way to find out about ongoing fire research and programs and has revealed opportunities to collaborate and build relationships.

2.5 Objective: Support the field with timely and risk based decisions

Decision Support Sets a New Record

The WFM RD&A continued to staff a decision support hotline this year and have analysts on standby for fire behavior requests. WFM RD&A analysts provided more individual incident support this year than any other, supporting 122 incidents in eight Geographic Areas. Support provided varied widely, including Values and Risk assessments, Management Action Point assistance/creation, and map products, but the most delivered products were Fire Spread Probability (FSPro) projections and Near Term Fire Behavior simulations (Figure 15).

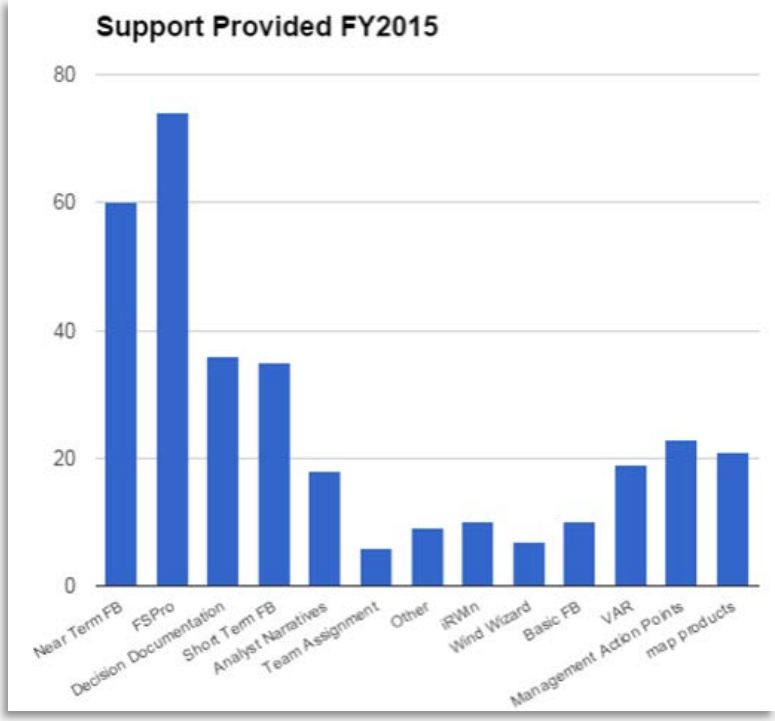

Figure 15 Support products provided by NFDSC

The majority of the support was to the Northern Rockies, Alaska, and the Northwest Geographic Areas (Figure 16). Incidents of all types were supported, with the greatest support to Type 1 incidents, followed closely

by Type 2 (Figure 17). With the increased use of Area Command Teams also came additional requests for WFM RD&A support at that level. WFM RD&A members continually seek to build skills and abilities in the field and on local units, to that end team members trained or mentored 49 individuals while supporting the 122 incidents in FY 2015.

