
2014 Quadrennial Fire Review



Sub-Task 2.2 – Report Card

USDA Forest Service Fire & Aviation Management

1621 N. Kent Street
Arlington, VA 22209

Department of the Interior Office of Wildland Fire

1849 C Street, NW MS 2660
Washington, DC 20240

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BACKGROUND & METHODOLOGY

This report card evaluates the recommendations and predictions included in the 2005 Quadrennial Fire and Fuel Review (QFFR) and the 2009 Quadrennial Fire Review (QFR) (hereafter referred to as “previous QFRs”) to provide an analytical foundation for the 2014 QFR.

The report card applies a structured methodology to examine progress toward the recommendations put forth in the previous QFRs, and to begin to understand why implementation may have been successful in some areas but not in others. The project team based its assessment of each recommendation on its understanding of the current environment and the original intent of the QFR, and recognizes that work related to many of the recommendations will be ongoing and may never be truly complete. The document also provides an evaluation of the accuracy of predictions included in the two previous reviews to gain insights about the reliability of the processes employed to arrive at those predictions.

This effort began with a review of the previous QFRs to extract 143 specific recommendations and 31 predictions related to wildland fire management and the synthesis of that content into 33 high-level recommendations and 24 forward-looking predictions. The project team then conducted an extensive literature review of government, academic, and science documents – along with selective engagement of wildland fire subject matter experts (SMEs) – to analyze progress toward each recommendation and to gauge the accuracy of each prediction. The team developed a report card template that depicts the results of that effort using gradient scales and “stoplight” charts and which also includes several process-oriented recommendations to enhance future QFRs.

Figure 1: Approach for QFR Sub-Task 2.1 (Analysis) & 2.2 (Report Card)



It is the intent of the U.S. Department of Agriculture (USDA) Forest Service (FS) and the Department of the Interior (DOI) Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Fish and Wildlife Service (FWS), and National Park Service (NPS) that future QFR processes begin with the development of a report card to evaluate previous QFRs. Similar to the document that follows, future QFR report cards will measure the wildland fire community’s performance against the goals included in previous QFRs, help ensure accountability, and glean best practices for the future. This report card is a departure point for that effort.

EXECUTIVE SUMMARY

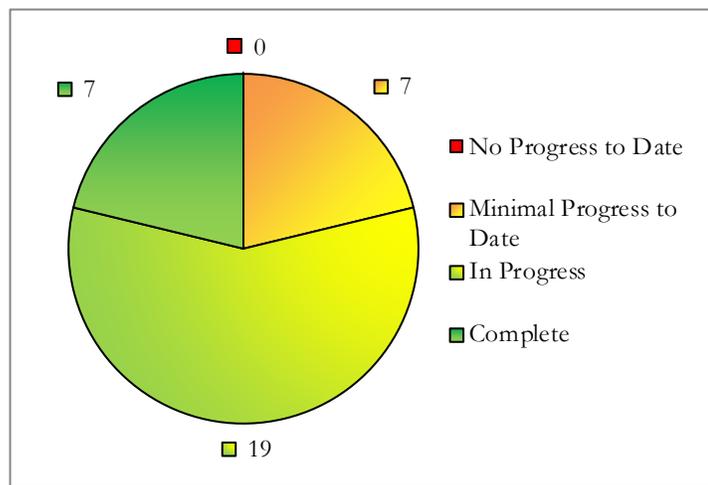
This report card evaluates progress toward 33 high-level recommendations and the accuracy of 24 forward-looking predictions from the previous QFRs. The methodology employed to develop the report card uses a gradient scale (ranging from “No Progress to Date,” to “Complete”) to evaluate each recommendation, and a “stoplight” chart to evaluate each prediction.

Recommendations

The analysis that resulted in this report card suggests that previous QFRs have been drivers of change as related to FS and DOI fire management programs. It is also apparent that past QFRs have been instrumental in altering the thought processes of FS and DOI fire leaders, and in focusing the attention of those leaders on the highest priority issues identified during each review process.

Of the 33 recommendations distilled from the previous QFRs, the project team assessed the majority to be either “Complete” (7) or “In Progress” (19), with the latter indicating significant accomplishments to date; the project team assessed a minority (7) as showing “Minimal Progress to Date” and none (0) as showing “No Progress to Date.” Figure 2 displays the grading distribution of recommendations posed in the previous QFRs.

Figure 2: 2005 & 2009 QFR Recommendation Rating Distribution



Key insights from the report card include the following:

1. **Budget Challenges:** Many of the recommendations that remain incomplete have been negatively impacted by budget constraints affecting Federal wildland fire management agencies and their state and local partners.
2. **Partnerships and Decision Support:** The wildland fire community has achieved significant progress in developing new partnerships, improving its decision support capabilities, and expanding and promoting community education, knowledge, understanding, and self-sufficiency through efforts such as the National Cohesive Wildland Fire Management Strategy (hereafter referred to as the “Cohesive Strategy”).
3. **Technology:** Though the wildland fire community made significant progress toward integrating and employing new technology, significant opportunities remain for adopting new technology in fire cache management, dispatch, communications, remote sensing, and other program areas (e.g., unmanned aerial vehicles (UAVs)).
4. **Fire and Land Management Planning:** FS and DOI have made steady progress in improving planning processes and tools since the previous QFRs through programs like the co-funded Joint Fire Science Project, the work of the FS Forest Research Stations, and other interagency efforts to assist fire and land management planners. Although these initiatives have been useful, management planning continues to leverage traditional metrics such as Fire Regime Condition Class (FRCC), fuels conditions, and values at risk that may no longer be sufficient in an era where wildland fire conditions are evolving quickly due to changing environmental factors. Fire agencies have not yet

developed tools to assist in planning based on the future desired condition that addresses changes on the landscape from climate variation, invasive species, insects, disease and other factors.

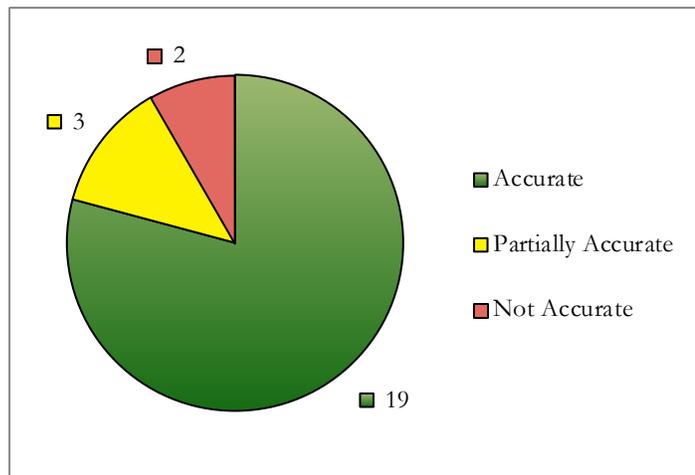
5. **The Wildland Fire Workforce:** The fire agencies have begun to transform their workforces to meet the community’s evolving needs, and have done so with a backdrop of constrained budgets and an aging workforce that is retiring rapidly. Nonetheless, these efforts are in their infancy and it is critical that they remain high priorities for fire leadership.
6. **Non-Fire Emergency Response:** New national, state and local capabilities developed through collaborative efforts with the Federal Emergency Management Agency (FEMA) U.S. Fire Administration (USFA), the continued development of the National Incident Management Organization (NIMO), and the transition of many standard Incident Command Courses from the National Wildfire Coordinating Group (NWCG) to FEMA, have resulted in decreased demand for fire agency support in non-fire disaster readiness and response activities. This has allowed FS and DOI to focus more on wildland fire and has reduced burdens on the program.

Predictions

With few exceptions, the predictions posed in the previous QFRs have proved to be accurate. Of the 24 predictions posed, the project team rated 19 as “Accurate,” 3 as “Partially Accurate,” and 2 as “Not Accurate.” Figure 3 displays the rating distribution of those predictions.

A noteworthy discrepancy was the predicted increase in fire season annual acres burned cited in the 2009 QFR. The number of annual average wildland fire acres burned per year peaked from 2004-2007 and then declined from 2008-2013. While this decline could represent an anomaly, it may also provide evidence that acres burned annually has reached a temporary stasis point.

Figure 3: 2005 & 2009 QFR Prediction Rating Distribution



QFR Study Process Recommendations

The review conducted for this report card included an in-depth analysis of the previous QFRs and engagement with wildland fire SMEs who contributed to the development of the 2005 and 2009 reviews. Several process-oriented recommendations worthy of consideration by FS and DOI fire leadership for inclusion in the 2014 QFR final report and follow-on reviews are as follows:

- Most importantly, the 2014 QFR report and future iterations should provide no more than five focused, strategic, long-range recommendations to the wildland fire community.
- QFR recommendations should be easily identifiable in the report executive summary, as well as in a table in the body of the report (or an appendix) for easy reference that allows agency leaders, planners, and programmers to readily identify those recommendations without reading the entire report.
- Future QFR reports should also include a methodology section describing the analytical approach and/or tools employed to arrive at any conclusions or predictions posed therein.
- Consider opportunities to more closely integrate the QFR and Cohesive Strategy processes.

