Towards a Collaborative Cost Management Strategy

2006 U. S. Forest Service Large Wildfire Cost Review Recommendations

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A Report on 2006 Wildland Fires by the Independent Large Wildfire Cost Panel Chartered by the U. S. Secretary of Agriculture.

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Center for Executive Education
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Executive Summary

This report by an independent review panel examines fire suppression costs for wildfire incidents during Fiscal Year 2006 that exceed $10,000,000 in cost. Its purpose was to: "Determine if the Forest Service exercised fiscal diligence in managing specific incident suppressing activities." In terms of objectives, the Panel was asked to focus on strategic decisions and actions, compliance with policy and law, and risk analysis and management. There were 20 such fires whose suppression cost approached $500 million in total, exclusive of burned area emergency rehabilitation costs and accounted for over 1.1 million burned acres. One fire (Sawtooth) was excluded as a state managed fire. The fires were in 17 national forests, included five regions, six states and numerous counties.

The Panel conducted site visits on 16 forests where the fires occurred (four forests had two fires exceeding the $10 million mark). These site visits featured strategic discussions of pre-fire conditions, the fire chronology and suppression actions and results, and assessment of cost management and fire outcomes.

The Panel formally voted "No" in terms of the forest having exercised inappropriate or inadequate fiscal diligence for each of the 19 fires they assessed.

A second purpose of the review was for the Panel to address cross-cutting cost management issues and potential strategies that could impact fire suppression costs at strategic levels. The panel acknowledged that current efforts by forests and their incident business advisors to ensure compliance with contracting and resource allocation procedures and to maintain a high level of fiscal vigilance for potential waste and abuse were important, but unlikely to affect spending levels by more than 10%.

Four issue areas are addressed in the recommendations section that could, in the view of the Panel, potentially help contain suppression costs and future increases in wildfire costs at much higher levels. Recommendations are developed for:

- Land Management and Resource Plans and Fire Management Plans as Strategic Frameworks for Managing Fire Suppression Investment
- The Wildland Fire Situational Analysis and Delegation of Authority as Fire Suppression Management and Cost Factors
- Incident Management Team Structure & Transitions As Fire Suppression Cost Factors
- Formulating a new Collaborative Cost Management Strategy

Summary of Recommendations

Land Management & Fire Management Plans

1A. Develop guidance for future revisions of Land Management Plans. Future LMPs would incorporate elements on fuels reduction activities, changes in the WUI, the impacts of climate change and forest health, including fire history as an integral component.

1B. Transform the Fire Management Plan from a static, program reference document to a strategic assessment of fire management planning and policies. The FMP would factor in fire protection policies with state, local, tribal neighbors, cost management expectations, and establishes a strong linkage from the FMP to the WFSA process.

1C. Expand Appropriate Management Response guidance beyond the model and textual boilerplate currently found in most FMPs.

Wildland Fire Situational Analysis and Delegation of Authority

2A. Encourage more collaboration in the WFSA process while rethinking the WFSA process to allow IMTs and line staff to jointly develop wildfire strategies through (WFSA or replacement process for the WFSA), within 36 hours from the time of assignment,

2B. Address options for short term and long term management of suppression resources. WFSAs should develop and contain scale-down triggers for resource management, especially with regard to the length of time Type I and Type II teams remain on fires.

2C. Make delegation of authority letters strategic documents. They should contain specific statements outlining larger suppression objectives, resource values and final restoration concerns, and expectations about containing fire cost growth.

Incident Management Team Structure and Transitions

3A. Tailor more agile IMTs to the needs of the incident, as opposed to a standard IMT formula. Make IMTs more adaptable towards selective deployment capability.

3B. Enhance local Type III IMTs to provide for a more robust capability during incident close out while capitalizing on state and local resources to provide additional protection resources or to supplement the IMT.

3C. Instill more flexibility when committing IMTs to prolonged large fire operations. By pre-setting trigger points (up/down/maintain) based on incident complexity and tactical resource commitments that indicate a need to rescale incident operations, particularly during the closing phases of fire fighting operations.

Formulating a New Collaborative Cost Management Strategy

4. Formulate a collaborative cost management strategy that provides a better picture of fire suppression costs over the incident span, establishes short term and longer term cost plans for fire resource ordering and procurement, and reaffirms the regional and national role in pricing fire resources (federal, state & local, private contractor and military).

