

Quadrennial Fire Review 2009



Final Report
January 2009



December 2008

Dear Reader,

The Quadrennial Fire Review (QFR) is a strategic assessment process that is conducted every four years to evaluate current mission strategies and capabilities against best estimates of the future environment for fire management. This integrated review is a joint effort of the five federal natural resource management agencies and their state, local, and tribal partners that constitute the wildland fire community. The objective is to create an integrated strategic vision document for fire management.

The 2009 QFR presents incoming federal policy leadership and the agency senior executives with the driving forces for change, suggested mission strategies, and analyses of workforce and operational capabilities. The document provides a solid foundation for policy discussions within the federal agencies and, importantly, among the federal agencies and state, local, tribal, and other partners. While the QFR is not a formal policy or decision document, it sets the stage for a “strategic conversation” about future direction and change in fire management.

Our thanks goes to the QFR Integration Panel members who led the two-year analysis and review process and who prepared the final report, along with those members of the wildland fire community who submitted information, commentary, and suggestions during the process.

We look forward to joining our wildland fire colleagues in using the QFR to chart and implement a national approach to wildland fire management.

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Dear Colleagues,

On behalf of the National Association of State Foresters, I express our appreciation for the opportunity for state forestry agencies to participate as full partners in the development, review and completion of the 2009 Quadrennial Fire Review (QFR). We endorse the processes utilized in the development of the 2009 QFR. Identifying forces driving change in wildland fire and assessing current programs and capabilities for comparison with future needs should provide valuable insight in addressing the many challenges we are all experiencing. We recognize the significant role the mission, strategies and assessments may provide to the wildland fire community.

Not all state forestry agencies will concur with each of the assessments, strategies and considerations in the report but we all recognize the importance of the document in framing future dialogue on wildland fire management issues.

The states' commitment to participate in the process ensured that a broad range of interests were considered and melded into the report. We look forward to additional interaction and participation in implementation.

Sincerely,

Leah W. MacSwords
President
National Association of State Foresters

Table of Contents

Foreword	i
Executive Summary.....	iii
I. Introduction: Wildland Fire in the First Decade of the 21 st Century	1
Looking Back: Wildfire Costs, Programs, and Policy Developments	2
Looking Forward – Emerging Threats and Risks	6
Driving Forces for Future Change	9
Effects of Climate Change	9
Cumulative Drought Effects and Fuels	10
Continued Risk in the Wildland Urban Interface	12
Escalating Emergency Response Demands.....	14
Fiscal Stress and Budget Realities	15
II. Mission Strategies: Fire Management's Next Decade	17
Asymmetric Fire and Strategic Management Response	19
Reshaping Emergency Response within Fire Leadership	20
Reaffirming Fire Governance:	21
Building a National Intergovernmental Wildfire Policy Framework	21
Achieving “Fire Adapted Communities”	23
Cross-cutting Strategies: An Integrated Fuels Portfolio In Support of Land Management Objectives	25
Cross-Cutting Strategies - New Platforms for InformationSharing and Education (Web 1.0/Web 2.0).....	27
Looking to the Future: Balancing Risk – Creating New Results	29

III. Workforce Capabilities, Structure and Preparedness.....	30
Current Force Structure	30
Workforce Preparedness and Development	31
Creating New Workforce Skill Set Requirements.....	34
Strengthening the Workforce	34
IV. Operations, Capital Resources, and Technologies	36
Capital Assets: Equipment & Aviation Resources	36
Modernizing Aviation	37
Improving Strategic Sourcing.....	39
Preparing Fire Management for Future Operations	40
Advancing Decision Support and Prioritization	41
Improving Resource Coordination	41
Providing More Flexible Logistical Support	42
Future Directions in Resources and Technology	43
Appendix A.....	A-1
References	
Appendix B	B-1
Quadrennial Fire Review Methodology	
Appendix C	C-1
QFR Panels and Acknowledgements	

Figures and Tables

Figure 1 Federal 10-Year Suppression Average	2
Table 1A U.S. Annual Number of Wildfires & Acres	7
Table 1B Number of Wildfire and Acres in Geographic Areas 2004-2008	8
Figure 2 Federal Large Wildfires 1979-2008	9
Table 2 USFS & Department of Interior Fuels Treatment Acres – 2004-2008	12
Table 3 Preparedness Resources	31
Figure 3 Federal Firefighters by Qualification Level by Age	33
Table 4 Fire Equipment Resources (2008-2009)	36
Figure 4 National Preparedness Levels 4 & 5 1999-2008	40

Foreword

This 2009 Quadrennial Fire Review (QFR) builds from its predecessor -- the 2005 QFR -- to advance a unified fire-management strategic vision for the five federal natural resource management agencies under the Departments of the Interior and Agriculture with the active participation of many of their partners in the larger fire community.

The source idea for the QFR was the Defense Department's Quadrennial Defense Review model, which for the past two decades, has served as a vehicle for the military to reexamine shifts in military strategy and changes in organizational tactics and capabilities. Similarly, the intention of the QFR is to examine the future environment of wildland fire and provide "projective thinking" about potential shifts in mission, roles, responsibilities, and agency relationships while surveying new course directions for fire management. It is important to note that, as an interagency assessment, the QFR is purely advisory in tone. In terms of strategy evaluation, its value is to reaffirm interagency fire management priorities and help shape discussion about investment decisions for the future.

To ensure an integrated perspective, the QFR focuses on fire management as a whole enterprise. There is no review of the separate programs -- Preparedness, Prevention, Suppression, Fuel Reduction, and Restoration -- or the functions that make up fire and fuel management. Integration also means that the five federal public lands agencies with wildland fire responsibilities (the Bureau of Land Management, the National Park Service, the Fish and Wildlife Service, and the Bureau of Indian Affairs within the Department of the Interior and the U. S. Forest Service within the Department of Agriculture) conduct this review as a joint effort. State, local, tribal and non-government partners in the greater wildland fire community also were asked to participate in different phases of the QFR effort to ensure that a broad range of interests were fully considered and melded into the final report. A more detailed description of the methodology used for the QFR can be found at the end of the report.

In terms of logic, the report emphasizes core mission strategies and key capabilities that must be developed, strengthened and modernized to meet the challenges of the future wildfire environment. It summarizes the likely impacts of the most significant driving forces behind this dynamic environment: climate change effects, drought and fuel conditions, demographic shifts and public expectations in the wildland urban interface. Two new driving forces, fire management's involvement in emergency response as a result of probable increases in natural disasters and acute levels of budgetary stress and funding shortages facing all government units out of the worst economic recession in decades, are noted.

The QFR advances new core strategies for reinforcing fire management's role in ecosystem sustainability by developing strategic management response capabilities that are more flexible and agile and further in line with the national response framework. While continuing to promote the concept of fire-adapted human communities, the QFR outlines new strategies to realign fire governance by rethinking federal, tribal, and state and local roles and responsibilities for wildland urban interface fire prevention and protection. Tied to this mission strategy of building a new national intergovernmental wildfire policy framework, are specific strategy elements for developing community fuels reduction zones in the interface, supporting leave-early or stay-and-defend alternatives for property owners while working with communities to assure that community fire prevention regulations are in place along with adequate local response capability.

These core strategies are supported by two crosscutting strategies that dissect all fire management programs. An integrated fuels management portfolio is outlined that would help ensure fuels treatments investments are tied more closely to land stewardship objectives and that small scale, localized treatments are supplanted by

larger, multi-jurisdictional landscape scale efforts. Finally, the QFR calls for re-envisioning public outreach and information processing by creating new content, establishing new mediums and platforms for information sharing and environmental education with new social networks about all aspects of fire management and public land management.

Shifts in mission strategies such as those outlined in the 2009 QFR will necessarily require realigning current capabilities, building additional skills in the workforce across functions and within the incident management team organization, modernizing capital assets, and in some cases, creating next-generation systems decision-support and resource management tools. This goes well beyond simply reorganizing work processes and refining coordination mechanisms. Meeting future demands, while sustaining fire management's overarching commitment to firefighter and public safety, will demand more than a shared common vision and strengthened collaborative processes. There must also be greater expectations about the combined effort of the agencies, the tribal and state and local partners, and the contracting community. As the QFR final report notes: "Given the threats and risks of the escalating wildfire challenge, the path forward must seek to ensure that the efforts of all the stakeholders in fire management reinforce and multiply each other – so the whole will be greater than the sum of the parts."

The National Wildfire Coordinating Group Executive Board, as the signatory body to the 2009 QFR Report, fully endorses its strategies and capabilities for the future of fire management.

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Executive Summary

The Quadrennial Fire Review (QFR) is a strategic assessment process that is conducted every four years to evaluate current mission strategies and capabilities against best estimates of future environment for fire management. This integrated review is a joint effort of the five federal natural resource management agencies and their state, local, and tribal partners that constitute the wildland fire community. The objective is to create an integrated strategic vision document for fire management.

A QFR begins by developing a long-term perspective for consider future conditions and risks that could affect fire management for the next several decades. There is also a near- term perspective as the report looks back over the past five years (to the 2005 QFR) and reviews and updates the state of fire management programs and capabilities. Key natural and social environmental trends are analyzed that may potentially impact fire management. From these trends, a strategic course for the future in terms of mission strategies is charted.

The 2009 QFR benefitted from a research phase featuring panels and forums with fire researchers and social and environmental scientists and natural resource specialists. A briefing report resulting from these “strategic conversations” was used as the primary source for detailing future environmental trends and identifying the following five main driving forces.

The effects of climate change will continue to result in greater probability of longer and bigger fire seasons, in more regions in the nation. What has already been realized in the past five years: Shorter, wetter winters and warmer drier summers, larger amounts of total fire on the landscape, more large wildfires will persist and possibly escalate in an irregular pattern termed asymmetric fire. Fire mitigation efforts must be prepared to cope with moving potentially to a 10-12 million annual wildfire acres range over the next five years.

Cumulative drought effects will further stress fuels accumulations. The current drought cycle is expected to last for another twenty years. In terms of impact, competition for water in ecosystems, continued problems with exotic invasive and insect kill, and faster drying of vegetation will make fuels more flammable and drive fire behavior. Drought effects in the Southeast, Southwest, and West will make these areas especially vulnerable in terms of fire risk.

There will be continued wildfire risk in the Wildland Urban Interface despite greater public awareness and broader involvement of communities. Slower growth and the still-to-be-assessed impacts of the global economic recession and rising energy costs may moderate this over the next few years. But overall regional shifts in population and the increasing development of former timberland holdings will drive more seasonal recreation and full time residency in areas adjacent to the public lands (and in some cases where there are extensive in-holdings, inside the public lands). At the tribal, state, and local level, efforts promoting fire prevention (adapting community wildfire protection plans, promoting hazardous fuels treatments, and fire education) will continue to build.

Emergency response demands will escalate. The growing impacts of global warming and extreme climatic change will also be felt in the likely increase in frequency and devastation of other natural disasters. Floods, storms, and other natural disasters are only one set of potentially “major events” where massive government emergency response efforts could be required. As FEMA and other agencies and communities involved in emergency response have developed their capabilities in this arena, fire management must prepare and expect to be called on to play an increasing major role.

Fire agency budget resources – federal, tribal, state or local – will be strained by increased demands and rising costs during a period where government budget revenues will be very tight or falling. The current budget environment for federal and partner fire management is at best uncertain and difficult. Recession and very volatile energy costs are already putting pressure on all fire management budgets. Federal suppression costs have already outstripped budgeted costs five consecutive years. Many states are seeing their reserve funds overwhelmed when they have significant wildfires. Coupled with the rising pressure over this past decade to find ways to control wildfire costs, budget stress at all levels is likely to further intensify over the next 2-3 years and even after the economy recovers.

The QFR outlines four core mission strategies for the future along with two cross-cutting strategies. Above everything is fire management's commitment to safety and risk management. **Fire management must expand its thinking beyond continuous reinforcement of safety as a function and operational concern.** Safety and risk management must be strengthened and more systematically incorporated into fire planning, developing safety metrics on a level equal with post-fire resource impacts and productivity. New models, new scientific knowledge, and emerging information on reliability, safety, and risk management must be promoted and integrated throughout all capabilities and levels within fire management.

The challenge of greater fire, larger fires, and longer fire seasons occurring irregularly within and across regions – asymmetric fire – will demand greater flexibility and more agile capabilities within fire management. **The first QFR core strategy outlines a course forward that moves beyond appropriate management response to strategic management response** that creates a framework for a multi-phased approach for incident management. Elements within strategic management response will include ensuring proactive wildland fire decisions with greater transparency and accountability, recalibrating fire planning, and establishing more robust fire outcome metrics. Organizationally, strategic management response would involve realigning incident management team structures to transform ability to respond, reposition more rapidly, be more scalable to situations, and also place fire management response in line with the National Response Framework.

Bringing fire management response more in line with the National Response Framework leads to a core strategy for rebalancing emergency response within fire management. While the federal fire agencies must continue to make their land stewardship and protection responsibilities the primary objective, a more interactive and robust approach enabling fire agencies to work more effectively with the Federal Emergency Management Agency (FEMA) and state and local community emergency response forces will be needed. Fire management must build beyond the strong training and technical assistance roles in national incident management that are already well-established and promote stronger interplay and planning for emergency response efforts of all agency and jurisdictional forces -- in effect, extending the reach of emergency response through a total force concept.

Fire Management				
Overarching Commitment to Safety & Risk Management				
Core Strategies Fire Adapted Ecosystems and Wildfire Management		Future	Core Strategies Wildfire Prevention and Mitigation In the Wildland-Urban Interface	
Moving to Strategic Management Response within Asymmetric Fire	Reshaping Emergency Response within Fire Leadership		Mission Strategies	Fire Governance: Building a “new” National Intergovernmental Wildfire Policy Framework
Cross-Cutting Strategies				
Integrated Fuels Management Portfolio ----- Fire Information, Communication & Education: New Content, Mediums, and Networks via Web 1.0/Web 2.0.				

The 2005 QFR cornerstone mission strategy called for promoting fire-adapted human communities rather than escalating protection of communities-at-risk in the wildland- urban interface. The 2009 QFR mission strategy takes “Achieving Fire-Adapted Communities” further. Implementation of this core strategy will include steps for increasing knowledge and commitment, and building a sense of responsibility among private landowners, home owners, the insurance industry, fire districts, local governments and other key players in interface communities for wildfire prevention and mitigation.

To accomplish this, the QFR outlines **a core strategy calling for reaffirming fire governance, essentially building a “new” national intergovernmental wildfire policy framework.** Such a framework would first clarify federal, tribal, state and local roles, responsibilities, and authorities for wildland-urban interface protection and then realign federal, tribal, state and local roles, responsibilities, and authorities for interface fire protection (to include suppression, prevention, mitigation, and education).

Strategy elements to extend the reach and deepen the base for Achieving Fire-Adapted Communities will also be needed. The premise is that all partners recognize a general set of common operating precepts: namely, fulfilling pre-fire mitigation, defensible space, and individual responsibilities, applicable regulations, and providing a robust local response capacity must be a reality. Other key steps include building community defensible space or fuels reduction zones in the interface as an essential component of a larger integrated fuels management portfolio, enabling (where appropriate) “leave-early-or-stay-and-defend policies” for property owners, and recalibrating public expectations with a broader set of fire outcome and risk metrics.

The QFR details two cross-cutting strategies that are critical to all fire management efforts. **Establishing an integrated fuels management portfolio would transform fuels management from a project/output perspective to a larger investment strategy in support of greater land management priorities and multi-jurisdictional goals.** The portfolio would support multiple programs – starting with the fuels reduction zones in fire-adapted communities and reaching efforts to treat larger landscapes in wilderness areas and public lands between the wildland-urban interface and the wilderness.

A final crosscutting strategy outlines directions for creating new content, mediums, and networks for information sharing and public education using web 1.0 and web 2.0 internet capabilities. While there are numerous applications, the QFR details several strategy elements to include rethinking public information on fire risk, prevention, and fire safety (“TheFireChannel.gov”), enhancing collaboration and building partnerships through social networks (“MyFirecommunity.net) and revitalizing environmental stewardship education on public lands and wildfire (“Fire-opedia”).

Two closing sections in the report examine requisite capabilities, workforce and capital asset requirements, and operating systems and developing technologies. Current workforce capability faces a number of challenges ranging from high rates of use and an upward trending growth rate in preparedness levels to optimizing training investments and a growing need for succession planning. There are significant needs for capital modernization, especially in aviation. Strategic sourcing must be refined as fire management seeks to build partnerships within the contracting community that clearly advance reliability and safety. Developments of new technologies to expand the capabilities within fire management decision support must continue.