EVALUATION OF PREVIOUS QFR RECOMMENDATIONS

As a quick reference, the table below provides a full list of the 33 high-level recommendations the project team extracted and synthesized from the previous QFRs, along with a simple assessment of each recommendation’s status. The team assigned status grades for each recommendation on a linear scale comprised of “No Progress to Date,” “Minimal Progress to Date,” “In Progress,” and “Complete.” The team then plotted the status of each recommendation on a gradient scale ranging from red to green, with red representing “No Progress to Date” and green representing “Complete.”

For details about the justification for the grade associated with each recommendation, see pages 6-20.

#	QFR	Recommendation	Status
1	09	Modernize Aviation Policy & Capability	
2	09	Establish National Interagency Air Attack & Aerial Supervision Module Programs	
3	05	Enhance Decision Processes & Tools for Managers	
4	05/09	Implement AMR & Refine WFSA & WFIP Processes	
5	05/09	Enhance Predictive Services Capabilities	
6	05/09	Improve Spatial Landscape Data	
7	05	Employ FPA for Prioritizing Interagency Staffing & Facilities	
8	05	Improve Monitoring & Evaluation Processes	
9	05/09	Increase Collaboration in Emergency Response	
10	05/09	Expand Local-Level All Hazard Response Capability	
11	05/09	Upgrade IMT Capability & Structure	
12	05	Enhance Decision Support Tools for Fuels Management	
13	05/09	Create Landscape-Level Fuels Investment Strategy	
14	05/09	Promote Fire Adapted Communities	
15	05/09	Launch Public Outreach & Education Initiatives	
16	05/09	Create New Wildland Fire Governance & Policy Framework	
17	09	Employ Web-Based Forums to Educate the Public	
18	05	Improve Planning Processes to Better Support NEPA	
19	05	Model the Desired Future Vegetative Condition	
20	05	Realign Hazardous Fuels Program Policies & Processes	
21	05/09	Increase Use of AARs in Wildland Fire	
22	05/09	Consider All Factors in Suppression Decisions	
23	09	Strengthen Safety & Risk Management Metrics	
24	09	Implement Strategic Management Response	
25	05/09	Increase Remote Sensing Capability	
26	05/09	Improve Efficiencies in Dispatch and Mobilization	
27	09	Expand Science & Technology Partnerships	
28	05	Maintain Fire Management Force Structure	
29	05	Explore Realigning GACC Boundaries for Efficiency	
30	05/09	Enhance Employee Development Opportunities	
31	05	Implement a Targeted Career Development System	
32	05	Leverage Strategic Sourcing	
33	05	Enhance Succession Planning Processes	

QFR(s)	Recommendation #1: Modernize Aviation Policy & Capability		
2009	Develop a more agile and modern aviation policy and capability to include aviation asset and base modernization, common standards, and approval processes for the streamlined use of federal, state, and local aviation assets, as well as to increase the number of aerial-delivered fire fighters to meet national needs for initial attack and large fire support.		
No Progress to Date	Minimal Progress to Date	In Progress	Complete
Justification			
<p>There have been nine significant efforts to analyze aviation needs for fire management since 1995 (and seven since 2005). FS and DOI have made progress in upgrading fire aviation programs, but there is still significant work to be done. Impediments to progress stem from a lack of funding to develop and acquire new aviation assets, issues with aviation sourcing, a need to improve and incorporate more rigorous understanding of aircraft effectiveness and its relationship to fleet mix planning, and a large airtanker fleet that has been decimated due to airframe issues on aircraft that are often 50 years old or older. (Sources 1-7)</p>			

QFR(s)	Recommendation #2: Establish a National Interagency Air Attack & Aerial Supervision Module Program		
2009	Establish a government-owned, centrally-managed, and highly-mobile national interagency air attack and aerial supervision module (ASM) program that includes standardized platforms to provide interoperability and efficiency between agencies, as well as wide-ranging response for aerial supervision and intelligence gathering missions.		
No Progress to Date	Minimal Progress to Date	In Progress	Complete
Justification			
<p>Fire bureaus have expressed a desire to obtain a government-owned and centrally managed air attack and aerial supervision module program, but funding has not been available to accomplish this goal. Fire bureaus continue to rely on a combination of agency-owned aircraft, long-term contracts, and call when needed (CWN) contracts for their aviation resource needs. (Sources 8-13)</p>			

QFR(s)	Recommendation #3: Enhance Decision Processes & Tools For Managers		
2005	Increase the availability and usefulness of decision-making processes and tools such as predictive services, risk analysis, and decision support for fire and land managers.		
No Progress to Date	Minimal Progress to Date	In Progress	Complete
Justification			

Since the 2005 review, FS, DOI, and the interagency fire community (through the Wildland Fire Leadership Council [WFLC], National Wildfire Coordinating Group [NWCG], and other fire governance bodies) have initiated projects such as the Wildland Fire Decision Support System (WFDSS), the Interagency Fuels Treatment Decision Support System (IFTDSS), and the Joint Fire Science Program (JFSP) – Fire Research and Management Exchange System (FRAMES). These projects focus on developing and implementing modeling and decision support systems as well as enhancing the experience and knowledge of fire and land managers. Recent effort on the Wildland Fire Information Technology (WFIT) project is particularly relevant as it aims to streamline and improve a wildland fire enterprise architecture that has existed for years without a guiding central focus and oversight process. Although significant work has been accomplished, several of these efforts, particularly IFTDSS, have been subject to protracted delays and will not be completed for some time. The Predictive Services community has also raised concerns about the lack of necessary technology and resources to deal with changing support functions and address technical refreshment needs. This recommendation relates to an area of the program that will continue to evolve as new science and technology becomes available and, as such, it may never be fully “completed.” (Sources 14-23)

QFR(s)	Recommendation #4: Implement AMR & Refine WFSA & WFIP Processes			
2005 & 2009	Improve wildland fire decision making and implementation of appropriate management response (AMR) through further refinement of the Wildland Fire Situation Analysis (WFSA) and the Wildland Fire Implementation Process (WFIP). Specifically, enhance and better document strategic decisions and facilitate access to and use of next generation risk-informed decision support tools.			
No Progress to Date		Minimal Progress to Date		In Progress
Complete				
Justification				
WFLC Policy Modification of Federal Wildland Fire Policy Guidance (May 2, 2008) states that “Every wildland fire will be assessed following a decision support process that examines the full range of responses. The system is known as the Wildland Fire Decision Support System (WFDSS).” WFDSS was used in a pilot program in 2008 and FS and all DOI bureaus formally adopted it in 2009 following a transition from the WFSA. The WFSA has been replaced by WFDSS while the WFIP was eliminated as part of the policy modification that eliminated “wildland fire use” as a strategic option. (Sources 24-28)				

QFR(s)	Recommendation #5: Enhance Predictive Services Capabilities			
2005 & 2009	Increase the capacity for Predictive Services, analysis, and support at both national and geographic area levels in support of large fire strategy selection, resource allocation, and hazardous fuels treatment.			
No Progress to Date		Minimal Progress to Date		In Progress
Complete				
Justification				

Improvements and enhanced capability in Predictive Services have occurred since 2005 at national and geographic area levels, both internally and through partnerships with the National Oceanic and Atmospheric Administration (NOAA) National Weather Service - Fire Weather Forecasting Offices. However, the Predictive Services community has raised concerns about the lack of necessary technology and resources to deal with changing support functions. Those concerns are under examination through the WFIT process to address technical refreshment needs. As this is a critical area of information and decision support to fire and land managers, adopting new tools and enhancing existing ones will remain critical to addressing future changes in the fire environment . (Sources 29-36)

QFR(s)	Recommendation #6: Improve Spatial Landscape Data		
2005 & 2009	Expand efforts to review and modify landscape data used in the Fire Spread Probability (FSPro) spatial model, including continued investments in the LANDFIRE tool to enhance the capacity and accuracy of modeling large fire spread, and to inform land and fire managers.		
No Progress to Date	Minimal Progress to Date	In Progress	Complete
Justification			
<p>LANDFIRE has been updated continuously since its inception in 2004 and underwent a program review in December 2009 (see June 27, 2011 DOI memo). LANDFIRE collects new data each year from FS and DOI staff and incorporates it into the next LANDIRE update. Data layers for all areas of the country are typically updated as needed on a biennial basis. Data updates on a more frequent basis are desired but are limited due to budgetary and resource constraints. Although LANDFIRE and FSPro as products have seen significant improvements, the 2009 QFR also identified a need for better data to support decision-making; this need has not yet been fully addressed. This recommendation will remain a priority going forward simply due to the community's ongoing need for data updates. (Sources 36-40)</p>			

QFR(s)	Recommendation #7: Employ FPA for Prioritizing Interagency Staffing & Facilities		
2005	Fire Program Analysis (FPA) fire management planning should be used to prioritize and identify interagency options for staffing reorganization and streamlining. FPA should inform determinations about the best locations for new fire facilities and opportunities for jointly-funded facilities, equipment, and staffing to best leverage interagency funds between FS, DOI, and other partners.		
No Progress to Date	Minimal Progress to Date	In Progress	Complete
Justification			
<p>FPA, initially designed for use at all levels (from national to individual field units), has evolved to become primarily a national strategic budget and planning tool, thus many of the elements of the original recommendation in 2005 are no longer valid. FPA is being assessed as a possible test case to transition into the WFIT strategy, but to date has not met the recommendation's intent of</p>			

identifying interagency options for staffing reorganization or streamlining of joint funded facilities and equipment as originally envisioned in the 2005 QFR. (Sources 41-47)

QFR(s)	Recommendation #8: Improve Monitoring & Evaluation Processes
2005	Develop and implement evaluation processes and effectiveness monitoring protocols across land ownership boundaries to increase capabilities to assess land condition changes, values at risk, and develop enhanced strategies and tactics for use in the full range of wildfire decision-making (<i>See also Recommendation #27</i>).
	