Introduction – The 2006 Fire Season

The 2006 fire season in the United States set a number of historical records for wildfire activity; 9,873,745 acres on federal and state lands were reported burned from a total of 96,385 fires.[1] To provide some perspective, acres burned as a result of wildfires since 2000, generally regarded as the "fire year of the century" when 7.4 million acres burned, have now exceeded that supposed benchmark three out of six years.

Total suppression costs for the U.S. Forest Service in 2006 were also at record levels, as the FY 2008 President's budget succinctly notes: "The agency (US Forest Service) spent 1.5 billion in suppression costs, on over 2 million acres burned. Nearly $400 million was spent on 20 of the largest fires." [2] Actually, those 20 largest fires – the object of this 2006 large wildfire cost review approached $500 million, exclusive of burned area emergency rehabilitation costs.

What is driving this dramatic increase in wildfire activity has also been extensively commented on. Since the advent of the National Fire Plan in 2000, several studies of large wildfire activity and the resultant costs have been conducted looking at causal factors and driving forces involved. The 2005 Interagency Quadrennial Fire Review projected that the intersection and combined impact of accumulation of biomass and hazardous fuels, worsening drought and global climate change, growth in the wild-urban interface, and rising public expectations that both property and habitat will always be protected would result in a new era with larger wildfires and increased population exposed to the threat of wildfire[3]. The President's budget message again provides an apt summary of this "current management landscape". After noting the decadal trends in deterioration of forest health and crowded stand density now affected by global climate change, the message concludes: "Forest Service activities to protect life, property, and natural resources from wildland fire have become more complex and demanding. Placing a high priority on wildland fire suppression has resulted in a dramatic impact on the agency's budget."[4]

Since 2004, there has been a requirement for an independent review panel to review all wildland fires that exceed $10 million. This national review comes on top of a regionally required review for all fires that exceed $5 million. Previous national reviews by an independent panel in 2004 & 2005 (although 8 million acres each fire year) examined a total of five fires in three regions combined. By comparison, this 2006 large fire review covers a much larger sample of fires: 20 fires in five regions, covering 17 National forests, six states and numerous counties (Table 1).

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[1] National Interagency Fire Center, April 2006. Wildland Fire Statistics (www.nifc.gov)

[2] U. S. Department of Agriculture Forest Service FY 2008 President's Budget "Budget Justification" Revised February 23, 2007 pg 2.

[3] National Fire and Aviation Executive Board "Quadrennial Fire and Fuel Review" June 30, 2005 pp 15-17.

[4] Budget Justification p 2.

Table 1 – FY 2006 Fires that Exceed $10 million (Reviewed by Brookings Panel)

Fire	Dates	State	Region/ Forest	County	Size (acres)	Cost ($MM)
Derby	Aug 22 - Oct 3	MT	1/Gallatin and Custer	Sweet Grass, Stillwater,Park	223,570	22.5
Potato	Jul 27 - Aug 25	ID	4/Salmon-Challis	Custer	18,236	14.1
Red Mountain	Aug 14 - Sep 24	ID	4/Boise	Boise	35,482	13.7
Rattle-snake	Aug 21 - Oct 3	ID	4/Boise	Valley	45,500	13.2
Bar Complex	Jul 23 - Oct 15	CA	5N/Shasta-Trinity	Trinity	100,024	66.0
Pigeon (pt of Bar)	Aug 2 - Sep 7	CA	5N Shasta-Trinity	Trinity	in Bar	22.0
Orleans Complex	Jul 24 - Aug 31	CA	5N/Six Rivers	Humboldt, Siskiyou	15,710	16.9
Uncle Complex	Jul 23 - Oct 15	CA	5N/ Klamath	Siskiyou	30,425	14.7
Happy Camp	Jul 23 - Sep 24	CA	5N/ Klamath	Siskiyou	6,134	12.5
Ralston	Sep 5 - Sep 19	CA	5N/Tahoe	Placer	8,423	13.0
	Jul 24 - Aug 7	CA	5N/ Mendocino	Mendocino	16,297	12.1
Day	Aug 4 - Oct 5	CA	5S/Los Padres	Ventura, Los Angeles	162,702	73.5
Horse	Jul 23 - Aug 1	CA	Cleveland	San Diego	16,681	13.7
Sawtooth	Jul 9 - Jul 26	CA	5S/San Bernardino	San Bernardino	61,700	17.9
Heart/ Millard Complex	Jul 9 - Jul 25	CA	5S/San Bernardino	San Bernardino	23,917	13.0
Tripod Complex	Jul 24 - Oct 5	WA	6/ Okanogan	Okanogan	175,184	74.2
Columbia Complex	Aug 21 - Sep 2	WA	6/ Umatilla	Columbia, Garfield	109,402	35.9
Shake Table Complex	Aug 22 - Sep 15	OR	6/ Malheur	Grant	14,453	16.1
Maxwell	Jul 24 - Aug 13	OR	6/ Ochoco	Wheeler	7,157	11.3
Cavity Lake	Jul 14 - Aug 20	MN	9/ Superior	Cook	31,380	11.4