Above all, fire management must continue to recognize that its capability to manage in its highly dynamic future environment rests on its capacity and resolve to operate as interagency-cooperator fire service working seamlessly across jurisdictional or organizational boundaries, leveraging the existing capabilities of partners, contractors and the public to help accomplish the mission.

I. Introduction: Wildland Fire in the First Decade of the 21st Century

In 2004, the U.S. Forest Service, the four U. S. Department of the Interior (DOI) agencies and their state, local, and tribal partners that constitute the wildland fire community, chartered the first Quadrennial Fire Review (QFR). Like its predecessor, this 2009 QFR is designed as a strategic evaluative process that develops an internal assessment of capabilities of current programs and resources in comparison to future needs for fire management. In terms of time frame, projections of future conditions and risks potentially affecting fire management are long-term (a 10-to-20 year timeframe), while strategies for new mission requirements and building new capabilities are near-term, defined in a 4-to-5 year period.

In projecting how fire management is likely to change in the future, the QFR first seeks to interpret how fire management has changed in the past decade. And much is different since the inception of the National Fire Plan, when, after the fire season of 2000 nearly 2 billion dollars in new fire funding (an effective fire budget increase of 90%), was provided for the Forest Service and the Department of the Interior for fire management.

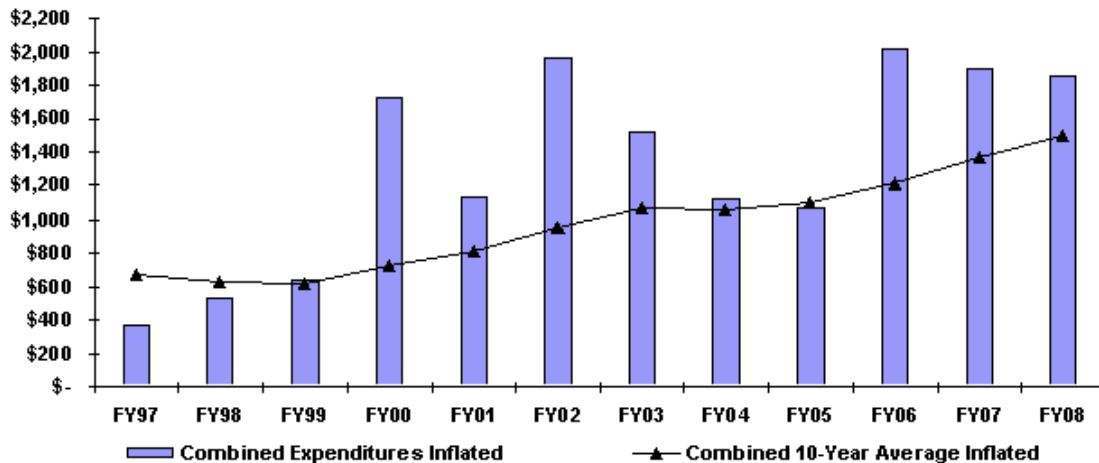
As the 2005 QFR noted, there has been a significant increase in the amount and cost of wildfire suppression efforts as a result of dramatic changes in weather conditions, fuel build up and growth in the Wildland Urban Interface (WUI). The 2006 and 2007 fire seasons set modern historical records for both suppression costs and wildfire acres. As Figure 1 illustrates, suppression costs have continued to rise over the decade.

The gap between appropriated funds for fire suppression and actual costs also continues to widen. Emergency transfers of resource management and other funds to support fire suppression impacts agencies' resource programs to accomplish land management goals and stresses relationships with external partners. Supplemental funding of the federal wildland fire suppression program has been an annual requirement in each of the last five years, with annual supplemental funding ranging from \$200 million to over three quarters of a billion dollars. This supplemental funding now represents 27% of the total suppression expenditures – just under a half billion dollars.

Rising wildfire suppression costs have also impacted state and local budgets. As an example, the lightning fire siege in Northern California in 2008 and the previous year's fall fire siege in Southern California pushed that state's fire fighting expenditures to nearly \$400 million, requiring a drawdown of \$310 million from the state's reserve fund.

Figure 1

Federal 10-Year Suppression Average
(Dollars in millions inflated to FY 2008)



Source: National Interagency Fire Center – December 2008

Looking Back: Wildfire Costs, Programs, and Policy Developments

Historically, fire management has been event-driven, but the case might be made that fire management is now increasingly cost-driven. The 2005 QFR report covered in some depth the major changes in wildland fire policy and fire, fuel, and restoration programs that were reshaped by the National Fire Plan. Since then, the emphasis, especially among federal fire management agencies, has been on implementation of those plans and policies and of course, cost management. While there have been additional major studies, reviews, and reports both in and outside of fire management, they have focused mostly on ascertaining how much progress has been made and proposing recommendations for greater program effectiveness. This section provides a brief update on program, policy, resource, and systems developments before addressing future trends.

Cost Management

While several policy-oriented reviews were completed on escalating wildfire cost issues prior to the 2005 QFR, the focus has shifted to programmatic and specific incident assessments. Fire management placed increasing emphasis on suppression costs at both unit and national levels. Incident business advisors are assigned to units to monitor outlays and look for cost efficiencies. Incident teams are asked to report on cost savings measures they are implementing during suppression operations. The Forest Service conducts separate regional reviews where internal teams review costs and incident management operations for all fires over \$5 million. In 2007, senior executives were sent out to larger wildfires as the chief’s principle representatives to assess suppression operations and cost issues – and reinforce the message of the importance of both risk and cost management from agency leadership.

Beginning in FY 2004, the requirement to conduct “independent” reviews of fires exceeding \$10 million in federal expenditures was added to wildland fire appropriations language. The number of fires exceeding \$10 million increased from 6 in FY 2004-2005, to 20 in FY 2006, and 27 in FY 2007 (and an estimated 32 in 2008, though yet to be determined). These large, costly wildfires accounted for federal and non-federal expenditures of \$500 million in FY 2006, \$600 million in FY 2007, and now about a billion dollars estimated for FY 2008. All but three of the more than 50 fires since FY 2004 with federal expenditures over \$10 million were Forest Service fires.

The 2004 and 2005 reviews (The Ferraro Reports) were conducted by a panel of retired Forest Service and other research experts while the 2006 and 2007 independent reviews were conducted by an independent panel of national and international experts outside the federal fire community (The Brookings Reports). All four of the panel assessment reports confirmed that there was no fiscal malfeasance or inadequate financial actions.

What the panel reports did point to in terms of recommendations was the need for greater currency and linkage between fire management plans and suppression strategies, replacement of the wildfire situation analysis process that consistently underestimated fire outcomes and costs, and new approaches for moving and reshaping incident management teams and aviation assets on and off of wildfires, among others. The wildland fire situation analysis will eventually be replaced by the Wildland Fire Decision Support System as part of the modified *Interagency Strategy for the Implementation of Federal Wildland Fire Policy*. The 2006 and 2007 panels’ reports noted that cost controls through the use of incident business advisors and cost savings reporting by teams, while helpful in providing proper “fiscal vigilance,” had marginal impact at best on fire suppression costs at these higher levels of scale.

In addition to these efforts, there were separate reviews by the USDA Office of Inspector General and the U. S. Government Accountability Office (GAO) on fire cost containment. The Office of the Inspector General issued several reports reviewing audits and assessments of wildfire suppression costs. They found rising suppression costs were driven primarily by suppression efforts tied to protecting private property, and recommended, in addition to more cost accountability measures, the expansion of wildland fire use and more prevention efforts in the form of building codes and ordinances for WUI communities. Aviation safety was addressed in one review. While the Inspector General concluded that significant progress had been made, the review stated that much more needed to be done regarding airworthiness to ensure safety in aerial firefighting.

GAO also conducted several studies of rising suppression costs in this interval. While its reviews recognized the value of specific initiatives and new management system developments, GAO emphasized higher-level needs for more strategic emphasis on reducing fuels and increasing wildfire prevention efforts. GAO called for redeveloping the cohesive strategy for fuels management (prepared initially in 1999), ensuring more strategic selection of fuels reduction projects, and establishing wildfire suppression management goals that included specific and measureable strategies for containing costs.

Fire Policy and Program Planning

The Federal Wildland Fire Policy has clearly identified the objective of integrating fire as a critical natural process into land management and resource activities to protect, maintain, and enhance resources, and, as nearly as possible, allowed to function in its natural role. Achieving this objective requires balancing risk – protecting and enhancing resource values while maintaining public and firefighter safety. Expanding the capability of fire managers and agency administrators to use fire to meet resource objectives is a critical step to restoring fire adapted ecosystems.

As a component of land and resource management, the Federal Wildland Fire Policy, adopted in 1995, stated, “Fire, as a critical natural process, will be integrated into land and resource management plans and activities on a landscape scale, and across agency boundaries. Response to wildland fire is based on ecological, social, and legal consequences of fire. The circumstances under which a fire occurs, and the likely consequences on firefighter and public safety and welfare, natural and cultural resources, and values to be protected dictate the appropriate management response to fire.” This policy was reaffirmed and guidance supporting implementation of this policy was issued in 2001.

In 2008 the agencies, with agreement by the Wildland Fire Leadership Council, modified the “Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy” direction issued in 2003 to improve opportunities for field managers to implement federal wildland fire policy. Revised implementation guidance moves to two kinds of wildland fire: prescribed fire (planned ignitions), and wildfire (unplanned ignitions), removing the formal distinction between wildland fire use (fires managed to achieve resource benefits and suppression fires (managed to minimize damage). This significant revision is designed to increase managers’ ability to respond to changing incident conditions and firefighting capability and to implement tactics and strategies supporting public safety and resource management objectives.

A “Cohesive Fuels Treatment Strategy” was released in 2006 by the federal fire agencies. This strategy addressed the need to reduce the risk of catastrophic wildland fires by reducing fuels build-up in forests and woodlands and by reducing threats by flammable invasive species in rangelands and grasslands. The strategy focused on four principles: prioritization, coordination, collaboration, and accountability, and emphasized creating effective fuel treatments across landscapes.

In 2006, the federal fire agencies, along with representatives of the Western Governors Association, updated the Implementation Plan for the “10-year Comprehensive Strategy.” While many of the action objectives set forth in the initial plan had been accomplished, progress was uneven. This effort was notable in part because the non-federal partners played key leadership roles in establishing goals and also in promoting and reporting community assistance efforts. The updated plan included revised and additional performance measures and implementation tasks developed collaboratively among all partners.

Fire Resource Planning and Risk Assessment

Considerable progress has been made in advancing new systems and decision support processes for fire management. Prominent among systems developments is LANDFIRE, also known as the Landscape Fire and Resource Management Planning Tools Project, a multi-partner project producing consistent and comprehensive maps and data describing vegetation, wildland fuel, and fire regimes across the United States. Data products include layers of vegetation composition and structure, surface and canopy fuel characteristics, and historical fire regimes that are designed to facilitate national and regional-level strategic planning and reporting of fire management activities. A second system using LANDFIRE data, the Hazardous Fuels Allocation and Prioritization System, allows managers to evaluate and prioritize fuels reduction funding using natural resource, values-at-risk, and restoration opportunity criteria.

Linked to LANDFIRE are efforts by two major multi-state wildland fire risk assessment processes. Under the aegis of the Southern Group of State Foresters, the Southern Wildfire Risk Assessment for the 13 Southern states is now operational. This system, with software, provides a federal, state and local unit land manager or community a clearer picture of what the overall potential is for wildland fire and any associated problems. A “West-Wide Wildfire Risk Assessment” for 17 western states is currently in the request for proposal process. Both the southern and the western risk assessments are designed to be populated with LANDFIRE data in the future.

Two other major system developments rely on LANDFIRE data as a nationally consistent starting point for analysis. Fire Program Analysis (FPA) was designed to provide interagency investment analysis of initial response and prevention organizations, hazardous fuel treatments, and large fire suppression. FPA outputs, when complete, would display trade-offs between program components relative to performance metrics and be utilized in fire planning, budget formulation and execution. FPA is being deployed in FY 2009 to support the 2011 budget process.

While still under revision, in 2008 the modeling systems programs for FPA were released to the agencies for data population. In a 2008 report on FPA, the GAO noted that FPA would be able to provide the foundation for a single framework for the five federal agencies to develop their budget requests and allocate funds by analyzing needed firefighting assets across agency jurisdictions. The report also noted that FPA is also likely to help the federal agencies achieve another key objective in analyzing the most important fire management activities: preparedness, fire suppression, and fuel reduction.

In addition, another systems effort includes the development of tools to support the development of extended-duration wildfires. The Wildland Fire Decision Support Systems tools include Fire Spread Probability (FSPRO) and Rapid Assessment of Values At Risk (RAVAR). FSPRO is a spatial model that calculates the probability of fire spread from a current fire perimeter or ignition point for a specified time period. FSPRO, through the use of high end computers, can calculate fire spread probabilities out into the future. Projections can range from 7 to 90 days compared to current “normal” projections for a 10 –14 day period. RAVAR is an economic model that uses the fire spread probability output from FSPRO to provide value assessments relative to the potential of a wildfire reaching identified areas of concern threatened by the fire’s spread. It currently provides estimated monetary values for significant community assets and on a more limited level, assessments of non-monetary values such as critical habitat and cultural heritage sites. Both of these tools have been fully tested and are now being deployed on the most significant fire situations.

Looking Forward – Emerging Threats and Risks

The 2005 QFR's prediction that the United States could be moving to a new level of increased fire activity and larger wildfires has been realized all too quickly. Wildland fire activity, as measured by acres impacted, had been increasingly consistently since the mid-1980s. But since the fire season of 2000, (then touted as the "fire season of the century") total wildfire acreage that year has been eclipsed by subsequent fire activity from 2004 to 2008. Wildfire acres reached a new modern day record of 9.8 million acres in 2006.

Fire activity now is being compared in scale to the wildland fire seasons in the early 1900s that burned large acreages in the West and Northern Midwest. The 10-year moving average has now doubled from 3.78 million wildfire acres in the 1990s to 7.15 million acres in the 2000-2008 period. Table 1 in two parts that follow shows wildfire activity (number of fires and wildfire acres) for the five-year period 2004 to 2008. Total wildfire acres on all lands exceeded the 8 million acre level four years out of five.

There is also a separate breakout for geographic areas – which displays the high variability within fire activity patterns when compared to five year averages. Wildfire acreage for the geographic areas except for the East and South exceed 20% or 200% of the regional 5-year averages the majority of years. The Eastern Great Basin is a superb example -- two of the five years, fire acres are below 150,000, one year is more than double, and two years are basically the same as the 1 million acre five-year average for that geographic area. These levels of variability or the lack of predictable patterns are part of a construct – what this QFR terms **asymmetric – or irregular fire** -- for the shape of future wildfire management environment.

Risk levels also continue to increase because of the growth of population and housing in the Wildland Urban Interface and Intermix. (While definitions vary, interface is generally refers to areas with communities or basic level of houses units near wildlands, while intermix has fewer houses and more vegetation). While conversion of unpopulated forest and rangeland to housing in the WUI will undoubtedly be affected by the national economic housing and financial crises for the next several years, the fact remains that housing growth rates in the WUI have been nearly triple the rates of increase outside the WUI.

Further, the intermix, where housing is more likely to be outside of fire districts and community jurisdiction boundaries, has consistently sustained a faster rate of growth within the overall expansion of the WUI. The fact that in 2007 only 3,000 homes in the U.S. were damaged or destroyed by wildfires is rather remarkable given the number of structures that are in the WUI and at risk and the level of large wildfire activity. (In 2003, over 4,000 homes were destroyed in California alone).

Table 1A U.S. Annual Number of Wildfires & Acres

Fires*							
	USFS 193 mil Acres	BIA 56 mil Acres	BLM 264 mil Acres	FWS 96 mil Acres	NPS 84 mil Acres	State/ Other Totals	Totals
2004	8,606	3,661	2,906	381	490	49,834	65,878
2005	7,331	5,127	2,655	518	395	50,727	66,753
2006	10,403	6,768	3,848	524	537	74,305	96,385
2007	8,486	4,593	2,613	396	489	69,128	85,705
2008	6,477	4,317	1,906	412	396	44,804	58,312
Acres							
	USFS	BIA	BLM	FWS	NPS	State/ Other Totals	Totals
2004	551,966	71,292	1,305,707	2,096,403	42,352	4,026,811	8,094,531
2005	781,148	194,757	3,591,721	1,842,177	128,761	2,150,825	8,689,389
2006	1,896,071	376,824	2,406,622	236,746	73,566	4,883,916	9,873,745
2007	2,835,577	266,593	2,021,009	501,038	102,459	3,601,369	9,328,045
2008	1,232,649	155,808	333,803	94,159	84,684	2,571,329	4,472,432

*Does Not Include Prescribed Fire

Source: National Interagency Fire Center – December 2008

States and local communities are also acutely aware of this increase in risk. Many more communities have adopted community wildfire protection plans that recognize the increased probability that more houses and people will find themselves threatened by wildfire.