<p>No Progress to Date Minimal Progress to Date In Progress Complete</p>	
Justification	
<p>Since the 2005 review, FS and DOI have dedicated significant resources to developing and implementing tools to: (1) support monitoring and evaluation across land ownership boundaries in the United States, and; (2) to upgrade decision-making capabilities to ensure fire and land managers can determine and utilize the best strategies and tactics for all aspects of wildland fire management. These efforts include new partnerships and modeling and decision making tools such as the Fire Effects Monitoring and Inventory System (FIREMON), WFDSS, NFPORS and LANDFIRE. Although the community has achieved substantial progress, this recommendation may never be fully complete as it relates to an area of the program that will continue to evolve as new science and technology becomes available, and as landscape conditions change. (Sources 48-58)</p>	

QFR(s)	Recommendation #9: Increase Collaboration in Emergency Response
2005 & 2009	Develop a more interactive and robust approach that allows federal fire agencies to work more effectively with FEMA and state and local community emergency response forces, to include strengthening memorandums of understanding (MOU), cooperative agreements, and interagency policies. This approach should extend the reach of emergency response through a total force concept, while sharing the burden of training and development with other agencies.
	
<p>No Progress to Date Minimal Progress to Date In Progress Complete</p>	
Justification	
<p>The FS Disaster and Emergency Operations Branch of the Washington Office Fire and Aviation Management Directorate (FAM) interfaces directly with FEMA headquarters on behalf of the wildland fire agencies to maintain a close working relationship that supports planning for and response to disasters. Since 2008, more than 200 FS and DOI personnel have been trained to serve as Emergency Support Function #4: Firefighting (ESF #4) liaisons during disasters. FS FAM represents the wildland fire agencies on FEMA's Emergency Support Function Leadership Group at the headquarters level. Each FS Region also has a formal liaison with FEMA who serves on the Regional Interagency Steering Committee and works with state and local response agencies within the region. An MOU between FS and FEMA has solidified a strong, efficient, and effective working relationship in response to declared emergencies and major disasters. The</p>	

NWCG NRF/NIMS Committee also provides an avenue for ongoing collaboration between FEMA and the wildland fire agencies. FAM is also developing agreements with states and major metropolitan fire departments to expand structure fire response capability through ESF #4. Other progress toward this recommendation includes work accomplished through the Cohesive Strategy, NIMO, the NWCG training transition to FEMA-USFA, and several other NWCG and FEMA-USFA collaborative initiatives. (Sources 59-72)

QFR(s)	Recommendation #10: Expand Local-Level All Hazard Response Capability
2005 & 2009	Expand the capacity of fire management forces through the adoption of the NIMO initiative and by working with FEMA to develop additional capacity in All-Hazard Incident Management Type 3 teams at the local level, extending to larger national and even international areas of operation.
	
No Progress to Date Minimal Progress to Date In Progress Complete	
Justification	
<p>NIMO has maintained four teams since 2008 and collaborated with FEMA to develop additional incident management team capability at the local (Type 3) level, including an NWCG supported pilot program that began in 2010. Many states have also expanded local and state level capacity on their own, further reducing the need for federal support.</p>	
<p>The FS Disaster and Emergency Operations Branch of FAM is working closely with groups such as the All Hazard IMT Association, FEMA-USFA, NWCG, and others to expand the ability of wildland fire agencies to utilize local and State All-Hazard IMTs and both wildland fire incidents and missions assigned under ESF4 under the National Response Framework and Stafford Act. FAM and DOI are working closely with the FEMA National Integration Center to develop standard qualifications and resource typing for local All-Hazard IMTs, and are working with NWCG to develop an endorsement process that will clarify the linkages between wildland fire and all-hazard IMT qualifications (<i>See also Recommendation #9</i>). (Sources 73-82)</p>	

QFR(s)	Recommendation #11: Upgrade IMT Capability & Structure
2005 & 2009	Upgrade Incident Management Team (IMT) capability and structure by shifting to a more modular incident management organization that enables IMTs to cope with the full range of management responses, while also reducing costs and improving efficiencies.
	
No Progress to Date Minimal Progress to Date In Progress Complete	
Justification	
<p>The NWCG Incident Management Organization Succession Planning, Evolving Incident Management (IMOSP-EIM) project, as depicted in the update issued June 12, 2013, spurred progress toward meeting this recommendation. Overarching principles of this process include: (1) Incident Complexity/Scalability, allowing managers to adjust team size commensurate with</p>	

incident complexity (rather than maintaining a fixed team configuration for the duration of the assignment); (2) evaluation of the potential for the development and utilization of Modules/Support Centers to meet the needs of complex or multiple incidents and promote efficient use of scarce resources, and; (3) adjusting team size through the creation of new versions of “short teams” and by combining the former Type 1 and Type 2 teams into a single group now termed “Complex Incident Management Teams.” These efforts focus on maintaining needed national IMT capacity in an era when staffing has become increasingly difficult due to reduced resources and losses due to retirements. Annual National Multi-Agency Coordinating Group (NMAC) preparedness strategies also continue to identify and promote increased use of modules and task teams. Much of the planning for how to move forward has been initiated, but the process overall is in the early stages. (Sources 83-96)

QFR(s)	Recommendation #12: Enhance Decision Support Tools for Fuels Management
2005	Develop decision support tools for the hazardous fuels reduction program to help identify the highest priority areas to expend fuels treatment funds, while prioritizing fuel management maintenance projects to protect prior investments in areas where desirable conditions have been obtained through projects or wildfire.
 <div style="display: flex; justify-content: space-between; width: 100%;"> No Progress to Date Minimal Progress to Date In Progress Complete </div>	
Justification	
<p>FS and DOI have directed significant funding and resources to develop and implement hazardous fuels decision support tools that assist in identifying the highest priority treatment projects, and have also realigned budget processes to focus on ensuring fuels treatment funding is being used as efficiently and effectively as possible. Efforts to date include the Hazardous Fuel Prioritization and Allocation System (HFPAS), including the Ecosystem Management Decision Support System (EMDS), the Large Fire Simulator, upgrades to the National Fire Plan Operations and Reporting System (NFPORS) program, development efforts of the Interagency Fuels Treatment Decision Support System (IFTDSS), the National Interagency Fuels, Fire, and Vegetation Technology Transfer Team (NIFTT), and others.</p>	
<p>Although the wildland fire community has dedicated significant time and energy to this area of fire management, developing interagency tools to prioritize fuels reduction projects across bureaus has been difficult and many efforts to date have been incomplete or not accepted. DOI is embarking on a new initiative, the DOI Fuels Program Revision Project, and has retired HFPAS. IFTDSS has experienced developmental issues, and none of these systems adequately addresses the recommendation to prioritize fuel management maintenance projects to protect prior investments. Both FS and DOI are evolving toward a substantially improved, more explicitly risk-based foundation for fuels decision support. Recommendations regarding IFTDSS were recently developed for presentation to the WFIT Executive Board in April 2014. The Board will consider approval of a three-phased approach to implement IFTDSS and make it the authoritative data resource for all fuels-related project information. (Sources 97-110)</p>	

QFR(s)	Recommendation #13: Create Landscape-level Fuels Investment Strategy
2005 & 2009	Establish an integrated fuels management policy to transform fuels management from a project/output perspective to a landscape-level investment strategy in support of greater land management priorities and multi-jurisdictional goals, which rewards programs for creating new approaches to interagency planning and target accomplishment.
<p>No Progress to Date Minimal Progress to Date In Progress Complete</p>	
Justification	
<p>Numerous efforts initiated to address this recommendation since 2005 have met limited success. Although effort and commitment from the fire agencies has been constant, appropriation law as it pertains to what has historically been known as the Hazardous Fuels Reduction (HFR) subactivity, has been an issue. Appropriations have routinely directed HFR to emphasize the WUI, constrained the flexibility of HFR funding and limited the desired shift to a landscape level strategy. Furthermore, fiscal austerity measures have resulted in insufficient funding to keep pace with the number of acres needing treatment and the degree of departure from the desired condition after a century of suppression emphasis. These factors have largely been out of FS and DOI control. (Sources 111-132)</p>	

QFR(s)	Recommendation #14: Promote Fire Adapted Communities
2005 & 2009	Promote community self-sufficiency and collaboration with local leaders through the expanded use of Community Wildfire Protection Plans (CWPP) and the development of building codes, zoning ordinances, and landscape defense tactics that support community protection.
<p>No Progress to Date Minimal Progress to Date In Progress Complete</p>	
Justification	
<p>The wildland fire community has fully embraced this recommendation, as evidenced by work associated with the Cohesive Strategy and initiatives such as FIREWISE, the Fire Adapted Community Coalition, Fire Learning Network, and significant collaborative efforts between FS and DOI with the International Association of Fire Chiefs (IAFC), FEMA-USFA, National Fire Protection Association (NFPA), and other partners. Although the wildland fire community has put significant effort promoting community self-sufficiency and collaboration, success depends primarily on actions undertaken by actual communities at risk. The question of whether or not the progress toward this recommendation since the 2005 and 2009 QFRs matches the level of effort and funding invested remains outstanding. (Sources 133-151)</p>	