Data Source: Final ICS 209's submitted for each incident, provided by NIFC

On two incidents, concern about fires reaching Canada was a factor in fire suppression strategy, adding an international dimension to the cost problem. Table 1 details the 20 fires by region and state & county and illustrates fire size, cost, and time. One of these fires, the Sawtooth, was completely state managed and was dropped from the analysis.

Another way of putting the significance of these fires in perspective is a simple percentage comparison. The fires account for 11.2% of the total 9.9 million acres burned on all federal and state lands in 2006 but 29.7% of the 1.5 billion expended for suppression by the U.S. Forest Service. Of course, it is important to point out that wildland fire does not respect boundaries and that the 9.9 million acres burned are a mixture of different federal agency, state, tribal and private lands in and around the national forests. Likewise, the nearly $470 million expended for these large wildfires by the Forest Service is offset by various cost share agreements and formulas. These caveats aside, the imprint of these 20 wildfires on the 2006 fire season is both large and significant.

Reviewing the fire conditions at the time of ignition it is not surprising that a record number of fires became escaped large fires with suppression costs exceeding $10 million. The panel compiled information on the four pre-fire conditions and three post fire conditions it considered important elements in determining fire behavior

Pre-fire conditions on day of ignition

1. Regional and national preparedness levels both at 4 or 5
2. Fuel energy release index near the 90th percentile
3. Extreme fuel loading in area of fire
4. Extreme weather conditions (temperature and humidity)

Fire conditions during fire

1. Ignition in a remote location
2. Burning in rugged terrain
3. Major wind event(s) having a dramatic change in fire spread

Ten of the 19 fires examined in this review started when both the regional and national preparedness levels were at level four or higher, 16 fires occurred with fuel hazard indexes (Energy Release Component or Burning Index) near or above the 90th percentile for the forest, 14 were experiencing extreme hot and/or dry weather conditions, 11 ignited in very remote locations, eight burned in very rugged terrain, and nine experienced a major wind event during the fire (Supplemental Table 1). Any four of these seven elements present could justify a large fire; 14 of the 19 fires had four or more (tab).

7 elements present	**6 elements present**	**5 elements present**	**4 elements present**
Day	Heart/Millard	Tripod	Bar
		Derby	Uncles
		Orleans	Red Mountain
		Potato	Horse
		Rattlesnake	Ralston
		Happy Camp	Cavity Lake

Defining Large Wildland Fires:
Complexes – Campaigns – Cross Jurisdictional Boundaries

One advantage of a large sample set of 19 large wildfires is the ability to categorize beyond simply the size or cost of the fire. By definition, these wildfires were costly. But they also fit into three other management categories. Many were managed as complexes (multiple fires under one area management), campaign fires (fires managed over long periods of time with multiple teams), and/or cross jurisdictional (fires that crossed national forest boundaries onto other state, tribal, or community lands.) Each of these will be discussed in turn with regard to how they affect fire management practice.

Complex Fires

Fire managers have specific techniques and practices regarding the bundling of fire suppression activity in an area when one Incident Management Team (IMT) is given responsibility for managing several fires (known as a complex). This is usually the case when there are multiple fire starts in one area caused by lightning strikes. On very large fires it is also possible that more than one IMT will be assigned to the fire and the fire will be managed as branches under some form of unified command. An IMT commander managing a complex of fires will generally be given additional initial attack responsibilities in their geographic area of responsibility.

