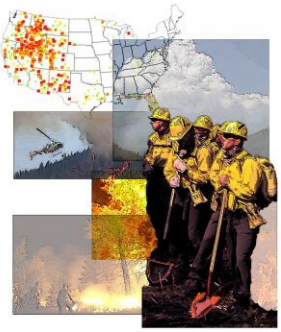

LARGE FIRE SUPPRESSION COSTS

STRATEGIES FOR COST MANAGEMENT

A REPORT TO
THE WILDLAND FIRE LEADERSHIP COUNCIL
FROM THE STRATEGIC ISSUES PANEL
ON FIRE SUPPRESSION COSTS

Fire suppression costs are high and expected to remain high into the foreseeable future.

DISCLAIMER: This report was prepared by an independent panel appointed by the Wildland Fire Leadership Council. The recommendations contained in this report are those of the panel and do not necessarily reflect the Administration's views on this subject.

August 26, 2004

CHARTER FOR A STRATEGIC ISSUES PANEL ON FIRE SUPPRESSION COSTS

The members of the Wildland Fire Leadership Council (WFLC) commission this Panel to review cost related issues from the 2003 Large Incident Strategic Decision and Assessment Oversight Reviews and other information received from stakeholders and experts. The purpose is to provide substantive findings and recommendations in a report to the Council for consideration and acceptance. The emphasis will be on cost containment within the context of existing budgets and resources.

During the summer of 2003 an interagency "Large Incident Strategic and Assessment Oversight Review Team" was dispatched to large fire incidents to determine if cost saving actions were being implemented, monitored and documented. The Review Team concluded that for the most part, cost containment was considered at all incidents and agency administrator delegations of authority to Incident Commanders included cost containment direction.

However, based upon other findings in these large fire cost reviews, the United States Department of Agriculture (USDA) Forest Service and Department of the Interior fire staffs made 10 specific recommendations for cost containment to the WFLC on October 16, 2003. The Council accepted all of the operational recommendations and provided specific direction and timelines for implementation.

While the Council endorsed the principal findings and recommendations from the Oversight Review Team reports, it acknowledged that wildland fire suppression should be examined from a broader land management context that integrates fire suppression and vegetation management. It is within this context that the Council is commissioning a Panel to explore specific strategic issues associated with large fire costs, including the relationship of fire to vegetation management and land and resource management plans.

The report shall, as a minimum, include findings, specific actions and recommendations on:

- The barriers and obstacles to cost containment,
- The strategies for cost containment success,
- The impediments to equitable sharing of suppression and cost apportionment among all jurisdictions,
- The criteria to measure cost containment success,
- The relationship of fire management plans and resource management plans to suppression costs.

The Panel will take a collaborative approach to this commission and seek knowledge and information from a broad range of stakeholders to develop findings and recommendations and, where appropriate, alternatives to recommendations.

January 7, 2004

Lynn Scarlett, Chair, Wildland Fire Leadership Council

EXECUTIVE SUMMARY

In response to widespread perceptions by Congress, agencies, and the public that fire suppression costs have escalated to an unreasonable level, the Wildland Fire Leadership Council (WFLC) chartered the Strategic Issues Panel on Fire Suppression Costs. A diverse group of senior level managers and administrators from federal, state, and local governments studied the last five years of fire cost reports and analyzed more than 300 past recommendations. The Panel also interviewed a wide variety of individuals including researchers, special interest group representatives, fire managers and other government officials to better understand the dimensions of the issues and then develop substantive actions to meet the intent of the Panel's charter.

Fuels and demographic trends affect wildland fire costs to be sure. But most significantly, it is absolutely critical to understand that if the climate prognosis is correct, the prevailing climatic conditions for the next 20-30 years may well negate any marginal gains in cost management. The catastrophic fires that have occurred in the past five years provide a sobering look at the impacts on public health and safety. Jobs have been lost, businesses and schools were interrupted, infrastructure and environmental damages occurred, and lives, property and natural resources were seriously threatened and often destroyed.

The Panel recommends seven primary actions. Some recommendations have specific requirements and sub-actions that accompany the primary recommendation and are necessary for full implementation.

The recommendations are:

- Increase the level of accountability and interest for large fire costs and their impacts by allocating suppression funds on a regional or equivalent basis.
- Set policy and direction on agency land/resource management planning to incorporate cost management on large wildfires.
- Plan, budget, and manage resources effectively for large fire suppression such that resources for effective initial response and extended attack are not compromised.
- Ensure initial responses are always aggressive and driven by the principle of utilizing the closest appropriate resources, including those of local and tribal governments.
- Incorporate fuels management and future fire management cost considerations when planning all resource management projects for public and private lands.
- Commit to improving the fire cost data infrastructure as a prerequisite step towards improving accountability and strengthening fire management performance.
- Develop and use a benefit cost measure as the core measure of suppression cost effectiveness.

Successful implementation of the recommendations will require the full support and attention of agency administrators and the oversight of Wildland Fire Leadership Council.

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Introduction

The Wildland Fire Leadership Council (WFLC) commissioned the Strategic Issues Panel on Large Fire Costs to explore specific strategic issues associated with large fire costs, including the relationship of fire to vegetation management and land and resource management plans. As a minimum WFLC asked the panel to provide substantive findings and recommendations on specific strategic issues related to:

- barriers and obstacles to cost containment,
- strategies for cost containment success,
- impediments to equitable sharing of suppression and cost apportionment among all jurisdictions,
- criteria to measure cost containment success,
- relationships between fire management plans and resource management plans and suppression costs.

Reducing fire suppression costs has been an objective of wildland fire protection agencies for years. Most recently, severe and widespread fire activity has resulted in impacts to other resource programs due to the transfer of funds to cover increasing suppression expenditures. Funding allocation mechanisms for fire suppression have varied little over the years.

Fire suppression expenditures are overwhelmingly centered in larger fires. From 1980 through 2002 small fires (less than 300 acres) managed by the Forest Service totaled 98.6 % of the fires but represented only 6.2% of the total suppression expenditures. Larger fires (greater than 300 acres) represented 1.4% of the fires and a whopping 93.8% of the suppression expenditures. All expenditures are adjusted for inflation to 2002 dollars.

There have been many reports recommending actions to reduce cost. These have varied from fiscal procedures to ensure adequacy and timeliness of apportionment funding to expenditure monitoring and oversight reviews. While structural improvements in oversight and monitoring have been employed, the underlying reasons for increasing suppression costs have gone unchecked.

The Panel examined more than five years of reports, which included more than 300 recommendations, and conducted numerous interviews with a wide variety of individuals. There is little doubt that the prior reviews address efficiencies in managing large fires, but they result in marginal reductions at best. Unwillingness to take greater risks, unwillingness to recognize that suppression techniques are sometimes futile, the “free” nature of wildland fire suppression funding, and public and political expectations are all potential contributors to the underlying causes for the high cost of large fires.

Hopefully, this effort, with the support of the wildland firefighting agencies, will lead to a new paradigm that will make substantive changes in large fire cost management. Our recommendations provide strategies that collectively enable agencies to more effectively contain and manage the costs of large fires. The recommendations contained within this report are designed to complement each other. The Panel recognizes that fully implementing the recommendations may take time, but firmly believes that it is absolutely critical to address the root causes for large fire expenditures and to define suppression cost expectations not now found in land management documents.

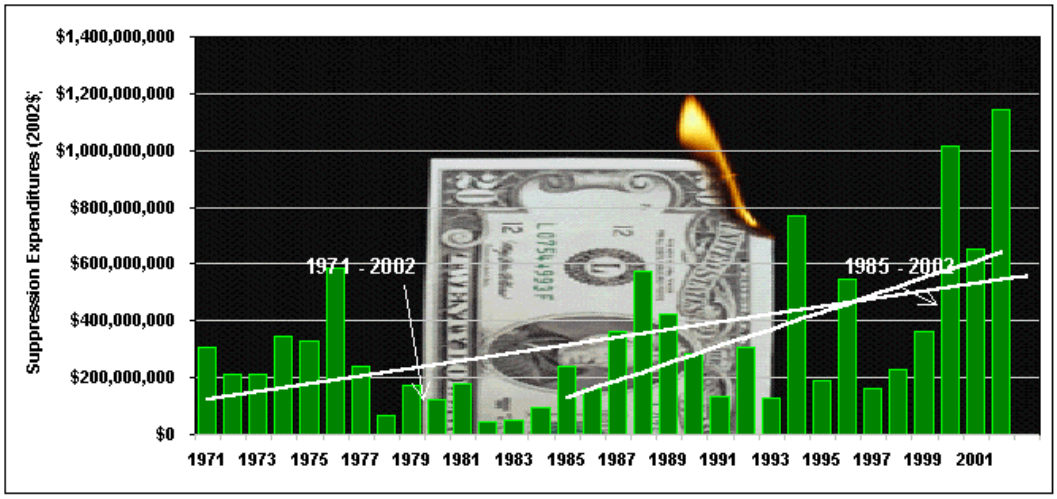
Finally, the absence of a rigorous definition of large fire cost containment (or cost management) creates managerial ambiguity. The Panel therefore views cost management as a process that identifies large fire cost solutions which improve the cost situation. In other words, cost management is defined as the measures and steps to be taken by management to keep large fire costs as low as possible without significantly compromising wildland fire management objectives (MacGregor and Haynes, 2004).

Background

Increasing Wildland Fire Suppression Expenditures[1]

The Panel's work addresses the strategic issues that influence large fire costs and proposes actions that will result in more effective cost management. Large fire costs are reported as wildland fire suppression expenditures by the federal agencies. These suppression expenditures include costs that are directly related to the wildland fire suppression and emergency rehabilitation effort, but do not include the costs of hazardous fuels treatment nor the costs of preparedness for the wildland fire protection program.

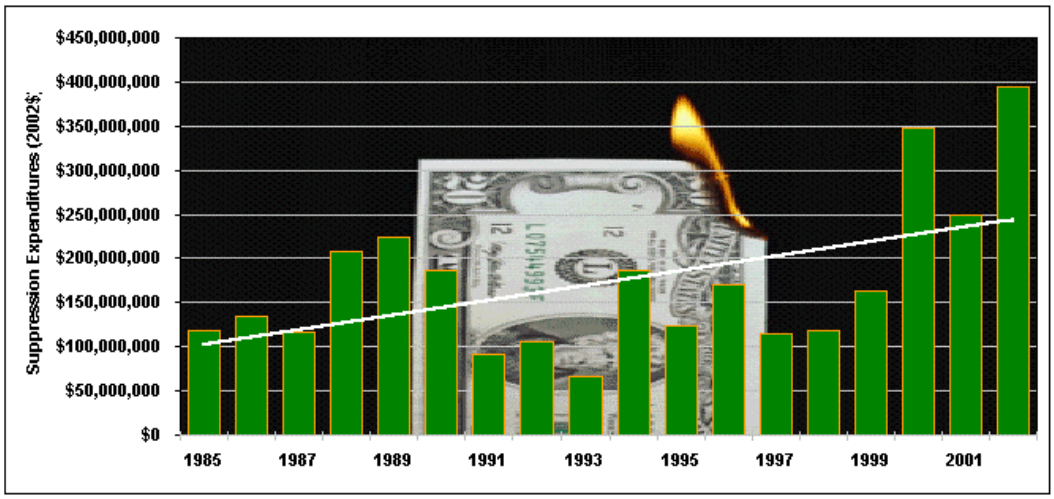
Figure 1 – Rising Costs of Wildland Fire Suppression (Forest Service Only)



Wildland fire suppression expenditures have been increasing over the past two decades (Figure 1 and Figure 2). When adjusted for inflation Forest Service expenditures have exceeded a billion dollars twice since Fiscal Year 2000 (Gebert et al, 2004). Furthermore, in the Forest Service, since 1985 the rising trend has been steeper (trend lines in Figure 1). However, as the National Academy of Public Administration (2003) noted, "…that while fire costs are rising they do not reflect a program that is either 'soaring' or spiraling out of control."

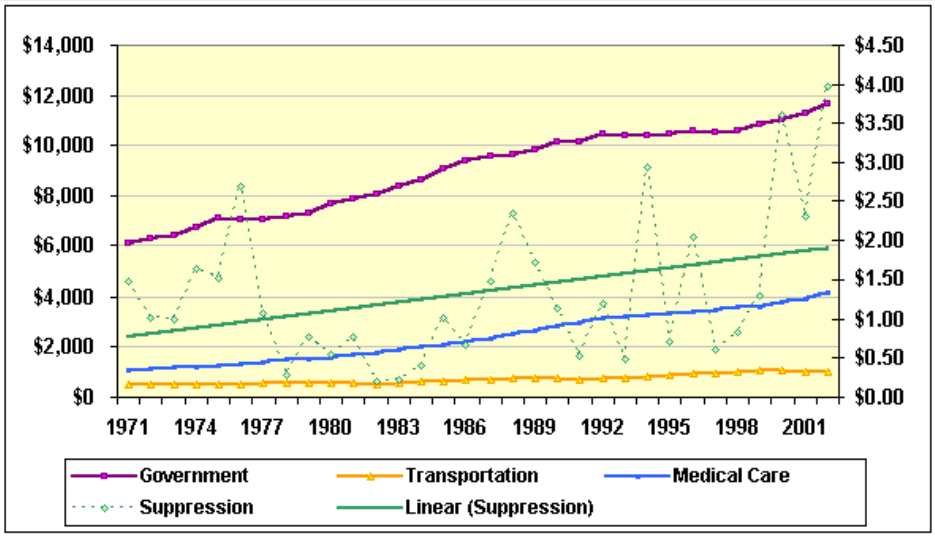
[1] Throughout this report, and the Panel's work, Forest Service wildland fire suppression expenditures and Forest Service large fire (>300 acres) data from 1971 through 2002 are used. The Department of the Interior data represent 1985 through 2002.

Figure 2 – Rising Costs of Wildland Fire Suppression (DOI Only)



Economic influences on wildland fire costs include the general inflationary environment, the intrinsic cost of doing business and productivity changes. The general inflationary environment affecting wildland fire expenditures was discussed by the panel at great length.
Economic presentations compared four major per capita expenditures: government spending, medical spending, transportation spending, and wildland fire suppression spending (Gebert, 2004). As expected, the general trend for all spending reviewed is upward (Figure 3). Wildland fire suppression expenditures per capita appear to be increasing at roughly the same rate as medical and government spending but at a faster pace than transportation spending.