QFR(s)	Recommendation #15: Launch Public Outreach & Education Initiatives
2005 & 2009	Develop and implement public outreach and education initiatives, including reorienting existing workforce (prevention teams, WUI specialists, and public affairs) and clarifying roles, responsibilities, and authorities of federal, state, tribal, and local fire protection

	organizations and property owners. Initiatives should help shape more realistic public expectations of the federal fire agencies and expand knowledge and understanding of prescribed fires, natural fires, and the concept of creating fire adapted communities that complement the fire adapted ecosystems that they adjoin.		
No Progress to Date	Minimal Progress to Date	In Progress	Complete
Justification			
Efforts associated with the Cohesive Strategy have contributed to progress toward this recommendation and have had a substantial impact on public expectations and responsibilities through collaboration, outreach, and education. Other programs such as FIREWISE, the Fire Adapted Communities Coalition, Fire Learning Network, the IAFC's Ready-Set-Go program, and coordination between FS, DOI and FEMA-USFA have also contributed. It is apparent that there has been growth in the understanding and knowledge of wildland fire and its role in the natural world, but there remains a significant future workload in this area. (Sources 152-170)			

QFR(s)	Recommendation #16: Create New Wildland Fire Governance & Policy Framework		
2005 & 2009	Construct a “new” national intergovernmental wildfire policy framework that encompasses all of the stakeholders and affected public in protecting communities, while improving the understanding of community expectations and concerns for resource values (air, water, and view shed) beyond simply protecting homes, as well as recognizing that fire has a role in managing these landscapes.		
No Progress to Date	Minimal Progress to Date	In Progress	Complete
Justification			
This recommendation has been a guiding principle of the Cohesive Strategy, which resulted in the development of new governance structures and alterations to existing governance to facilitate a new generation of thinking and collaboration. These changes range from the highest levels of government to the individual community level, and include structural and membership changes within the NWCG governance structure, the development of regional strategy committees as well as high-level interagency governance groups including groups developed under the Federal Advisory Committee Act (FACA) to increase non-federal participation. (Sources 171-187)			

QFR(s)	Recommendation #17: Employ Web-Based Forums to Educate the Public		
2009	Explore the development of new information access and public communication efforts using new mediums, technologies, and internet applications such as Web 2.0 to develop social networks and portals, wikis, and other forums. These efforts should support public fire education and enhance new understandings about wildfire, water, air quality, carbon, global warming, biodiversity, and habitat restoration.		
No Progress to Date	Minimal Progress to Date	In Progress	Complete

Justification	
<p>The wildland fire community has embraced the use of new web-based forums to enhance information access and public communications efforts since the 2009 QFR. Many of these forums have been developed in conjunction with the Cohesive Strategy and include new networking platforms such as YouTube, Facebook, Twitter (@US_Wildfire), a Cohesive Strategy News Feed, and centralized regional information available on Cohesive Strategy Regional Strategy Committee web pages. Many other fire program areas have developed web-based portals and other mechanisms to support information distribution, communication, and collaboration among partners. The Joint Fire Science Project has developed 14 web-based regional science consortia designed to develop, promote, and manage web-based regional communities of practice to support peer-to-peer networking and knowledge exchange, along with a regional web-based National Environmental Policy Act (NEPA) aid that allows fuels and resource planners to quickly access relevant research results (<i>See also Recommendation #27</i>). The original concept of “Web 2.0” contained within the 2009 QFR envisioned a more robust utilization of the web by fire management, thus this recommendation has not been fully achieved. (Sources 188-202)</p>	

QFR(s)	Recommendation #18: Improve Planning Processes to Better Support NEPA			
2005	Encourage NEPA planning processes at the highest level to reduce the overall NEPA workload.			
No Progress to Date		Minimal Progress to Date		In Progress
				Complete
Justification				
<p>FS and DOI have implemented numerous policy changes, tools, and procedures to support streamlined NEPA processes and address this recommendation in concert with the Healthy Forest Restoration Act (HFRA) and the Healthy Forest Initiative (HFI). These efforts, along with new fire management planning (FMP) policies and processes, development and implementation of spatial FMPs, and the use of categorical exclusions for fuels treatment projects have likely accomplished this recommendation to the extent possible given existing policy, legal, and regulatory statute limitations. (Sources 203-221)</p>				

QFR(s)	Recommendation #19: Model the Desired Future Vegetative Condition			
2005	Use integrated modeling and planning processes to establish the desired future vegetative condition with the realization that it may not be the same as the past.			
No Progress to Date		Minimal Progress to Date		In Progress
				Complete
Justification				
<p>The literature review identified efforts by FS in forest health monitoring, by the BLM to complete rapid ecosystem assessments in select areas of the country, and by the NWCG Fuels Management Committee to review the current use of the Fire Regime Condition Class (FRCC) system in planning and modeling. It was unclear from this review, however, how these efforts</p>				

may have addressed the need to develop and implement modeling tools and planning processes to identify the future desired condition based upon expected changes due to fire, climate change, insect and invasive plant infestations, and other factors.

In addition to its literature review, the project team also conducted one-on-one interviews with agency SMEs. Those interviews identified that while there have been ongoing discussions on this topic and some local level site specific projects that do address this recommendation, there have been no broad (national or regional) level efforts to develop modeling and planning processes that utilize the desired future condition based upon landscape changes that are beyond the agency's ability to alter. Current modeling and policy continues to rely on reference condition based on historic condition class through the FRCC model. FRCC is an interagency, standardized tool for determining the degree of ecological departure from historical, or reference condition, vegetation, fuels, and disturbance regimes. (Sources 222-237)

QFR(s)	Recommendation #20: Realign Hazardous Fuels Program Policies & Processes
2005	Adjust policies, performance measures, and accomplishment reporting processes for individual agencies and fuels targets (not burned acres per agency) to encompass an interagency landscape perspective and address barriers to pooling money, fund transfers, cross billing, and accomplishment accountability to enhance overall program effectiveness and expand opportunities for success.
<p>No Progress to Date Minimal Progress to Date In Progress Complete</p>	
Justification	
<p>A number of program developments since the 2005 review were initiated to address the needs of the interagency fuels program and assist with aspects of fuels planning, including treatment prioritization, development of targets, and simplification of accomplishment reporting and accountability tracking. Program developments since 2005 include HFPAS (including EMDS), FPA, annual updates to the NFORS program, and others.</p> <p>Although the fire agencies have initiated numerous efforts to address this recommendation, complexities and limitations related to several of the aspects of this recommendation have made it difficult to meet its original intent. For example, DOI retired HFPAS, FPA is not being employed as originally intended, and there are numerous outstanding issues related to funding transfers, pooling of funds and resources, and cross billing. Efforts to establish a landscape level strategic program have been limited by budget appropriation language. Significant funding cuts within the fuels program have exacerbated these issues in recent years (<i>see also recommendations 12 and 13</i>). (Sources 238-259)</p>	

QFR(s)	Recommendation #21: Increase Use of AARs in Wildland Fire
2005 & 2009	Foster a culture that allows Incident Commanders and IMT members to recognize errors in judgment, highlight good decisions, and consider better strategies and tactics in an after action review (AAR) setting that provides a feedback loop for improving decisions.

No Progress to Date	Minimal Progress to Date	In Progress	Complete
Justification			
The policies, processes, training opportunities, tools, and leadership within the wildland fire community have embraced the AAR process since the 2005 QFR and it appears to be firmly instilled. The AAR process is now used regularly on both fire suppression and prescribed fire operations throughout the fire services and is routinely employed across the spectrum including after individual shifts, at the end of an incident, and at the end of a season. (Sources 260-266)			

QFR(s)	Recommendation #22: Consider All Factors in Suppression Decisions		
2005 & 2009	Realign governance, policy, and mission strategies to allow wildland agencies to consider all resource attributes rather than focusing primarily on suppression costs. Return wildland agencies to basic wildland fire protection responsibilities while continuing to emphasize tribal, local, and volunteer fire response organization's first responder priorities of structure suppression, vehicle accidents, and basic life support.		
No Progress to Date	Minimal Progress to Date	In Progress	Complete
Justification			
The Cohesive Strategy largely addresses this recommendation, which aligns closely with #16. Policy changes and decision support tools, including implementation of the WFDSS program have supported the transition to a more holistic use of fire on the landscape. FS, DOI, and NMAC policy direction also clearly articulate the intent to consider all resource attributes during suppression actions. (Sources 267-282)			