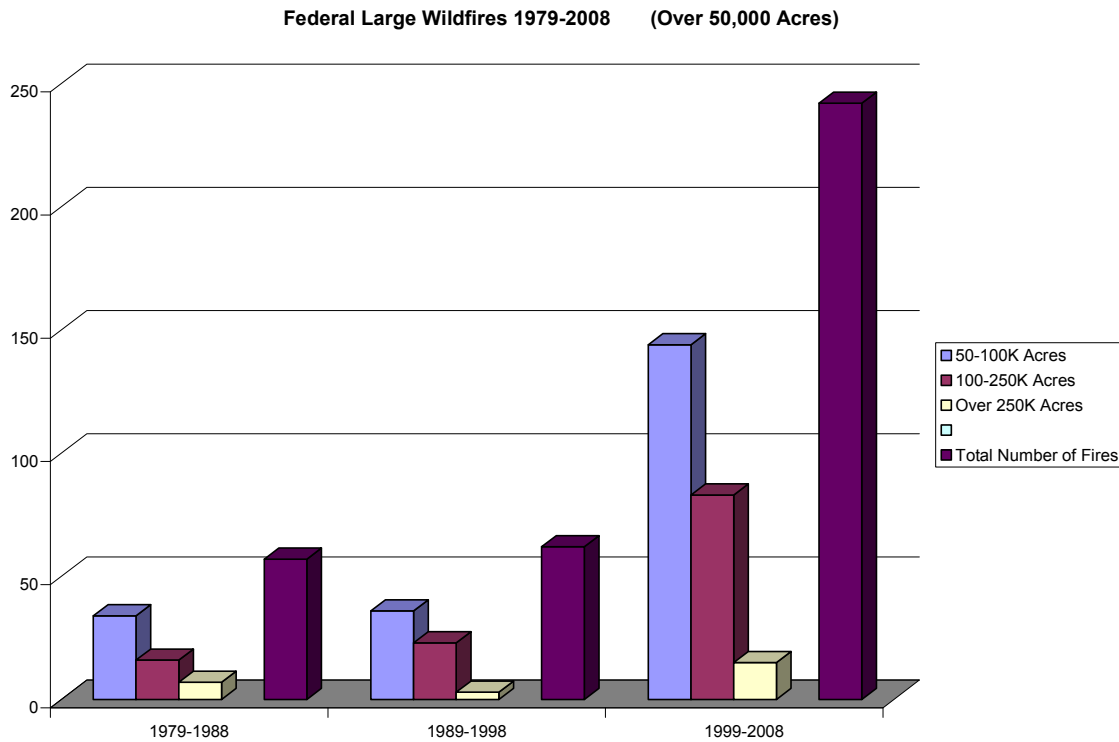
Table 1B Number of Wildfire and Acres in Geographic Areas 2004-2008

	2004	2005	2006	2007	2008* As of Dec 5th	5 year Average (2003- 2007)
Eastern Area	11,869 101,398	13,189 87,423	14,483 87,423	12,783 250,052	11,016 66,221	13,442 164,869
Southern Area	28,716 462,797	29,436 577,064	48,632 2,632,358	45,659 1,865,655	43,379 2,306,110	33,839 1,166,041
Rocky Mountains	2,044 52,267	3,338 86,213	5,447 658,782	3,548 161,944	2,088 232,946	4,099 228,055
Eastern Great Basin	2,286 89,187	2,158 953,362	3,202 1,244,452	2,482 2,411,428	1,654 140,705	2,615 1,010,861
Western Great Basin	954 39,791	798 1,032,114	1,274 1,348,871	888 890,171	451 71,930	942 665,705
Northern Rockies	2,973 38,430	1,931 129,066	4,273 1,166,476	3,368 1,084,569	2,595 223,372	3,287 660,000
Northern California	4,248 150,305	3,196 63,075	4,624 321,653	3,667 208,548	4,701 934,081	4,099 177,124
Southern California	4,168 92,408	4,053 141,003	3,575 367,096	5,431 899,592	5,101 395,693	4,312 431,585
South West	3,553 302,681	5,222 838,777	5,731 761,777	3,599 167,855	2,925 562,108	4,493 469,309
North West	3,943 122,638	2,825 341,143	4,836 956,082	3,832 863,214	2,972 262,541	3,882 528,758
Alaska	707 6,645,978	607 4,440,149	308 266,266	448 525,017	337 62,647	504 2,487,348

Source: National Interagency Coordination Center Annual Report 2007 & 2008 (in draft)

Larger wildfires will continue to have a major impact on fire suppression strategy and cost. The 2005 QFR report predicted that there would be a significant increase in both the amount of fire activity and the number of large wildfires, even if the fire agencies sustained their initial attack success rate at over 95%. This trend has been realized. Since 1999, there have been 242 recorded large wildfires in the United States exceeding 50,000 acres compared to 119 in the previous two decades. In terms of cumulative impact, another way to assess the significance of these large wildfires would be to note that from 2004 to 2008, they accounted for 18.9 million acres out of 40.5 million acres or 46.7% of all wildfire acres reported. Figure 2 illustrates:

Figure 2



Source: National Interagency Fire Center – December 2008

Driving Forces for Future Change

In looking to the future, there is now consensus from nearly all research quarters about the cumulative effects of accelerating climate change, accumulating biomass, and long-term drought effects on the wildland fire environment. While there are differences about the magnitude and timeframes associated with these changes, there is broad agreement in the direction wildfire and ecosystems are headed for next several decades.

Effects of Climate Change

Effects of climate change will certainly 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, but there is a high likelihood that wildland fire activity will exceed the established 8-10 million wildfire acre plateau reached over the past five years and move up into a new 10-12 million wildfire acre range by the start of this coming decade.

Climate change will worsen the effects of extended droughts in various locations around North America. The Southwest, and Southeast regions of the United States are expected to be impacted even more severely by the effects of the long-term drought cycle than they have been since the late 1990s. Additionally, large, costly and damaging wildland fires will be more likely to occur in geographic areas that haven't traditionally experienced such events, such as the Midwestern, Eastern and Southeastern parts of the US.

The warming and drying effects of climate change will also tend to increase the period of the year in which wildland fires occur. Studies already indicate that wetter and warmer winters followed by faster snowmelt in the West have expanded the fire season horizon.

Research has also confirmed that fire seasons are lengthening, indicating that 30 days or more should be added to the start of the traditional fire season and possibly at the end.

Insect and disease mortality on forest lands have contributed to the hazardous fuels problem in the United States. While good historical data is lacking – the 10-year trend in mortality due to declining forest health since 1997 shows increasing impact. Between 1997 and 2001, the five-year trend ranged between 2 to 3 million acres. From 2002 to 2007, the mortality range was between 5 and 12 million acres, with the average at 8 million compared to a 2.5 million acre average previously. Closely related to this factor will be impacts on landscape restoration, particularly when there is a conflict between native and invasive species. Post-fire restoration budgets in recent years have reached record levels.

Finally, the potential impact of new legislation and agency objectives on CO₂ emissions and carbon effects on global warming must be factored in. Wildland fire emissions are currently excluded from CO₂ emission calculations, but it is not yet clear where states will be on CO₂ emissions and wildfire suppression objectives.

Cumulative Drought Effects and Fuels

Since the adoption of National Fire Plan and the commitment of nearly \$350 million annually in program funding, federal fuel treatments have grown to meet a annual target level of 3 million acres. This target was further amended in 2003 by requiring that 50% of the acres treated be in the WUI. Fuels treatments are just one of the options in the land manager's toolbox to provide for healthy lands and protected communities. The fuels program provides a significant level of accomplishment toward the long-term goal of fulfilling land-management objectives while furthering the establishment of a system of healthy lands providing economic and recreational opportunities and protection for adjacent communities.

The resulting accomplishment has been the cumulative treatment of nearly 30 million acres on public land since 2001, as Table 2 shows. The table includes those acres designated wildland fire use as part of the fire category. The wildland fire use category over the past five years has amounted to over 1.4 million – 463,000 acres for Department of the Interior agencies and 970,000 acres for Forest Service.

Fuels treatment in the United States, which averaged around 3 million acres per year by all federal agencies since 2001, has now increased to over 4 million acres with the inclusion of wildfire acres that produce resource benefits in the calculations. But even this level cannot compete with current average annual levels of 8-10 millions acres of wildfires that are occurring annually, much less meet the 10-12 million acres level of scale predicted for the next decade.

As the 2005 QFR report noted, the fuels program has been outpaced by the continued growth in biomass and wildfire activity, further impacted by global warming factors. Fuel accumulation is further affected by drought which is making fuels more flammable and increasing the risk of greater fire intensity and faster fire rate spread. Most researchers assume that the nation is still in the first decade of what is expected to be a 25-30 year drought cycle.

In areas where fuels treatment programs are established, continued treatments to maintain past gains are critical to meeting long term goals. However, the ability to increase current levels of treatments, particularly through the use of prescribed fire, is limited to certain geographic areas and fuel types. The Southeast has traditionally accounted for more than a third of all treated acres, and is best positioned to continue and potentially expand its program. The Southwest, Great Plains, and areas of the Midwest are also poised to expand treatment programs in the future. The capability to significantly increase treatments in much of the West is limited, even if the hurdles of funding, smoke management and air quality, planning, legal concerns, and operational windows are overcome.

The development and implementation of new strategic management responses that provide enhanced flexibility and promote increased utilization of available opportunities will provide significant potential to increase total acres treated through the management of wildfire for resource benefit and long-term community protection. Facilitation of these strategies will increase treatments by a third or more, but are contingent on public acceptance. Even with increased public understanding that fire is essential to long term healthy lands and protected communities, the required planning, preparation and policy changes necessary for widespread use of these new strategies will require time to develop, and will still not be available in many areas of the country due to public health and safety concerns.

Essentially, the impacts of these two facets of fire management are an order of magnitude apart with wildfire essentially “treating” ecosystems at a much higher rate. While planned fuel treatments are being outpaced by wildfire, it remains critical to maintain existing fuel treatment programs in order to maintain gains already achieved, promote agency capacity to accomplish such work and to place fuels treatments strategically in conjunction with fire activity. Fire research efforts to determine fuels treatment effectiveness and numerous examples where wildfire activity stopped when it reached a treated area or where burn severity was significantly reduced due to prior treatments will help land and fire managers realize greater return on fuels investments and improve fire suppression strategies on the ground.

Table 2 USFS & Department of Interior Fuels Treatment Acres – 2004-2008

Acres by Year	Wildland Urban Interface			Non-Wildland Urban Interface			Totals
	Fire	Mechanical	Other	Fire	Mechanical	Other	
2004							
USFS	1,163,000	436,000	101,000	491,000	357,000	13,000	2,561,000
DOI	250,000	294,000	16,000	572,000	299,000	200,000	1,631,000
Total	1,413,000	730,000	117,000	1,063,000	656,000	213,000	4,192,000
2005							
USFS	1,044,000	515,000	99,000	688,000	343,000	33,000	2,722,000
DOI	284,000	276,000	49,000	580,000	233,000	180,000	1,620,000
Total	1,328,000	791,000	148,000	1,286,000	576,000	213,000	4,342,000
2006							
USFS	812,000	683,000	95,000	580,000	356,000	21,000	2,547,000
DOI	243,000	236,000	108,000	420,000	229,000	220,000	1,456,000
Total	1,055,000	919,000	203,000	1,000,000	585,000	241,000	4,003,000
2007							
USFS	1,018,000	392,000	244,000	858,000	504,000	11,000	3,027,000
DOI	332,000	244,000	275,000	663,000	168,000	105,000	1,787,000
Total	1,350,000	636,000	519,000	1,521,000	672,000	116,000	4,814,000
2008							
USFS	1,114,000	808,000	19,000	689,000	397,000	11,000	3,038,000
DOI	384,000	233,000	57,000	521,000	131,000	340,000	1,630,000
Total	1,462,000	1,041,000	76,000	1,210,000	528,000	351,000	4,668,000
2004-2008 Totals							
USFS	4,133,000	2,442,000	314,000	2,448,000	1,453,000	78,000	10,868,000
DOI	1,125,000	1,039,000	230,000	2,111,000	892,000	940,000	6,337,000
Totals	5,258,000	3,481,000	544,000	4,559,000	2,345,000	1,018,000	17,205,000
2001-2008							
USFS	7,293,000	3,168,000	572,000	4,705,000	2,140,000	90,000	17,968,000
DOI	1,832,000	1,641,000	625,000	4,395,000	1,422,000	1,255,000	11,170,000
Totals	9,125,000	4,809,000	1,197,000	9,100,000	3,562,000	1,345,000	29,138,000

Source: Interagency Fuels Report –NFPORS Data 2008

Continued Risk in the Wildland Urban Interface

The 2005 QFR Report noted that demographic shifts, notably new population and housing, toward the WUI would continue to accelerate in the first decade of the new century. This reflects both regional shifts in population and the increasing attraction of owning property for both seasonal recreation and full time residency in areas adjacent to public land (and in some cases where there are extensive in-holdings). This trend has greatly complicated the mission of fire management in protecting communities at risk from wildfires.

For the next decade, social scientists and demographers are predicting a somewhat slower rate of growth in the WUI. This slower growth rate is already being realized with the double impacts of higher gasoline and energy costs and the national recession and financial credit crises. Nonetheless, more growth will come on top of the 15 to 17 million homes built in the interface since the 1990s. Much of this increase is in the West, where regional population growth already exceeds national growth rates and is on track to exceed 80 million people, or 24% of the United States population, by 2020.

Economic factors (now dramatically worse and more volatile than predicted) are expected to curb WUI growth greatly in the short run and somewhat less in the longer term, as effects of falling housing pricing and home equity in the current economic reversal are felt over the next several years. The higher cost of gasoline and utility costs may also limit new residential development. This will vary greatly by geographic region but growth in the WUI is likely to mount when better economic conditions resume. These resulting demographic trends in the WUI, especially in high-growth areas including the Southwest, Southeast and Southern California, will increase the probability of large wildland fires becoming significant WUI fires.

In several regions of the country, ownership of large timber holdings has shifted from timber companies to timber investment management organizations and real estate investment trusts. For most of these tracts, there is little financial incentive for these new owners to invest in management practices such as thinning or prescribed burning. Fire is typically viewed as an undesirable event that must be controlled by federal, state, or local firefighters.

As more studies are being conducted of the needs and expectations of residents in the WUI, two factors are already clear. The first involves aversion to smoke. Smoke will continue to be a major issue, particularly in terms of health, as research shows that a number of households in the WUI have health issues related to air pollutants. This is also true of smaller communities and cities as well as the WUI, which may be subject to smoke effects from prolonged wildland fires. Secondly, the Interface and the Intermix will further diverge with more home construction and settlement away from new and old communities which will create a higher proportion of homes in the Intermix rather than the Interface. The larger growth in the Intermix will present challenges for fire management programs requiring some organized community element.

All communities must develop and maintain growth management plans that specifically address the WUI issues. This is paramount in designing and maintaining new growth in the WUI by use of modern wildland fire and building codes. Key to the solution to the WUI problem will be property owners' support including their willingness to retrofit existing structures with fire resistant building material.

Current efforts to promote fire prevention in communities will continue. More communities will adopt Community Wildfire Protection Plans (CWPP). Transforming federal fire management plans and linking them to CWPPs to promote a collaborative approach to fire prevention, mitigation, and response is an excellent strategy if implemented locally. Without local involvement and commitments, community planning can become irrelevant and as such may not be appropriate for all areas of the country. The challenge will be moving them from compacts or agreements to commitments backed up by funding and program investments.

Future budget outlooks, even for those states with increased population growth, does not bode well for more self-financed fuels management and fire prevention programs. Indeed, the expectation that the national economic recession may be prolonged has already slashed state and local revenues and stretched reserves to the breaking point.

Despite these economic reversals, community expectations are changing. There is more awareness of the risks and the limitations of what any government entity can do to suppress wildfires. Indeed, very recent trends are likely to escalate in the media coverage of the WUI fires that shift the emphasis to personal risk as opposed to public responsibility for resident decisions to live in potentially dangerous fire zones. Fire management can likewise expect to contend with property owner expectations shifting toward increasing ability to stay and defend property by constructing or retrofitting homes with fire-resistant construction and undergoing training providing an option to not evacuate. Community attitudes are already shifting to increasing support of prescribed fire and thinning programs for fuels reduction. Likewise, community attitudes about more flexible suppression strategies will be more supportive or at least realistic as the level of fire activity increases.