Figure 3 – Per Capita Spending on Selected Items



Increasing Acres Burned from Wildfire

The Panel attempted to find explanations for the rising cost trends (Figure 4 and Figure 5). Analysis work of Forest Service data shows a rising trend in the total acres burned by wildfire (Gebert et al, 2004). The number of acres burned for the Forest Service has been increasing since 1971 while the Department of the Interior trend has also risen since 1985, but at a slower pace.

Burned area in Alaska comprises the bulk of the Department of the Interior area burned data and remains relatively constant annually. *Note that the Forest Service and Department of the Interior data span different time periods.*

Figure 4 – Escalating Wildland Fire Acres Burned (Forest Service Only)

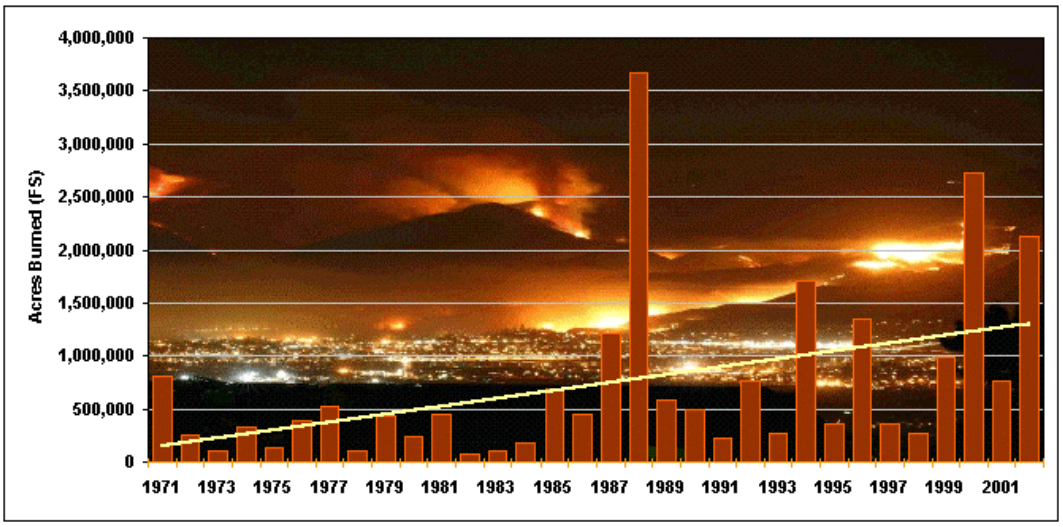
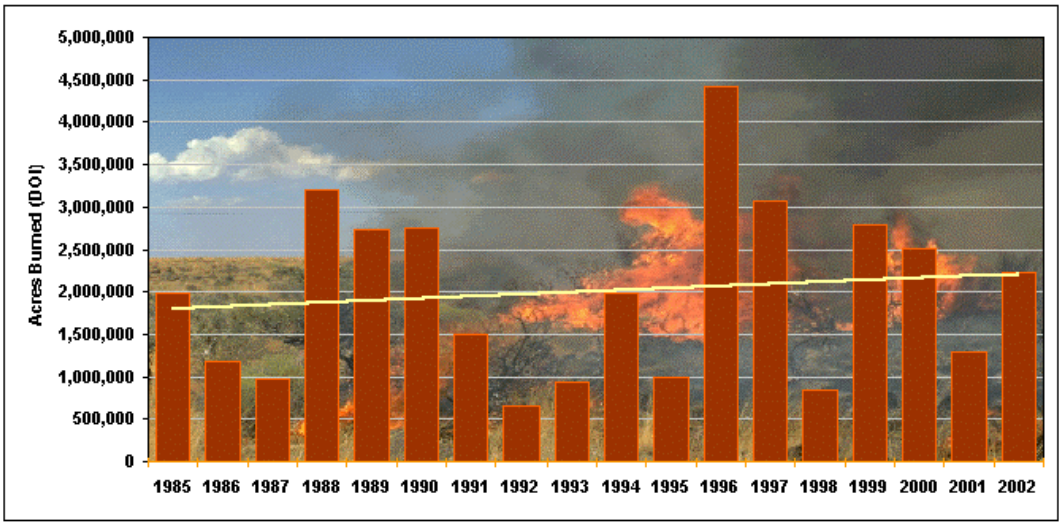


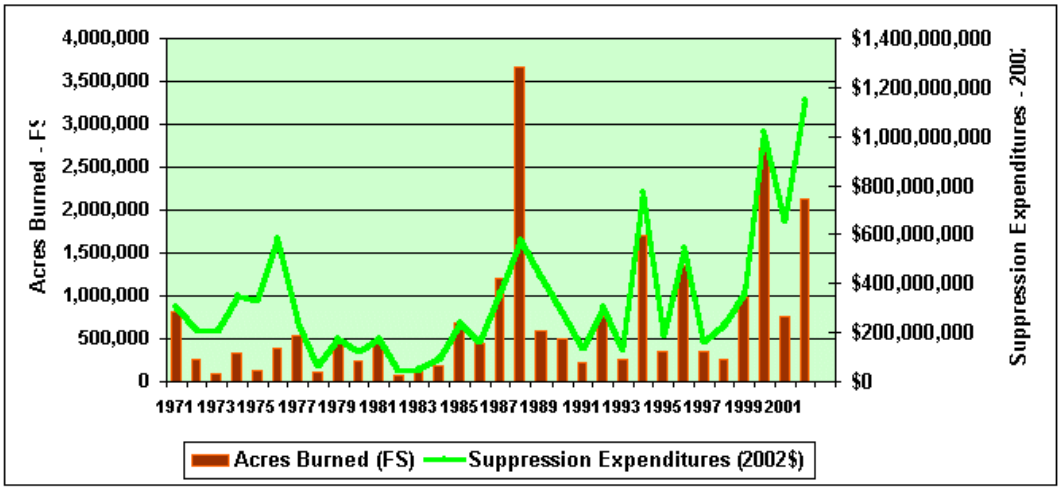
Figure 5 – Escalating Wildland Fire Acres Burned (DOI Only)



If the size of the problem (acres burned) is increasing the cost of the problem will also increase. In fact total suppression expenditures are strongly correlated (R^2=0.76) with total acreage burned, i.e., large total expenditures are associated with large acres burned, and, as shown, total acres burned are increasing (Figure 6).

The same analyses by Gebert, et al, 2004, confirms that a statistically significant change in the variability of total costs occurred in the mid to late 1980s. This variability can be seen in Figure 1 and Figure 6 as well.

Figure 6 – Expenditures and Acres Burned Are Correlated (Forest Service Only)



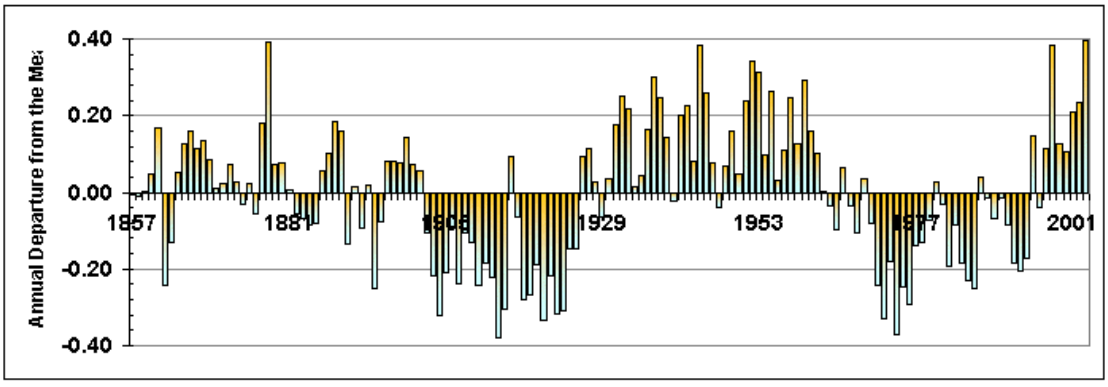
Barriers And Obstacles To Cost Management

Environmental

Climate

Climate is essentially the long term accumulation of weather. Climatic trends are important in assessing wildland fire suppression expenditures because climate directly affects the temporal dimension of wildland fire problems.

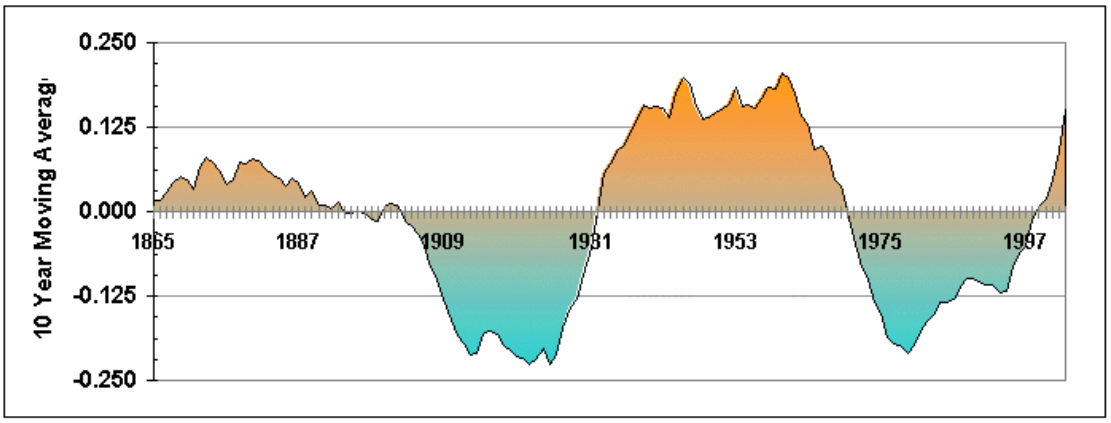
Figure 7 – Atlantic Multi-decadal Oscillation (Departure) as an Indicator of Drought Trend (Annual Departure)



A significant climatic feature affecting wildland fire is drought. Recent studies suggest a relationship between global sea surface temperatures and drought patterns in the United States (McCabe, et al, 2004). One particular sea surface temperature pattern that is correlated with U.S. precipitation and drought is the Atlantic Multi-decadal Oscillation (AMO). The AMO (Figure 7) represents two phases of sea surface temperature anomalies (departures from normal) over the

North Atlantic Ocean, a warm phase in which sea surface temperatures are warmer than normal and a cool phase in which sea surface temperatures are below normal. Because the North Atlantic Ocean takes considerable time to warm and cool, the sea surface temperature pattern tends to persist over periods of several decades. When the annual departures are smoothed over a ten-year moving average, the resultant persistence can easily be seen (Figure 8).

Figure 8 – Atlantic Multi-decadal Oscillation (Departure) as an Indicator of Drought Trend
(10 Year Moving Average of Annual Departure)

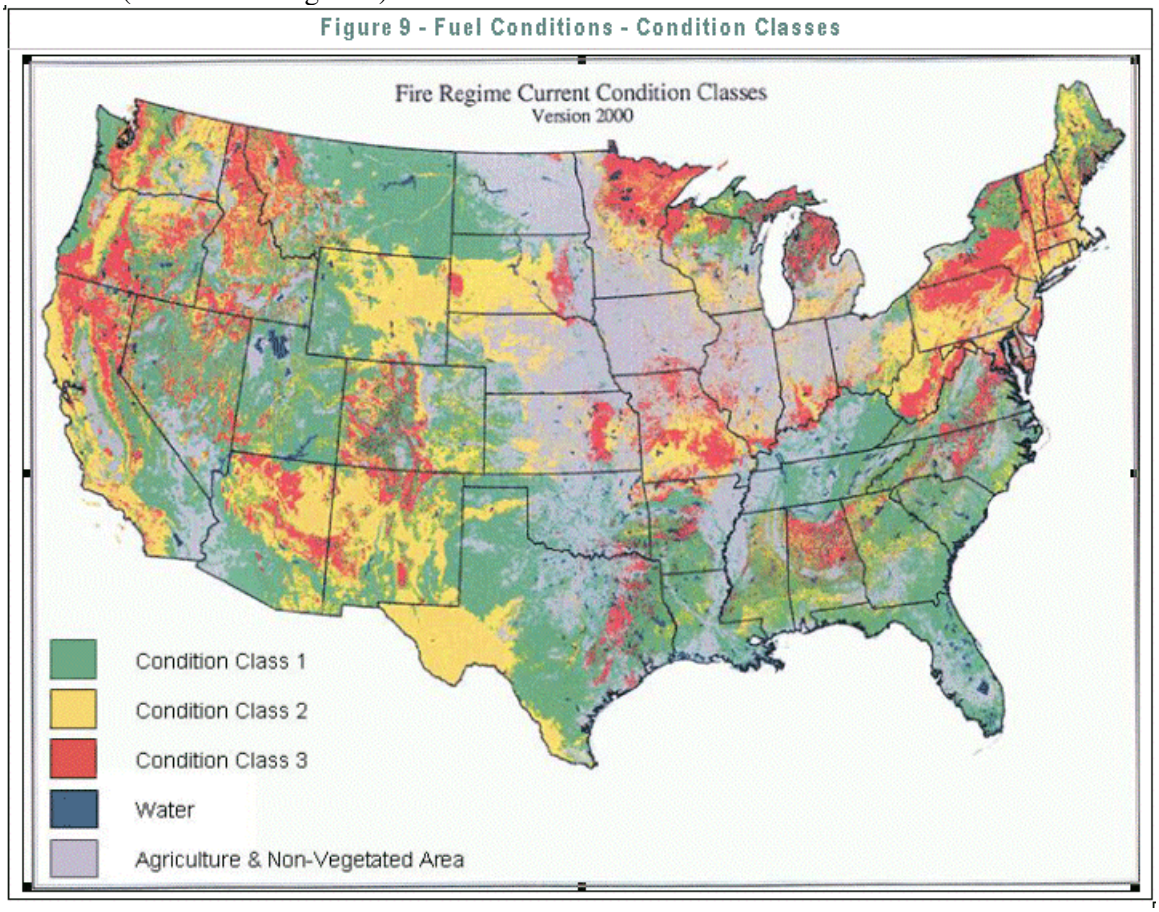


"Though the mechanisms of drought are not fully understood, nor are beginning and ending dates of drought highly predictable, a forecast that the western U.S. will likely continue its current drought phase for the next several years is not unreasonable based on scientific analyses completed to date." (Brown, 2004)

Fuels

Wildland fires are influenced by the quantity, arrangement, and size of fuels. Fuels directly affect an ongoing fire, but also long-term and wide spatial fuels problems can indicate persistent wildland fire problems. An extensive effort has been undertaken to identify the areas of the United States where fuels have departed from the historical fire regimes which may result in alterations of key ecosystem components (Schmidt et al, 2002). A coarse scale analysis of fire regimes (fire frequency and size) and the current conditions of the fuels (Condition Class) has been completed. Condition Class 3 areas are those areas which are most removed from historical condition (red areas on Figure 9).