QFR(s)	Recommendation #23: Strengthen Safety & Risk Management Metrics		
2009	Strengthen and systematically incorporate safety and risk management metrics into all aspects of fire management planning, policies and operations.		
No Progress to Date	Minimal Progress to Date	In Progress	Complete
Justification			
Safety and Risk Management were integral components of every policy document examined in this review and were identified as the highest priority in fire program planning and execution. There has been a significant amount of work accomplished to develop training, experience and knowledge sharing capabilities, decision support tools, and other capacity to expand and enhance planning and operational safety and risk management concepts throughout the program from firefighters to high-level leaders. The wealth of resources available to the community in terms of safety and risk management provide evidence of progress against this recommendation. Although substantial progress has occurred, this is one facet of the wildland fire program that will always be of critical importance and should never be considered fully complete. (Sources 283-293)			

QFR(s)	Recommendation #24: Implement Strategic Management Response
2009	The wildland fire community must move beyond the policy of “appropriate management response” to a new “strategic management response” process that creates a framework for a multi-phased approach for incident management.
 <p data-bbox="188 441 1427 506"> No Progress to Date Minimal Progress to Date In Progress Complete </p>	
Justification	
<p data-bbox="188 552 1427 630">The concept of “strategic management response” as identified in the 2009 QFR included five main recommendations and strategies (below) specifically addressed elsewhere in this document:</p> <ol data-bbox="350 630 1427 850" style="list-style-type: none"> 1. Improving wildland fire decision-making and implementation; 2. Linking land-use plans and tiered fire management planning with CWPPs; 3. Transforming planning to a landscape-level and promoting a collaborative approach for fire prevention and response planning; 4. Redesigning incident management team structures; and, 5. Investing in new aviation capabilities. <p data-bbox="188 850 1427 1039">The status of these individual recommendations ranges from completed to minimal progress to date, justifying an overall status for this recommendation of “In Progress.” Recommendations #3 and #4 address Item 1; Recommendation #14 addresses Item 2; Recommendations #6, #14, and #22 address Item 3; Recommendation #11 addresses Item 4; and Recommendations #1 and #2 address Item 5. (Sources 294-301)</p>	

QFR(s)	Recommendation #25: Increase Remote Sensing Capability
2005 & 2009	Explore aviation, fire suppression, and fire cache system processes and investment strategies to increase the utilization of remote sensing capacity. Introduce, evaluate, and adopt new technology from the military, research, and other sources to determine if efficiencies and cost savings could result from utilizing new technologies similar to those adopted by the military in the modernization of its supply program.
 <p data-bbox="188 1419 1427 1484"> No Progress to Date Minimal Progress to Date In Progress Complete </p>	
Justification	
<p data-bbox="188 1530 1427 1785">Several efforts are ongoing to address this recommendation. These efforts include the Interagency Cache Business System Re-engineering process (ICBS-R) to upgrade the cache system, numerous initiatives to expand remote sensing capability through military and non-governmental sources (including a four state pilot program exploring opportunities to enhance infrared remote sensing capability through the use of military UAVs), increased participation in the Homeland Infrastructure Foundation Level Data (HIFLD) Working Group, and the exploration of other sources to identify new technology for use in fire suppression processes.</p> <p data-bbox="188 1785 1427 1927">The Interagency Cache Business System (ICBS) was implemented in fifteen interagency fire caches from 2007-2011 and has been in production use since. ICBS is built upon the IBM Sterling Warehouse Management System® (WMS), a commercial inventory system that uses</p>	

wireless bar code label scanning to provide real-time visibility of the NFES (National Fire Equipment System) inventory. This satisfied a USDA Office of the Inspector General (OIG) recommendation that FS should manage its fire cache inventory at the enterprise level, rather than as separate inventories at each cache. ICBS will be upgraded in 2014 to a more current WMS version to ensure prolonged compatibility with newer architectural components and continued IBM support.

An ICBS-R Project Team task group explored automated identification technology including radio frequency identification (RFID) technology in 2006, but identified limited opportunities to use RFID to support internal cache business processes at that time. Today, RFID technology is more mature and becoming increasingly cost effective. Combined with the increased use of technology at incidents, these advances may warrant a new and more holistic analysis considering cache, incident, and perhaps other uses of RFID technology.

Although the use UAVs for remote sensing has increased, significant issues remain. These issues include the travel time from home bases that may add hours to the process, acquiring Federal Aviation Administration (FAA) airspace clearance, and regulatory as well as aeronautical constraints on the operation of UAVs in the fire environment and airspace. Though previous efforts have employed larger UAVs, a pilot project is underway with four western states to explore utilization of smaller UAVs that are more operationally flexible. The DOI Office of Aviation Services (OAS) recently created a UAV coordinator position to assist in developing this capability and established an MOU with the FAA that streamlines airspace requirements and procedures.

The procurement of new technologies to support UAV operations does not address the wildland fire agencies need for additional fire intelligence capability and technology infrastructure to download and process the wealth of data available through these platforms in a timely manner. Staffing, business requirements, and policies are prerequisites for safe and effective utilization of UAV-provided data. (Sources 302-311)

QFR(s)	Recommendation #26: Improve Efficiencies in Dispatch and Mobilization
2005 & 2009	Improve efficiency within the current fire dispatch, mobilization, and resource ordering system (ROSS) through the use of new technologies such as enhanced geospatial capabilities, electronic status, location, tracking, and ordering processes to support incident mobilization and resource coordination (use of radio, satellite [GPS], cell technology to track core resources).
 <div style="display: flex; justify-content: space-between; padding: 0 10px;"> No Progress to Date Minimal Progress to Date In Progress Complete </div>	
Justification	
NWCG conducted a ROSS program review in 2013 and produced a final report dated January 9, 2014. Review participants overwhelmingly wanted to improve and enhance the usability and functionality of the ROSS application to leverage available technologies and functionality. The review did not address specific modernization functionality such as geospatial, electronic location and tracking through cell, GPS, radio technology, or other electronic means tied to the ROSS system.	

FS reviewed Satellite Emergency Notification Devices (SEND) technology in 2008, issued a solicitation in April 2012 to purchase a number of these devices, and reportedly procured and distributed them in late 2012. It is unclear what the outcome of the solicitation was to the fire program, but this capability has not been included in the ROSS system.

Per input from wildland fire SMEs, a possible solution would involve leveraging existing and emerging geospatial tracking capabilities through an enterprise geospatial portal (EGP) and existing dispatching information data systems such as the Wildland Fire Computer Aided Dispatch System (WILDCAD) or the SELKIRK Dispatch Situational Awareness Application through the use of the Integrated Reporting of Wildland Fire Information System (IRWIN). IRWIN is in production and recently conducted a successful integration demonstration of these capabilities. The goal is reducing the number of standalone systems and focusing on successful integration of new and existing systems, via IRWIN, to more holistically share desired data and capabilities and streamline information technology systems within the wildland fire community (*see recommendation 25*). (Sources 312-316)

QFR(s)	Recommendation #27: Expand Science & Technology Partnerships			
2009	Expand partnerships with other science and technology organizations such as the National Aeronautics and Space Agency (NASA), the National Institute for Standards & Technology (NIST), and the military, to leverage research and technology dollars, and become more efficient in incorporating new science and technology into programs.			
No Progress to Date		Minimal Progress to Date		In Progress
Justification				
Expansion of science and technology partnerships and the creation of new programs and projects to facilitate this transformation since 2005 have been both significant and highly successful. The Joint Fire Science Project, co-funded by FS and DOI, along with partnering efforts through the FS's Research Stations have been major factors in that success. Although significant efforts have been initiated and completed to date, we rated this recommendation as "In Progress" as this is a timeless recommendation that will always need to be an integral part of the interagency wildland fire program. (Sources 317-332)				

QFR(s)	Recommendation #28: Maintain Fire Management Force Structure			
2005	Maintain the core fire management force structure, especially at the local (initial response) level, and maintain high levels of initial attack success.			
No Progress to Date		Minimal Progress to Date		In Progress
Justification				

FS and DOI recognize the importance of maintaining force structure, especially in initial response capability, and have worked to address this recommendation despite severe budget challenges over the past six years (particularly the past three). More specifically, the issues affecting the agencies' ability to maintain force structure include flat or declining budgets, annual inflation, continued increases in suppression costs, the 2013 budget sequestration, and reductions in agency militia (non-fire funded) firefighters. Although force structure has declined, initial attack success remains high. (Sources 333-354)

QFR(s)	Recommendation #29: Explore Realigning GACC Boundaries for Efficiency
2005	Current Geographic Area Coordination Center (GACC) boundaries should be reviewed to explore potential efficiencies from realignment regardless of political or agency boundaries.
<p>No Progress to Date Minimal Progress to Date In Progress Complete</p>	
Justification	
<p>Several recent efforts have addressed this recommendation, including the Interagency Dispatch Optimization Pilot Project (IDOPP), the Interagency Dispatch Improvement Project (IDIP), the Interagency Dispatch Strategic Plan, the Management Efficiency Assessment of the Interagency Wildland Fire Dispatch and Related Services, and efforts to explore the combination of the Eastern and Western Great Basin Geographic Areas into a single GACC. The 2012 DOI Fire Program Assessment also addressed a plan to assess and enhance dispatch efficiency. Some of these efforts included interagency and cross-programmatic dispatch operations, including fire, law enforcement, and public safety. While these studies produced a variety of recommendations, to date, FS and DOI have implemented few of the suggested changes and many long-standing issues (including geographic area realignment) remain. (Sources 355-361)</p>	