Flexibility is the operational imperative within complex management as IMTs move resources and assets to deal with the competing priorities of each fire incident. However, this does result in three issues that can alter perceptions and assessments of a large fire situation. Combining smaller fires under one command produces a larger fire size for reporting purposes. In fact, there were several complex fires which would not have surpassed the $10 million limit had they been managed and listed as separate fires.

There's also an issue with transparency. Some of the IMTs report consistently in fire subtotals (acres burned and costs) within their complex, others don't. Neither of these issues is major from an internal perspective since IMT and forest staff are generally in daily contact regarding suppression priorities and what assets are being deployed where. Externally, however, the image is often not clear as to the fire situation, the suppression objectives, and the resources expended. A third issue the Panel saw in many fires managed as complexes was that multiple wildland fire situational analyses (WFSA) are developed and approved that covered a complex of fires. This can and often confuses the WFSA process and especially incident objectives and priorities.

For the 2006 review, the majority were managed as complexes (13 out of 19 fires).

Campaign Fires

Campaign fires, while technically defined in terms of time length, vary and as the old saw goes- aren't over until they're over. Even fires that are reported as 100% contained may still be active in spots until a season ending event occurs. The Panel's categorization of the 19 fires was focused on the length of time the fire was under some form of IMT management above the Type III level. Also, the number of Type I teams assigned to the fire was tracked, although there were fires in this sample where only Type II teams were assigned. The mean number of days from fire start of IMT management to turning the fire back to a "local" Type III team was 52. It should be noted and will be discussed in greater depth in the findings and recommendations section that there is a natural tendency to hold onto IMTs as long as there is a fire risk threat, especially when national and regional preparedness levels are at maximum levels.

Only five of the fires lasted 28 days or fewer. Of the 14 that lasted more than 28 days, nine were over 42 days. Across these 19 fires, 31 Type I national team assignments were recorded.

Cross (Jurisdictional) Boundaries

A final categorical effort examined the fires in terms of boundaries. How many of the fires stayed primarily within the national forest boundaries? This is somewhat problematic because of the often fragmented and discontinuous boundaries of the forests. Some forests, like the Tahoe National Forest, have alternate forest-private checkerboard land holding patterns. Others have extensive private landowner inholdings within the forest.

The panel refined this category to try to capture the effects of wildfires crossing over the forest primary outer perimeter boundary and burning into another jurisdiction (i.e. Canada, state lands, tribal lands, or communities). Fire suppression strategy is expected to be affected by objectives such as keeping the fire from crossing into others' territory, even when protection responsibility maps, cost sharing agreements, and regional and community fire protection plans are in place. Indeed, on two fires, the Panel heard that keeping the fire from crossing over onto another national forest's land was a suppression management objective.

Twelve of the 19 fires had cross jurisdictional aspects- 11 where the fire originated in the forest and affected other jurisdictions and one fire where the origin was on community lands and ultimately crossed into the national forest.

Added together, the majority of the 19 fires exhibited all three of these categories – 15 were campaign length, cross-jurisdictional, complex managed wildfires. Table 2 illustrates the original 20 fires of this review (Sawtooth is listed although it was a state managed fire and Pigeon is included as a linked fire to the Bar Complex Fire). In terms of cost ranking, all eight fires costing more than $15 million exhibited at least two of the categories and five of the eight exhibited all three.

Table 2 – 2006 Large Wildfire Sample by Cost, Size, and other Management Categories (listed in descending cost order).

Fire Name	Multiple Named Fires	Total # Type I Teams	Cross Jurisdictional (cost share or boundary)	Days to final Type III IMT	Cost of Fire (million)
Tripod Complex	Spur Peak, Tripod	4	Yes	74	$74.2
Day	None	6	Yes	42	$73.5
Columbia Complex	Payne Hollow	1	Yes	36	$35.9
Bar Complex	Oven, Bake, Little	6	Yes	82	$24.0
Derby	Derby, Jungle	2	Yes	75	$22.5
Pigeon	None	1	No	86	$22.0
Orleans Complex	Buck, Somes, Crawford, Hancock	0	Yes	107	$16.9
Shake Table Complex	Thorn Creek, 10 others by numbers	1	No	21	$16.1
Uncles Complex	Rush, Hancock, Uncles	0	No	64	$14.7
Potato	Potato, Zane	1	No	38	$14.1
Horse	None	2	Yes	10	$13.7
Red Mountain	Red Mt, Boundary	2	Yes	40	$13.7
Rattlesnake	Rattlesnake, Summit Lake	1	No	38	$13.2
Heart-Millard Complex	State, Sure Fire, Jump Off, Millard	1	Yes	73	$13.0
Ralston	None	1	Yes	14	$13.0
Happy Camp	Titus, Goff	0	No	63	$12.5
Hunter	Hunter, Kingsley, McCoy	1	No	28	$12.1
Cavity Lake	None	1	Yes	26	$11.4
Maxwell	None	0	Yes	108	$11.3