Figure 9 - Fuel Conditions - Condition Classes



Areas of Condition Class 1 are within the historical norms. Wildfires can occur at any time in any fuel type, Condition Class, or fire regime. The fire regime most sensitive to changes in fuels is the short (0-35 years) fire return interval, low fire severity areas of the United States. These areas display adverse changes in fuels the most quickly because of their short fire return interval. There are approximately 35 million acres of federal land in Condition Class 3 within this fire regime. Current fire regime Condition Classes are found in Appendix B (page 43).

Further impacting fuel condition are the current pandemic insect infestations found in almost all major forested ecosystems of the United States. Insect infestations kill trees, thus drying and accumulating fuels, and making forests easily susceptible to wildfires (USDA Forest Service, 2003).

Social

Another important influence on the cost of wildfires comes from people building houses in the wildland/urban interface (WUI) at an increasing rate. The largest demographic consideration is the movement of urban populations to the wildland/urban interface. Recent social science research supported by the Forest Service indicates that 8.4 million new homes were added to the WUI in the 1990s. The wildland/urban interface expanded, as did the area of the intermix (24%). Private property, particularly developed property, complicates wildland fire suppression efforts by increasing the values-at-risk and the social and political pressures to extinguish fires at all costs, regardless of the futility of the effort. In addition, the growth in WUI complicates hazardous fuels reduction projects and retards the use of fire as a management tool in these areas.

Another dimension of the social influence on large fire costs is found in the land management decisions made on federal lands. These decisions reflect societal values and may not include adequate consideration of large fire costs.

Implications

All of these obstacles -- climate, fuels, demographic and social considerations -- serve as a "suite of indicators" about wildland fire costs. The general belief that the most important influences on large fire costs are fuels, climate and increasing population in the wildland/urban interface is substantiated by the Panel's work. These areas, coupled with the economic considerations discussed earlier, serve as the basis for the Panel's work and its recommendations.

In general, wildland fire suppression costs do not appear to be spiraling out of control but rather are reacting to the increase in the number of acres burned by wildfire throughout the United States. There is a high level of confidence among climatologists that climatic conditions are moving toward a long-term drought with no relief in the foreseeable future. Fuels treatment programs are expanding, but the rate at which fuels are being treated will likely not keep up with the need to treat them. Demographic trends indicate that more people will continue to seek the amenities offered by living in the wildland/urban interface. In short, there is no relief in sight from the drivers of large fire costs.

That is not to say that cost management should not be practiced. Just the opposite is true. Costs are important and will likely become more important as the workload increases under prevailing conditions. The Panel offers several recommendations to improve cost management within the federal agencies.

Recommendations

Methodology

The Panel concluded that most of what is knowable about the large fire cost problem and its management was already known because the issue has been studied extensively over the last decade. Its first task, therefore, was to assemble all the relevant studies to assess the findings presented and recommendations forwarded to the wildland fire community. The Panel ultimately found ten reports prepared over the last five years, from internal and external sources, that seemed most relevant and that had proposed possible strategies for large fire cost management. In addition, two studies were added for review as they were being prepared during the Panel's tenure. The list of reports referenced follows:

Federal Agency Studies

- Large Fire Cost Reduction Action Plan – USFS-USDI & NASF, March 2003
- Chief's Incident Accountability Report for USDA Forest Service, January 2003
- Consolidation of 2003 National and Regional Large Incident Strategic Assessment and Oversight Review Key Findings – September 2003
- Policy Implications of Large Fire Management, March 2000
- U.S. General Accounting Office, Cohesive Fuels Strategy, GAO/RCED 99-69, April, 1999

State and Association Reports

- NASF- Cost Containment on Large Fires, July 2000
- National Academy of Public Administration - Wildfire Suppression: Strategies for Containing Costs, September 2002
- Idaho Conservation League, Fire In Idaho, July 2003
- The Wilderness Society, The Wildland Fire Challenge, October 2003
- Yale University, Assessing the Environmental, Social, and Economic Impacts of Wildfire, May 2003
- Wildfire Suppression Funding Coalition: Cost Containment Accountability Recommendations, March 2004
- State of California – Governor's Blue Ribbon Fire Commission Recommendations, May, 2004

The Panel compiled the individual large fire cost recommendations from each. The resulting list included over 300 recommendations for consideration in a three-stage meta-analysis process. First, the panel grouped similar recommendations in order to reduce redundancy, and dropped any recommendation where there was consensus that the recommendation had been adopted and fully implemented.

Secondly, the remaining list of approximately 200 recommendations was categorized into three levels: strategic, operational, and tactical. Each recommendation was placed into a category with the idea that, given its charge, the Panel would deal with only the most strategic issues, given its charge by the Wildland Fire Leadership Council.

Lastly, the 20 recommendations rated as strategic by a majority of the panel were rank ordered in terms of potential impact. The panel produced a list of eight priority subject areas. The final ranking process of the meta-analysis produced five core recommendations.

In addition, the Panel discussed what key recommendations might be missing from the meta-analysis process. In this final step the Panel developed two key recommendations from presentations made to the Panel on two highly significant issues; improving current wildland fire suppression databases and creating new wildland fire suppression metrics.

This effort covered four of the five major issues on which WFLC asked the Panel to provide substantive findings and recommendations. The request to review "impediments to equitable sharing of suppression and cost apportionment among all jurisdictions" was reviewed and determined to be of a tactical nature and therefore not appropriate for the Panel's consideration.

In the end, a small number of recommendations were analyzed in depth by the panel and are proposed as "The Vital Few." These are the primary focus of the Panel's deliberation and require WFLC support and oversight for implementation.

The Vital Few

The seven key areas representing the vital few are:

1. Increase the level of accountability and interest for large fire costs and their impacts by allocating suppression funds on a regional or equivalent basis.
2. Set policy and direction on agency land/resource management planning to incorporate cost management on large wildfires.
3. Plan, budget, and manage resources effectively for large fire suppression such that resources for effective initial response and extended attack are not compromised.
4. Ensure initial responses are always aggressive and driven by the principle of utilizing the closest appropriate resources, including those of local and tribal governments.
5. Incorporate fuels management and future fire management cost considerations when planning all resource management projects for public and private lands.
6. Commit to improving the fire cost data infrastructure as a prerequisite step towards improving accountability and strengthening fire management performance.
7. Develop and use a benefit cost measure as the core measure of suppression cost effectiveness.

The Panel' s seven major recommendations are presented in the following pages. The format for each recommendation includes a succinct statement of the core recommendation with required features and primary action items. A brief discussion of the background is included followed by a summary of the goal of the recommendation. Each recommendation concludes with a business case summary highlighting both positive impacts and challenges to be confronted in terms of implementation. A detailed outline of the recommendations is presented in the Appendix, along with supporting steps and supplemental actions.

PANEL RECOMMENDATIONS

I - LEADERSHIP, COMMITMENT AND ACCOUNTABILITY

CORE RECOMMENDATION

1. Increase the level of accountability and interest for large fire costs and their impacts by allocating suppression funds on a regional or equivalent basis. Create a dedicated group of agency administrators representing local and regional levels, and at least one member of the large fire cost panel, to develop operational rules and oversight procedures.

Required features are:

- Allocate suppression funds to regions or logical geographical divisions.
- Use predictive based budgeting, as opposed to the current system of 10-year moving averages, as the basis for allocation. The 10 year-average will not provide sufficient funds to implement this recommendation.
- Establish special relief provisions for "mega" or "extreme" large wildfires, i.e., establish reasoned estimates for reasonably anticipated levels of funding.
- Create and manage a national suppression reserve from allocated suppression funds. Eliminate severity funding, as it is known today.
- Provide incentives for staying within allocated amounts by allowing up to 51% of "savings" to be used for other fire-related projects. Set provisions for the remaining 49% of savings to be returned to the national suppression reserve.
- Require each region or logical geographic division to contribute a co-payment to the wildland fire suppression expenditure before granting access to the national suppression reserve (see example).
- Improve adjacent agency partnerships to co-manage the funds. Combine allocations where practical and feasible.
- Increase regional tracking and reporting of suppression expenditures. Establish a headquarters Comptroller, who reports directly to the agency administrator (not the fire organization) explicitly for suppression cost allocations, monitoring, and suppression reserve management.

Background

The strategy, and ultimately the final cost outcome of a large wildfire, is determined by agency administrators, directly and indirectly. Agency administrators significantly affect wildfire costs in two key ways:

Before the Fire – Agency administrators influence planning (Resource Management Plans and Fire Management Plans), wildfire prevention and preparedness investments, and implementation of the National Fire Plan. The decisions made before the fire often have a greater influence on final costs than those made once the fire starts.

Once the Fire Starts – The agency administrators' role becomes even more immediate and direct with responsibility for suppression strategies, complexity analysis, the WFSA, delegation of authority and monitoring of fire suppression efforts, including costs. In general, the decisions that an agency administrator makes with regard to wild fire complexity and risk in fire operations (safety and impacts) lead to higher costs.

Currently, Incident Management Teams (IMTs) and agency administrators understand and generically accept that they will be held accountable for the conduct of suppression efforts on an incident. However, no method exists to determine whether an agency administrator in fact significantly contained or reduced costs. The variables associated with large wildfires are so numerous as to make individual fire assessments of efficiency difficult.

Generally, cost considerations take a back seat to firefighter and public safety and environmental concerns. While this hierarchy for concern may be appropriate, cost considerations are never brought to the forefront.

Throughout the federal wildland fire suppression organizations, costs and cost effectiveness have rarely been regarded as a priority, and most agency administrators have operated under the current system of essentially having a blank check. The lack of accountability for costs allows for increasing costs of wildland fire suppression.

Goal of the Recommendation

The purpose of this recommendation is to recognize the difficulties of cost accountability by eliminating the proverbial blank check. The philosophy is that different decisions must be made to live within a suppression allocation and that agency administrators are the only ones with the authority to provide oversight -- not the fire organization. The core recommendation aims to institutionalize "cost management" as a strategic priority at all levels of the agencies. This can happen only when each agency administrator at each level has a role in cost management that is non-delegable.

Supporting recommendations designed to augment and institutionalize the core recommendation are included in Appendix A (page 36). They address consultation, operational protocols, training and mentoring, and include a proposal to eliminate large fire costs reviews as they are currently conducted.

Business Case Summary

Agencies at all organizational levels hold themselves accountable for making strategic and tactical decisions that affect fire suppression costs. Agency administrators must view and interpret risk management from a broad perspective, including cost management, safety issues, risk, alternative strategies and tactics that balance environmental impacts and socio-economic concerns.

An Example Suppression Allocation Model

A geographic area (region, state, etc.) receives an allocation for wildland fire suppression of $100. If the fire season requires the area to expend an amount less than $100 to suppress wildfires, 51% (more than half) of the resultant savings is carried over by the area to the next fiscal year to be used as they decide on wildland fire management activities of any kind. The remaining 49% of the savings is returned to the national suppression reserves account. If the fire season requires the area to expend an amount greater than $100 to suppress wildfires, the area must contribute (pay) up to $20 of their own allocated money (from any appropriation) before the national suppression reserves become available to them. Thus, if over $120 is spent, the national suppression reserve would pay the amount over $120. If the fire season requires the area to expend exactly $100 to suppress wildfires, nothing happens.

Allocation of suppression funds will force a different outcome from today's experience. Greater consideration to wildland fire use will predominate. Adjacent agency administrators will have a greater interest in the outcomes of a neighbor's fire cost management efforts. Business will not be as usual. If the possibility of other program impacts is upfront and enforced, a more in-depth level of decision making and risk taking will emerge.

Ultimately, only agency administrators can make reasoned decisions that will result in lower (slower rate of growth, smaller) suppression costs. This will happen when cost containment is a core organizational value and operational principle for agency administrators and IMTs.

Challenges

The current level of suppression funding is predicated on a 10-year average. Based on the core premise of this report (i.e., climate, fuels, and demographic conditions will prevail for the foreseeable future) managing a fund that is already too small will either cause much consternation or result in dismissal of its worth. Basically it will be ignored due to the futility of the effort. Funding adequacy issues are further complicated by the inclusion of workers compensation and restoration line items in wildland fire suppression budgets.

While federal agency resources have been expended to generate a multitude of various cost management reports (indicating an awareness and acceptance that a problem exists), little in the way of broad and effective change has been implemented at the federal level in response to those reports. This implies that a more drastic approach is required, such as that provided by regional allocation of suppression funds.

Undoing more than 20 years of blank check management will be a difficult concept for federal agencies. However, managing and living with allocated budgets is not a new concept for most other levels of government.

Eliminating severity funding as it is currently managed (supplementing funding for severe fire seasons that are almost guaranteed to occur anyway) would place more accountability back at the geographic or regional level. However, this will require a different form of oversight and management from what exists today. A different approach to prevention and mobility (pre-positioning) of presuppression resources is a requirement for this new paradigm.

II - RESOURCE/LAND MANAGEMENT PLANNING (R/LMP) AND FIRE MANAGEMENT PLAN (FMP) RELATIONSHIPS

CORE RECOMMENDATION

2. Set policy and direction on agency land/resource management planning to incorporate cost management on large wildfires.

Required features are:

a. Display the anticipated wildland fire suppression costs in R/LMPs for each alternative proposed, including the no-action alternative.
b. Establish the expectations in R/LMPs and FMPs for costs of implementing the plans by recognizing the probability of large fire occurrence and specifying acceptable losses, given the land management direction established.
c. Where state, local, and tribal governments have established effective cost management guidance, consider it in the agency planning process.

BACKGROUND

The Panel was specifically asked to make recommendations on "The relationship of fire management plans and resource management plans to suppression costs."