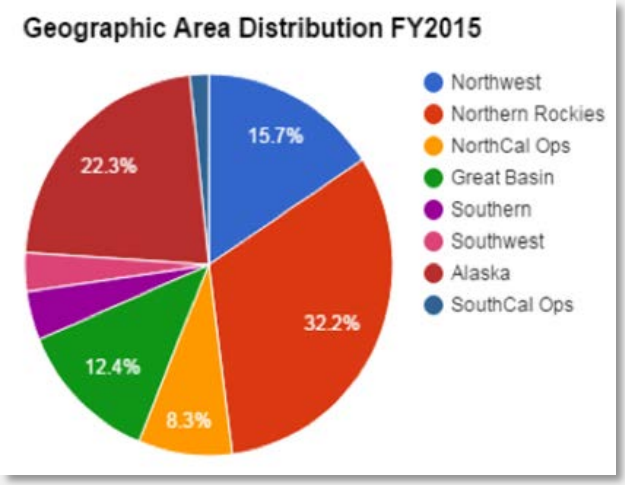

Figure 16 Support provided by geographic area

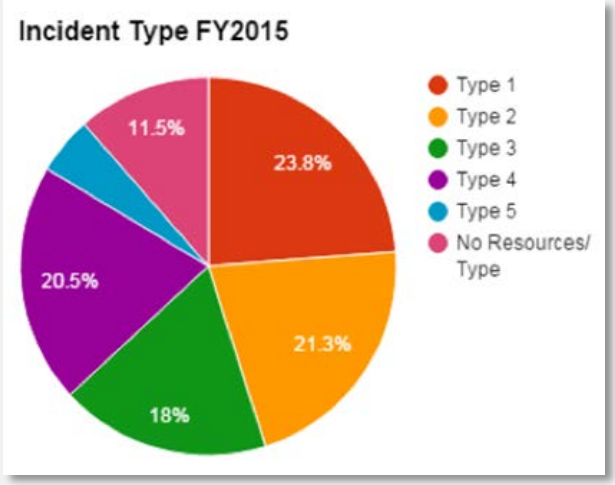

Figure 17 Support provided by incident type

In addition to staffing on-call analysts, the WFM RD&A provides daily support to the field through formal and informal means: answering technical questions about how the WFDSS program works, providing information about fire modeling systems and training, and providing guidance and references to policy. The total number of formal support tickets in FY 2015 was greater than our average at 2,409. Formal support includes contacts to the WFDSS Helpdesk via email or phone, Tier 2 Support for when the Helpdesk in unable to resolve an issues. Figure 18 shows a breakdown of formal support by support type in 2015. Informal support includes personal communications with individuals outside of the formal means via phone and email. Informal support reached a new high this year at 1,008.

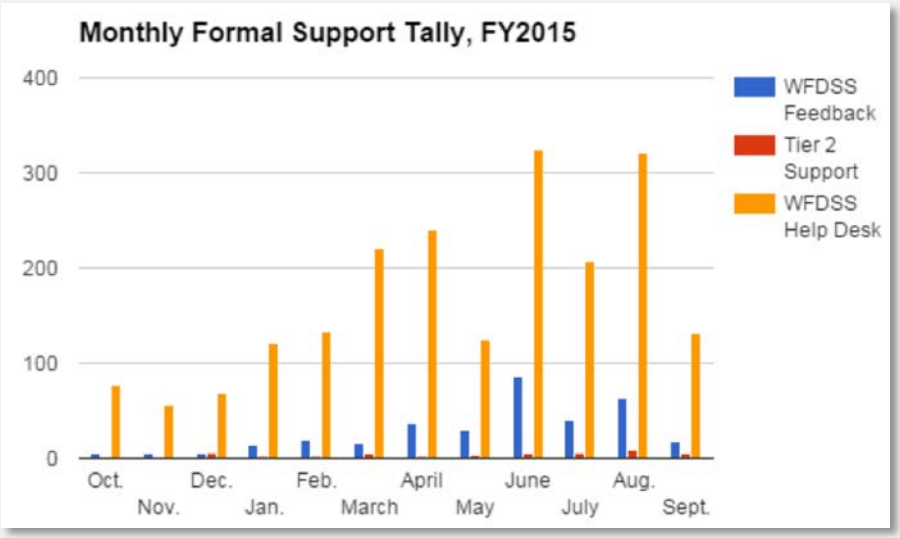

Figure 18 Monthly formal support

Goal 3: The Wildland Fire Management RD&A connects with stakeholders to modify projects and evaluate future needs.

3.1 Objective: Work with field practitioners to understand management needs

Geographic Area Editor Information Coordination

The WFM RD&A continues to maintain regular communication with WFDSS Geographic Area Editors (GAEs), who represent the interagency fire community. GAEs provide a vital communication link by disseminating information from the WFM RD&A to the field, and giving quality feedback from the field to the WFM RD&A. Monthly conference calls with the GAEs allow the WFM RD&A to solicit feedback on specific items that will affect WFDSS users, share new proposals, and discuss current issues. Additionally, an annual After Action Review is held with the GAE community to review the previous year's successes and areas for improvement. Priority tasks are identified and tracked throughout the monthly calls. 2015 saw many new GAEs as retirements and replacements occurred. GAEs were vital this year in helping spread the word to the field about the new Decision Editor in WFDSS and its utility as well as providing feedback on initiatives of the WFM RD&A on improving Incident Objectives and proposed adjustments to the Delegation of Authority format. The WFM RD&A is committed to maintaining strong connections with the GAEs to constantly provide an outlet for information and a point of contact for feedback.