Attitudes toward protection of private property will continue to change with the intervention of insurance company contracted resources providing asset protection activities such as foaming or removing fuels near structures prior to fire reaching the area. This privatization facet 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.

Escalating Emergency Response Demands

The last five years has also left little doubt that large scale disasters are going to be more significant in the 21st century. Globally, the interval between QFRs has already seen two devastating disasters – the December 2004 Indian Ocean earthquake that triggered a series of tsunamis that killed more than 225,000 people in 11 countries and the 2008 Sichuan earthquake that killed more than 75,000 people in China.

While natural disaster activity in the U.S. has been much less deadly over the same period, it still has been of great impact. Fire management was significantly involved in the 2004 Florida hurricanes response and even more so in the aftermath of Katrina in 2005. At one point in 2005, the estimate of the level of engagement of national incident teams in emergency recovery was approaching 40% of dedicated work hours. Another metric for gauging the growing significance of emergency response in past years is the increasing number of national and state disaster declarations. According to FEMA reports, there were 74 state disaster declarations in 2008 with 51 of them fire management assistance declarations. Since an emergency declaration is needed for FEMA reimbursement for tribal, state and local governments, the increase in disaster declarations is perhaps a trailing edge indicator. Even so, there have been 500 disaster declarations in the states since 2000 out of a total of 1,808 declarations since the system was established in 1953.

While natural disasters are the major category of emergency response and recovery incident that fire management must continually prepare to be involved in, there are other scenarios of national disaster situations that potentially would involve response requirements and place major stress and strain on current incident management capacity. These include: global disaster response (pandemic flu); large scale accident response (Exxon Valdez, Three Mile Island, massive bridge failures, levee or dam breaks); natural disaster response (hurricane, earthquake, volcano, coastal flooding); zoonotics disaster response (Exotic Newcastle Disease, Mad Cow outbreak); and, attack/threat based disaster response (radiological release, anthrax attack, pyroterrorism, bio-terrorism, eco-terrorism, weapons of mass destruction).

While the probability of each of these threats is thankfully small, the potential impacts are devastating and long lasting. Each assumes correctly that some form of extensive fire community response would be involved from immediate emergency response to longer- term disaster recovery. Fire management must ensure that it is prepared to fulfill its responsibilities under FEMA's Emergency Support Function IV and continue to train and provide technical assistance to build capacity both within the federal agencies and for other agencies.

Fiscal Stress and Budget Realities

This QFR adds emerging government budgetary stress as a fifth driving force. A quadrennial review, by definition, builds in certain basic budgeting assumptions for the next four year interval. As Figure 1 illustrates, the rising cost in fire suppression is already a major factor for federal fire agencies. As might be expected given the rapid increase in wildfire activity, the 10-year rolling average suppression funding formula currently used has resulted in underfunding for suppression activity for the most recent years in the last decade. This in turn has resulted in almost annual additional Congressional and agency emergency financial intervention to remedy the growing shortfall.

The use of supplemental funding has had another budgetary impact. Between 1999 and 2006, more than \$3 billion was transferred from other DOI and Forest Service program accounts to support fire suppression. While this "fire borrowing" has generally been replaced, it has placed another source of financial strain on other agency programs. A 2004 GAO report documented numerous examples of project cancellations and delays, strained partner relationships, and management disruptions attributable to these fire transfers.

Future budgetary stress will also impact the larger cost of fire management. It will be important in the future to account not just for suppression funding but the full range of fire management costs. This will mean accounting for the full range of fire programs and support and assistance programs. Included within this are FEMA reimbursement costs to states and local governments for their suppression efforts, fuels reduction and fire prevention grants, and other intergovernmental assistance programs. FEMA reimbursements alone for fire management assistance declarations were \$74 million in FY 2007 and \$121 million in FY2008.

Further aggravating the chronic budget situation are the severe impacts of the current economic recession and volatile energy pricing. Federal budget priorities are likely to be focused on economic stimulation and financial restructuring, meaning that cost containment for all other programs will be a continuing and growing emphasis putting all new capital investments under greater scrutiny. However, there may be opportunities to tie into economic recovery efforts in the future. For example, hazard fuel reduction work around WUI communities might be accomplished using a type of civilian conservation corps or similar public works program.

Lastly, budget stress at the federal level may pale in comparison to growing state and local budget shortages. Here, actual declining housing values (and decreasing property tax revenues) and reduced consumer spending (lower sales tax revenues) will put the majority of state budgets in a deficit condition for the next several years. Recent reports on state budget for FY 2009 show forty-plus states cutting budgets or using reserve funds to manage revenue shortfalls. It must be recognized that as budgetary reductions affect fire agencies, there also will be an adverse affect on these agencies ability to support and provide mutual aid to requesting agencies. Initial estimates of these budget shortages or gaps are not small, ranging from Nevada and Georgia (budget gaps of under 2 billion) to Florida at \$5 billion and California at over \$30 billion. Seen another way, these budget shortfalls account for 10 to 25% as a percentage of states general revenues.

A schematic follows that summarizes these driving forces that will shape the future wildland fire management environment.

<h2 style="text-align: center;">Threats and Risks in the Wildfire Future Environment</h2> <p style="text-align: center;">Summary of Driving Forces</p>	
Climate & Ecosystems	Social & Political
<p>Effects of Climate Change & Global Warming</p> <p>Greater probability of bigger and longer fire seasons in more regions. Potential to reach 10-12 million acre platform.</p> <p>Factors: Shorter, wetter winters, warmer drier summers, longer fire season. Larger amounts of total fire on the landscape. More large wildfires, continued irregular pattern (Asymmetric fire).</p>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Driving Forces</p> <p>Continued Wildfire risk in the Wildland Urban Interface</p> <p>Regional shifts in population and more development of former timberland holdings more seasonal recreation and residency in WUI.</p> <p>Factors: Slower growth and likely impacts of economic recession. Rising energy costs. Growing role of tribal, state, and local level efforts. Mitigation and fire prevention (adapting CWPPs, promoting hazardous fuels treatments, and fire education).</p>
<p>Biomass Accumulation & Drought effects</p> <p>Drought cycle another twenty years. Southeast, Southwest, and West regions especially vulnerable in terms of fire risk.</p> <p>Factors: Competition for water in ecosystems. Exotic invasive and insect kill effects. Faster drying of vegetation. More flammable fuels drive fire behavior.</p>	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Driving Forces</p> <p>Escalating Emergency Response Demands</p> <p>Fire management plays a major role in emergency response (greater involvement with FEMA and states involved in emergency response).</p> <p>Factors Likely increase in frequency, devastation, duration of other natural disasters (hurricanes, floods, etc.). Preparedness for other national disasters (earthquakes, pandemics, terrorism).</p>
Organizational	
<p>New Fiscal Realities (2-3 years)</p> <p>-----</p> <p>Stress on Agency Budgets and Fire Budget Resources</p> <ul style="list-style-type: none"> Recession and volatile energy costs State and local budget shortfalls Pressure on reserve funds 	

II. Mission Strategies: Fire Management's Next Decade

The assumptions of future threats and risks to both natural (public lands) environments and human (wildland urban interface) communities will require continued development and reprogramming of federal wildland fire agencies' strategies and capabilities. Efforts expended by and resources committed to fire prevention, preparedness, fuels reduction, and suppression response have surpassed what was expected from the National Fire Plan, 10-Year Comprehensive Strategy, and the Cohesive Fuel Strategy. Looking ahead, fire management's approach to build strategic and tactical capability, more aggressively incorporate safety and risk management, and confront greatly increased and still escalating risks and threats and remain within stressed budgets will be a challenge.

While the statutory missions of the land management agencies vary, each contains land and resource management planning directives that incorporate fire management planning as a component of the larger land management planning process. Fire's responsibility within land management is prefaced by its overarching commitment to safety and risk management. The four core strategies identified in this QFR for the future challenges re-enforce fire management's pursuit of minimizing risks to public and firefighter safety and maximizing the re-establishment of fire-adapted ecosystems. Likewise, fire management must encompass all of the stakeholders and affected public in protecting communities and WUI residents while recognizing that fire has a role in managing these landscapes.

Two other cross-cutting strategies are also outlined. One is the refinement of current fuels reduction efforts into an integrated fuels management portfolio capable of supporting multiple objectives and reconciling different priorities. The other entails developing new information access and public communication efforts using new mediums, technologies, and internet applications to support new social or "wildfire" networks to support public fire education.

The mission strategies to be adopted, however, must do more than to position the federal agencies and their state, tribal, and local partners to address the challenge of more severe and more complex wildfire behaviors. That challenge has already arrived. What will be required will be more flexible, agile, and resilient incident organizations, more integration of fire management's multiple roles to achieve both fire adapted communities and more fire resilient ecosystems, and perhaps most importantly, a collaborative framework for fire governance (local, state, tribal and federal) that promotes stronger intergovernmental fire and emergency management planning, prevention and mitigation efforts. Memorandums of understanding, cooperative agreements and interagency policies will need to be strengthened and maintained and the integration of municipal fire departments, volunteer fire organizations and other agencies outside the federal government will be required to meet the juxtaposed challenges of the future. Given the threats and risks of the escalating wildfire challenge, the path forward must seek to ensure that the efforts of all the stakeholders in fire management reinforce and multiply each other, so the whole will be greater than the sum of the parts.

The schematic below overviews these strategies that will be developed in this QFR:

Fire Management				
Overarching Commitment to Safety & Risk Management				
Core Strategies Fire Adapted Ecosystems and Wildfire Management		Future	Core Strategies Wildfire Prevention and Mitigation In the Wildland Urban Interface	
Moving to Strategic Management Response within Asymmetric Fire	Reshaping Emergency Response within Fire Leadership		Mission Strategies	Fire Governance: Building a "new" National Intergovernmental Wildfire Policy Framework
Cross Cutting Strategies				
Integrated Fuels Management Portfolio ----- Fire Information, Communication & Education: New Content, Mediums, and Networks For Web 1.0/Web 2.0.				

Cornerstone Strategies identified in the 2005 QFR¹ will continue to be highly relevant into the next decade. However the continued probability that fire seasons over the next decade will be longer, fires will be larger and longer lasting, and wildfire acreage totals and suppression costs will increase will necessitate more strategic, robust, and more collaborative responses from federal fire managers and the tribal, state, and local partners. At a minimum this will require renewal and reprogramming of existing core capabilities within fire management and revisualization and realignment of roles and responsibilities throughout fire governance.

Inherent in all cornerstone strategies is the continued and increasingly important expansion of safety and risk management awareness and involvement at all organizational levels. In concert with more strategic, robust, and collaborative responses from all federal fire managers, and state, local, and tribal partners, safety and risk management must receive greater attention and be incorporated into fire planning and implementation activities more completely and efficiently.

While safety has long been a prime concern and priority in fire management, its operational attention and implementation has not kept pace with the functional evolution from specific safety concerns to a comprehensive risk evaluation and management activity. Fire management needs to expand its thinking and implementation from attention to safety factors to full risk management discussions and inclusion in everyday implementation activities. The five federal wildland fire management agencies and their state, local, and tribal partners that constitute the wildland fire community while continuing current safety and risk management activities must not be content with these levels of output. To sustain the commitment to reducing safety issues and improving risk management, safety and risk management activities must be expanded and incorporate the following strategic elements:

¹ These Cornerstone Strategies include (1) Ensuring Fire Management's Role in Ecosystem Sustainability, (2) Promoting Fire Adapted Human Communities and, (3) Balancing Emergency Response.

- Expand risk management to enable a much greater involvement in fire management planning and implementation activities. Advocate and carry out investments in risk management commensurate with production pressures, expectation demands, and increasing accountability.
- Promote inclusion of new models, new scientific knowledge, and other emerging information on human error, safety, risk management, and implications for safe and effective operations throughout all fire and aviation management activities.
- Develop new outcome measures that place safety metrics on a level equal with post-fire resource impacts and cost efficiency.

Safety and risk management must progress as an activity, must become more robust, and must be incorporated to a much greater extent in all planning and implementation actions to keep pace with the renewal and reprogramming of existing core capabilities within fire and aviation management.

Asymmetric Fire and Strategic Management Response

The challenge of greater fire, larger fires, and longer fire seasons occurring irregularly within and across regions – asymmetric fire – will demand greater flexibility and more agile capabilities within fire management. Going forward will require revising overall fire suppression management strategy – moving beyond appropriate management response to Strategic Management Response (SMR). SMR is not a new fire management acronym, much less doctrine. Rather it should be viewed as a framework involving a multi-phased approach for addressing incident management. The phases include preparedness, response, strategic plans for fire on the landscape and a continual revision process. This shift in mission strategy is partly in response to definitional and cultural barriers.

Appropriate management response is often referred to as common sense fire management, but what may seem like common sense to one set of decision makers can easily run afoul of other stakeholders and decision makers with different missions, competing objectives, and conflicting perspectives on situation information. Moving to strategic management response is designed to ensure a higher level of transparency, accountability, and support for specific fire decisions and to better display the costs and benefits of suppression strategies. This approach would weigh factors such as suppression costs and value of resources lost against the value of ecosystems restored and improved and infrastructure protected.

The other force behind an SRM framework is creating a matching capability to better integrate cost sensitivity and risk management into the acquisition and allocation of all resources. Given budget stresses and cost issues, fire management must be able to focus on the totality of fire management effort. Allocating resources in accordance with priorities is more than simply managing multiple demands and putting resources on the most-needed fire locations, it also must be able to tackle the issue of overall supply. Indeed, part of the premise of SRM is that suppression strategy has to be able to both scale up to higher levels of activity and reposition more rapidly to respond to irregular demands of asymmetric fire.

To accomplish this, the SRM framework would incorporate several strategy elements.

- Improve wildland fire decision-making and implementation through the introduction of a system to document strategic decisions, facilitate access and use of the next generation of risk-informed decision support tools, and allow for the completion of a detailed set of implementation actions as needed. Decision-making would be realigned to be more agile, flexible, and responsive to rapidly developing and changing conditions and retain relevancy over longer time periods.
- Land-use plans and tiered fire management planning would contain strong and effective linkages to CWPPs and reflect relative costs, values, and landscape resiliency associated with proposed actions, alternatives and decisions.
- Established plans would be transformed from static, program reference documents to landscape-level strategic assessments of fire management objectives (reaching fire adapted) with strong effective linkages to National Incident Management Systems-compliant, Community Wildfire Protection Plans and promoting a collaborative approach for fire prevention and response planning. Planning would also ensure that new fire outcome metrics that reflect cost, values, and resiliency are in use.
- Redesign of incident management team structures to not only broaden their ability to respond (range of tactics and capabilities). Instead of forming larger teams, shift the focus to more modular and meldable incident management organizations (i.e. building the organization to fit the situation).
- Key ingredients in this drive for greater mobility and agility will be investment in new aviation capabilities (in the sense that major parts of aviation asset base must at a minimum be modernized) along with the application of more advanced communication, and monitoring assets for fire fighting forces.

An additional benefit of this approach to strategic management response framework would be to bring fire management response in line with the National Response Framework (defined as tiered response with scalable, flexible, and adjustable operational capabilities).

Reshaping Emergency Response within Fire Leadership

Bringing fire management response more in line with the National Response Framework leads to a concurrent approach for reconfiguration of emergency response within fire leadership. Large wildfires and longer fire seasons are not going to be the only natural disasters in the headlines. Fire management must be prepared to go up a step beyond simply fulfilling its role in the national emergency support function. While the federal fire agencies will always make their land stewardship and protection responsibilities the primary objective, what will be needed is a more interactive and robust approach enabling fire agencies to work more effectively with FEMA and state and local community emergency response forces. Fire management must build beyond the strong training and technical assistance roles in national incident management that are already well established and promote stronger interplay and planning for emergency response efforts of all agency and jurisdictional forces.

This strategy entails a recalibration of emergency response into a total force concept that would consist of three strategy elements:

- Developing the capacity of incident management organizations (Types I, II, and III) so that all team members have the training and ability to address wildfire and emergency response situations, regardless of jurisdictional boundaries.
- Continuing to train and assist other communities and other partners in incident management and adding fire and emergency response planning to emergency response training
- Building the capability for all incident management teams to be able to integrate and work effectively within emergency response – focusing first on local incident management teams working with FEMA All-Hazard Incident Management Type 3 teams and extending to larger national and even international areas of operation.