The Panel examined three specific land management plans (R/LMPs) and their related Fire Management Plans (FMPs) to identify links between the direction given in the R/LMP and the implementation direction in the FMP, as required by fire planning policy. Where possible, the Wildland Fire Situation Analyses (WFSA) for wildfires on the planned units were examined as well. No links were found in the land management planning process related to wildland fire suppression costs. Furthermore, the Panel discussed this issue with several planning specialists at the regional and national level. The specialists reported no real requirement to consider wildland fire suppression costs in the planning process and no known consideration of them in any current plans. As one headquarters planning staff indicated, "Our effects analysis … including economic analysis … was highly speculative. I don' t recall economic analysis of standards and guides." The Panel believes there is basically no linkage in land or resource management plans with respect to wildland fire suppression costs.

As mentioned, none of the R/LMPs examined by the Panel included consideration of wildland fire suppression costs resulting from the management direction developed in the plan. In fact, some R/LMPs included constraints to wildfire suppression efforts that actually drive up costs. The lack of consideration for wildland fire suppression costs in developing these constraints simply defers the consideration (and high concern) for costs to the time of the incident.

R/LMPs basically operate like zoning ordinances when it comes to wildland fire suppression. The plans constrain activities that are perceived to be detrimental to the good of the whole. The

unintended consequence is a higher cost of wildland suppression. In addition, because wildland fire suppression decisions are not considered in the land management planning process, and thus not disclosed through NEPA, legal challenges are surfacing. Currently there are FMPs under litigation in California because the FMPs are making "decisions" with respect to wildland fire suppression in the absence of any "decisions" made in the land management plan.

R/LMPs are developed in the domain of gains. These plans establish the gains to be had by proper management of the land. These gains are expressed by such things as desired future conditions. Implementation of wildland fire suppression actions, through the WFSA, operates in the domain of losses where one tries to minimize the losses associated with the emergency. Emergency management clearly operates in a loss aversion rather than gain framework. R/LMPs provide no help in the loss aversion process.

The Aspen Fire review has done the most creditable job of describing the problem of land management decisions predisposing areas to large, costly, catastrophic wildfire. Many reviews have pointed out that decisions made in the land management planning process avoid consideration of the resultant fire behavior conditions created by the decision. In many cases these decisions end up, paradoxically, destroying the very "desired future condition" which is prescribed.

GOAL OF THE RECOMMENDATIONS

Without the consideration of cost in the planning process, costs are simply a result of the incident and nothing else should be expected since nothing else was planned. The goal is the establishment of a "line of sight" from land management planning through Fire Management Plan preparation and on into the WFSA, that incorporates cost management as a priority.

Land management planning must recognize the wildland fire behavior conditions its decisions create.

Supporting recommendations designed to augment and institutionalize the core recommendation are included in Appendix A (page 36). They address land management planning and fire Condition Class and operational considerations for fire management in the WFSA on large wildfires. (The panel also recognizes that other current study efforts are under way regarding strengthening the WFSA).

BUSINESS CASE SUMMARY

As stated in the 2003 Consolidation Report review, "Comprehensive planning provides extensive benefits in the terms of efficient fire management and cost management. Most importantly they provide a framework for determining the most appropriate response to fire incidents. These plans will help determine where fire suppression is necessary, costs involved with this decision and where other strategies are more efficient and appropriate."

Proper consideration of wildland fire suppression costs in the planning process could reduce the cost of large wildfires by:

- Allowing for more wildland fire use and greater flexibility in operational implementation.
- Understanding and displaying the cost of land management constraints on wildland fire suppression costs.
- Changing the expectation for suppression cost by recognizing many current land management decisions create an inherently higher cost of suppression.

- Changing the future expectation of total suppression costs. If costs are important they must be considered at all levels, planning through implementation.

Consideration of wildfire suppression cost would highlight management actions that potentially increase wildland fire suppression costs. It would force consideration of options (decisions) that would reduce large fire costs, or, would force explicit acceptance of high costs before they actually occur.

Integrity improves in the management and protection of the resources as the agencies become consistent from planning (R/LMP and FMP) through implementation (WFSA).

Challenges

Displaying the high cost of wildland fire suppression may attract undesirable comment from external forces.

There will be a reluctance to abandon traditional and current practices that are incompatible with cost management goals. This recommendation threatens some traditional current practices and the cost of certain firefighting resources. Some current practices appear contrary to land management direction or fire policy implementation. For instance, in wilderness and remote areas, fire suppression activities may be contrary to long-term land management goals for these areas. Another example would be suppression tactics calling for utilization of high-cost aerial resources which are often deemed politically important for public support but would be incompatible with cost management goals.

III - SUSTAINING INITIAL AND EXTENDED ATTACK CAPABILITY (DRAWDOWN)

CORE RECOMMENDATION

3. Plan, budget, and manage resources effectively for large fire suppression such that resources for effective initial response and extended attack are not compromised.

Required features are:

a. Develop standard procedures to determine minimum resource levels needed to be maintained for effective initial and extended attack in each geographic area using predictive services capabilities based on Energy Release Component, or other applicable fire danger index.
b. For those resources not needed to meet the requirements noted above, develop and establish protocols for national control and positioning of those resources.

BACKGROUND:

In past instances, initial attack resources have been sent to large fire support activities at the expense of maintaining acceptable levels of initial attack locally. This can and frequently does increase wildland fire suppression costs for the local unit that sent the resources in support of someone else.

Initial attack resource levels should be maintained at a capacity that will effectively deal with the demands of the local area. To reduce capability in one area to marginally improve large fire suppression in another may not be cost effective.

Pre-positioning and sustaining initial attack resources to ensure initial attack capability is critical to successful cost management. Cost effectiveness will also be improved by providing flexibility in mobilizing and reassigning resources to high potential areas based on Predictive Services' best information.

Indirect costs, requiring overhead assessments (especially in the Forest Service), are often reported to be excessive and can diminish the amount of money available to field units. Field units often report that in spite of increasing agency budgets, less money is reaching operational units.

GOAL OF THE RECOMMENDATIONS

Creating a sustained program means emphasizing both a strong initial attack and extended attack capability. It must also provide for increasing state and local capability for efficient support of federal programs. This entails optimizing funds provided to field units by ensuring support costs are appropriate for services received.

With maximum financial flexibility to pre-position resources, it is possible to increase initial attack success with the benefit of containing or possibly lowering costs. It is also critical to sustain initial and extended attack resource capability at the local level by ensuring consistent budgeting for preparedness resources. This element would involve a cohesive, long-term budget strategy that includes preparedness, emergency suppression, fuels management, and state and local fire assistance in order to implement an effective, cost-efficient fire management program.

Supporting recommendations designed to augment and institutionalize the core recommendation are included in Appendix A (page 36). They address budgeting and resource allocation issues, procedures for fire preparedness stability, and Multi-Agency Coordination (MAC) protocols for shifting resources that use cost management as a criterion.

BUSINESS CASE SUMMARY

The need to maintain a strong initial action capability should be coupled with the best science to avoid unacceptably drawing down resources from an area with high or extreme potential for large costly wildfires. Predictive Services' tools are continually being developed and refined to provide fire managers with the best possible information. This information is used to make strategic decisions on mobilization, pre-positioning, and the potential for wildfires to escape and become a large costly incidents. These tools need to be incorporated into decision matrixes to replace what has been previously accomplished intuitively.

An understanding of the fire suppression budget and budget processes needs to be provided to all levels of the agencies, including the entry-level firefighter. The need to manage these funds realistically should be integrated into the agencies' culture.

Maintaining a strong initial attack policy coupled with the budget element to fund this capacity should maintain, and quite possibly improve, a strong initial attack success rate, lowering the number of large costly wildfires. For the incidents that are not contained during initial or extended attack, striving to attain a least cost should assist in lowering the cost of the large incident. Utilizing incident business advisors as a standard practice will keep the effort of lowering fire suppression cost at the forefront.

The pre-positioning of resources when based on sound decision tools will provide geographic areas the capability to increase initial attack resources to improve their initial attack success. Predictive Services has also improved its capability to provide decision makers with the best available information to make sound decisions on the movement of resources from one area to another.

Challenges

A complete and balanced fire management program in all likelihood will increase budgetary requirements, particularly in the hazardous fuels program and in support to states and locals. If it is determined that the fire management program is excessively supporting the common services requirements (overhead) of the agencies it will be very difficult to reduce those costs and find other funds to replace them.

In the current climate of mounting federal budget deficits, it will be difficult to make the fire management program a high enough national priority to maintain adequate consistent funding. Adopting a least cost alternative may run into state and local opposition because of the desire to eliminate the incident from their back yard. Adopting a least cost alternative may have a negative effect on the resource to be protected.

Without an analysis of large fire resource needs, the pre-positioning of resources from one area to another will serve to increase one area' s capability while decreasing another' s. Predictive Services needs to be provided with the best support tools possible in order for them to provide reliable information.

IV - INITIAL ATTACK AND EXTENDED ATTACK RESPONSE

CORE RECOMMENDATION

3. Ensure initial responses are always aggressive and driven by the principle of utilizing the closest appropriate resources, including those of local and tribal governments.

Required features are:

a. Use all available local resources in wildfire suppression strategy to create an integrated and coordinated response to wildland fire.
b. Form local Type 3 Incident Management Teams (IMTs) to manage initial and extended attack operations locally rather than rely on mobilization of Type 1 and Type 2 teams. Develop agreements with local, state and federal agencies that establish local Type 3 IMTs.
c. Focus meaningful federal and state agencies' financial support and provide appropriate technical assistance to strengthen local resources and assure their availability on a wildfire incident.

BACKGROUND

The least expensive wildfire is the one that never starts. Logic and supporting data indicate that minimizing the size of a fire will also minimize the cost of suppressing it. The next least expensive wildfire is one that doesn' t escape initial attack and is thus kept relatively small and of short duration.

Rural, volunteer and other local fire departments are the nation' s first line of defense against fire growth in the wildland/urban interface (WUI) and surrounding landscapes. The ability of local firefighters to contain a fire through quick and efficient initial response can dramatically reduce large-scale wildfire impacts. Volunteer local resources are often the first to respond to a fire start. Their ability to quickly take action allows them to efficiently contain or suppress a fire; this can prevent a fire from exploding out of control, threatening lives and property, or consuming significant natural and financial resources.

Efficiently implementing extended attack operations is also critical to managing large fire costs. If initial attack fails, the next line of defense is organizing for a larger, longer duration wildfire. Stopping the fire as soon as possible is critical to saving cost and minimizing damage, particularly in the WUI. Typically, because initial attack averages about 97% success, only a small number of wildfires move to extended attack; however, these can become very expensive. It is possible to contain many wildfires before they become large problems.

GOAL OF THE RECOMMENDATIONS

Enhanced firefighting preparedness and increased interagency coordination at the local level will improve the cost effectiveness of federal and local wildland firefighting efforts. An effective local department that is prepared to act immediately or in cooperation with other agencies to suppress wildfires can attack and contain wildfires on adjacent state and federal land, often before state and federal forces arrive. They can also provide much-needed assistance to large state and federal wildfires, reducing national mobilization costs for federal agencies and lowering overall suppression expenditures.

Increasing the skills and availability of locally based Type 3 teams will lead to effective extended attack. When successful, the need for mobilization on higher cost Type 1 or 2 teams is negated. Additionally, the development of Type 3 teams that use local firefighters and support (regardless of agency) extensively will reduce costs in a variety of ways: the teams could take command, coordinate an effective extended attack, order necessary resources, and provide for safety through increased supervision, command, and control. Most importantly, these teams will have knowledge of the local conditions and landscapes that will help them make good informed decisions. Within the first few hours of a fire start, they can be very effective in controlling the fire quickly by establishing a competent management organization.

Supporting recommendations designed to augment and institutionalize the core recommendation are included in Appendix A (page 36). They address financial support, technical assistance, new training systems (to include performance-based wildland fire training "delivery packages"), and other measures to increase the capacity of local federal units to support large fire management.

BUSINESS CASE SUMMARY

More effective and efficient initial attack response will reduce suppression costs. It will also reduce economic loss to communities and reduce destruction of homes and infrastructure.

Since 1980, only 2.80% of the more than 400,000 federal wildfires have exceeded 300 acres. In the Forest Service, these wildfires have averaged over 800,000 acres burned per year at an average annual cost of over $350 million. A small reduction in these large wildfires will result in reductions in large fire suppression costs.

The Forest Service has estimated national mobilization costs to be in the range of $40-50 million annually. Saving just 10% of these national mobilization costs through effective use of local resources would reduce costs by $4-5 million annually.

Challenges

Existing cooperative agreements and arrangements will have to be renegotiated to assure an integrated and coordinated system. Re-negotiation will take time and careful consideration of other agencies' policies and processes.

The standards each agency has adopted for its training, qualifications, and personnel safety will likely conflict, requiring additional negotiation.

Development of Type 3 teams that use local firefighters and support (regardless of agency) will require a major shift in the federal wildland firefighting culture. In order to implement this, criteria to evaluate federal agencies' implementation of this policy must be developed and federal agencies must be held accountable for the integration and implementation.

The federal agencies must reexamine current qualifications and standards that are imposed upon cooperating agencies. The effect of this imposition is a restriction on the use of non-federal agencies that results in limiting initial and extended attack resources. There are imposing federal wildfire cultural implications to this issue.

V - LANDSCAPE FUELS MANAGEMENT FOR PUBLIC, TRIBAL, AND PRIVATE LANDS

CORE RECOMMENDATION

4. Incorporate fuels management and future fire management cost considerations when planning all resource management projects for public and private lands.

Required features are:

For Public and Tribal Lands
a. Develop interagency protocols that identify and report acres of hazardous fuels reduction from wildland fire.
b. Require analysis of burned-over areas and adopt active management strategies to ensure that excessive fuels do not accumulate again.
c. After large wildfires, re-evaluate the impacts and feasibility of adopting strategies that use the recently burned areas as boundaries for less costly wildland fire use. Incorporate the opportunity presented by the wildfire into the unit fuels strategy.

For Private Lands
a. Engage communities and property owners in creating defensible space around structures, and appropriate land use, zoning and construction methods/standards for structures situated in fire hazard areas.
b. Strive to make R/LMPs and FMPs ultimately into national, comprehensive, interagency and intergovernmental wildland vegetation defensive management plans.

The Panel also notes that a paradigm shift in thinking about hazardous fuels reduction effectiveness is required and can be started by ceasing to use acres treated as a results measurement for program accomplishments.

BACKGROUND

The 2003 fire season was undoubtedly one of the most challenging on record relating to structures lost, suppression cost and acres burned. Federal agencies must move beyond current hazardous fuels reduction strategies toward a more holistic wildland fire management program that seeks to put into practice fuels reduction goals. It should protect communities at risk and establish a framework that is realistic by setting priorities for community protection and values-at-risk.