3.2 Objective: Work with researchers to ensure that latest science is relevant and applicable to field needs

Safety Zone Research

The WFM RD&A supports Safety Zone Research work through funding, assistance with application development, coordination of potential test sites and tech transfer with operations, training and field personnel. Research is underway to review current understanding of heat transfer in wildland flames, summarize current knowledge of how humans are injured by heat and smoke, compare current safety zone guidelines, define the primary factors that should be evaluated within the context of safety zones, recommend new guidelines that account for convective heating, and suggest future research needs. It is expected that the new guidelines will depend on multiple variables including fire characteristics (flame length or height), site characteristics (e.g. slope percent) and relative location (i.e. chimney, ridge, mid-slope, ridgetop). Special emphasis is placed on the effect of "chimneys" and other terrain features that produce dangerous levels of convective heating ahead of the fire front. Additionally, consultation with the wildland fire management community has identified the need to explore the flow field around structures in the context of safety zones. New guidelines are under development that will link slope, wind, and fire intensity to safety zone size. These guidelines are expected to take the form of simple rules, Pocketcards, and smart phone apps. Ultimately this research will make fire managers and firefighters safer and more effective. The WFM RD&A continues to support this effort. More information can be found at: http://www.firelab.org/project/firefighter-safety-zones.

3.3 Objective: Work with the Washington Offices to ensure national interagency coordination

Coordination with National Incident Management Organization (NIMO)

The WFM RD&A has been working with the National Incident Management (NIMO) teams to align risk management philosophies and processes. Work with the NIMO teams includes evaluating the deliberative risk process in WFDSS and incorporating the Strategic Risk Assessment (SRA) process to ensure one risk management process is being utilized. WFM RD&A staff members attended workshops completed by NIMO at local forests in Regions 1 and 9 to gain understanding of what is taught, to ensure it can be supported by the deliberative process in WFDSS, and to assist where needed.

Risk Summit

Several WFM RD&A members helped plan and participated in the first Risk Summit held in Tucson in December 2014. The Risk Summit was convened because risk assessment and management is a critical part of managing any fire but the concepts are not well defined or understood in the fire community or land management agencies. The summit brought together a wide range of fire managers as well as line officers, fire scientists, researchers and training specialists from many different agencies. It offered the opportunity for this diverse group to discuss these issues and define the future of risk management. Several task groups resulted from the summit, one of which was a Terminology Task Group, to develop common definitions of risk and related terms for adoption by the wildland fire community. WFM RD&A members were involved with this task group and a document with new terminology will be presented at the Risk Summit in December 2015.

Pacific Northwest Fire Season Timeline Report

The 2015 fire season was the most severe in the Pacific Northwest's modern history, with Oregon and Washington experiencing more than 3,800 wildfires that burned more than 1.6 million acres. The Pacific Northwest Region of the Forest Service commissioned a narrative summary to capture the full story, not only for historical purposes, but also to help the agency and the public continue to learn from past experiences and prepare for future fire seasons. WFM RD&A staff members organized and contributed significantly to this report. The interactive report provides story maps and full narrative summaries and is available online http://www.fs.usda.gov/main/r6/fire-aviation and in an interactive application (Figure 19).