It should be noted that this mission strategy represents a course change from the 2005 QFR. The 2005 QFR supported efforts to limit emergency response efforts primarily to National Incident Management Organization teams and to emphasize short-run response efforts and avoid longer-term disaster recovery operations. The environment is different now- as are the capabilities of FEMA and state and local emergency response forces. It is difficult- both managerially and politically to distinguish between response and recovery and overall there has been a movement toward more integration of emergency response forces. Fire management’s engagement in a total force concept recognizes that all fire incident management resources must be able to participate effectively in emergency response, both in fulfilling emergency support functions and in assisting in other areas if appropriate. Conversely, the participation of FEMA and state and local Emergency Response forces (as with the California fire sieges in 2007 and 2008) is a future indicator of a more reciprocal state of emergency response.

Reaffirming Fire Governance: Building a National Intergovernmental Wildfire Policy Framework

The QFR’s other cornerstone mission strategy in 2005 called for promoting fire-adapted human communities rather than escalating protection of communities at risk in the WUI per the 2000 National Fire Plan. Behind that goal was building a greater “sense of living with fire within communities” to which the federal agencies would work toward establishing responsible partnerships with WUI communities that focused on “defensible space.” As some ecosystems must adapt to a fire-prone environment in order to survive, so must human communities in the interface, if they are to survive over the long term. The fire agencies must take the lead in effecting change in the public’s expectation that government will always be there during a wildland fire event. It is time to change the public expectation to encourage communities and property owners to take responsibility and become active participants and an integral part of the solution.

The 2009 QFR mission strategy takes “Achieving Fire-Adapted Communities” much further. Implementation should include strategies for increasing knowledge and commitment, and building a sense of responsibility among private landowners, home owners, the insurance industry, fire districts, local governments and other key players

in WUI communities for wildfire prevention and mitigation. Before addressing strategy specifics for extending progress on fire adapted communities, it is essential to revisit the intergovernmental dynamic, or fire governance that prefaces fire prevention and mitigation efforts.

The Fire Governance core strategy encompasses these elements.

- Clarifying existing federal, state and local roles, responsibilities, and authorities for protecting the WUI
- Realigning federal, state and local roles, responsibilities, and authorities for WUI fire protection (suppression, prevention, mitigation, and education)

It is important to note that there is a larger vision of fire-adapted communities here, mainly to extend the reach (i.e. having more communities involved and making collaboration more effective) and deepen the base (i.e. strengthening existing practices and capabilities of communities). The goal is nothing less than moving the consensus beyond why fire-adapted communities are important, to making them a greater reality, and ultimately defining success by switching the role of fire management from the “communities at risk, protect at all costs,” to “foster self-reliance and increase resiliency.”

What “achieving fire adapted communities” entails is important. Just as SRM must be seen in the context of a larger vision of restoring fire in ecosystem sustainability, “fire adapted communities” also presumes that states and local communities are fulfilling their roles and responsibilities in land-use planning and regulation (including building codes and ordinances), ensuring provision of a robust local suppression response capability, and establishing fire management planning and community wildfire protection plans. An apt restatement of this core mission strategy in this regard would be creating more effective alliances and relationships within a larger community of prepared and responsible partners.

While new codes work well for new communities, the core of the nation’s WUI problem is the existing structures that can only be mitigated by retrofitting said structures. The fire service in partnership with building officials need to develop an outreach program for government, homeowners and the insurance industry. This program must include fiscal options and other incentives for success.

In order to reaffirm fire governance, the strategy requires building a “new” national intergovernmental wildfire policy framework. The central premise would be to promote the operating practice that the protection and management of wildlands (forests, parklands, refuges, and rangelands) surrounding or adjacent to the WUI should be provided by the protection organization that is best-suited and positioned to effectively and cost-efficiently provide that protection. The first strategy element would seek new understandings and consensus among all the partners in the WUI to clarify the roles, responsibilities, and authorities of federal, state, tribal, and local fire protection organizations and property owners that are currently living in or providing wildland fire protection in the WUI and surrounding areas.

Once all protection organizations have confirmed their response capabilities, the second strategy element – realignment -- would identify opportunities to revise WUI protection roles and responsibilities among existing protection organizations to better match their organizational missions and response capabilities.

Realignment would be guided by several overarching objectives. While the aim is to realign or exchange suppression responsibilities to give responsibility to the party best suited to that area, a further goal would focus the federal suppression role on the wildland and put state or local agencies in charge of more populated areas. Realignment would likely entail some reallocation of the annual suppression/preparedness funding to finance these negotiated shifts in suppression or mitigation responsibility. Another option would be for federal lands immediately adjacent to communities to be managed by state or community entities via stewardship contract tied to clear and achievable objectives for fire behavior mitigation and land management plan guidelines. Finally, opportunities for potential biomass energy projects and green waste reduction could be encouraged.

None of the steps above needed to create a new intergovernmental framework for wildfire policy will be easy. While the commitment to cooperate and willingness to share resources during fire incidents within the fire community is legendary, there are real differences in land management objectives, fire management capabilities (and funding availability), and protection philosophies. Still, as the costs of annual wildfire suppression and fuels reduction programs soar, there is increasing recognition that the time has come for clarification and realignment as opposed to continued controversy and dispute about whose fire strategy dominates and who should bear the cost.

Crafting a new intergovernmental fire policy framework will provide an opportunity for all the partners to first ensure adherence to a general set of common operating precepts: namely, fulfilling pre-fire mitigation, defensible space, and individual responsibilities; taking suppression actions to keep wildfires originating on own jurisdictions from spreading to adjacent jurisdictions (especially when structure protection is involved); managing fuels to reduce fire spread potential along boundaries with other jurisdictions; and allowing reasonable access across ownership to support neighboring jurisdictions.

Other dimensions subject to realignment would include local initial response contracts, exchanges of protection responsibility, and contracts for maintenance of fuels reduction. A further aim of the new framework would be to encourage community wildfire response planning where by federal land managers and state and local government representatives and community stakeholders establish adequate response capabilities and a joint community wildfire response plan that links community wildfire protection plans with federal fire management plans.

Achieving “Fire Adapted Communities”

Governance realignment would enhance three other mission strategy elements within Achieving Fire-Adapted Communities:

- Creating community defensible space/fuels reduction zones for the WUI
- Enabling (where appropriate) leave-early-or-stay-and-defend policies for property owners
- Recalibrating public expectations for fire adapted communities (tied to new fire outcome metrics)

A first strategy element ensures community defensible space or fuels reduction zones for the WUI is a central part of an integrated fuels management portfolio within fire management. Fuels reduction efforts on both federal and non-federal lands would be reprogrammed in the WUI under the rubric of creating community defensible space and fuels reduction zones in which treatments are properly spaced, sequenced, and maintained. Federal

commitment to fuels reduction for the interface is anchored in program funding requirements that half of fuels investments are in the WUI. And while this rate of investment has been sustained, (see Table 2) it needs to move to a higher level characterized by multi-jurisdictional determination for prioritizing fuels reduction projects around *proactive* communities (those with CWPPS or part of FireWise, Fire Safe, and so forth). Likewise, grant funding available to states for WUI protection should be focused on these same proactive communities. The objective should be to make strategic fuel reduction investments in and around communities where there is a high probability of successfully lowering the communities' exposure to major damage from wildfire.

This level of fuels investment would pursue “shared responsibility” in the WUI where fuels reduction efforts are jointly planned and treated (restoring landscapes to desired condition) and long term expectations for community maintenance are factored in. The ideal result would be the creation of fuels defense zones bordering on and extending beyond WUI communities with the expectation of creating safer communities. These defense zones may be on a combination of private, state, and federal land. In addition, the opportunity for utilizing biomass for energy production could be an incentive to communities and land managers.

Another mission strategy element for Achieving Fire Adapted Communities entails providing a wider range of alternatives for residents and property owners and fire managers in the WUI. It is already evident in some community evacuation policies and recent incident experience that total enforced evacuation from encroaching wildfires is changing. Indeed the logical extension of more fire-adapted ecosystems and more communities that require defensible space around fire-resilient structures built according to wildfire defense minded codes and ordinances is that homeowners should have an option to stay and defend their homes. Obviously this alternative must be viewed in the total context of the fire risk – there will always be fires of such a threat that early evacuation is the most and perhaps only responsible option.

Enabling – “Leave Early or Stay and Defend” (what is often called the “Australian model”) -- will be a departure from past fire management suppression tactics that have tried to dictate complete evacuation within fire zone perimeters. Even here, however, fire management's potential use of point protection tactics over total perimeter control supports a more nuanced and flexible policy for property owners and residents. To make this alternative work, fire management policy would call for a clearly defined, risk- informed, “Leave Early or Stay and Defend” option where adequately informed homeowners would have a choice to stay and protect their homes and property. The option would detail agency and public education efforts, require information and notification procedures, and summarize community preparation steps from building codes and property owner defense planning to resident education. In addition, it would clarify existing policies involving rural ranchers and landowners regarding their ability to protect their own property. It might also consider steps to certify or at least provide for reliable self-determination of risk levels in terms of being fire-adapted communities.

This leads to the last strategy element for achieving fire adapted communities. As fire management develops a new and more robust set of fire outcome measurements outlined under SRM, it must not leave out fire-adapted communities. Extending the reach and deepening the base can't happen if fire management lacks understandable and demonstrable metrics on what fire-adapted means. Outcome metrics must go beyond a simple checklist of having defensible space, fuels treatment programs, ingress/egress and infrastructure standards, local wildfire response capacity, and building codes/ordinances and spacing/density for new and established structures. These are of course the program elements of what communities and their residents strive for in the WUI. The task ahead is to enable an evaluation of the return on investments of these efforts in the context of fire risk in the wildlands nearby. Only this way can public expectations become more realistic and enable communities and residents in the WUI to see both the value of past investments and what still needs to be done.

Cross-cutting Strategies: An Integrated Fuels Portfolio In Support of Land Management Objectives

Since the inception of the National Fire Plan, fuels reduction efforts have been an essential program component in support of land management objectives, which include protection of communities from wildfire as well as ecosystems management. As noted in Table 2, nearly 30 million acres have been treated since 2000 which does not include acres treated by state and local agencies and communities.

As essential as fuels management is, it does not exist as an end in and of itself, but is one of many tools used to accomplish land and resource management objectives. Fuels management is comprised of many methods and techniques, which together form a fuels portfolio which may reduce, modify, or maintain fuels characteristics in support of other management programs.

The strategic goal is to integrate fuels management investments and projects into larger land-management priorities. Ecosystems management requires the integration of a variety of management objectives and techniques which may include, but are not limited to, wildland fire risk reduction. Fuels management must be directly linked with all natural resource management functional programs, including watershed, wildlife, forestry, range, soils, air quality, etc. It needs to progress beyond simply a hazardous fuel treatment program of small scale and localized treatment and grow to represent and support a landscape-scale management capability. But, it must not be viewed as landscape strictly on the basis of a treatment size alone; it must combine small and large scale ecosystem maintenance activities, including the occurrence of wildland fire, with mid- to large-scale fuel treatments across a landscape to accomplish multiple land-management objectives.

Management objectives, which may be accomplished with a fuels management portfolio, also include ecosystem resilience to wildfire-induced damage, increased resistance of watersheds to damage or erosion from intense fires, reduced smoke emissions, and reduced occurrence of invasive species. The integration of several objectives using a variety of fuel management techniques constitutes an integrated fuels portfolio.

The future portfolio for fuels management programs will be driven by four factors:

- Placement of fuel treatments based on strategic risk management or habitat protection criteria for both the WUI and to protect and enhance natural resources, such as important habitats or watersheds.
- Leveraging fuels treatment through cooperative state and local government programs to incentivize community efforts and build “local” fuels management capacity via grant programs to state and local entities and establishing cooperative programs with willing and able neighbors.
- Building potential platforms through support of the nascent wood energy/cogeneration/ethanol industry for support of federal goals of energy production from wood and moving toward intermixing fuels reduction biomass with other woody feed stocks and agriculture residue stocks.
- An integrated fuels management portfolio would also involve, taking advantage of opportunities presented by the occurrence of wildfires. Fuels projects are often done in anticipation of a wildfire to reduce risk. The occurrence of a wildfire has not often been used as a factor in the selection of areas for fuel

treatments, either to maintain the burned area in an appropriate ecological condition, to maintain fuels at a prescribed level, or to generally take advantage of reduced fuels and risk following the occurrence of a wildfire.

Restoration as a management objective is complex. If one looks at restoration as the recreation of a snapshot in time of ecosystem composition and structure, it may be ignoring changing environments, climate change, invasive species, etc. This is also true if the land-management objective is the restoration of fire as a natural process, when climate change may be affecting fire occurrence in unprecedented ways.

A fuels portfolio may include mechanical, fire, chemical, or other techniques. It may also include the timing of treatments, their size and location, and coordination with other local, state, and federal land-management activities, and in particular the utilization of specialized skills and staff these entities may possess. This portfolio is applied in support of larger land and resource management objectives which may be unit or bureau specific. Inherent in the “portfolio” concept is an organization’s ability and willingness to make investment decisions that reflect larger overall goals and potentially involve other units.

An example of the use of the fuels management portfolio has already been introduced as part of Achieving Fire-Adapted Communities – creating community defensible space and fuels reduction zones. As a component of the portfolio, future “investment priority” would be for those communities prepared and committed for joint planning, coordinating treatments, and ensuring maintenance. This process of community protection from fire would be part of a larger program to more broadly use fire to achieve a variety of land management objectives, such as the maintenance of fire-dependent ecosystems.

A second component in the portfolio would schedule treatments on the public lands between the community’s WUI and the fire-dependent wilderness, for example. Here the portfolio would emphasize, using a coordinated, interdisciplinary, and collaborative process, new investments based on doing treatments at landscape levels as opposed to small unit projects. Planning for such projects would include multiple objectives -- WUI protection, fire effects, habitat restoration, watershed health, and even potential environmental and energy needs over longer timeframes (years to decades).

The third component for the portfolio would involve wilderness. Here, accessibility, preservation of wilderness values, and land-management objectives limit the application of both fire and non-fire treatments on a small-scale basis. Predominant land management objectives direct the maintenance and reestablishment of natural processes, including fire. Managing unplanned ignitions for resource benefits plus the application of landscape-scale prescribed fire treatments represent the best means to effect fuels management and vegetation manipulation and accomplish land management objectives. Expansion of this activity will necessitate the updating of land-use and fire-management planning processes to include fuels management planning as investments on large landscapes with neighboring jurisdictions, water and airsheds, and species and other resource values while still supporting land-management objectives focusing on preservation and maintenance of wilderness values and natural processes.

This crosscutting strategy recognizes that not all land/resource management plans will support the scale and multi-jurisdictional reach contemplated here, even using the integrated fuels portfolio as a tool in achieving multiple objectives. But again, the value of the integrated portfolio is to give priority to areas that fit the new management model for achieving fire-adapted communities and to provide incentives for all local units to think and plan differently about fuel management and related restoration efforts

Cross-Cutting Strategies - New Platforms for Information Sharing and Education (Web 1.0/Web 2.0)

A second cross-cutting strategy is vital to connectivity and information delivery in fire management. Incident teams on wildfires and briefing centers in the geographic and national centers are increasingly being pressed to communicate in real time directly to the public in wildfire situations, or conversely, provide real-time, direct access to incident management situations. The increase in wildfire behavior affecting risk on public lands and the WUI has made public outreach within fire more complex and demanding.

A new Information Sharing and Education Strategy is advanced to establish internet platforms via Web 1.0 and Web 2.0. New content and mediums are included capable of reaching and supporting emerging and developing networks. Central issues affecting a shift in fire management information management philosophy include:

- Public Information on Fire Risk, Prevention and Fire Safety is shifting from a central command and control focus to expanded community information sharing emphasizing real time access resulting in promotion of public trust.
- Enhancing collaboration with stakeholders and strengthening larger community relationships and expanding public education. Platforms are developing for dialogue with tribal, state and local authorities including elected officials, business and private property owners, and the larger public to develop a better understanding of fire-adapted ecosystems.
- Environmental Stewardship which promotes building and support of larger networks that are concerned with land management issues and public lands restoration, without driving the inclusion of a federal design or message.

Recent developments in internet communications and information organization will allow fire management to rethink mediums and opportunities for broader access and greater stakeholder and public engagement. The QFR recognizes the opportunities surrounding future models addressing public communication and information in both Web 1.0 and Web 2.0 environments.

The steady decline of traditional media is in large part linked to trends involving the public obtaining information in real-time from non-traditional sources. The implications for the fire community are clear. The morning newspaper and evening news will not meet the demand for timely, specific and relevant information regarding fire management. The dynamics of future models for incident reporting and communications must provide real time information for those affected by the wildland fire risk. In short, the media as well as the message must change. What worked 10, 20 and even 30 years ago will not be effective now.