In response to unprecedented levels of fuels accumulation across much of the U.S., federal land management agencies have significantly increased hazardous fuels reduction funding and treatments. However, the continued rise in suppression costs suggests that current fuels reduction strategies will not be able to fully or efficiently mitigate the risks of hazardous fuels in light of existing budgets, current forest health conditions, and predicted climatic changes.

The magnitude of the fuels accumulation problem is staggering. A 1999 Government Accountability Office (GAO) report (GAO-99-65) estimated that, on national forests alone, there are 39 million high-risk acres in need of some form of fuels treatment. The report estimated the annual cost of that treatment to be $725 million.

The Forest Service responded to the GAO report with *A Cohesive Strategy: Protecting People and Sustaining Resources in Fire-Adapted Ecosystems*. In this report, a course of action was delineated that, over time, would reduce the impact of fuels on suppression costs. In FY 2001, with the advent of the National Fire Plan, hazardous fuels reduction treatments were significantly increased. Unfortunately, suppression costs have continued to rise because of a convergence of adverse climatic conditions and the existing forest conditions. This suggests that, under current budgetary decisions, fuels reduction projects alone will not be able to address current and expected fuels profiles.

Compounding the problem of the massive accumulation of hazardous fuels in the nation' s wildlands is ever-increasing community development occurring in and near those fuels. The wildland/urban interface will continue to be an escalating, major fire problem.

Wildland/urban interface fire protection and prevention is not a new problem, nor are the recommended solutions newly conceived. Many of the reports and recommendations generated in the aftermath of prior wildfires that destroyed homes are very similar in content and substance. For example, documents created in the early 1960s, 1970s, 1980s and 1990s all contain the same goals, i.e., "defensible space must be provided around structures," and "wildland fuels must be actively managed near structures," and "appropriate land use, zoning, parcel size and construction methods for structures situated in high hazard area must be instituted."

GOAL OF THE RECOMMENDATIONS

Better integrated fuels reduction strategies, resource management activities, and suppression strategies will decrease the number of acres of hazardous fuels in Condition Classes 2 and 3.

Despite recent increases in funding and fuels treatments, it is apparent that current fuels reduction strategies are not able to address the full magnitude and scope of the fuels problem. Collectively, the integration of wildland fire risk mitigation measures into all resource management activities, a shift in suppression tactics and greater emphasis on post-fire fuel characteristics may reduce the overall costs of suppression while ensuring the protection of high values-at-risk.

Solutions must address how to create a politically viable, collaborative effort to manage the landscape and mitigate fire risks within and around the wildland/urban interface.

Supporting recommendations designed to augment and institutionalize the core recommendation are included in Appendix A (page 36). They address public education and support for FIREWISE and fire safety programs for the wildland/urban interface.

BUSINESS CASE SUMMARY

Implementation of the recommendations incorporates three core elements:

- Pre-Fire Planning: Incorporating wildland fire risk mitigation planning and measures into all resource management activities.
- Suppression Planning: Shifting suppression strategies away from 100% perimeter control to "point of control" efforts that prioritize and protect the greatest values-at-risk and manage wildfires from a fuels reduction standpoint will reduce cost.
- Post-Fire Planning: Maximization of the fuels reduction benefits after large wildfires can be obtained by utilizing recently burned areas as natural fuel breaks in the overall hazardous fuels treatment program.

Federal fuels reduction treatments should be refocused on the wildland/urban interface where the values-at-risk are the greatest. Federal wildland agencies should seek collaboration with and partnerships from public and private agencies to support a local government defensive strategy in managing those things under their control, e.g. development occurring in or near wildland fuels. A similar approach to the management of high value resources that are in non-WUI areas (e.g., late successional reserves, threatened and endangered species habitat, cultural resource sites, municipal water sources) would ensure protection of those resources that are of the greatest value. This approach calls for all non-fire resource activities to incorporate accompanying mitigation strategies to protect the resource investment being made.

When pre-fire planning is incorporated into all resource management activities, the risks to such high-value resources are minimized. Further, suppression tactics can then shift from traditional 100% perimeter control to "point of control" tactics that reinforce existing protection measures, making more efficient use of suppression resources. The success of point-of-control strategies is contingent upon two factors: the development and implementation of resource management policies that incorporate such measures to reduce fuel loading, and adequate support and funding of such policies. In cases where point-of-control strategies are implemented, agency administrators and Incident Management Teams should be guided by fire management plans and fuels management standards that allow for such decisions. They should also be confident that their decisions in such matters would be defended in public by their superiors as being in conformance with accepted standards and policies.

Following pre-fire planning and point-of-control suppression, post-fire planning should take advantage of recent large wildfires that have reduced fuel loads and created natural fire breaks.

Too often, little action occurs in large wildfire areas and their adjacent lands. Burned areas should be monitored and maintained to ensure that excessive fuels do not accumulate again. Such maintenance is likely to cost less than treatment of areas that have never burned. In this way, the incidence of wildfire is included in a holistic view of a wildland fire management program that encompasses hazardous fuels treatment.

Additionally, subsequent hazardous fuels treatments may be incorporated near or adjacent to burned areas to develop larger, more effective fuel breaks. Suppression strategies on future wildfires on adjacent lands may be centered on the use of previously burned areas as natural barriers.

This strategy uses all the activities of the agencies for a common purpose by requiring a fuels reduction/fire protection component to be incorporated into projects on public lands. This may marginally increase short-term project costs but would result in long-term investment protection and restoration costs savings from damaging fire effects. It also would result in less costly suppression tactics such as perimeter control and less costly obligation of firefighting resources assigned to the value-at-risk. For instance, if a resource value were effectively "fire safe," less effort and fewer resources would be necessary for protection.

The recommended changes regarding private lands (i.e. the WUI) must be strong enough to provide adequate life safety and asset protection to all populations and community assets within local government jurisdiction that are at risk of devastation by wildland fire. Minimum levels of WUI protection will be defined in a way that will provide the local fire chief, planning director, city manager and county administrator sample ordinances and examples of wildland fire policies and planning documents. This will improve prevention, mitigation and preparation for response to the local WUI challenges.

This strategy effectively uses "pay as you go" requirements by recognizing and paying for investment protection costs up-front rather than deferring them to the forces of costlier and less controllable suppression tactics. Requiring a fire protection component for all resource projects would also better integrate fuels reduction into total resource management. This would result in more acres treated and reported, lower rehabilitation costs, and improved protection of highly valued resources.

Challenges

For other resource areas, there may be resistance to incorporating fuels considerations into project plans as a cost element or as a constraint. This strategy may increase marginal project costs and there may be identified incompatibility with other resource objectives. For instance, a wildlife habitat improvement project may require more tree stocking density than would be necessary for effective fuels treatment. Another example would be an archaeological site that requires some form of fire protection. As part of the site development or preservation, project plans would include an additional cost for effective fuels reduction.

Abandoning perimeter control could appear riskier to the public. There is an inherent and implicit notion that firefighters can actually control large wildfires even in the face of the most extreme fire behavior.

Regarding private lands, measures that appear to impinge on individual rights are almost always seen as negative. The public may be loath to adopt measures that cost them directly, such as through increased taxes or indirectly with more restrictive building codes.

Too much of the public fails to perceive a fire risk in the wildland/urban interface. They believe that government agencies (federal, state and local) should and will protect them from any loss. Additionally, private landowners believe that insurance companies and government assistance will always be available to cover any loss they incur.

Past voluntary land use planning, zoning and construction methods have been inadequate in high risk fire areas. Therefore, it will take leadership from the state and federal agencies to reduce "incentives" to do nothing.

VI - FIRE COST DATA MANAGEMENT NEEDS

CORE RECOMMENDATION

6. Commit to improving the fire cost data infrastructure as a prerequisite step toward improving accountability and strengthening fire management performance.

Required features are:

a. Wildland fire management agencies should begin the development of a more complete fire database and management information system.
b. Forest Service Research and Development, in partnership with the fire agencies, should be charged with developing and maintaining this database and with developing a regular series of peer-reviewed reports and analyses that track cost patterns and influences over time.
c. Establish an effective national fire-related information technology/information management framework under the guidance of the Wildland Fire Leadership Council.
d. Develop an integrated database for all federal, state, and local agencies involved in the collection of wildland fire data that allows for sharing information across agencies and provides for a consolidation report on wildland fire response.

BACKGROUND

Understanding large fire costs and what drives them is a prerequisite for containing costs and linking performance, budgeting, and cost management activity. Underlying the process of better understanding large fire costs is the need for comprehensive, timely, and accurate information.

For the fire community this will require fixing, in the short term, serious deficiencies and inconsistencies in historical data on large wildfires. Existing data is inadequate for informing decisions or providing a basis for changing practices to contain costs. Furthermore, data that is available is not consistent among the firefighting agencies. Improvements in the collection and correlation of fire program data and cost information are fundamental to achieving the principal recommendations in this report.

The key to affecting accountability, better cost management and improving program performance is the ability to better understand the fire business, including the costs of fire policies, strategies, and operations. The federal fire program expends more than $2 billion annually. It is important to understand what work is accomplished for these levels of expenditures, and how comparable or improved performance might be achieved at lower cost.

The increasing cost of the fire program, especially suppression costs, has generated interest and concern from the public, OMB, and Congress. Increasing expenditures to suppress wildfires in recent years (over $1 billion in three of the last four years) is raising a variety of questions about fire policies, planning, and operations -- and their cost effectiveness.

Important questions include:

- Do total costs and major cost drivers exist for wildland fire suppression?
- Do relative costs of fighting wildfires in WUI and non-WUI settings differ?
- What is the influence of geographic and organizational variables on suppression costs?
- Are there relationships between fuels treatment investments and potential changes in subsequent wildland fire suppression costs?

- What are the comparisons in expenditures for protecting the values inside agency boundaries versus the values outside?

The information to answer these questions is very difficult if not impossible to develop or extract from existing data sources. The issue of data deficiency emerged as a common impediment to understanding firefighting costs and performance management in our meta-analysis of previous studies, analyses of existing data, and during panel interviews with stakeholders and interest groups. Many of the reasons given for high costs of wildland firefighting could not be validated with the data that is currently being collected. Many of the recommendations made in earlier reports offered little quantitative rationale or prognosis because there were little data on which to base inferences.

Historic cost data is at best incomplete. The type of data being captured does not answer questions asked by fire managers, stakeholders, and the public -- questions about a changing fire environment that is greatly influenced by climate, forest/rangeland fuels conditions, and changing demographics.

Because of data deficiencies, previous studies of fire program costs, including this one, were forced to confine their analyses to Forest Service data (representing 67% of federal suppression expenditures). Further, only 40% of Forest Service expenditures can be attributed to specific wildfires. Consequently, cost analyses are limited to broad averages from national aggregate data. Although there is some confidence in aggregate expenditures, there is much less confidence in the data below the national level and therefore little programmatic insight about the cost effectiveness and efficiency of expenditures at the regional, forest, or Fire Planning Unit levels and related firefighting operations and practices.

Answers to external questions and information about modifications in management practices are usually based on subjective judgments and anecdotal responses, with limited basis in quantitative performance and cost information. This is a serious deficiency because major savings in suppression costs may be obtainable at these levels, if guided by accurate, quantitative feedback.

GOAL OF THE RECOMMENDATIONS

The absence of information inhibits the ability to improve program management and to contain costs. Not knowing fully what wildfires cost -- and why -- retards credibility and accountability at all levels throughout the organization and with external stakeholders. Before cost management can become an integral part of the fire culture, similar to safety and stewardship, data and meaningful information on costs and cost management performance will have to be made readily available.

Data problems are not confined to suppression expenditures. Data on actual fuels treatment expenditures and treatment characteristics are also absent. Information maintained in the National Fire Plan Operations and Reporting System contains planned -- not actual – costs, and data are collected to report progress rather than evaluate and analyze actual results. Without better data on actual costs and their drivers, the agencies cannot assess their firefighting effectiveness or the efficiency with which they are managing costs.

Specific problems include a lack of data on factors that can influence cost, including fire physical settings, values-at-risk, and managerial actions -- and incomplete information on the components of total cost. These two sets of data should be available for every fire. Overall, an alignment of

accounting data with performance data will be necessary to provide meaningful information for managing and containing costs.

Supporting recommendations designed to augment and institutionalize the core recommendation are included in Appendix A (page 36). They detail data requirements for fire expenditure information, management actions and results, and physical fire settings.

BUSINESS CASE SUMMARY

Improving the data for large fire costs involves a range of efforts, from actions that could be undertaken immediately to longer-term actions that would require a major overhaul of the way data is collected and handled. Increasing fire costs and the changing nature of the fire environment require information that is timely, accurate, and responsive to the needs of natural resource and fire managers at all levels throughout the organizations.

The results will be:

a. Better understanding of fire management costs by multiple stakeholders.
b. Greater confidence in fire management agencies through more transparent and science-based management judgment.
c. Identification of opportunities for major cost savings or increases in the effectiveness of expenditures.
d. More solid basis for comparing losses averted and other benefits of fire suppression and management with the amounts invested and expended.
e. Better understanding of the tradeoffs between suppression and other investments in fire management, including prevention, fuels management, and initial attack.

Challenges

Fixing existing data problems and creating new information systems will be seen as costly, time consuming, and politically "boring." Critics will want solutions rather than systems improvements.

VII - COST MANAGEMENT METRICS

CORE RECOMMENDATION

7. Develop and use a benefit cost measure as the core measure of suppression cost effectiveness.

Required features are:

a. Measure should be supported by a comprehensive analysis of wildland fire suppression expenditures and losses averted.
b. Analysis should be supported with a comprehensive knowledge base of fire management costs, suppression cost drivers, and values-at-risk.
c. Losses averted and suppression costs should be estimated and compared on every fire greater than 300 acres, using defensible methodology for estimation of values-at-risk and scientific fire behavior predictions for estimating the extent of fire involvement in the absence of control.
d. Benefit/cost ratios should be tracked over time and across regions and forests to assess trends.