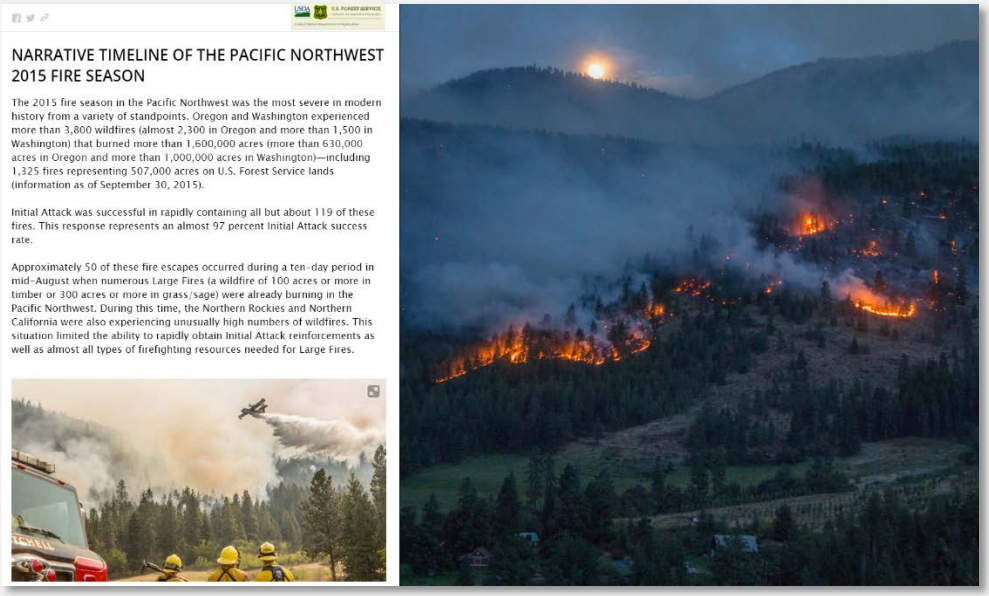

Figure 19 Interactive application of PNW 2015 Fire Season Timeline Report

3.4 Objective: Communications with collaborators improve WFM RD&A functions (includes local, state, and non-government entities)

Implement Marketing Plan for the WFM RD&A

Communication is an important aspect of the WFM RD&A to disseminate new ideas and technology, and stay in touch with the field, cooperators and the public. In an effort update current plans, staff worked this past year, reviewing current communications planning and identifying opportunities to enhance current communications and collaboration. The WFM RD&A has also been working with Rocky Mountain Research Station (RMRS) communications leads on opportunities for collaboration. One of the key ideas identified for improving communications includes working with university communication programs to identify graduate candidates and projects that could contribute to better communications planning for the WFM RD&A. Students would contribute to the following project goals: 1) evaluation and synthesis of existing wildfire science communication strategies; 2) design of systems, templates, and strategies used to communicate with wildland fire science users and identify the audience that would benefit from new science; and 3) obtaining/analyzing managers' evaluations of existing and potential wildland fire communication efforts and technology transfer methods.

Goal 4: Staff maintain and increase professional qualifications and explore professional interests that augment the WFM RD&A.

4.1 Objective: Developmental and continuing education opportunities are provided for our staff

WFM RD&A Detail to the USFS Southwestern Regional Office- Fuels and Fire Ecology Program Manager

October through December of 2014, Marlena Hovorka, Fire Management Specialist, was detailed to the Southwestern Regional Office as the Fuels and Fire Ecology Program Manager. The Southwestern Regional Office is located in Albuquerque, NM. She worked on several projects for the region: served regional restoration committees, reviewed restoration funding proposals, facilitated Type 1 prescribed burn briefings for the regional forester and prepared regional FY 2015 fuels and fire ecology budget submission material. She also provided guidance to field units for burn boss refreshers, Veteran Green Corp projects, and acreage targets.

WFM RD&A Detail to the National Fire Desk

Figure 20 National Fire Desk briefing area

In June of 2015 Ben Butler spent two weeks detailed to the Forest Service's National Fire Desk in Washington, D.C (Figure 20). He worked as part of a three-person team to compile data and put together daily reports on fire activity. While in D.C. Ben was able to demonstrate the use of the TwitterFire web application as a tool for gaining valuable insight into where and when wildfires occur. Working at the Fire Desk provided a valuable insight into the Washington Office and was a great opportunity for Ben to hone his data skills.