QFR(s)	Recommendation #30: Enhance Employee Development Opportunities
2005 & 2009	Enhance educational programs and opportunities to support the professional development of current and future employees in planning, decision-making, leadership, mentoring, public education, collaboration, conflict resolution, and other key skill areas that will be critical to the future of fire management.
<p>No Progress to Date Minimal Progress to Date In Progress Complete</p>	
Justification	
<p>FS and DOI have made substantial efforts since 2005 to develop and implement training and knowledge enhancement programs, with a particular emphasis on developing fire employees and land managers' leadership and risk assessment skills. The National Advanced Fire and Resource Institute (NAFRI), Wildland Fire Lessons Learned Center, NWCG Training and Development Branch, and other initiatives firmly embraced this need and have developed and implemented a variety of training and experiential opportunities for fire and land management personnel.</p>	

Although progress is evident, this is an aspect of employee and program development that will continue indefinitely and may never be complete. (Sources 362-369)

QFR(s)	Recommendation #31: Implement a Targeted Career Development System
2005	Create and implement incident management training, including a development system for new employees to identify and target skill set areas where shortages are anticipated in both planning and operations positions.
<p>No Progress to Date Minimal Progress to Date In Progress Complete</p>	
Justification	
<p>The NWCG Incident Management Organization Succession Planning (IMOSP) Project, now known as the Evolving Incident Management (EIM) initiative, addresses this issue in its initial report and planning documents, as well as in the EIM implementation plan. As this effort is in the early implementation state, it receives an “In Progress” rating. Shifting from the historic fire training and development system, which allows new employees to pick fire management development tracks based on their desires, to a new accelerated training system that targets specific positions with known or anticipated future resource shortages, will take years to develop and implement. (Sources 370-379)</p>	

QFR(s)	Recommendation #32: Leverage Strategic Sourcing
2005	Increase emphasis on strategic sourcing to accomplish fuel treatments and enhance landscape defense management. Consider new approaches in the use of contract resources by expanding grant development and contract administration training and capability.
<p>No Progress to Date Minimal Progress to Date In Progress Complete</p>	
Justification	
<p>There have been numerous initiatives to increase the use of strategic sourcing throughout the fire programs and associated agencies in a more holistic fashion. Examples include continued work with the General Services Administration (GSA) to provide strategic sourcing for common wildland fire products and supplies, participation by the DOI bureaus through the DOI Strategic Sourcing Initiative that began in February 2010, competitive sourcing identified in the FS Strategic Plan 2007-2012, and OMB’s Strategic Sourcing Initiative, which began covering all bureaus/agencies in December 2012. There was an extensive effort by the fire agencies immediately following the 2005 review to use strategic sourcing through numerous blanket purchase agreements and multiple source contracts established to enable use by multiple agencies. Strategic sourcing has been used in heavy equipment purchases, including wildland engines, tractor plow units and bulldozers, as well as command and general staff vehicles. More recently, efforts in the use of Service First agreements have also streamlined fire management operations. Additional progress is possible toward this recommendation, but agency leadership and the community more broadly appear to be embracing strategic sourcing. (Sources 380-384)</p>	

QFR(s)	Recommendation #33: Enhance Succession Planning Processes
2005	Assess the impact of looming retirements in fire management and succession planning for the next generation of fire leaders.
	
<p data-bbox="204 449 464 483">No Progress to Date</p> <p data-bbox="506 449 831 483">Minimal Progress to Date</p> <p data-bbox="961 449 1107 483">In Progress</p> <p data-bbox="1289 449 1416 483">Complete</p>	
<p data-bbox="204 516 370 550">Justification</p>	
<p data-bbox="204 562 1416 764">The NWCG reviewed incident management succession needs and is implementing a plan to address those needs via the EIM program. FS also conducted a firefighter workforce assessment in 2009 and is working on a new assessment that is in the implementation phase. DOI included a discussion of an assessment of succession planning needs in its 2012 Fire Program Assessment process and has an implementation plan that provides next steps. All these efforts remain in the planning and implementation phase and may take time to complete. (Sources 385-399)</p>	

EVALUATION OF PREVIOUS QFR PREDICTIONS

The tables below capture 24 forward-looking predictions related to the future of wildland fire included in the previous QFRs. The project team categorized each prediction as “Accurate” (green), “Partially Accurate” (yellow), or “Not Accurate” (red). Applying a similar process to the one described in the previous section, this assessment involved a literature review and selective engagement of SMEs. The table includes a brief justification for each rating.

QFR	Prediction A: Severity of Wildland Fires will Increase	Rating
2005	More large, severe wildland fires will occur, potentially increasing firefighter and public fatalities and the destruction of homes, communities, and resources.	
Justification		
<p>The analysis associated with this prediction employed a variety of methods for rating fire severity. Though not all the statistics reviewed support this prediction, the team assessed it to be generally accurate. Statistics provided by the NIFC-NICC Predictive Services Unit demonstrate that while the severity and size of wildfires has increased since the 1990s, the average number and acres burned annually by wildfires peaked from 2005-2007, and actually decreased from 2008-2013. However, the average number of fires exceeding 100,000 acres in size increased from 8.5 per year from 2000-2005 to 12 per year from 2006-2012. Further, the average size of wildland fires increased from 30 acres per fire in the 1990s to 65 acres in the 2000s, and 88 acres from 2010-2013. The number of wildfires burning more than 1,000 acres increased from 160 per year in the 1990s to 250 per year from 2000-2013. Since 2000, every state in the western United States experienced an increase in the annual average number of large wildland fires per year compared to 1980-2000. The average number of structures lost per year to wildland fire in the United States during the 1990s was 932. Since 2000, this number has increased from an average of 1,951 per year from 2000-2005, to 2,890 from 2005-2009, and increased further to 4,032 from 2010-2013. Wildland firefighter fatality numbers have fluctuated from an average of 17.2 per year in the 1990s to 20 per year from 2000-2005, and 17.6 per year from 2006-2013, though the highest annual fatality rate since 1994 occurred in 2013 (34 fatalities). (Sources 400-408)</p>		

QFR	Prediction B: Acres Impacted by Wildfire Annually Will Rise	Rating
2009	At the beginning of the next decade, the range of acres impacted by wildland fire will increase to 10-12 million annually.	
Justification		
<p>Annual acres burned by wildland fire in the United States has not reached 10 million in any single year on record through 2013 and average acres burned per year declined since the 2009 review. The average number of acres burned annually in the United States peaked at 7.8 million from 2005-2009 and decreased from 2010-2013 to 6.4 million acres per year. (Sources 409-411)</p>		

QFR	Prediction C: WUI & Population of Western States Will Expand	Rating
2005	The WUI will continue to expand, as will the population of the western United States (projected to reach 80 million by 2020). Growth in the WUI will equate to more than eight million new homes by 2015 with the Intermix representing the area of highest growth. This expansion will position more housing and more people in areas at risk, not just at the edges of wildland fires, but potentially in the midst of those fires.	
Justification		
Statistics support the prediction that the WUI will continue to expand and that the population in the western United States will increase. Some eight million new homes are projected to be built in the WUI within the next 10 years (most in the Intermix) and the U.S. Census Bureau's state population estimates for July 1, 2013 suggest that from 2000-2013, 11 of the 15 fastest-growing states were in the West. It is unclear if eight million new homes will actually be constructed in the WUI by 2015 or if the western population will reach 80 million by 2020, but statistics suggest that this prediction is trending toward accuracy. (Sources 412-415)		

QFR	Prediction D: WUI Growth Will Slow	Rating
2009	Growth in WUI is predicted to slow for the next decade due to rising fuel costs and the national recession/financial crisis. Growth is likely to increase when better economic conditions resume. More home construction and settlement will occur in the Interface, presenting challenges for fire management programs.	
Justification		
National statistics demonstrate that the growth of the WUI did slow due to the recession, and has begun to increase again as the effects of the recession recede. (Sources 416-419)		

QFR	Prediction E: Western Drought Will Continue	Rating
2005	Western states face what appears to be a long-term (25-35 year) drought cycle that began in the mid- to late-1990s. This shift appears to represent a return to the dry climate patterns of the 1930s-1950s.	
Justification		
Current climatology models suggest continued potential for significant drought cycles extending through the end of the 21 st Century in areas of the western United States. Modeling conducted through the North American Regional Climate Change Assessment Program, and scientific study and analysis conducted by the Intergovernmental Panel on Climate Change suggests that by mid-century, warming in all regions of North America will exceed the natural variability estimate for all models. The models depict that this warming will potentially lead to a two to four fold increase in heat wave frequency during the 21 st Century coupled with precipitation decreases across much of southwestern North America and significant evaporation increases due to mid-latitude continental warming and an increase in drought frequency. One of the models does differ in the precipitation regime forecasted; with less drying than the others, however, it still shows a strong decrease in soil moisture due to increasing evaporation from increased temperatures. (Sources 420-427)		

QFR	Prediction F: Drought Will Worsen in the SW and SE	Rating
2009	Climate change will worsen the impacts of extended droughts that will affect the southwest and southeast more severely than the droughts of the late 1990s.	
Justification		
Since the 2009 QFR, drought conditions have worsened in the southwestern and southeastern United States, but change has varied across regions. Though the southwestern drought continued into 2013 and areas of the southeast experienced its highest drought levels since 2011, the southeast also experienced something of a reprieve in 2012 and 2013. (Sources 428-433)		