BACKGROUND

Currently, there is not a generally accepted set of reliable measures for cost management performance in fire suppression. The establishment of targets for cost management behavior must be based on measures that are reasonable and that truly reflect the nature and purpose of the fire management enterprise. Measures now being used, primarily total costs and cost per burned acre are misleading, incomplete, and not useful in guiding performance. Cost per burned acre contains no information about what was protected in incurring the cost, so that it does not equate costs with the objective of the expenditure. Measuring effectiveness of wildland fire by cost per acres burned is analogous to measuring the performance of structural fire departments by the cost of houses lost. This is especially nonsensical given that fire suppression expenditures are incurred specifically to keep acres, and the valuable resources that are located on them, from burning.

The cost per acre measure assumes, incorrectly in most cases, that what was lost is somehow proportional to what was saved. It assumes that the larger the fire, the larger the pool of resources, property not lost because of the suppression activities on the lost acreage.

Mathematically, the larger the number of acres burned, the smaller the cost per acre as the fixed cost of responding to the fire will be spread out over a large number of acres. A cost-effective fire (low cost per acre) could actually be a disaster if the acreage included values lost that could have been averted with a different suppression strategy.

Many of the reasons for the use of cost per acre burned stem from limitations in the current fire reporting system. The ease of calculating a simple ratio from what single measures are available is compelling, but not useful in measuring program success. Despite the absence of good data on a range of variables, the size of the area burned and the direct suppression expenditures are almost always available for all wildfires.

GOAL OF THE RECOMMENDATIONS

Performance measures need to encourage managers to balance costs and protection objectives and to inform the public and government officials with a more complete problem frame for public debate. Without reliable and clear performance measures and cost information, land and fire managers may be compelled to select suppression alternatives to reduce potential negative impacts regardless of the cost.

Needed is a measure that helps evaluate the benefits and costs of suppression alternatives. Cost management involves not only minimizing the cost of suppression inputs and assuring their productive deployment, but also making sure that the total value of the cost and losses averted is in line with the direct and indirect costs of protection of those values. To bring the costs and benefits of an activity into an acceptable balance, managers of the activity can either increase the benefits or decrease the costs. An appropriate measure should consider the following relationship:

- **Costs:** Cost of suppression + resources (and structures) lost + rehabilitation cost incurred + economic impact of resource losses
- **Benefits:** resource (and structure) loss averted + suppression cost forgone + rehabilitation cost forgone + economic impact forgone.

Conceivably, every fire can be modeled using the topography, fuels, and weather that actually would have influenced the fire event. A reasonable fire perimeter could then be projected and the probable changes in values of resources that would have been destroyed, degraded, or improved could then be estimated.

One possible measure is an expression of the total value of the resources in the expected path of the fire compared with the costs that have been (or are projected to be) expended. If the total value being threatened is close to the suppression cost within a small number of intervals out from the existing perimeter, the cost effectiveness of the current or recorded strategy may be relatively sound. Using scientific projections and expert judgment, fire managers can assess how far the fire would have had to progress in any given direction before the losses would have exceeded the costs.

This should be coupled with the development of a comprehensive database and information system for fire management costs and values-at-risk (see data issue elsewhere), and the dedication of resources (people and money) to identify values-at-risk, both market and non-market, in wildfire decision making. Developing new methods and systems will assist land and fire managers and communities in evaluating the cost effectiveness of preparedness and suppression activities.

Supporting recommendations designed to augment and institutionalize the core recommendation are included in Appendix A (page 36).

BUSINESS CASE SUMMARY

New metrics will also allow program analysts and appropriators to adequately assess the economics of fire control activities and develop useful performance measures and criteria for measuring the success of cost management measures. New metrics will allow fire managers and agency administrators to appropriately consider the economic consequences of their decisions and develop verifiable strategies for successful cost management. These measures will help minimize risk and reduce potential negative impacts without wasteful expenditures and will allow cost

management performance to be more clearly defined, encouraged, and rewarded. New performance measures will provide a better basis for organizational learning and help guide cultural change toward a higher level of cost management consciousness.

Challenges

Fire managers will react negatively to the increase in analysis work recommended on fires greater than 300 acres. These analyses will add marginally to the cost of suppression. From 1980-2002 the average number of federal wildfires exceeding 300 acres is 537 per year. The number has ranged from 190 in 1982 to 917 in 2000.

Decision quality on an incident cannot, and should not, be judged by the cost/benefit ratio itself. The ratio is an outcome of the WFSA decision process (or equivalent). Judgment about the quality of an individual suppression decision should focus on the decision process, not the outcome, and use the best retrospective analysis techniques available.

APPENDIX

A - Recommendations - Further Details

B - Data Used

C - Other Considerations of the Panel

D - Others Consulted

E - Panel Members

A - RECOMMENDATIONS - FURTHER DETAILS

I - Leadership, Commitment and Accountability

Core Recommendation

1. Increase the level of accountability and interest for large fire costs and their impacts by allocating suppression funds on a regional or equivalent basis. Create a dedicated group of agency administrators representing local and regional levels, and at least one member of the large fire cost panel, to develop operational rules and oversight procedures.

Required features are:

a. Allocate suppression funds to regions or logical geographical divisions.
b. Use predictive based budgeting, as opposed to the current system of 10-year moving averages, as the basis for allocation. The 10-year average will not provide sufficient funds to implement this recommendation.
c. Establish special relief provisions for "mega" or "extreme" large wildfires, i.e., establish reasoned estimates for reasonably anticipated levels of funding.
d. Create and manage a national suppression reserve from allocated suppression funds. Eliminate severity funding, as it is known today.
e. Provide incentives for staying within allocated amounts by allowing up to 51% of "savings" to be used for other fire-related projects. Set provisions for the remaining 49% of savings to be returned to the national suppression reserve.
f. Require each region or logical geographic division to contribute a co-payment to the wildland fire suppression expenditure before granting access to the national suppression reserve (see example).
g. Improve adjacent agency partnerships to co-manage the funds. Combine allocations where practical and feasible.
h. Increase regional tracking and reporting of suppression expenditures. Establish a headquarters Comptroller, who reports directly to the agency administrator (not the fire organization) explicitly for suppression cost allocations, monitoring, and suppression reserve management.

Supporting Recommendations

A. Training and Mentoring

*Improve agency administrator performance in large fire management decision making by developing a decision making module explicitly for agency administrators that addresses cost management and risks. It should be a prerequisite for approval of large fire strategies.
*Require certification of completion of training via the red card system.
*Adopt the principles and essence of the Oregon "Interagency Wildfire Administrator Mentoring Program." Require mentors for all agency administrators who have not experienced a large fire event within the last three years.
*Sponsor an interagency cost-containment symposium at the national level with IMT members and agency administrators as the target group. Have presentations by WFLC, fire economists, OMB, GAO, and others as appropriate. Use work groups to brainstorm innovative methods of strategic cost containment principles and practices which can be incorporated into all operational components.

B. Consultation and Operational Protocols

*Require approval of the suppression allocation operational rules and oversight procedures by WFLC.
*Consult frequently with OMB and Congressional interests on the management of severity funding and suppression costs.
*With Congressional approval, allow regions to mix presuppression and suppression funds for the most effective program to reduce or control the rate of growth of suppression costs.
*Develop extreme fire decision-making protocols that include national leadership and stakeholders.
*Require a strategic re-evaluation of the suppression operations and outcomes for extreme fires, those that have escaped initial and extended attack and for which there is no apparent end in sight. Required features of the re-evaluation include:

*National level, facilitated by senior level fire and agency administrators
*Abandon perimeter control in favor of values-at-risk protection
*Involve state and local stakeholders

C. Large Fire Costs Reviews

*Eliminate large fire costs reviews as they are currently conducted.

II - Resource Management Planning (R/LMP) and Fire Management Plan (FMP) Relationships
Core Recommendation

2. Set policy and direction on agency land and resource management planning to incorporate cost management on large wildfires.

Required features are:
a. Display the anticipated wildland fire suppression costs in R/LMPs for each alternative proposed, including the no-action alternative.
b. Establish expectations in R/LMPs and FMPs for costs of implementing the plans by recognizing the probability of large fire occurrence and specifying acceptable losses, given the land management direction established.
c. Where state, local, and tribal governments have established effective cost management guidance, consider it in the agency planning process.

Supporting Recommendations

A. Land management planning and Condition Class
*Land management planning must consider the Condition Classes that result from land management decisions.
*R/LMPs will specifically analyze all alternatives, including the no-action alternative, to determine and display the resultant Condition Class distribution over time for the unit planned.
*Land management decisions must consider the reality and probability of maintaining the desired conditions they attempt to create.
*Greater consideration of wildland fire use must be employed to maintain appropriate Condition Class.

B. Operational considerations for fire management in the WFSA on large wildfires
*Operational consideration of wildland fire suppression cost will be included in the management of all fires larger than 300 acres.
*Each administrative unit will develop cost data for large fires. These will be used in the WFSA as guidance for implementation by comparing similar wildland fire events.
*The WFSA will be prepared using the acceptable losses established in the land management and fire management planning processes.
*Break-even analysis for each fire will become the measure for wildland fire suppression success (Calkin et al, 2004). The use of break-even measures will change the agency frame of reference to savings created by wildland fire suppression rather than simply cost.
*The cost of social and political influences on operational decisions in wildland fire suppression will be identified and displayed in the WFSA.

III - Sustaining Initial and Extended Attack Capability (Drawdown)
Core Recommendation

3. Plan, budget, and manage resources effectively for large fire suppression such that resources for effective initial response and extended attack are not compromised.

Required features are:

a. Develop standard procedures to determine minimum resource levels needed to be maintained for effective initial and extended attack in each geographic area using predictive services capabilities based on Energy Release Component, or other applicable fire danger index.
b. For those resources not needed to meet the requirements noted above, develop and establish protocols for national control and positioning of those resources.

Supporting Recommendations

A. Budgeting and resource allocation issues
*Provide consistent budgeting for preparedness resources to the field. This element would involve a cohesive, long-term budget strategy that includes preparedness, emergency suppression, fuels management, and state fire assistance to implement an effective, cost-efficient fire management program.
*Establish a group comprising agency administrators, budget personnel, regional and forest fire managers (or equivalent) to review and establish equitable procedures to ensure yearly stability or growth in fire preparedness allocations to field units.

B. Procedures for fire preparedness stability and Multi-Agency Coordination protocols.
*For positioning resources effectively to meet the wildland fire suppression need, develop Multi-Agency Coordination group protocols for shifting resources among incidents using cost management as a criterion, in addition to the other criteria currently used. Resources could potentially be made available if rapid containment could be achieved on a lower priority incident.

IV - Initial Attack and Extended Attack Response
Core Recommendation

4. Ensure initial responses are always aggressive and driven by the principle of utilizing the closest appropriate resources, including those of local and tribal governments.

Required features are:

a. Use all available local resources in wildfire suppression strategy to create an integrated and coordinated response to wildland fire.
b. Form local Type 3 Incident Management Teams to manage initial and extended attack operations locally rather than rely on mobilization of Type 1 and Type 2 teams. Develop agreements with local, state, tribal and federal agencies that establish local Type 3 IMTs.
c. Focus meaningful federal and state agencies' financial support and provide appropriate technical assistance to strengthen local resources and assure their availability on a wildfire incident.

Supporting Recommendations

A. Financial support, technical assistance and new training systems
*Focus existing cooperative programs on developing new training systems designed to meet the needs of rural and volunteer firefighters in support of an integrated system.
*Local, state and national fire organizations will work together to develop a performance-based wildland fire training "delivery package" that targets volunteer and rural fire departments. This package should include on-site delivery of training, short training blocks, and virtual and distance education opportunities.

B. Capacity of local federal units to support large fire management
*Increase the capacity of local federal units to support large fire management.
*Develop requirements that all new employees support wildland fire emergencies to the fullest extent of their abilities.
*Employees will be strongly encouraged to become involved on the local unit level.

V - Landscape Fuels Management for Public, Tribal and Private Lands
Core Recommendation

5. Incorporate fuels management and future fire management cost considerations when planning all resource management projects for public and private lands.

Required features are:

For Public Lands
a. Develop interagency protocols that identify and report acres of hazardous fuels reduction from wildland fire.

b. Require analysis of burned-over areas and adopt active management strategies to ensure that excessive fuels do not accumulate again.
c. After large wildfires, re-evaluate the impacts and feasibility of adopting strategies that use the recently burned areas as boundaries for less costly wildland fire use. Incorporate the opportunity presented by the wildfire into the unit' s fuels strategy.

For Private Lands
a. Engage communities and property owners in creating defensible space around structures, and appropriate land use, zoning and construction methods and standards for structures situated in fire hazard areas.
b. Strive to make R/LMPs and FMPs ultimately into national, comprehensive, interagency and intergovernmental wildland vegetation defensive management plans.

Supporting Recommendations

A. Public education and support for FIREWISE and fire safety programs
*Develop and disseminate Fire Safe and FIREWISE guides and building code changes for development in the wildland/urban interface. Develop a wildland fuels hazard rating, indicating flammability potential and locations of highest wildfire risks, relative to social, community and ecological values. Design a wildland fuels treatment objective aimed toward achieving a safer mix of age-class distributions in chaparral fuel types and condition-class distributions in conifer fuel types.
*Develop programs for upgrading the fire safety of nonconforming structures in WUI zones
*Pursue consideration of tax credits for retrofitting older homes and provide insurance industry discounts

VI - Fire Cost Data Management Needs
Core Recommendation

6. Commit to improving the fire cost data infrastructure as a prerequisite step toward improving accountability and strengthening fire management performance.

Required features are:

a. Wildland fire management agencies should begin the development of a more complete fire database and management information.
b. Forest Service Research and Development, in partnership with the fire agencies, should be charged with developing and maintaining this database and with developing a regular series of peer-reviewed reports and analyses that track cost patterns and influences over time.
c. Establish an effective national fire-related information technology/information management framework under the guidance of the Wildland Fire Leadership Council.
d. Develop an integrated database for all federal, state, and local agencies involved in the collection of wildland fire data that allows for sharing information across agencies and provides for a consolidation report on wildland fire response.

Supporting Recommendations

Improvements in information development are needed in three major areas cited below. Some of this information is available elsewhere, such as aviation use (in the Aviation Management Information System) but this information can' t be matched with specific fires under the current fragmented non-relational data system.

A. Fire expenditure information

The most onerous deficiency is the lack of P-code information to track fire-specific expenditures currently available in the National fire occurrence database (NIFMID). As it now stands, only about 40% of the large fires in the database have a usable P-code information for the Forest Service. The Department of the Interior information is unknown. This means that for more than 60% of the fires, there is no way to match actual fire suppression expenditures from the financial accounting system to the fire characteristics in NIFMID. This problem could be fixed by going back, if possible to FY 1995, the earliest year for which we still have the fire-specific expenditure data in the files (Forest Service only). This data needs to be collected in a way that can identify fire complexes. At the same time we should incorporate DOI data (BLM data may be the most compatible) to build the broadest federal database for assessing large fire costs.