A Web 1.0 future model identifies opportunities to streamline fire information through the use of different platforms which might include: The Fire Channel, (Hosting of a wide array of fire information including current affairs, history and technical information), Fire Camp as a News Center, (live broadcast or podcasts of morning and evening briefing, broadcast of evacuation notifications, web cam in the fire camp or on the line), NICC – National Interagency Coordination Center (NICC) as a Situation Room (moderator accessing fire camp or other Geographic Area feeds combined with interviews and pertinent information), the National Advanced Fire Research Institute (NAFRI), (promoting My Fire Community and Lessons Learned as the educational component).

A Web 2.0 future model connects opportunities to develop social networks and portals, crises and open source editing, wiki's and the use of other Web 2.0 mediums. These platforms and applications also demand a new understanding of fire management's traditional role of providing public information on fire risk, prevention and safety, effects and final outcomes. Fire management must seek to improve communication, provide better access to information promoting fire-adapted communities and enhancing new understandings about wildfire, water, air quality, carbon, global warming, biodiversity and habitat restoration, etc.

In actuality, these future models along with advances and uses of emerging technologies are already transforming conventional concepts of public outreach. Benefits of a new crosscutting strategy for fire management on information and communication will be an informed, active and knowledgeable community better suited to take on additional protection and mitigation responsibilities and emergency responses. A true fire-adapted community will be connected and communicative which are both inextricably linked.

The summary figure that follows displays the 2009 mission strategies and elements.

Mission Strategy	Core Strategy Elements & Capabilities
Overarching Commitment to Safety & Risk Management	
Suppression Strategy within Asymmetric Fire Moving to Strategic Management Response:	<ul style="list-style-type: none"> • Ensure proactive wildland fire decisions aligned in a Strategic Response Framework • Recalibrate fire planning and fire outcome metrics • Realigning team structure to transform ability to respond to SRM • Place fire management response in line with the National Response Framework • Fuels Management Portfolio for larger landscapes
Reshaping Emergency Response within Fire Leadership	<ul style="list-style-type: none"> • Recalibrate capacity to respond – total force concept • Train and assist other agency and community players (build partnership capacity) • Extend reach for emergency response through total force concept
Reaffirming Fire Governance: Building a "new" National Intergovernmental Wildfire Policy Framework	<ul style="list-style-type: none"> • Clarify federal, tribal, state and local roles, responsibilities, and authorities for WUI protection • Realign federal, tribal, state and local roles, responsibilities, and authorities for WUI fire protection (suppression, prevention, mitigation, and education)
Achieving Fire-Adapted Communities Supported by an Integrated Fuels Management Portfolio	<ul style="list-style-type: none"> • Building Community Defensible Space / Fuels reduction zones (treatments properly spaced and sequenced) • Enabling (where appropriate) Leave Early-or-Stay and Defend policies for property owners • Recalibrating public expectations in the Fire Adapted Community era (Fire outcome metrics)
Reimagining Wildfire in a Web 2.0 World Creating New Content, Mediums, and Networks For Information Sharing & Education	<ul style="list-style-type: none"> • Rethinking public information on fire risk, prevention, and fire Safety within Web 1.0 (The Fire Channel) • Enhancing collaboration and building partnerships through social networks within Web 2.0 (Myfirecommunity.net) • Revitalizing environmental stewardship education –Public lands & wildfire ("Fire-opedia" Web 2.0)

Looking to the Future: Balancing Risk – Creating New Results

All of the mission strategies for the future carry a continued expectation for high reliability that transcends successful performance. Given the levels of wildfire and the risks inherent in potentially annual 10-12 million acres of wildfire on the land, public and firefighter safety must remain an unequivocal priority.

Fire management's role in ecosystem sustainability will also require new consideration of environmental mandates for carbon sequestration and reduction of CO2 emissions. State and regional regulations and new carbon goals will have a concurrent effect that may also have to be factored into agency resource value goals, land management resource planning, fire management plans, and community wildfire protection plans. Strategic Management Response will require better planning and decision-making support systems along with the realignment of incident management teams to situation management organizations.

Continued progress toward achieving fire adapted human communities will demand more than redrawing protection boundaries and mobilization compacts. Movement toward a new federal framework that pushes beyond appearances of federal fire management dominance to true intergovernmental fire management cooperation is paramount.

Strategies should support communities organizing to take action, striving to be self-sufficient, and above all, becoming more comfortable (and knowledgeable) with prescribed and natural fires in their environs. This will be further enabled by the new generation of public information and education strategies via internet communications and social networking that require cultural change as well as rethinking information access and exchange technologies.

The remaining two sections of the QFR report switch to an assessment of current workforce and resource levels with a review of decision support, resource coordination, and logistical planning systems. Section III details workforce capabilities and projects training and development needs. Section IV examines capital equipment requirements, modernization issues, and strategic sourcing before reviewing systems and technology development issues.

III. Workforce Capabilities, Structure and Preparedness

Fire's mission strategies for the future will also demand renewing key capabilities in planning, decision-making, reliable response, collaboration in governance, building stronger community relationships, and enhancing training, technical assistance, and public education. The QFR defines new mission strategies and objectives for repositioning the workforce within fire management in core capabilities to meet future risks and threats.

The federal wildland fire agencies are in the process of reviewing how the larger structure (national and regional) of the agencies should be adapted to accomplish fire management's mission and how it should support the interagency-landscape and more collaborative community relationships changes. This review will be especially significant in light of the advocated realignment proposed in the fire governance mission strategy and the more robust capabilities that are inherent in fire adapted communities

Current Force Structure

Over the next few years, as federal and state agencies cope with mounting budget deficit pressures to contain and, in many instances, reduce expenditure levels in all programs, fire management's force structure and ability will be challenged. Reliance on retirees to fill some incident management team positions will continue in the short term. Fire management will at best be expected to maintain fire fighting capacity at zero growth levels and absorb higher inflationary costs. At the other budget end, annual appropriated costs for fire management may actually be cut with the expectation that suppression costs would be covered by reserve funds or supplemental. Either way, fire management will be challenged to just to hold level its preparedness force structure numbers as they deal with larger program cost pressures, financial adjustments, and other budget issues.

Even if funding levels for the current force structure numbers in preparedness are maintained, operational and equipment costs will continue to increase. While forecasts for inflation vary because of the current recession and slumping demand, most economists expect costs to double from levels in the last 5 years, especially when high energy costs return. While recessionary pressures will make fire fighting attractive to contractors, the net result will still be considerable reductions in buying power for firefighting operations. When energy prices again reach higher levels, cost increases in agency operations and contract operations will be dramatic.

Faced with the ongoing challenges of climate change, fuel accumulation and the WUI, the primary objective is to continue to maintain the core fire management force structure, especially at the local (initial response) level, and maintain the initial attack success rate. While the preparedness resources summarized in the table below are not absolutes they represent basic thresholds for support of local fire and fuel management.

Table 3 Preparedness Resources

Preparedness Resources				
Federal Personnel*		DOI	FS	Total
Firefighters (includes IHC)		3,529	9,760	13,289
Smokejumpers		137	320	457
Overhead & Prevention		1,302	400	1,702
Federal Agency Subtotal		4,968	10,480	15,448
Tribal, State, Local, Volunteer**		Career	Volunteer	Total
Firefighters		294,100	807,150	1,101,250
Incident Management Teams	I	II	II (State)	FUMA
# Teams (all agencies)	17	18	36	7

*Source: DOI and Forest Service 2009 Budget Justifications

**Source: USFA, Oct 2006

There are several initiatives currently in progress among the National Wildfire Coordinating Group, the National Association of State Foresters, and the U.S. Fire Administration to integrate local government forces into the overall, interagency response capability to reflect true national resource levels. In 2006 it was estimated that almost 25% of fire departments could handle an urban-interface fire of more than 500 acres using just locally trained personnel, though 27% of departments consider such an incident outside their responsibility. Maintaining programs to increase the capability of local fire departments to respond successfully to wildland fire and WUI incidents is vital.

Workforce Preparedness and Development

The federal wildland fire agencies have long used a variety of workforce resources, both internally and externally, to accomplish the full range of the fire and fuel management missions. With the increase in funding and hiring from the National Fire Plan in 2000, fire management took a major step toward transforming a mostly collateral duty volunteer workforce to a more dedicated professional fire management force. Likewise, efforts to raise firefighting and emergency response capabilities increased among tribal, state, and local partners and volunteer fire departments and contractors. The challenge to the agencies now is to identify the effects of flat or declining budgets with increased overhead costs and buying power which will require reassessing organizational structures and alternative forms of hiring and service acquisitions.

In suppression, the federal agencies still rely on their fire preparedness funded resources and other resources from non-fire programs, which make up the “militia” for fire. The militia provides valuable resources to both fire suppression and prescribed fire, and its involvement in the future will be essential. In 2008, there were more than

36,000 federal personnel with some qualifications that are certified to support and/or fight fire. About 15,000 of those have participated on “all-risk” incidents. These “responders” are located throughout eleven geographic areas across the United States and are classified as national, regional, or local resources for wildland fire.

This QFR is premised on the near-term assumptions that the total preparedness workforce strength (nearly 15,448 fire fighter equivalents) will be sustained while the total incident qualified numbers (between 32,000-36,000 individuals) may slip due to a number of factors. One dominant issue that must be considered is the impacts of workforce reductions, increases in workload, and re-organizations in non-fire program areas that could affect the future availability of the fire militia. Other challenges will include maintaining certification levels and meeting training requirements in the growing complexity of fire management work.

The federal wildland fire agencies devote a significant amount of time and resources to training and employee development. This begins with the basic and advanced training required so that all fire management personnel meet interagency standards and are certified as qualified to perform their duties. Agencies also provide advanced technical and specialized training for the full range of fire management activities at the regional and national levels.

Safety remains as the fundamental basis for most training requirements. As fire ground situations become ever more complex, fire fighters from all levels of government need cross-training in both wildland and structural fire fighting safety, tactics and strategy. Every fire response brings with it the risk of injury and death to both firefighters and the public. Firefighters must be skilled in assessing the risk associated with both taking action and not taking action. Occasionally, even sound decisions result in tragic outcomes and while firefighters operating within the scope of their training and qualifications are legally protected, these protections will continue to be challenged.

Building the workforce capacities to accommodate the new mission requirements outlined in the QFR will require realignment and redirection of the existing workforce. Succession planning will also be needed. A preliminary review of the IQCS federal firefighting force shows general balance in terms of age distribution among fire fighters, crew supervisors, and incident team leadership. Figure 3 shows the demographics for the percentage-age breakout of basic firefighter ranks, crew supervisors, and select leadership positions and some of the specialist positions². Although there is considerable variation among the agencies and there is a significant cadre of top leaders in the Incident Command leadership ranks in the upper age ranks (over 48), the overall numbers show the expected balance of age distribution across ranks of the federal firefighting workforce.

² This analysis uses an IQCS data base number of 10,500 qualified fire fighters, 5,000 crew supervision, and 1,500 in incident command.

Federal Firefighters By Qualification Level By Age

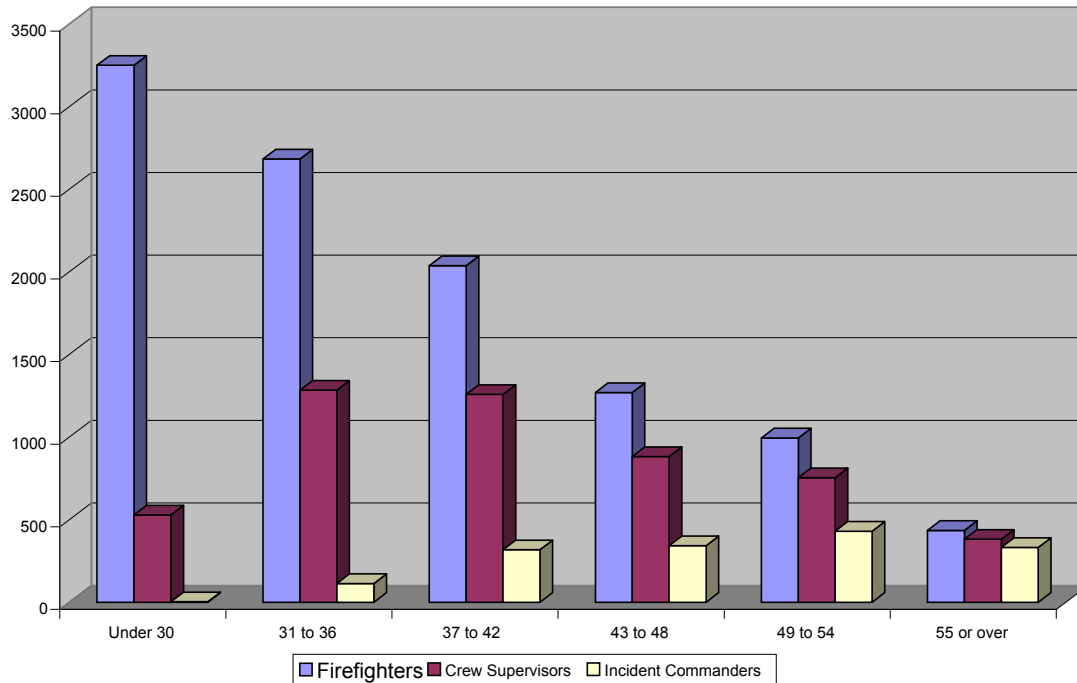


Figure 3

Source: National Advanced Fire Research Institute – November 2008

Within some of the more specialized positions, there are issues with older employees. In some specialties – such as public information, plans, and logistics -- more than two-thirds of the leadership positions are over the age of 50. As the Incident Qualifications Certification System in place now does provide the numbers of trainees in the systems, this will enable fire management to look at training and qualification incentives to deal with succession management at the macro level. (It should be stated, however, that the system numbers reviewed here reflect only numbers of qualifications obtained and do not speak to availability or multiple qualifications held individuals.) What is apparent is that fire management is rapidly reaching a point where it must redirect the choices made by firefighters -- choosing qualifications for firefighters as opposed to letting firefighters choose their qualifications.

The workforce cannot simply be stretched to accomplish increasing workloads to essentially “do more with less.” The nature of fire and fuel management work will still require high levels of reliability, and concerns for safety are always paramount. The reality of current and future budget levels entails improving existing workforce skills, shifting to multi-purpose roles, and ensuring that better decisions are made and are consistent with the cost management goals pursued by fire management at all levels. Investments in training will be needed to improve workforce capability so that the flexibility and modularity envisioned in strategic management response can be realized.

Creating New Workforce Skill Set Requirements

The general assumption of no net gain in positions within fire and fuel management due to funding limitations is a given, and the reality that some positions may have to be reduced given current budget scenario should not be discounted. This means accomplishing mission capacities must come through redirecting existing workforce skills and developing new workforce strengths. Planning skills need to include modeling for future ecosystem changes and emphasizing landscape ecology. Planners for both agency land management plans and fire management plans need better collaboration, conflict resolution and understanding of social demands skills. Decision-making skills need to include more predictive skills for long term risk assessments and monitoring to allow for adaptive management. Leadership and science needs to better support and create new learning experiences for the decision maker.

Community relations and education skills need to include knowledge of grants and agreements processes, assessing fire protection capability, technical knowledge of building codes and ordinances, FIREWISE use and promotion, and long-term fuel maintenance planning near fire-adaptive communities.

Skills in fuel management need to be further developed to provide better modeling capabilities, adaptive management and assessment of risk, fuels, and disturbance regimes. These skills need to be seamlessly integrated into all fuel planning efforts, which will further support decision makers. Most past successes in fuel management by the agencies can be attributed to strong local leadership. Future fuel management training efforts need to be focused on developing leadership in both fire managers and agency administrators.

The skill set for emergency response requires increased training skills to improve knowledge and experience levels of non-fire and National Response Framework response agencies outside of the incident environment. Skills in mentoring external personnel during incidents will need to be enhanced and broadened. Competitive sourcing and contract management skills can also offer options for accelerating the dependency reduction.

Strengthening the Workforce

Overall, fire management must continue building a workforce that better melds core capabilities and workforce capacities into successful mission accomplishments. In terms of core capabilities, workforce capacities must address the following:

- First and foremost, the agencies' priorities must focus on meeting their land stewardship role, and fire management should continue to build its expertise in environmental leadership.
- Relationships need to be enhanced among fire management, line officers/agency administrators and resource management personnel to provide more cohesive leadership and integrated planning.
- Build a strong Strategic Management Response capability where suppression strategies are focused on fire's role in the ecosystem to maximize resource benefits and reduce costs.

- Prevention and mitigation efforts need to be directed toward creating fire adaptability in communities. Partnerships must be created within communities to promote fire adaptability and support those communities that embrace the concepts
- Educational programs must be enhanced to support the professional development of current and future employees in planning, decision-making, leadership and public education.
- Cadres must be provided to support and train non-fire agencies entering the field of incident management through the National Response Framework, which would reduce overall response demand and provide additional resources for fire incidents.
- Monitoring systems need to be established, including third party monitoring protocols, to ensure that fire use and/or suppression strategies are being accomplished, that to assure objectives are met in accordance with established priorities for maximizing resource benefits.