QFR	Prediction G: Climate Variability Will Increase	Rating
2005	Climate studies increasingly assert that the variability of climate has risen. Patterns in abrupt climate change indicate uncertainty for the coming years. Most climate models predict a future much warmer than in the past.	
Justification		
NOAA historic weather data shows considerable annual variability in climate across the United States. For example, in 2013, 10 states experienced annual precipitation totals ranking among the 10 wettest years on record, including Michigan and North Dakota, which experienced the wettest years on record. In contrast, California experienced by far its driest year on record in 2013 (with 2.42 inches less than the previous record set in 1898). Further, 2012 was the warmest year on record in the United States, while 2013 tied with 1980 as the 37 th warmest year in the 119-year period of record. The vast majority of current climate models still predict a future much warmer than in the past (<i>see also Prediction E</i>). (Sources 434-437)		

QFR	Prediction H: Hazardous Fuel Loads Will Increase	Rating
2005	Increased fires will consume increased amounts of vegetation, but will not be sufficient to hold back fuel expansion, nor the increase of carbon sequestration. This would mean an increase in fire <i>and</i> the release of carbon in the West at the same time. It is estimated that 10-12 million acres must be treated annually to make an impact on reducing overall fuel loads.	
Justification		
Although wildfire acres burned per year have increased since 2005 and fuel treatments have added millions of additional acres towards the goal of reducing overall fuel loads, these actions have not been sufficient to keep pace with the continued growth of fuels across the country and address the remaining backlog from reduced fire on the landscape over the past 75-100 years.		
The combined acreage burned through wildfires and treated through fuel reduction programs has not reached an average of 10-12 million acres annually, and many of the acres burned or treated are not “new” acres, but instead lands burned in the recent past or through maintenance treatments on prior investments. Other factors (e.g., insects, disease, and drought) have also increased fuel loading		

and carbon sequestration and cycling. As of the 2005 review, an estimated 500 million acres in the United States had been identified as at high risk to wildfire due to fuel loading (with hundreds of millions more at moderate risk). Treating 10-12 million acres annually as identified in the 2005 QFR likely underrepresented the true need. (Sources 438-460)

QFR	Prediction I: Climate Change Will Increase the Variability of Fire Occurrence	Rating
2005	The effects of climate change will vary from year-to-year and from one geographical area to another. This variability will create uncertainty in the amount and location of wildfire acres.	
Justification		
NOAA statistics show that there has been regular variability in climate and drought factors since the 2005 review (<i>see Prediction G</i>) and NIFC-NICC Predictive Services Unit fire occurrence records support an annual variability of both wildfire occurrence and the geographical distribution of fires and acres burned. (Sources 461-464)		

QFR	Prediction J: Fire Season Length Will Increase	Rating
2009	The warming and drying effects of climate change will increase the period of the year in which wildland fires occur, potentially adding 30 days at both the beginning and the end of the traditional fire season.	
Justification		
Statistical data shows that fire seasons have expanded between 2-4 weeks at both the beginning and end of the traditional wildfire season in the west. Since 1970, average annual temperatures in the west have increased by 1.9 degrees Fahrenheit, approximately twice the pace of global average warming. According to stream flow data, the onset of spring snowmelt in the west is occurring one to four weeks earlier than it did in the middle of the 20 th century. Weather records are showing longer frost-free periods (contributing to longer growing seasons), quicker melting of snowpack, and longer periods for natural fuels to dry, causing fuels to reach lower moisture content levels, which supports more intense fires. Further, 2012 was the warmest year on record in the United States, and seven of the 12 warmest years on record have occurred since 2000. (Sources 465-466)		

QFR	Prediction K: Geographic Distribution of Large Fires Will Change	Rating
2009	Large, costly, and damaging fires are more likely to occur in geographic areas of the United States that have not traditionally experienced them (i.e., Midwest, east, and southeast).	
Justification		

Per annual wildland fire statistics kept by the NIFC National Interagency Coordination Center-Predictive Services Unit, there have been few large, costly and damaging fires in the Midwest, east, and southeast since the 2009 QFR. Uncharacteristically large fires in Texas and Georgia are exceptions. The Texas fires represent much larger fires than occurred historically and are indicative of altered conditions. However, the preponderance of large, costly, and damaging wildfires have continued to occur in the western United States. (Sources 467-468)

QFR	Prediction L: Insects & Disease Will Exacerbate the Fire Problem	Rating
2009	Insects and disease will increasingly affect mortality on forest lands, adding to hazardous fuels.	

Justification

Data indicates that insect and disease impacts in forest ecosystems have increased since 2009 and that these factors have at times exacerbated wildland fire and hazardous fuel problems in areas of the United States. However, the relationship between insect and disease outbreaks and their effects on hazardous fuels were not well understood in 2009. Research completed since clarifies fuels changes and associated impacts on fire through the various phases of infestation and tree mortality. In general, this research shows that the time since infestation is critical for determining if the changes in fuel loading and availability result in an increase in the severity of wildfires. While wildfire severity may increase during some phases, in others the results are similar to before the infestation, or even reduced from pre-infestation levels. Bark beetles have been a significant threat to western forests in recent years and have destroyed more than 41 million acres of trees across the western United States. The recent level of insect destruction has exceeded any previously recorded. However, tree mortality in public and private forests across the United States has declined for the past two years, with most reductions occurring in the western states where bark beetle infestations are on the decline due to a decrease in lodgepole pine, the insects' preferred food source. The bark beetle is not the only significant risk to forests. The spruce beetle, the fir engraver, and subalpine fir deaths caused by insect infestations have also affected hundreds of thousands of acres in the West since 2009.

Effects on forest health due to disease pathogens are also in question. It is clear that climate change will increasingly affect the geographic distribution, growth and sustainability of tree species. Current science suggests that forest pathogen issues will become more frequent and intense under a climate-change scenario of warmer and wetter future conditions, but may decline or plateau should future conditions be warmer and drier. How these scenarios play out in the future and what specific effects they may have on the hazardous fuel problem remain to be determined. (Sources 469-480)

QFR	Prediction M: CO2 Emissions May Effect Fire Operations	Rating
2009	States could begin to incorporate wildland fires' CO2 emissions into their EPA state quotas.	

Justification

This prediction is ambiguous as written. While states could elect to include emissions from wildland fires into their carbon goals, this has not occurred to date, and there has been no apparent change in the EPA’s policy on wildland fire emissions since 2002. (Sources 481-488)

QFR	Prediction N: Non-Fire Disasters Will Increase Workloads	Rating
2005	Large-scale disasters will be more significant in the 21 st century. Fire management must continually prepare to be involved in response to these emergencies.	
Justification		
<p>Large-scale disasters have become more prominent since 2005, but as the assessment of <i>Prediction O</i> explains below, this has not resulted in increased involvement by fire management resources. Conversely, due to the maturation of the National Response Framework and the efforts of FS to increase the response capabilities of FEMA and other agencies, workload on wildland fire resources for non-fire incident support actually decreased since the 2005 QFR. Because of the uncertainty of future support needs, fire management continues to prepare to manage the appropriate response to non-fire emergencies and major disasters by working with FEMA on planning initiatives, conducting training, and maintaining a cadre of Emergency Support Function #4: Firefighting (ESF- #4) trained personnel to staff FEMA coordination facilities during disaster response.(Sources 489-498)</p>		

QFR	Prediction O: Non-Fire Disaster Support Needs Will be Uncertain	Rating
2009	Demand for services from the wildland fire community not explicitly related to wildland fire (e.g., natural disasters, terrorism) will remain uncertain.	
Justification		
<p>Although the development and maturity of the National Response Framework (NRF) though FEMA reduced the impact of support to non-fire all hazard incidents on wildland fire resources over the past decade, this prediction was assessed to be accurate as the future of disaster support is unknown and the wildland fire community must be ready to assist when necessary. To prepare for this uncertainty, FS has worked with FEMA and other agencies at the headquarters and regional levels to increase collective response capacity and capability to ensure mission fulfillment even if wildland fire resources are not available due to a significant fire situation nationally.</p>		
<p>The wildland fire community was heavily involved in supporting the response to Hurricane Katrina in August 2005, as it had been for similar disasters for decades. Wildland fire entities supported the Katrina/Rita response with as many as 17 incident management teams at the same time, and averaged more than 3,000 firefighters supporting these incidents daily over a several month period. The NRF Emergency Support Function #4: Firefighting (ESF #4) was perhaps the best developed of the ESFs in the NRF at the time, and was heavily utilized to mobilize firefighting resources for all types of missions. Since 2005, the other ESFs in the NRF have matured, and increased capabilities among Federal agencies and state and local partners have continued to reduce the dependence on wildland fire resources to support non-fire incidents. An example of this transformation is ESF #7. Coordinated by FEMA and GSA, ESF #7 now has contracts in place to establish and manage responder base camps. This was a mission assigned</p>		

through ESF #4 and performed by several wildland fire IMT's during the Hurricane Katrina/Rita response. (Sources 499-503)