Supporting Forest Service Fire and Aviation Management Information Technology

WFM RD&A Data Manager Andrew Bailey completed a 90-day detail as a Group Leader for Geospatial Resources and Information Management with the USDA Forest Service Fire and Aviation Management, Information Technology Branch (FAM-IT). FAM-IT, located in Boise, Idaho, manages a suite of fire management computer applications used to collect, maintain, and disseminate fire, weather, and all-hazard data (current and historical) in support of fire operations, budgeting, fire resource planning, firefighter safety, public affairs information dissemination, and public and private research and development.

While working as Group Leader, Andrew served on the branch leadership team, supervised staff with geospatial project management responsibility for a suite of national interagency geospatial fire management tools, and worked through the information technology approval and acquisition process. His most visible role during the detail was managing a 3-month-long project to re-engineer the FTP.NIFC.GOV file-sharing site prior to fire season, adding security controls and multi-application user authentication features to this heavily used interagency site. The detail was beneficial to both FAM-IT and the WFM RD&A in terms of understanding the roles, capabilities, and opportunities available to each, resulting in improved relationships between these two technologically adept program areas.

WFM RD&A Detail to the Washington Office FAM, Fuels and Fire Ecology Group

In February, Erin Noonan-Wright, Fire Application Specialist, was detailed to the WO Fuels and Fire Ecology group in Washington, D.C. She worked on helping the staff develop performance metrics to evaluate the efficacy of applying the number of acres claimed from beneficial fire as a performance metric for land management on National Forest Lands. The result was a new reporting requirement, documenting "beneficial acres" for each wildfire on a home unit. Beneficial acres are acres that burned as a result of a wildfire and moved the land toward a desired condition as defined in a land and resource management plan. In addition, she facilitated and presented at the "Wildfire Risk and Fuel Treatment Analysis Workshop" in Missoula Montana, that focused on teaching a quantitative risk assessment framework for wildland fire planning. Through working with the WO Fuels and Fire Ecology staff, Erin experienced the challenge of communicating on a national scale, the benefit of doing fuel treatments and allowing fires to play their role in maintaining ecosystem health.

Future of the WFM RD&A, Deputy Program Manager, Lisa Elenz

The WFM RD&A looks forward to future innovations in technology and how these changes will be used by the wildland fire community in risk based decision making for wildland fire and fuels management.

The team (Figure 21) has identified many FY2016 opportunities that promote new innovations, research, and new technology transfer opportunities. Greatest growth will include continued development of the Interagency Fuels Treatment Decision Support System (IFTDSS) identified for a FY2017 release; alignment of the Rocky Mountain Center products with Predictive Services to ensure the information is evaluated, timely, relevant and supports wildland fire incident; work with NOAA/National Weather Service Centers for Environmental Prediction to finalize a historic gridded weather data set for use in fire behavior analysis and research; collaboration with the USDA CIO's Spatiotemporal Innovation Center to investigate more efficient and cost effective information technology solutions; testing of new technologies for cloud solutions and data processing applications and development of a new charter and focus areas for the WFM RD&A. Continued collaboration with the IRWIN team, the Wildland Fire Information Technology Advisory and Program Board, and the interagency data management processes and standards will lead to truer coordination of applications, resources and data. Support to Line Officers and the field remains a priority with new training materials, webinars, and courses being developed based on user feedback, previous field support, and reviews. Essential to all WFM RD&A work and the above listed tasks is the continued support to the risk-centered approach to wildland fire management and supporting the interagency fire and Line Officer community in risk-based decision making.

The WFM RD&A will continue to focus on partnerships and communications with research, the field, and collaborators which will lead to new innovations and improvements to risk management and decision making tools utilized by the interagency wildland fire community.

Figure 21 WFM RD&A Staff - spring 2015

FY 2016 Planned Activities

Goal 1: Foster fire management decision support systems that are risk-based, relevant, timely, and integrated, including planning (fuels) and incident response.