The future agenda must address human capital issues. There will be numerous challenges facing the federal agencies during this workforce transformation and development of skill sets for the future. Recruitment, training and development, retention, and safety will all pose new challenges to the agencies and affect all employees. As a priority, the agencies must devote time and energy into recruitment to create a diverse and dynamic workforce that assists new and existing employees in skill development and career planning. New employees should be directed or counseled toward skill set areas where shortages are anticipated due to looming retirements.

Continuing the support of professional development within the fire and fuel programs will greatly increase retention and promote the agencies as the employer of choice. Investment levels in training within fire management amount to a million plus hours of training for the workforce annually from health qualification and basic safety and refresher training to the range of academy and specialized professional courses that comprise the backbone of the incident qualifications system for fire fighters. Fire management's continued success depends greatly on its commitment to safety within its workforce and its investment in that workforce to meet and maintain the highest standards in the vital work it performs.

IV. Operations, Capital Resources, and Technologies

Increased fire activity over the past four years has resulted, along with higher suppression costs, in higher usage rates of capital equipment and aviation resources. Federal agency assets have always operated concurrently with state and local forces and both sides are increasingly supplemented by contractor resources. In several situations, National Guard assets have also been utilized. As some fire seasons have extended and wildfires have gone to longer-term management efforts, resource contracts have also gone to longer terms or exclusive use to reduce costs and ensure continuity of resource availability. These increased rates of usage also demand that the fire management community address factors that limit its ability to respond effectively and maintain the highest safety levels in the future. These issues include aging and outdated capital assets (especially aviation assets), more flexible strategic sourcing options, and more robust and flexible fire management resources coordination, prioritization, and logistical support.

Capital Assets: Equipment & Aviation Resources

The 2008 fire equipment roster listed in the 2009 federal agency fire budget justifications shows the capital side of federal fire management’s capabilities.

Table 4 - Fire Equipment Resources (2008-2009)

Preparedness Resources	2008		
	DOI	USFS	Total
Equipment and Apparatus			
Engines	745	950	1,695
Tenders/Dozers/Plows	206	210	416
Total Heavy Equipment	951	1,160	2,111
Aviation			
Helicopters T2 and T3 (Exclusive use*)	43	87	130
Helicopters T1 (CWN**)		35	35
Airtankers (including water scoopers)	2	20	22
SEATS (Exclusive Use)	17	2	19
Other Aircraft (IR, Smokejumper, ASM)	22	21	43

Source: FS and DOI FY2009 Budget Justifications

*Committed to only wildland fire fighting for the contract period during fire season

**Call When Needed-Hired for specific events or incidents

Ground-based firefighting equipment and personnel will continue to be the backbone of the program; however, rising operating and replacement costs and budget constraints may eventually limit numbers. Engines, water tenders, dozers, plows, and specialized equipment for soft ground operation will undergo continual upgrading and replacement with little new technology coming on the scene. Hand crews will provide the ability to extinguish

and manage fire in rugged terrain. Maintenance of facilities that house and support these resources must be scheduled and funded. Improved geographic positioning systems, automated equipment tracking systems and communications capability will increase their efficiency of use and provide for both an increased measure of safety and some ability to redeploy resources, especially in larger complex and area command situations,

As noted, the capital assets of state, local, tribal, and volunteer fire departments that are a critical part of fire preparedness will play an increasingly important role. Different equipment and training are required for a wildland fire response than for an urban fire response. The place where these situations intermingle, the wildland urban interface, becomes a mixing pot of equipment types and firefighter skills. As this confluence zone increases, fire response agencies are compelled to equip, train, and staff for all situations. This type of hybrid fire response organization becomes increasingly expensive to maintain and often redundancies exist along jurisdictional boundaries. Part of the intention behind realignment within the fire governance mission strategy is to focus agency specialization on the type of fire that is consistent with that organization's land management purpose.

Rather than all jurisdictions organizing to fight all types of fire, more specialization is likely to happen in an attempt to increase efficiency of operations. A step forward will be if, as planned, in the governance realignment mission strategy, wildland agencies return more to their basic wildland fire protection responsibilities while tribal, local, and volunteer fire response organizations continue to emphasize their first responder priorities of structure suppression, vehicle accidents, and basic life support. As future roles for these forces in all aspects of fire and fuel management are augmented, these assets need to be included in current state assessments and future planning. Likewise, capital assets of contractors and other suppliers need to be included.

Modernizing Aviation

While aviation is just one part of the response to wildland fire, a more agile and modern aviation capability is essential to meet this challenge. Success in strategic management response strategies will require at a minimum:

- Focusing future strategies on increasing the number of aerial delivered fire fighters; this will allow agencies to maintain a professional, robust initial attack force while establishing a surge capability to support national mobilization during large-scale fire events.
- Establishing a national interagency air attack program characterized by a highly mobile fleet that is centrally managed and capable of meeting the increasing need for rapid and wide ranging response for aerial supervision and intelligence gathering missions for all federal agency, state, tribal and local governments.
- Adjusting the Aerial Supervision Module program from lease-based to government-owned will allow for the development of a standardized platform, that includes the same aircraft make, model and equipment, which is critical for interoperability and efficiency between agencies.
- Ensure that agency remote sensing programs are positioned to meet the increasing requirements for real time fire information while maintaining the capability to procure and/or develop new fire imaging technology that is portable and has interoperability with agency owned, leased or contracted aircraft

- Establishing common standards and approval processes for the streamlined use of federal, state and local aviation assets. This will help ensure that wildland fire fighters will have access to the widest range of aircraft for both initial attack and large fire support.

All these programs require intensive, and in some cases, centralized management to provide a safe and effective result.

Initial attack will remain the priority but support to large fire operations will be common. Aircraft replacements or upgrades that can perform multiple missions (retardant delivery, smokejumping, and passenger transport) should be given stronger consideration. These multi-purpose aircraft can increase efficiency and lower cost by eliminating the need for separate platforms.

Numbers and kinds of aircraft will remain relatively stable over the next 10 years with a few exceptions. Single Engine Air Tankers have become an increasingly effective tool. Their ability to operate from small airfields using portable retardant equipment makes them a nimble and effective resource when managing asymmetric fire. Infrared aircraft are likely to be replaced overtime by unmanned aircraft systems or satellite intelligence-gathering systems through government and commercial sources. Small increases in the number of aircraft for aerial supervision modules and air tactical group supervision will provide better operational management in an increasingly complex airspace environment. The numbers and mix of helicopters will likely remain about the same as are currently in the fleet.

As with any type of equipment fleet, a sustainable program requires periodic capital investments to replace worn, damaged or retro-fitted equipment with newer, more efficient purpose-built equipment. The wildland fire aviation program is no different and the Large Air Tanker fleet is particularly in need of this type of attention although capital investments must be planned for other aircraft types as well. Further, agencies should be positioned for the periodic unplanned replacement of existing aircraft through fleet acquisition and/or contracting commercially available aircraft. Agencies continued efforts on reducing aircraft losses through the development and implementation of aviation safety initiatives such as continued airworthiness programs, aircraft performance monitoring, safety management systems and mission-specific training will help reduce aircraft losses to incidents and accidents.

Equally important, the methods of acquisition and ownership will likely become more diverse. Vendor owned and operated aircraft currently provide the bulk of the aviation resources. These are procured through a variety of contracting methods with the major categories being exclusive use and call when needed. Exclusive use aircraft form the base organization, with call-when-needed being used for surge capability. Generally, exclusive-use aircraft contract availability and flight rates are less expensive than those for the same make/model call when needed aircraft. Vendor aircraft are provided by a variety of companies, ranging from a vendor with one aircraft to vendors that supply multiple aircraft. This situation makes contract administration, inspections, carding and monitoring of operations more labor and time intensive than contracting with one entity to provide all aircraft. The diversity of vendors does allow for more flexibility in acquiring aircraft that are a better fit for the geography, fire behavior, topography and length of season than would a single vendor.

Improving Strategic Sourcing

Contracting is a critical component of the wildland fire program. Without the option to procure a wide range of products and services, the fire agencies would spend a significant amount of money and energy to purchase equipment and supplies and hire additional employees. Over the past decade, considerable effort has been expended examining contracting options for the array of work performed within fire management.

Some of these efforts have centered on competitive sourcing reviews of various functions from public information and training to dispatch and aviation. Competitive sourcing is a process clearly defined by government regulation. The objective is to provide a fair and competitive process between government and private industry to provide services for the agencies. This process works best when the product or service is widely available and easily provided by either the government or industry. For the wildland fire agencies, many services are neither commonly available nor widely provided. Many require a large initial investment but do not have a wide or steady demand and may pose a high financial risk to potential providers. Competitive sourcing doesn't always provide a comprehensive solution to wildland fire acquisition needs but often provides insights for management efficiencies.

Three "management efficiency assessments" (Aviation, Dispatch, and Training) have been produced representing federal interagency teams designed to improve the efficiency and effectiveness of wildland fire operations. Recommendations cover a wide range of aspects of each of these important interagency components of the wildland fire program, covering business processes and rules, location and management of facilities, and development or refinement of management systems and tools. An interagency, intergovernmental steering committee is currently evaluating the recommendations from the three management efficiency assessments to prepare a proposal for agency leadership for integrated, multi-year implementation.

As an alternative to competitive sourcing, fire management has been moving to strategic sourcing in an effort to provide goods and services to the public for all fire management activities through an effective and cost efficient mix of agency, partner and contracting. The term "sourcing" can be viewed differently in that the source of the service may be from within the agency. The term "strategic" implies that the process is ongoing, long term, and does not sacrifice future options in order to maximize short term benefits, at the same time looks to increase options by involving all potential stakeholders

Describing sourcing and procurement as only a contracting action provides a limited view of the options and path ahead. A better way to describe the way agencies get resources and services should be through a partnership for strategic sourcing. By entering into a partnership, the hope is all would benefit and the wildland fire community and the taxpayer receive quality goods and services at a competitive cost. The partnership aspect may be the most difficult since all parties need to be included, without giving up the benefits of competition. Aviation is an example. Since there are limits by aircraft capability and availability in terms of supply. But options do exist, if all are involved --contractor, military, agency, cooperators.

The need to engage agency leaders, partners, and industry in a strategic dialogue about the demands and innovative and efficient ways to meet those demands is critical. A partnership for strategic sourcing could take many forms and would benefit from a diversity of members, processes and procedures. It is also possible that a range of partnerships will be more powerful than establishing one overarching group and process. It may also be useful in the future to look at sectors or part such as aviation, training, or other groups individually since the methods and resources may vary across the various specialties.

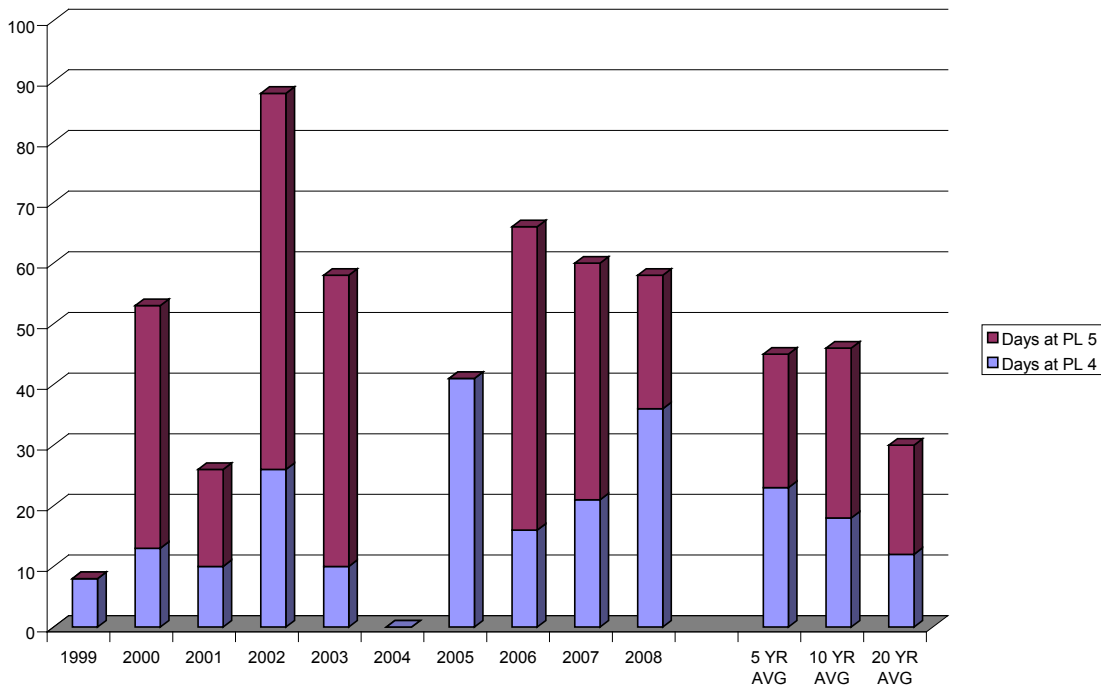
Preparing Fire Management for Future Operations

Fire management will need to be prepared to respond to significant changes in the theater of operations. As expected, workload is trending upward as reflected in Figure 4 which depicts the number of days when fire management has reached preparedness levels 4 and 5 over the past decade.

In the future, fire management integrated systems and services should provide additional tools to help manage national preparedness levels. Predictive Services will provide current and expected levels of incident activity, intensities, and growth potential. The Resource Ordering and Statusing System already provides real time availability for firefighting resources across the country. The Incident Qualifications and Certification System provides critical incident position management information and incident management succession planning capability.

Figure 4

National Preparedness Levels 4 & 5 - 1999-2008



Source: National Interagency Fire Center December 2008

However, several critical areas will demand significant investments to enhance the program capabilities needed for the federal fire agencies to meet future workload demands. Each of these areas greatly affects fire management’s potential to increase the efficiency and productive application of the existing fire resources: decision support and prioritization, resource coordination, logistical support.

However, just as future budget realities should dispel expectations for a large workforce increase, a flat budget in the foreseeable horizon means that modernization of operations and acquisition of new technologies must

also meet cost containment or even cost-reduction goals. Essentially, federal agencies must further develop their capability to more efficiently use the resources that are currently available.

Advancing Decision Support and Prioritization

This key area includes several aspects that need modernization and new knowledge developed. The FPA system is designed to provide managers with a common interagency process for fire management planning and budgeting to evaluate the effectiveness of alternative fire management strategies through time, to meet land management goals and objectives. FPA will reflect fire objectives and performance measures for the full scope of fire management activities. Firefighting assets will initially be positioned on the ground at the beginning of fire season based on FPA analysis.

Determining the current year's locally specific fire risk will depend on more a detailed analysis than FPA is designed to provide. This demands more analysis from the predictive services staff at the national and geographic locations that provide information and intelligence that support large-fire strategy selection and resource allocation. Inputs from these meteorological and fire behavior experts, coupled with topographical and vegetative information, should be expanded to enable local, geographic, and national managers to make better informed decisions and to better allocate fire resources.

The availability of centralized real time evaluations would free local fire managers from the time-consuming predictive assessment and allow them to focus on incident management and public safety. The National Predictive Service Unit should continue to provide the National Multi-Agency Coordinating Group with the information necessary to reinforce portions of the country that are approaching critical fire indices. The National Predictive Service Unit also should continue to play a vital role in helping shape portfolio decisions involving hazardous fuel treatment investments by providing information on localized conditions that affect treatment parameters.

Full application of the Wildland Fire Decision Support System should provide greater decision support and analysis tools. This system is primarily geospatial, and uses pre-loaded shape files and data layers to provide information to the user. One major component of the Wildland Fire Decision Support system is FSPRO (Fire Spread Probability) a spatial model that calculates the probability of fire spread from a current fire perimeter or ignition point for a specified time period.. More effort will be needed to in reviewing and modifying landscape data for use by FSPRO as a preplanning activity.

Improving Resource Coordination

Fire management is more than just firefighters, engines, and aircraft. The backbone of the federal wildland fire agencies' success in large fire response is their unique ability to coordinate the movement of vast numbers of firefighters and resources across the country. A network of interagency coordination centers throughout the U.S. maintains status information of all available firefighting personnel and equipment. The coordination system is a three-layered organization linking national, geographic or regional, and local hubs. These centers have the capability to order personnel and equipment, track asset movements, and arrange transportation to and from incidents throughout the country. The centers all utilize common ordering, tracking, and operating procedures to facilitate smooth operations. Coordination centers also provide current vital fire information such as weather

forecasts, and fuel conditions to fire managers, along with predictions for expected fire activity and intensity. Future development within resource coordination, whether solely for wildland fire activities and/or non-wildland fire response involvement over the next 5 to 10 years will be essential. With rapidly expanding information technology advances, electronic status, location, tracking, and ordering, are a must for timely resource coordination. Implementing new technology in a timely manner, providing funding and training at all levels/locations, and supporting changes is paramount for successful coordination.