B. Management actions and results

Data needs to be collected at several crucial points (temporal and geographic) during the fire, not just at the point and time of origin. The type of information that would be helpful includes:

*Primary objectives of fire suppression (why the fire is being suppressed), which could include categories such as protecting lives, property, preventing spread onto other agency lands and protecting threatened and endangered species habitat,

*Wildland fire use (WFU) details,

*Effort expended on structure protection, resources used -- not just type and number, but hours,

*Information on the incident management team type assigned to the fire,

*Length and type of fireline,

*Acres burned in different severity classes (and unburned acres),

*Timelines, including dates on which the fire made significant runs and associated weather on those dates,

*Information from daily updates made to the WFSA document (nationally archived WFSAs could be linked to individual fire events in NIFMID,

*Spatial database integrated with the WFSA system.

C. Physical fire setting data

Many of these can be obtained through existing geospatial databases and be recorded for the specific fire.

*Fire regime/Condition Class

*Topographic features indicating ease of access and fire behavior, including road access.

*Ownership patterns and wildland/urban interface development patterns in the surrounding area of potential fire influence.

*Property and resource values adjacent to the fire perimeter,

*Location of past fuels treatment areas.

VII - Cost Management Metrics
Core Recommendation

7. Develop and use a benefit cost measure as the core measure of suppression cost effectiveness.

Required features are:

a. Measure should be supported by a comprehensive analysis of wildland fire suppression expenditures and losses averted.

b. Analysis should be supported with a comprehensive knowledge base of fire management costs, suppression cost drivers, and values-at-risk.

c. Losses averted and suppression costs should be estimated and compared on every fire greater than 300 acres, using defensible methodology for estimation of values-at-risk and scientific fire behavior predictions for estimating the extent of fire involvement in the absence of control.

d. Benefit/cost ratios should be tracked over time and across regions and forests to assess trends.

B - Data Used

WILDLAND FIRE MANAGEMENT BUDGET DATA USED (NOMINAL VALUES)				
Fiscal Year (A)	Fire Operations		Initial Attack (B+C)	Suppression (D)
	Presuppression (B)	Severity (C)		
1971	$30,139,322	$0	$30,139,322	$82,929,089
1972	$30,194,836	$0	$30,194,836	$60,508,114
1973	$31,618,290	$0	$31,618,290	$62,141,570
1974	$35,864,090	$0	$35,864,090	$110,053,738
1975	$47,020,132	$0	$47,020,132	$114,479,335
1976	$38,354,111	$0	$38,354,111	$221,004,515
76TQ	$13,781,468	$0	$13,781,468	$0
1977	$111,254,555	$0	$111,254,555	$95,435,588
1978	$104,541,207	$0	$104,541,207	$27,683,921
1979	$115,288,501	$0	$115,288,501	$80,339,053
1980	$138,338,458	$0	$138,338,458	$63,375,264
1981	$151,709,352	$0	$151,709,352	$97,822,618
1982	$124,894,897	$0	$124,894,897	$27,158,985
1983	$135,081,899	$0	$135,081,899	$31,803,617
1984	$139,024,025	$0	$139,024,025	$62,011,053
1985	$141,477,807	$0	$141,477,807	$160,473,143
1986	$140,804,355	$0	$140,804,355	$110,252,540
1987	$145,674,975	$631,523	$146,306,499	$252,402,013
1988	$150,798,495	$10,995,389	$161,793,884	$413,603,415
1989	$144,755,945	$7,280,089	$152,036,034	$317,762,959
1990	$158,824,765	$27,341,672	$186,166,437	$219,750,976
1991	$162,674,056	$23,408,707	$186,082,763	$109,938,530
1992	$169,620,330	$29,160,879	$198,781,209	$254,825,229
1993	$164,620,006	$3,400,296	$168,020,303	$108,512,905
1994	$141,293,264	$6,225,922	$147,519,185	$667,557,238
1995	$105,486,062	$4,778,848	$110,264,910	$167,660,724
1996	$219,978,489	$16,304,408	$236,282,897	$493,420,582
1997	$238,639,552	$4,549,525	$243,189,077	$151,326,227
1998	$246,647,423	$3,887,661	$250,535,083	$215,441,312
1999	$239,329,001	$6,506,769	$245,835,770	$344,683,686
2000	$307,454,968	$45,313,602	$352,768,570	$978,947,398
2001	$570,848,582	$15,018,388	$585,866,970	$646,395,202
2002	$629,793,145	$59,850,085	$689,643,230	$1,146,024,767
SOURCE: RMRS-4802 Economic Research Work Unit, USDA Forest Service				

INDEX VALUES USED				
Year	All Items (CPI)	Transportation	Medical Care	SU Index (FS)
1971	40.5	39.5	36.1	205.65
1972	41.8	39.9	37.3	150.05
1973	44.4	41.2	38.8	154.10
1974	49.3	45.8	42.4	272.92
1975	53.8	50.1	47.5	283.89
1976	56.9	55.1	52.0	548.06
1977	60.6	59.0	57.0	236.7
1978	65.2	61.7	61.8	68.7
1979	72.6	70.5	67.5	199.2
1980	82.4	83.1	74.9	157.2
1981	90.9	93.2	82.9	242.6
1982	96.5	97.0	92.5	67.4
1983	99.6	99.3	100.6	78.9
1984	103.9	103.7	106.8	153.8
1985	107.6	106.4	113.5	398.0
1986	109.6	102.3	122.0	273.4
1987	113.6	105.4	130.1	625.9
1988	118.3	108.7	138.6	1025.7
1989	124.0	114.1	149.3	788.0
1990	130.7	120.5	162.8	545.0
1991	136.2	123.8	177.0	272.6
1992	140.3	126.5	190.1	631.9
1993	144.5	130.4	201.4	269.1
1994	148.2	134.3	211.0	1655.5
1995	152.4	139.1	220.5	415.8
1996	156.9	143.0	228.2	1223.6
1997	160.5	144.3	234.6	375.3
1998	163.0	141.6	242.1	534.3
1999	166.6	144.4	250.6	854.8
2000	172.2	153.3	260.8	2427.7
2001	177.1	154.3	272.8	1603.0
2002	179.9	152.9	285.6	2842.0
SOURCE: RMRS-4802 Economic Research Work Unit, USDA Forest Service				

INFLATION ADJUSTED 2002$ - FOREST SERVICE			
Year	IA	SU-2002$	Total = SU+IA
1971	$111,602,008	$307,075,682	$418,677,691
1972	$106,830,970	$214,080,999	$320,911,969
1973	$107,133,063	$210,555,876	$317,688,939
1974	$113,288,000	$347,639,319	$460,927,319
1975	$134,697,411	$327,946,127	$462,643,538
1976	$138,435,442	$585,867,957	$724,303,398
1977	$277,043,686	$237,651,636	$514,695,321
1978	$243,515,491	$64,486,185	$308,001,676
1979	$248,513,022	$173,176,862	$421,689,884
1980	$273,735,788	$125,403,147	$399,138,935
1981	$273,734,551	$176,504,811	$450,239,362
1982	$210,565,340	$45,788,428	$256,353,768
1983	$218,192,482	$51,371,132	$269,563,615
1984	$216,528,998	$96,581,805	$313,110,803
1985	$213,316,755	$241,957,455	$455,274,210
1986	$207,313,183	$162,330,242	$369,643,425
1987	$209,682,850	$361,736,313	$571,419,163
1988	$224,498,301	$573,898,479	$798,396,781
1989	$203,150,644	$424,595,066	$627,745,710
1990	$239,744,243	$282,994,251	$522,738,494
1991	$230,667,542	$136,279,418	$366,946,960
1992	$240,080,812	$307,768,768	$547,849,580
1993	$267,498,880	$128,022,767	$395,521,646
1994	$253,042,402	$770,820,162	$1,023,862,564
1995	$265,954,435	$189,484,322	$455,438,757
1996	$261,820,417	$546,749,614	$808,570,032
1997	$264,308,081	$164,467,686	$428,775,766
1998	$268,482,176	$230,874,461	$499,356,637
1999	$259,748,780	$364,190,968	$623,939,748
2000	$365,992,621	$1,015,644,688	$1,381,637,309
2001	$593,685,707	$655,021,724	$1,248,707,431
2002	$689,643,230	$1,146,024,767	$1,835,667,998
SOURCE: RMRS-4802 Economic Research Work Unit, USDA Forest Service			

DOI - INFLATION ADJUSTED 2002$ AND ACRES BURNED		
Fiscal Year	**SU - 2002$**	**Acres**
1985	$118,266,886	1,984,000
1986	$134,209,049	1,185,000
1987	$116,734,989	966,000
1988	$207,185,908	3,201,000
1989	$224,635,369	2,736,000
1990	$185,767,032	2,755,000
1991	$ 91,507,014	1,505,000
1992	$105,275,967	659,000
1993	$ 66,586,338	943,000
1994	$186,060,610	1,985,000
1995	$124,460,577	998,000
1996	$170,293,101	4,425,000
1997	$114,170,569	3,080,000
1998	$117,776,978	834,000
1999	$163,155,133	2,787,000
2000	$347,352,548	2,515,000
2001	$249,280,987	1,283,000
2002	$395,040,000	2,234,000
SOURCE: Office of Wildland Fire Coordination, Department of the Interior, Washington, DC		

NUMBER OF FOREST SERVICE FIRES BY SIZE CLASS AND YEAR

	Size Class							
Year	G	F	E	D	C	B	A	Total
1980	16	26	72	142	957	3,411	6,610	11,234
1981	13	33	66	127	1,061	3,745	7,923	12,968
1982	2	7	18	62	531	2,078	5,319	8,017
1983	0	11	34	64	509	1,865	4,546	7,029
1984	5	19	51	66	595	2,416	6,976	10,128
1985	25	50	57	119	709	2,694	6,531	10,185
1986	21	41	78	153	972	3,520	5,937	10,722
1987	55	79	145	201	1,193	4,264	7,608	13,545
1988	63	81	104	247	1,133	4,161	7,060	12,849
1989	30	61	83	148	800	3,833	7,006	11,961
1990	20	37	64	102	772	3,555	7,435	11,985
1991	7	38	61	108	631	2,989	7,122	10,956
1992	22	43	62	112	634	3,077	7,777	11,727
1993	12	22	44	70	580	2,300	4,813	7,841
1994	61	98	124	178	918	4,740	8,658	14,777
1995	16	46	56	126	787	2,932	5,340	9,303
1996	49	77	124	165	856	3,471	6,832	11,574
1997	10	14	38	60	465	2,264	5,098	7,949
1998	12	38	62	114	622	2,767	5,862	9,477
1999	30	61	99	152	856	3,335	6,460	10,993
2000	90	94	142	199	1,036	3,914	6,531	12,006
2001	29	65	83	154	721	3,330	6,753	11,135
2002	59	57	82	121	602	2809	5,586	9,316
Total	647	1,098	1,749	2,990	17,940	73,470	149,783	247,677

Source: NFMID as reported by Fire Programs Solutions, Cheetah2 data base.
Note: Fires listed are reported in NFMID to be >0 acres

NUMBER OF FEDERAL FIRES BY SIZE CLASS AND YEAR								
	Size Class							
Year	G	F	E	D	C	B	A	Total
1980	51	134	249	367	1,914	5,669	9,762	18,146
1981	83	169	286	374	1,917	6,085	11,728	20,642
1982	25	68	97	197	1,089	3,841	7,909	13,226
1983	45	110	216	277	1,467	4,186	7,359	13,660
1984	55	147	246	306	1,513	4,901	10,162	17,330
1985	133	244	289	387	1,649	5,696	9,416	17,814
1986	97	163	262	368	1,792	5,899	8,935	17,516
1987	98	200	326	455	2,170	7,123	10,963	21,335
1988	168	249	336	561	2,142	7,297	10,611	21,364
1989	61	171	269	379	1,621	6,531	10,306	19,338
1990	110	145	209	334	1,539	6,276	11,248	19,861
1991	97	132	201	279	1,327	5,739	10,931	18,706
1992	58	142	202	344	1,483	6,425	12,583	21,237
1993	60	113	190	283	1,453	5,613	8,380	16,092
1994	149	294	361	457	2,061	8,894	13,543	25,759
1995	64	175	244	325	1,601	6,520	9,223	18,152
1996	202	299	397	493	1,928	7,369	11,614	22,302
1997	52	88	160	237	1,119	5,119	8,786	15,561
1998	51	135	202	305	1,396	6,520	9,629	18,238
1999	149	269	331	409	1,807	7,203	10,655	20,823
2000	242	301	374	499	2,047	8,179	11,641	23,283
2001	95	201	267	381	1,532	7,240	11,646	21,362
2002	153	164	223	275	1,351	6,659	10,268	19,093
Total	2,298	4,113	5,937	8,292	37,918	144,984	237,298	440,840

Source: NFMID as reported by Fire Programs Solutions, Cheetah2 data base.
Note: Fires listed are reported in NFMID to be >0 acres

FOREST SERVICE ACRES BURNED			
Year	<300 Acres	>300 Acres	Total
1980	59,213	184,008	243,221
1981	75,063	381,778	456,841
1982	37,702	36,670	74,372
1983	33,704	70,127	103,831
1984	35,765	151,060	186,825
1985	52,039	641,513	693,552
1986	63,394	387,824	451,218
1987	58,467	1,147,711	1,206,178
1988	101,868	3,573,639	3,675,507
1989	52,752	535,528	588,280
1990	50,037	450,785	500,822
1991	41,315	180,364	221,679
1992	55,787	709,604	765,391
1993	31,734	235,962	267,696
1994	66,857	1,639,228	1,706,085
1995	50,047	308,651	358,698
1996	68,436	1,284,952	1,353,388
1997	38,698	315,079	353,776
1998	41,318	226,127	267,445
1999	49,321	936,137	985,458
2000	85,014	2,645,196	2,730,210
2001	51,488	714,290	765,778
2002	54,147	2,074,452	2,128,599
SOURCE: RMRS-4802 Economic Research Work Unit, USDA Forest Service			