- Support interagency Spatial Fire Planning efforts.
- Test, identify, and suggest developments to emerging risk and decision making applications including the Incident Risk Console (RisC) and TwitterFire.
- Partner with the RMRS Fire Economics Research group to continue development of "prototype forest" example.
- Collaborate with Innovations Project staff to validate and improve Scientific Modeling Framework and to develop and test new Integrated Interagency Data systems.
- Maintain, test, identify and suggest WFDSS application enhancements, including transition to new contactor.
- Test, identify, and suggest developments to the IFTDSS application.

Goal 2: Conduct technology transfer activities that foster innovation, improve risk based decision making, and promote the use of these tools by the interagency wildland fire community.

- Train the wildland fire community in utilization of the products we create and sponsor: NWCG courses, support Advancement Fire Behavior Learning Unit, develop tech and user guides, mentor field, and provide refresher materials.
- Continue support to international partners through USAID and other means.
- Increase customer awareness of the Rocky Mountain Center and integrate their products into wildland fire management systems: oversee and participate in the RMC steering committee, upgrade RMC webpage, develop Alaska fire weather products, and a system of predictive equations for large fire probabilities for Predictive Services.
- Improve technical transfer mechanism for broader audiences: provide technology transfer regarding Quantitative Risk Analysis Framework information, promote interagency data coordination and standards, test alternative methods to create Delegations of Authority and Leader's Intent Briefing Packages, maintain Fuel and Fire Planning Portal, continue involvement and support of interagency committee and working group that promote and further objectives.
- Provide daily support to ongoing fire incidents, remote and on-site as needed regarding decisions and fire behavior.

Goal 3: The Wildland Fire Management RD&A connects with stakeholders to modify projects and evaluate future needs.

- Coordinate with Geographic Area Editors and Fire Planners to understand and meet management needs.
- Work with researchers to ensure latest science is relevant and applicable to field needs: Safety Zone Research, Haines Index research, Fire Behavior Extremes project, Quantitative Risk Analysis Framework.
- Work with Washington Officer to ensure national interagency coordination: Red Book guidance, Line Officer's Desk Reference maintenance, National Line Officer's Team coordination, and develop and promote Risk terminology.
- Communicate with collaborators and audiences regarding WFM RD&A functions: 2016 IAWF conference, Association of Fire Ecology Conference, disseminating Annual Accomplishments, website maintenance, committee participation.
- Renew the WFM RD&A and National Fire Decision Support Center Charter and Service Level Agreement.

Goal 4: Staff maintain and increase professional qualifications and explore professional interests that augment the WFM RD&A.

- Provide developmental and continuing education opportunities for staff.

Appendix A FY 2015 Activities & Coordination

Publications

- Vaillant, N., Noonan-Wright, E., Reiner, A., Ewell, C., Rau, B., Fites-Kaufman, J., and S. Dailey. 2015. Fuel accumulation and forest structure change following hazardous fuel reduction treatments throughout California. International Journal of Wildland Fire. Available online: http://dx.doi.org/10.1071/WF14082
- Noonan-Wright, E., Sexton, T., and M. Burgard. 2014. "The Evolution of the Wildland Fire Decision Support System (WFDSS): Future Direction after Five Years of Implementation." in Viegas, Domingo Xavier (ed). Advances in forest fire research. Coimbra, Portugal: [s.n.]. ISBN 978-989-26-0884-6 (PDF)
- Noonan-Wright, E., Opperman, T. 2015. Applying the Wildland Fire Decision Support System (WFDSS) to Support Risk-informed Decision Making: The Gold Pan Fire, Bitterroot National Forest, Montana, USA. Conference Proceedings, Large Wildland Fires; Social, Political & Ecological Effects, Missoula, May, 2014