QFR	Prediction P: Public Expectations for Suppression Will Remain High	Rating
2005	Public expectations for protection of both communities and surrounding natural values will remain high and will lead to increased use of expensive fire-fighting techniques (e.g., aviation) that the public views as normal firefighting response.	
Justification		
<p>Public expectations for protection of communities, natural values, and public health have remained high, though expectations have evolved somewhat due to efforts to educate and enhance collaboration with states and local communities through the Cohesive Strategy, FIREWISE, the Fire Adapted Communities Coalition, and the IAFC's Ready-Set-Go program.</p> <p>The use of expensive aerial firefighting equipment and techniques remains important to the public, but employment of the most expensive aviation resources has declined since 2005, largely due to the loss of large airtanker capability and a reduction in average annual fires and acres burned from 2009-2013. However, this has been due to a reduction in capability more so than a change in expectations. The Congressional Research Service's report, Wildfire Management: Federal Funding and Related Statistics (August 30, 2013), states that the number of large air tankers has declined, with FS reporting a reduction from 43 to 11 air tankers from 2000-2011 due to aging of the available fleet. The report also concludes that FS expected to have 26 air tankers available for wildfire suppression in 2013, including "seven Next Generation airtankers, eight Legacy aircraft, up to three Very Large airtankers through contracts, and eight airtankers through an agreement with the Department of Defense." (Sources 504-525)</p>		

QFR	Prediction Q: Public Understanding of Fire Will Change	Rating
2009	Community attitudes about flexible suppression strategies will become increasingly supportive (or at least increasingly realistic as the level of fire activity intensifies) at least partly due to media coverage of WUI fires that emphasize personal risk versus public responsibility for residents who choose to live in fire zones. Fire management can also expect to contend with a shift in property owners who expect to stay and defend their properties by constructing or retrofitting homes for fire-resistance and undergoing training that provides the option not to evacuate.	
Justification		

Efforts associated with the Cohesive Strategy support this prediction and have begun to affect public attitudes, expectations, and responsibilities through collaboration, outreach, and education, however, these changes have been difficult and slow to be realized. FIREWISE, the Fire Adapted Communities Coalition, and the Fire Learning Network also contributed. The IAFC also developed the Ready-Set-Go program since 2009 to support property owners who want to stay behind to protect their properties. The home protection industry has also evolved, with many companies developing and marketing wildland fire home security systems.

Although support for flexible suppression strategies has been noted in some areas of the country, this has not been fully embraced by communities across the nation. Attitudes remain static in many areas and in some cases, have increasingly demanded less flexible, more aggressive suppression actions. In 2012, FS placed authority to utilize flexible suppression strategies that included restoration objectives at the Regional Forester level due to concerns over the predicted seriousness of the oncoming fire season. (526-545)

QFR	Prediction R: Fire Prevention & CWPP Efforts Will Increase	Rating
2009	Current efforts to promote fire prevention in communities will continue. More communities will adopt Community Wildfire Protection Plans (CWPPs).	
Justification		
The wildland fire community has fully embraced efforts to promote community fire prevention and protection, including CWPPs, as evidenced in the work conducted in the Cohesive Strategy, FIREWISE, the Fire Adapted Community Coalition, Fire Learning Network, and collaborative efforts between FS and DOI with IAFC, FEMA-USFA, NFPA, and other partners. According to the IAFC, there are some 70,000 communities at risk from wildland fire in the United States. Of those, ~900 are designated FIREWISE Communities, 8,000 have completed CWPPs, and 7,000 have adopted WUI zoning ordinances and building codes. In 2009 there were approximately 5,500 communities that had completed CWPPs. (Source 546-547)		

QFR	Prediction S: Insurance Issues & Privatization Will Affect Fire Operations	Rating
2009	Attitudes about protection of private property will evolve with the intervention of insurance company contracted resources providing asset protection activities (e.g., foaming or removing fuels near structures prior to fire reaching the area); this will challenge fire managers. Other areas of privatization, such as contracted incident support or management teams, will create both opportunities and a new business model.	
Justification		
The Cohesive Strategy, FIREWISE, the Fire Adapted Communities Coalition, Ready-Set-Go, and other initiatives have had a positive effect on attitudes of the public and in promoting new understanding of roles and responsibilities across the country. Many of these efforts have included participation by insurance companies, state and local planning groups, and members of zoning committees and housing construction code councils. Fire managers have had to address the incorporation of insurance company resources into fire suppression strategies and ensure the		

safety of those resources; contracting of incident support services has also increased. Contracted incident management teams also supported non-fire disaster response such as the Gulf Oil Spill, but have not yet presented issues for wildfire suppression operations.

The role of insurance companies has changed significantly since 2009. There are an estimated 1,470 wildland firefighters contracted by insurance companies to protect homes and businesses in the WUI. State Farm, the largest home insurer in the country, has begun reassessing high-risk properties in specific western states as they come up for policy renewal and making recommendations for defensible spaces. According to State Farm, in some areas, less than one percent of property owners decline to modify their property and discontinue their insurance policies.

According to the 2013 CoreLogic Wildfire Hazard Risk Report released on October 10, 2013, more than 1.2M residential properties in the western United States are located in “High” or “Very High” wildfire-risk categories valued at more than \$189B. In the “Very High” risk category, there are roughly 268,000 residences valued at more than \$41B, and another 1.8M residences valued at more than \$224B located in areas of “Moderate” risk. States with the most homes in the “Very High” category for total potential exposure to wildland fire damage are Colorado (\$15B), California (\$13B), Texas (\$6.3B), Oregon (\$1.7B), Arizona (\$1.2B), and New Mexico (\$1.2B). California has another \$65.5B in properties classified as “High” risk, followed by Texas with \$46B, Colorado with \$14.1B and Oregon with \$8.4B. (Sources 548-574)

QFR	Prediction T: Fire Budgets Will Impact Workforce Capability	Rating
2005	Expected static budget levels will not allow for workforce increases.	
Justification		
Wildland fire budgets have declined since 2005, roughly in parallel with those of other federal agencies, thus preventing workforce growth. In fact, declining budgets have actually resulted in significant contraction of the workforce since 2005. The 2012 DOI FPA stated that, “in terms of inflation adjusted 2011 dollars, total federal wildland fire program management appropriations for FS and DOI were approximately \$1.4 billion in FY 1999, rising to about \$4.4 billion in FY 2008, and declining to about \$2.5 billion in FY2012” (Source: CRS, 2011). (Sources 575-595)		

QFR	Prediction U: Budget Priorities Will Change	Rating
2009	Federal budget priorities will focus on economic stimulation and financial restructuring, meaning that cost containment measures for other programs will increasingly emphasize greater scrutiny of new capital investments.	
Justification		
Recent federal budgets, GAO and OMB reports, and media reporting confirms that efforts to reduce costs, shrink the deficit, and streamline operations to develop cost efficiencies across government (including limiting new capital investments) have been a focus area since 2009. (Sources 596-616)		

QFR	Prediction V: State Budgets will be Stressed	Rating
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2009	Budget stress at the state and local levels will be even more significant than at the federal level. Declining housing values (and property tax revenues) along with declining consumer spending (and sales tax revenues) will put the majority of state budgets in a deficit condition for the next several years. For some states, budget shortfalls could account for 10-25 percent of general revenues.	
Justification		
The recession, sequestration, loss of housing values, and other factors have combined to create significant budgetary stress on state and local programs that have impacted state wildland fire capabilities similar to what has occurred at the Federal level. In 2013, 31 states experienced funding gaps between revenues and spending that totaled \$55B. The recession caused an unprecedented collapse in state revenues. Since bottoming out in 2010, state tax revenues have begun to increase, but have not yet fully recovered to pre-recession levels. (Sources 617-621)		

QFR	Prediction W: Budgets Will Impact Federal Agency MOU Support	Rating
2009	Budget stress will adversely affect DOI and FS' ability to support and provide mutual aid to requesting agencies.	
Justification		
Budget reductions within the wildland fire accounts and non-fire agency operations accounts have reduced staff and resources available to FS and DOI, including those resources that traditionally provide mutual aid to requesting agencies. An assessment of the order requests for firefighting crews, overhead positions and aircraft per annual report data accumulated by the NIFC, National Interagency Coordination Center-Predictive Services Unit shows a steady increase in the number of resource orders that were unable to be filled (UTF) through the interagency fire dispatch system over the past decade. In 2012 alone, there were a total of 2,408 crew orders of which 1,083 were filled, 934 could not be filled due to lack of available resources, and 391 were cancelled (orders for resources are often cancelled if they cannot be filled for several days; a different strategy is employed to deal with the fact that resources are unavailable). That same year, 28 percent of overhead orders, 60 percent of helicopter orders, and 35 percent of fixed wing aircraft orders were UTFs or cancelled. (Sources 622-643).		

QFR	Prediction X: Fire Suppression Expenditures Will Rise	Rating
2009	Costs of fire suppression will continue to rise.	
Justification		
According to the annual reports of the NIFC National Interagency Coordination Center - Predictive Services Unit, average annual fire suppression costs have increased steadily since 2000. The average annual suppression costs from 2000-2004 were \$1.274B per year, increasing to \$1.568B from 2005-2009, and \$1.626B from 2010-2013. From 2000-2004 annual federal firefighting costs exceeded \$1B for four of the five years, from 2004-2009 costs exceeded \$1B in all but one year (2005 at \$952M), and from 2010 to 2013 costs exceeded \$1B every year. (Sources 644-650)		

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