PER CAPITA EXPENDITURES 2002$				
Year	Wildfire Suppression	US Government	Transportation	Medical Care
1971	$1.48	$6,089.17	$479.83	$1,045.60
1972	$1.02	$6,253.62	$500.43	$1,109.05
1973	$1.00	$6,407.94	$506.61	$1,175.14
1974	$1.63	$6,701.61	$504.92	$1,218.61
1975	$1.52	$7,088.01	$503.91	$1,271.08
1976	$2.69	$7,053.07	$522.95	$1,342.45
1977	$1.08	$7,024.28	$551.83	$1,419.81
1978	$0.29	$7,153.89	$560.06	$1,500.84
1979	$0.77	$7,291.20	$574.96	$1,545.40
1980	$0.55	$7,656.33	$567.78	$1,605.81
1981	$0.77	$7,834.89	$552.78	$1,703.96
1982	$0.20	$8,051.84	$530.53	$1,770.62
1983	$0.22	$8,332.90	$560.32	$1,895.13
1984	$0.41	$8,636.64	$615.53	$2,002.47
1985	$1.02	$9,088.21	$662.24	$2,100.79
1986	$0.68	$9,402.49	$681.20	$2,191.97
1987	$1.49	$9,565.98	$715.14	$2,319.92
1988	$2.35	$9,619.30	$757.06	$2,512.94
1989	$1.72	$9,828.54	$768.74	$2,666.24
1990	$1.13	$10,161.10	$761.98	$2,868.38
1991	$0.54	$10,138.51	$711.96	$2,983.59
1992	$1.20	$10,476.60	$742.51	$3,164.97
1993	$0.49	$10,405.40	$783.90	$3,245.90
1994	$2.93	$10,360.89	$836.42	$3,303.99
1995	$0.71	$10,461.77	$881.54	$3,386.53
1996	$2.03	$10,571.00	$931.65	$3,428.38
1997	$0.60	$10,543.66	$979.42	$3,480.01
1998	$0.84	$10,561.58	$1,008.10	$3,579.44
1999	$1.31	$10,801.84	$1,046.60	$3,639.24
2000	$3.60	$11,039.70	$1,071.03	$3,775.25
2001	$2.30	$11,286.73	$1,045.00	$3,945.06
2002	$3.98	$11,665.29	$1,016.76	$4,176.42
SOURCE: RMRS-4802 Economic Research Work Unit, USDA Forest Service				

HISTORICAL FIRE REGIMES BY CONDITION CLASS
(ALL FEDERAL RESOURCE AGENCIES-ALL COVER TYPES)

Historical Fire Regime	Condition Class							
	Class 1		Class 2		Class 3		Total	
	Acres	%	Acres	%	Acres	%	Acres	%
0-35 years; low severity	38,549,928	29	58737961	44	35284495	27	132572384	31
0-35 years; stand replacement	23,797,429	43	31326398	56	725988	1	55849815	13
35-100+ years; mixed severity	77,595,589	51	52312303	35	21084744	14	150992636	36
35-100+; stand replacement	29,198,107	52	10270812	18	17095773	30	56564692	13
200+ years; stand replacement	23,533,046	87	3139928	12	390913	1	27063887	6
Total	192,674,099	46	155787402	37	74581913	18	423043414	
Note: Cover types not included: Agriculture, Barren, Water, and Urban/Development/Agriculture								
USDA Forest Service General Technical Report RMRS-GTR-87. 2002. 15								

C - OTHER CONSIDERATIONS OF THE PANEL APPROACH TO THE ANALYSIS

The panel established a hypothesis testing model to guide their inquiry. The null hypothesis thus established was:

> HO = the unit cost of wildland fire suppression has not increased at a rate greater than other cost indices in the United States.

If this hypothesis is accepted, then the inquiry would take on a study of large fire cost considerations that deals with containing existing expenditures and reducing existing cost items. The Panel believes that in the multitude of studies, reviews, and reports that have already been written on this issue, most of what is knowable about containing and reducing costs under the accepted hypothesis is already known. Therefore, the panel would focus on review and prioritizing those actions already identified, assuring comprehensive coverage, adding any actions the panel thought were overlooked.

However, if the alternative hypothesis, that is: HA = the unit cost of wildland fire suppression has increased at a rate greater than other cost indices in the United States, is accepted, then the Panel's inquiry would focus on the driving factors that are making wildland fire expenditures increase at a rate greater than the general economy. This area of inquiry has received little attention in past reviews.

The analysis necessary to accept the null hypothesis is mostly an economic analysis. However, the panel did believe that environmental, demographic, social, and political influences on large fire costs were appropriate to review as well. This entire "suite of indicators" on large fire costs would serve as a foundation for the analysis by the Panel. The body of this report contains the indicators that drive large fire costs.

However, during the Panel's discussions two other items were carefully considered, and ultimately rejected, because of the inappropriate nature of the information. First, the use of a suppression cost index compared with other general economic indices (CPI, medical costs, and transportation cost indices) gave way to the use of the per capita expenditures on these same elements. Secondly, the use of suppression cost per acre as a criterion for anything was abandoned in favor of the Panel's recommendations on wildland fire suppression cost measures found in the body of this report.

In addition, one area reviewed and presented here as background information was the definition and analysis of "extreme cost" wildfires. Statistical analysis differentiated "extreme cost" wildfires from normal cost wildfires and the results are discussed below.

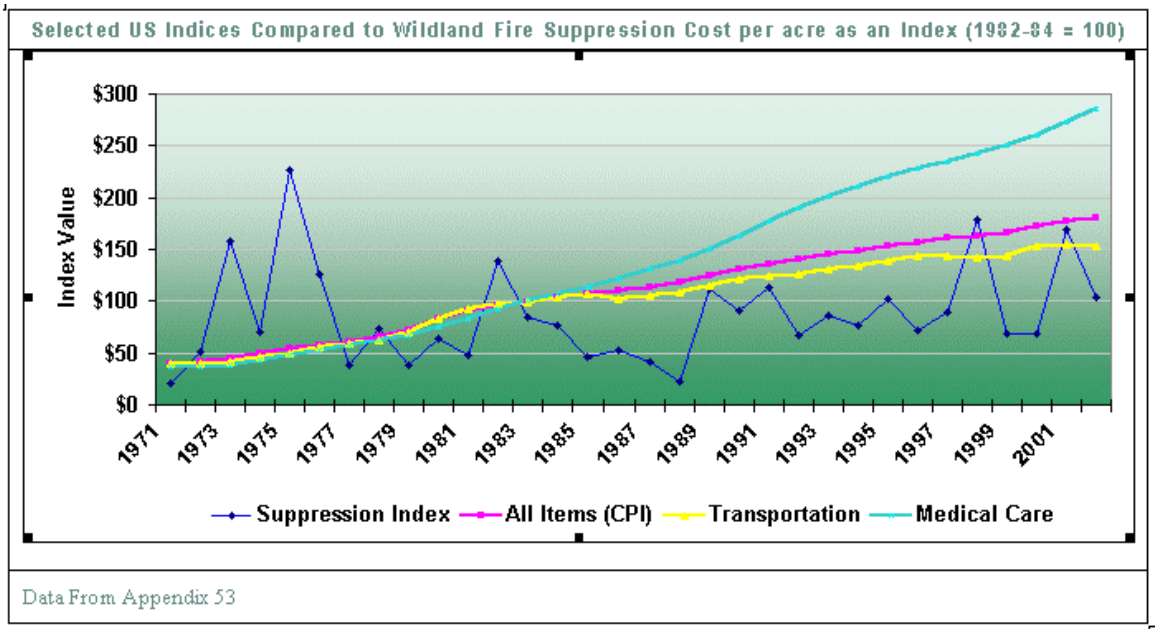
Suppression Cost Index

Economic presentations by the research work unit in Missoula compared three major U.S. indices; consumer prices, transportation, and medical cost indices, with the wildland fire suppression cost per acre expressed as an index (Gebert and Schuster, 2004).

It should be noted, however, that the comparison of wildland fire cost per acre with other cost indices is not a perfect comparison. The other indices are based on a fixed "market basket" of goods, that is, the quantity and type of items are fixed from year to year and the only factor that changes is the prices of the goods. For wildland cost per acre, there is not a fixed "market basket." The product "being purchased" changes substantially from year to year, hence the wide variability

in the cost per acre index. However, because there is no "official" index of wildland fire suppression costs, this comparison is presented in the graph below. This analysis is not statistically rigorous, so firm conclusions cannot, and should not, be made from it. In general, the analysis shows wildland fire suppression costs are not increasing at a higher rate than any other index. Suppression cost is not rising as fast as some, e.g. medical costs, according to the index comparison.

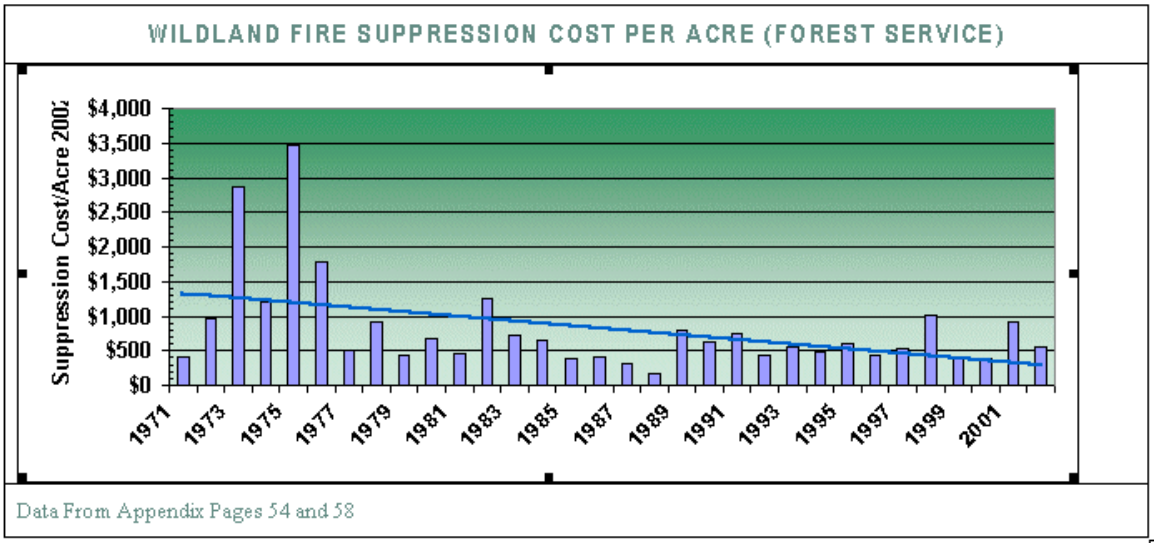
The comparison of indices to the suppression cost per acre (expressed as an index) was not used in the final analysis. The per capita expenditure information that follows was used to make similar, but different conclusions.



Wildland Fire Suppression Expenditures Per Unit Area (Cost per Acre)

An economic analysis shows the cost per acre is decreasing when costs are placed on a per unit basis (Gebert et al, 2004). Given that cost per acre is decreasing and that total cost is increasing one can infer that the total cost of suppression is simply keeping pace with the total number of acres burned. Basically, as the total number of acres burned has increased, so has total cost, but the unit cost has decreased.

Another inference is that declining unit cost implies increasing productivity in wildland fire suppression operations. However, this also could simply be a manifestation of expended capacity, i.e., at the highest Preparedness Level there is not a significant incremental increase in firefighting resources available (military assets aside) to be assigned to large fires, so the cost is relatively low. At the margin there are small increases in costs relative to acres burned, creating a potentially false sense that efficiencies are gained. As can be seen from this discussion, cost per acre can provide conflicting information.



The cost per acre measure is not a good one, and is actually far from it. The Panel debated the merits of using cost per acre as a metric for success. Cost per acre fails to measure the actual product of wildland fire suppression, e.g. its benefit.

The Panel rejected cost per acre and recommends the entire concept be dropped in the future. The Panel makes strong recommendations about the metrics used to measure wildland fire suppression success, and believes that cost per acre has no place in that measure. The cost per acre measure is presented here only for historical comparison and to illustrate its worthlessness as a success measure. Cost per acre might serve as a measure of efficiency if its variation could be explained from location to location, fire to fire, and year to year.

"Extreme Cost" Wildfires

In addition to the general expenditure trend, it appears as though some wildfires are "extreme" in their cost, as opposed to simply being expensive (table below). Preliminary economic research attempted to identify characteristics of these "extreme cost" wildfires compared to normal but costly wildfires (Gebert, et al, 2004). For purposes of the preliminary inquiry an "extreme cost" wildfire was defined as one that was an outlier (in terms of median cost) for both cost per acre and total cost (1.5 times the value of the 75th percentile of cost).

EXTREME COST WILDFIRES

	Extreme				Normal			
Size Class	D	E	F	G	D	E	F	G
Number of fires	41	20	12	13	221	174	118	76
Percentage	16.6	10.3	9.3	14.6	83.4	89.7	90.7	85.4
Median cost	$916,345	$2,397,630	$4,602,971	$16,149,982	$57,019	$142,328	$255,763	$2,500,677
Median cost per acre	4,618	4,172	2,119	902	334	280	120	157

From: Gebert et all, 2004, Comparison of the characteristics of "extreme" cost wildfires to the majority of Wildfires, RMRS-4802 (Economics Unit)

These characteristics (table below) drive the cost of a wildfire above 1.5 times the median cost value of all large wildfires. The results of the preliminary work indicate roughly 10 to 20 percent of large wildfires fall in the "extreme" category. A positive correlation means that the wildfire cost is directly related to the characteristic, while a negative correlation is the opposite. For example the distance a wildfire is from an open road is positively correlated with the wildfire' s "extreme cost" (farther from the road drives up cost). The distance from a town is negatively correlated (farther away from town means less cost).

IMPORTANT CHARACTERISTICS MAKING "EXTREME" WILDFIRES			
CHARACTERISTIC	**CORRELATION**	**CHARACTERISTIC**	**CORRELATION**
Fuel type (timber/slash versus grass/brush)	Positive	Wildland/Urban Interface	Positive
Burning index	Positive	Net value change	Positive
Energy release component	Positive	Median family income	Positive
Fire intensity level 5, 6	Positive	Median mortgage	Positive
Aspect, slope, elevation	Positive	Median housing value	Positive
Distance to a town	Negative	Forest Service Region (1, 5, 6)	Positive
Distance to an open road	Positive	Average fire deviation (more fires than usual)	Negative

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