Presentations

- "Risk Management in the U.S. Forest Service- Past, Present and Future" 2nd International Conference on Fire Behaviour and Risk, Alghero, Sardinia, Italy, May 26-29
- "The Evolution of the Wildland Fire Decision Support System (WFDSS): Future Direction After Five Years of Implementation." 7th International Conference on Forest Fire Research, Coimbra, Portugal, November 14-21
- "Risk Assessment and the Interagency Fuels Treatment Decision Support System- IFTDSS." Oral presentation given at the Wildfire Risk and Fuel Treatment Analysis Workshop, January 27-29, 2015, Missoula, MT
- "Data Management Supporting Decision Making on Wildland Fires", National Society of American Foresters and International Union of Forest Research Organizations Convention, October 6-10, 2014
- IFTDSS Presentation to USFS Regional Fire Planners and Fuels Specialists, April 30th, 2015, Atlanta, GA
- Spatial Fire Planning Presentation to USFS Regional Fire Planners and Fuels Specialists, April 30th, 2015, Atlanta, GA
- "Incident Risk Console (RisC)." Managing Fire, Understanding Ourselves: Human Dimensions in Safety and Wildland Fire, Boise Idaho April 2015
- Fire Planning and Fuels Management Portal Presentation to USFS Regional Fire Planners and Fuels Specialists, April 30th, 2015, Atlanta, GA
- WFDSS Updates and Spatial Fire Planning, Northwest Fire Planners Meeting, Bend, Oregon, January 13-15th
- WFDSS Overview and Use, Webinar with Washington Dept. of Natural Resources, November
- IFTDSS Overview, Burn Boss Refresher, John Day, Oregon, April 28th
- IFTDSS Briefing, Fire Behavior Subcommittee Meeting, Bend, Oregon, April 29th
- Presentation and Briefing to Australian Fire Representatives regarding WFDSS at NIFC, August, 2015
- "Improving Risk Assessment Through Fire Behavior Analysis Workshop," Human Dimensions in Safety and Wildland Fire, Boise, Idaho April 20th
- Fire Director Briefing June 2015 WFDSS updates, NLOT, Coach Shadow program and Line Officer Tools webpage
- Keynote presentation on Risk Management at Southwest, Northern Rockies, Great Basin and Pacific Southwest Regional Incident Management Team Meeting, Albuquerque, NM, Missoula, MT, Boise, ID and Sacramento, CA April, 2015
- Keynote presentation on Risk Management at the Area Command/Incident Command team meetings Phoenix, AZ March, 2015

Training/Course Instruction

- Fire Management Planning Course, Palangkaraya, Central Kalimantan, Indonesia, November 27th-December 6th, 2015
- Wildfire Risk and Fuel Treatment Analysis Workshop, January 27-29, 2015, Missoula, MT
- Technology Transfer of Quantitative Risk Framework Workshop, Missoula and Virtual, July 7-9, 2015
- S495, Geospatial Fire Analysis, Interpretation, and Application, taught winter/spring, online & Tucson, AZ, 2014/2015
- WFDSS Refresher, Willamette National Forest, Sweet Home, Oregon April 17th, 2015
- WFDSS Refresher, Nez Perce and Clearwater National Forests, May 6th, 2015
- National Fire Management Leadership, Tucson, AZ, March 23, 2015
- S482, Advanced Fire Management Applications, Boise, Idaho, Oct. 21-23, 2014
- S390, Introduction to Wildland Fire Behavior Calculations, Boise, ID, Nov. 18-22, 2014
- USFS Middle Leader Program Coach
- WFDSS Updates and Spatial Fire Planning, NPS East Coast Fire GIS meeting, Raleigh, NC, December, 2014
- WFDSS Update and IRWIN, California Intermediate GISS Class, McClellan, CA, March, 2015
- Rx310, Prescribed Fire Plan Preparation, Great Basin Training Center, Boise, Idaho, March, 2015
- WFDSS Overview, GISS Webinar Refresher courses, February and May, 2015
- BIA WFDSS Refresher, spring 2015
- WFDSS Data Management Deep Dive Webinars (2), spring, 2015