Recruiting and maintaining a high quality, enthusiastic workforce is increasingly important as the coordination system plays a large part in meeting expectations and goals within wildland fire and other natural resource disciplines, agencies, and departments. Resource coordination/response is enhanced, in part, by support of the fire management Predictive Service Units. Decisions are made based on current and future intelligence. Predictive Service Unit provides current weather and fire danger assessments, resource allocation (quantities and type) recommendations and prioritization support to the National Multi-Agency Coordinating Group.

Interagency cooperation, information exchange, and improving efficiency within the current dispatch system are, and will be a priority to meet the increased demands wildland fire agencies are facing. Tactical resources available to meet current and future demands need to be maintained as a minimum at current levels and should be increased. The coordination system is the hub of many agencies and disciplines, and is relied upon for accurate knowledge of multiple agency protocols and policies.

Providing More Flexible Logistical Support

Facilities to support firefighting operations include fire stations and engine bays, living facilities, administrative offices, retardant bases, and coordination and dispatch centers. The mechanisms to construct and provide maintenance are different between the two departments. The Department of the Interior agencies receive facilities funding through the fire appropriation, while the Forest Service receives its funding in the engineering budget line. That small difference makes it difficult to plan joint facilities or upgrades to existing facilities.

The implementation of FPA should present all agencies with interesting decisions. If the protection resources from adjacent jurisdictions are found to be the best alternative to provide protection, the prudent agency administrator must ask if it is a wise investment to maintain existing facilities in an area protected by some other agency. FPA may provide the information needed for making decisions to declare some facilities excess to our needs, and redirect scarce facility funds. Protection planning by fire protection units may also discover advantages to newly located facilities or, perhaps, jointly funded facilities to leverage both departments' funds. Additional studies will provide recommendations on adjusting the number and location of air and reload bases needed to support the air tanker program.

The National Interagency Fire Cache System provides direct support to incidents by furnishing equipment and supplies. The cache system has a combined inventory value of over \$70 million. Each of the caches serves an interagency community. Each cache is hosted by an agency within a geographic coordinating area and is funded, staffed, and managed by that agency and is responsible to provide incident support to all customers within the Geographic Area Coordination Center. All caches conform to a national plan, utilize a common ordering system, have common item designation codes, conform to national standards for equipment/supply kits and have refurbishing standards.

While the interagency fire cache system has served the fire community well, there are major new technologies that many organizations have used to replace their legacy large scale depot and warehouse storage systems. The military has made the modernization of its supply chain a major goal in trying to reduce the cycle time for resource delivery and cost reduction. Interagency cooperation and coordination in the use of new technology throughout the cache system will be essential.

A review process of fire management's cache system is currently underway which is assessing options from reengineering the system to strategic sourcing. The supply chain system being dealt with here involves reusable durable goods and expendable goods, which is different from other systems. Still, the future direction poses an opportunity to modernize fire cache management and save money while preserving cycle time standards currently being achieved.

Future Directions in Resources and Technology

The future course of resources and technology is promising with a list of promising investments and leading-edge projects. New technology in fire management systems is now focusing on minimizing direct human participation in high-risk activities and activities where human error could lead to significant failure. The use of increasingly sophisticated remote sensing technologies will begin to put greater distance between humans and the risks associated with wildland fire activities. Some of the more promising technological advancements include the use of Unmanned Aviation Systems, utilization of remote cameras, improved intelligence using real time information, implementing the Automated Flight Following system, and use of "Human Aiding" technology

New technology and different approaches that minimize human flight time will improve the effectiveness and efficiency of wildland fire operations while greatly reducing risk. Fire suppression in the next decade will begin a transformation process driven by technology, requirements for greater mobility and agility, and suppression strategies that will demand new levels of flexibility and precision. Major shifts in technology investment will include acquiring modern air assets, improving monitoring and surveillance capabilities, developing more complete and effective communication linkages including air-to-ground, unit-to-unit, engine-to-engine, etc., and creating a new generation of decision support tools. These new intelligence and decision support systems will use "real time" information collected by satellites and Unmanned Aerial Systems. Unmanned Aerial Systems has potential uses in fire detection, perimeter mapping, fire behavior assessment and command-and-control operations reducing both risk and cost. Utilization of remote cameras for fire monitoring can also reduce exposure and flight time in smoke and low visibility situations.

Several efforts will improve aircraft effectiveness and efficiency. Aircraft modernization will be an ongoing effort. Newer, safer, more agile aircraft with increased fuel efficiency and fewer carbon emissions will provide increasing levels of productivity. Effective centralized control will allow a greater ability to prioritize the use of aircraft but only to the extent that timely and accurate intelligence exists. Real time information is required to quickly and effectively respond to new fire incidents and rapidly changing fire situations. Faster containment of threat fires and better management of large fire events will result in reduce costs. Also, national implementation of the Automated Flight Following system will lead to improved aircraft location, information and flight tracking, resulting in utilization efficiencies and increased safety margins for crews.

Human aiding technology, including the Military C4 ISR concept (Command Control Communication Computer/ Intelligence Surveillance Reconnaissance), can be applied to activities such as resource ordering, mapping, radio frequency management, weather forecasting, and requesting Temporary Flight Restrictions using real time up-links to and from aircraft, further increasing aviation efficiency. This concept is compatible with existing large fire support and initial attack, fire use monitoring, aerial resource command and control lead planes, national airspace coordination and border patrol and homeland security missions. This further contributes to a coordinated response to national emergencies by all federal, state, and local agencies.

Both the Forest Service and the Department of the Interior have significant fire program dollars invested in developing new systems to support program needs in analysis, geospatial analysis, resource allocation, and predictive services. Advancements in new systems technology present significant issues to the fire agencies. Rising development and life-cycle costs, employee training, and system deployment costs further erode the funds available for firefighting and fuel management resources. Also, ever increasing systems security requirements make gaining access for all federal, state, tribal and local fire agency personnel difficult.

In an era of flat budgets, agencies must find innovative methods to increase opportunities for science and technology. Agencies must expand partnerships with other science and technology organizations such as NASA, the National Institute for Standards & Technology, and the military to leverage research and technology dollars, and become more efficient in incorporating new science and technology into the programs.

For the programs in fire and fuel management to be where they need to be in the next decade, new and innovative thinking will have to occur. Future wildland fire programs will depend heavily on technology and the predictive tools to conduct sound analytical analysis of aviation needs in support of agency resource management missions.

Appendix A

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Research Note: Numerous studies, articles, and academic and research reviews were referenced in the production of the Advance Research Briefing Report along with in depth presentations by various researchers. To list them all would require a separate bibliography. The QFR Research will be posted on the NIFC.gov website along with the 2005 and 2009 QFR Final Reports.

Appendix B

Quadrennial Fire Review Methodology

Following the release of the 2005 QFR report, the fire community partners took steps to bolster the QFR both as a future strategy development process and as a planning tool for enterprise performance objectives. The partners generally recognized that the 2005 report – in large part because it was the first quadrennial review conducted – essentially would be a baseline document. Still, it was useful (and certainly prescient) to have an interagency strategy document projecting that the remainder of the decade would likely result in a period of both more wildfire and larger wildfires with potentially significant impacts. The driving factors singled out in the 2005 report leading to this elevated plateau of wildfire activity were neither new or unknown to many in the research community and the field, but the QFR succinctly stated the mission strategy case for how fire management needed to and was responding to “ensuring fire’s role in ecosystem sustainability” and “promoting fire adapted communities” in the wildland urban interface.

In terms of institutionalizing the QFR process, the federal fire agencies committed to a three-fold approach for the 2009 report. First, participation in the QFR process was broadened to promote integration of fire management future strategy into the larger land management functions and urban interface communities and networks. Beginning most importantly with the coordinating group for the QFR – The Integration Panel -- the membership was overhauled to ensure that it included line officers, resource program managers, researchers, and especially state, tribal, and local representatives. One-third of the composition of the agency and partner working groups and panels who were to review the research, develop the mission alternatives and new strategies, and produce the final report was set aside for non-fire or non-federal members.

The second part of the approach was to expand the involvement of research. A first phase (actually completed in 2007), was added to produce a “synthesis report” based on research and futuring about the wildland fire environment. Federal, academic, and other research institutions nationally and internationally were engaged in trying to understand how ecosystems are changing in response to climate, ecological, social, and economic forces. Over 25 representatives of the research community addressed how these changes are both affecting wildland fire and being affected by wildfire. In early 2008, an “Advance Briefing Report” was released summarizing this work -- “to provide a range of ideas about possible futures and prospects for change in the wildland fire environment.”

A third and final aspect involved extending the reach of new ideas and issues that would be addressed by the working panels. The core work done in a quadrennial review is to have outside panels explore alternative strategies, assess scenarios, and submit recommendations for building new capabilities, strategy shifts, and changes in tactics. In the 2005 QFR, the panels all reviewed current capabilities and future challenges for the purpose of preparing mission alternative strategies, but each working panel had a separate domain of questions to focus on, that in part based its proposals on the cumulative work of the preceding panels. Working panels were also given the opportunity to develop shadow strategies and counter proposals to ensure a robust review of alternatives.

This was changed for the 2009 QFR process. The panels all worked concurrently and independently. In spring 2008 when this second phase of the QFR working panels was established, panels were given broad domains to explore and asked to prepare numerous future options. In total, the panels then prepared nearly 30 scenarios

and after consultation with the Integration Panel, refocused their efforts on one or two more developed strategy alternatives. While the final QFR final report is a blend of panel new thinking and in some cases new mediums, it is worth briefly denoting the original panel domains and the “issues list” they worked with below.

QFR 2009 Working Panels

Panel 1 - Suppression Strategy in the Era of Asymmetric fire

Building Scalability and Flexibility for Suppression Response for Irregular Fire

(AMR, Megafires, Cost Containment, Ecology & Fire Risk Issues)

Panel 2 - Fire Management on the Edges

Integration of Fire Management within Fuels and Restoration Governance

(Fuels outside of Fire, Restoration, Stabilization, Biofuels, Smoke etc)

Panel 3 Achieving Fire-adapted Communities

Reaching the Next Level of Supporting Adapting Communities to Wildland Fire Risk

(Landscape Defense, Zoning, WUI Limitation, CWPP, Homeowner Role)

Panel 4- Fire’s Emergency Response Role in Preparing for “Unknown Unknowns”

Reshaping Emergency Response to cope with New Demands/risks

(Pandemics, Mega-community Response, Pyro-terrorism, Major Natural Disasters)

Panel 5- Reimagining Information & Education of Fire in Web 2.0 world

Creating New Mediums and Messages on **Fire Risk, Prevention, and Wildfire Education**

(Fire blogs, Internet Fire Channel, New Media and Internet Interactions, Social Networking)

As with the 2005 QFR, the **Integration Panel** organized all the panel results into coherent sets of alternatives and developed the integrated strategic vision for the final report. After producing a synthesis of the overall vision, mission strategies and requisite core capabilities, the panel members reviewed prepared chapters summarizing the structure, workforce capacities, and operational and system assets for the QFR Comment Report Draft. A 30 day field internal comment period was conducted in November.

The Integration Panel reviewed all comments before submission to the **Senior Steering Group** for final approval. The senior steering group is the NWCG-Executive Board (NWCG-EB) consisting of the fire directors of the five federal agencies and the fire director from the National Association of State Foresters (NASF), who are the signatories for this 2009 QFR final report.

Appendix C

QFR Panels and Acknowledgements

Integration Panel

U.S. Forest Service Members

Rich Lasko, Co-Chair

Mike Hilbruner, Research Chair

Janet Anderson, Sandy Cantler, Maggie Doherty, Steve Gage, Neal Hitchcock, Merrie Johnson, Patti Koppenal, Sue A Stewart, Denny Truesdale, Tom Zimmerman

Department of the Interior Members

Brian McManus (FWS)

Tim Murphy (BLM) Co-Chairs,

Doug Alexander (NPS), **Glen Claypool** (BLM), **Sue Husari** (NPS), **Jim Kelton** (FWS), **Ken Kerr** (BLM), **Tom Nichols** (NPS), **Bryan Rice** (BIA), **John Segar** (FWS), **Bodie Shaw** (BIA,) **Dave Whitmer**, BLM-Alaska

State and Local and Line Officer Members

Ken Arney (USFS), **Don Artley**, NASF (Former Montana state forester), **Bob Ashworth** (State of Nevada), **Craig Axtell**, (NPS), **Tom Koontz** (Red Lodge, Montana) **Kurt Latipow** (Washoe County Nevada, representing IAFC), **Bob Leaverton** (USFS), **David Utley**, Florida State Forestry

Working Panels

QFR Panel 1 – Suppression Strategy in the Era of Asymmetric Fire

Co-chairs: Ken Kerr (BLM), **Doug Alexander** (NPS), **Steve Gage** (USFS)

Pete Bloom (State of Colorado), **Mark Boche** (USFS), **Alan Carter** (FWS), **Jim Fenwood** (USFS), **Bill Hahnenberg** (BLM), **Sam Hescoock** (USFS), **Chris Marks** (NPS), **Josh Mathiesen** (USFS), **Bruce Suenram**, (NASF)

QFR Panel 2 – Fire Management on the Edges (Fuels & Restoration)

Co-Chairs: Patti Koppenol (USFS), **Jim Kelton** (FWS)

Mike Brown (North Lake Tahoe Fire Protection District and International Association of Fire Chiefs), **J. Bruggink** (USFS),

Shane Del Grosso (FWS), **Mark Gray** (State of Washington), **Russ Graham** (USFS - Research Advisor) **Dennis Haddow** (FWS), **Clint Kyhl** (USFS), **Brad Washa** (BLM)

QFR Panel 3 – Achieving Fire-adapted Communities

Co-Chairs Don Artley (NASF), Sue Stewart (USFS)

Clint Cross (USFS), Kurt Latipow (Washone County, NV), Tim Melchert (USFS), Pam Leschack (USFS), Sarah McCaffrey (USFS - Research Advisor), Mike Roos (BLM), Michelle Steinberg (NFPA), David Utley (State of Florida) Kim Vanhemelryck (FWS)

QFR Panel 4 – Fire’s Role in Preparing for Emergency Response and Unknowns

Co-chairs: Janet Anderson (USFS), Bob Leaverton (USFS)

Roger Boykin (FWS), John Caffin (USFS), Dave Driscoll (IAFC), Joe Freeland (BLM), Darryl Jones (South Carolina), Buck Latapie, (Consultant), Rich Wands (Consultant)

QFR Panel 5 – Reimagining Information and Education of Fire in Web 2.0 World

Co-chairs: Bryan Rice (BIA-AK) Paula Nasiatka (USFS NAFRI)

Gary Greenberg, (Consultant), Don Hannemann (State of Texas), Kelly Hetzler (San Carlos Apache Tribal), Wayne Mitchell (CALFIRE), Barb Perkins (FWS) , Don Smurthwaite (BLM)

Research Panel Members

Chair: Mike Hilbruner USFS Assistant Director, Fire Research

Eric Berg - US Geological Survey

Elisabeth Brouwers - US Geological Survey

Colin Hardy - US Forest Service

Rich Lasko - US Forest Service

William (Ruddy) E. Mell - National Institute of Standards and Technology

Sarah M. McCaffrey - US Forest Service

Carol Miller - US Forest Service

Jeffrey P. Prestemon - US Forest Service

David V. Sandberg - Sam’s FireWorks

John R Shelly - University of California at Berkeley

Tim Swedberg - National Interagency Fire Center, Joint Fire Science Program

R. Gordon Schmidt (Senior Consulting Advisor- Brookings Institution)

Research Forum Senior Advisors

H Bowman - Resident Fellow, American Enterprise Institute

Tim Brown - Desert Research Institute, Reno, Nevada

Susan G. Conard - USFS Research and Development

Mark A. Finney - USFS Rocky Mountain Research Station

M. D. Flannigan - Canadian Forest Service

Eileen Forrester – Carnegie Mellon University, Software Engineering Institute

Sarah McCaffrey - USFS Northern Research Station

Ron Neilson - USFS Pacific Northwest Research Station

Steve Palmquist – Carnegie Mellon University, Software Engineering Institute

Mike Pellant - BLM ,Great Basin Restoration Initiative

Matt Rollins - USFS Rocky Mountain Research Station

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