Workshops/Conference Attendance

- Association of Southeast Asian Nations (ASEAN) Workshop on Peatland Fire Management under Regional Haze, December 7th-10th, Singapore, Singapore
- Managing Fire, Understanding Ourselves: Human Dimensions in Safety and Wildland Fire, Boise Idaho April 20-24, Planning Committee and Attendance
- 2nd International Conference on Fire Behaviour and Risk, Alghero, Sardinia, Italy, May 26-29
- 7th International Conference on Forest Fire Research, Coimbra, Portugal, November 14-21
- National Society of American Foresters and International Union of Forest Research Organizations Convention, October 6-10, 2014
- Canadian Fire Danger Rating System (CFDRS) Conference attendee and panel participant, Alaska, October 27-31st
- 2014 USFS- Risk Management Summit, December 9-11, 2014
- Fire Extremes Research Project and Data Evaluation Workshop, in partnership and DRI, Boise, Idaho, February 19, 2015

Organizational Representation

- NWCG US Forest Service Research Executive Board Representative
- NWCG Fire Behavior Subcommittee Chair
- NWCG Fire Planning Subcommittee Representative
- NWCG Fire Reporting Subcommittee Representative
- NWCG Fire Danger Subcommittee Member
- NWCG Geospatial Subcommittee Chair
- NWCG Data Standards and Terminology Subcommittee Representative
- LANDFIRE Liaison
- Predictive Services/Intelligence Liaison
- Fire Research And Management Exchange System (FRAMES) Liaison
- Air/Fire Group Liaison

- S495 Geospatial Fire Analysis, Interpretation, and Application Steering Committee Chairmen, Cadre, Mentors, Coaches
- S590 Advanced Fire Behavior Interpretation- Steering Committee Chairmen, Cadre, Mentor, Coach
- National Incident Management Organizations (NIMO) Liaison
- Information Technology Advisory Board representative
- Wildland Mobile Technologies Working Group Chair and member
- Northern Rockies Consortium Liaison
- Fire Consortia for Advanced Modeling of Meteorology and Smoke (FCAMMS) Representative
- Desert Research Institute (DRI) Liaison
- BLM WFDSS Oversight group
- Interagency Fire Planning Committee Representative
- Incident Risk Console (RisC) WFM RD&A Representative
- Emerging Technologies Group Chair and Representative
- NWCG Fire Environment Committee Representative
- Advanced Fire Environment Learning Unit Chair and Representatives
- National Line Officer Team Liaison
- Southern Fire Exchange Consortia Steering Committee
- Rocky Mountain Center (RMC) Steering Committee

Cooperative Agreements and Partnerships

- Air Fire Program, Pacific Northwest Research Station, http://www.airfire.org
- LANDFIRE Program, http://www.landfire.gov/
- Cooperative agreement and development of Board of Directors for oversight of DOI Fire Application Specialists and their participation in the WFM RD&A and the NFDSC
- Desert Research Institute (DRI), http://www.dri.edu
- National Oceanic and Atmospheric Administration (NOAA) and the National Weather Service (NWS)
- Fire, Fuel, and Smoke Science Program, RMRS, http://firelab.fire.org
- Human Dimensions Program, RMRS
- University of Idaho Wildland Fire Science Program
- University of Idaho Cost Reimbursable Agreement
- Fire Research And Management Exchange System (FRAMES)- University of Idaho, www.frames.gov
- National Center for Landscape Fire Analysis (NCLFA)- University of Montana, http://firecenter.umt.edu
- Department of Interior- Office of Wildland Fire Coordination (OWFC), www.doi.gov/pmb/owf
- Bureau of Indian Affairs (BIA)
- Bureau of Land Management (BLM)
- Fish and Wildlife Service (FWS)
- National Park Service (NPS)
- US Geological Survey (USGS)
- Joint Fire Science Program (JFSP), www.firescience.gov
- Northern Rockies Fire Science Network, http://nrfirescience.org
- National Wildfire Coordinating Group (NWCG), www.nwcg.gov
- National Predictive Service Program (NIFC), www.predictiveservices.nifc.gov
- USFS Fire & Aviation http://www.fs.fed.us/fire
- Pacific Southwest Research Station, www.fs.fed.us/psw
- Pacific Northwest Research Station, www.fs.fed.us/pnw
- The Nature Conservancy (TNC), www.nature.org
- International Association of Wildland Fire (IAWF)