Cost Dilemmas from the Forest's Perspective

This year's large wildfire sample afforded another perspective on cost containment- that of 17 National forest supervisors or agency administrators. The panel especially commends these agency administrators not just for enabling the site visits to take place with the full cooperation of the forest fire and resource program staff but also for talking with the Panel directly about the incidents. These interviews (either in person or by phone) enabled the Panel to discuss several key issues affecting the degree of control that they felt they have over fire suppression strategy and cost.

Decision Space

It was apparent to the Panel that while the ultimate management control and fiduciary responsibility rests with these agency administrators, their real decision space, especially to affect costs, is very limited. Once a wildfire escapes initial attack control efforts, it quickly escalates through extended attack to much more than the simple management of an incident. Factor in the difficulties of managing multiple fires under one management (complexes), long duration fires (campaigns) or cross jurisdictional concerns, and the incident quickly develops into complex situation management.

Granted, there are mechanisms – annual fire management plans and fuels reduction programs, wildland fire situation analyses (WFSA), delegation of authority letters, and briefing packages for incoming IMTs – to give the agency administrators some control over decision-making. But the Panel heard from the majority of agency administrators the perception that real decision space was very limited. For all practical purposes, once a Type I team is assigned with adequate aviation and engine support, a large wildfire situation is going to cost a certain amount regardless (a practical baseline guide the Panel heard in several forest discussions was one million dollars a day).

Values At Risk

Adding to the supervisors' dilemma is the perception of values at risk. In some cases, most notably Southern California, every large wildfire is viewed as a high-risk wildland urban interface (WUI) fire potentially threatening thousands of homes and millions of dollars of commercial and property interests. In remote locations, forests would consider watersheds, species habitat, recreational and grazing interests, and the recognition that there are few wilderness areas left that are big and isolated enough to simply let a large wildfire "run around in."

The business case of the values being protected from large wildfires may sometimes be a stretch, but every forest's assessment of values has its own merits. Indeed, on several site visits, the Panel questioned how forests could include protecting trail blazes, historic properties, look out towers, and the like as suppression protection priorities from a cost management strategic perspective. But conversely, critical species habitat and watersheds, while often identified, were difficult to place a tangible value on. This can in part be attributed to the lack of a decision strategy model that can factor in

non-monetary values at risk. But in terms of socio-economic factors (commercial interests, large employers, elected officials' priorities, historical landmarks, etc.) there are always values around which a compelling case for suppression action can be made. The real problem is that while every forest has a rationale for assessing the values at risk that is useful in defining a fire specific suppression strategy; when viewed from the cost management perspective it is difficult to see how this approach helps the forest to convey forward the information needed to assign suppression priorities on a regional or national level in an era of limited suppression resources.

Also, agency administrators hoping to confine and possibly fight fire less aggressively to contain cost, increasingly confront situations where the best place to fight and contain large wildfires that start inside the forest is outside the forest boundaries and often in conflict with neighboring priorities. Considering the apparent increase in large, complicated fires and the competing demands of protecting natural resources, protecting the desires of the forest's neighbors, and containing costs, agency administrators will increasingly need to develop strategies that do not stop at the forest boundary.

Growth of the Interface

To this must be added the encroachment of the wildland urban interface or intermix (WUI). That is, communities and housing located close to the public lands that bring more people and property into range of large wildfires. The Panel looked at the growth in population and housing in the 23 counties where the 19 wildfires occurred and found the following:

Growth in	1990-2000	2000-2005	2000-2010 (estimated)
Population	11.3%	6.8%	13.6%
Housing Units	6.9%	4.9%	9.8%

Source: US Census Data- the complete data is found in Supplemental Table 6

It should be noted that the Panel did not attempt to track these county trend numbers to specific forest neighborhoods. Nor do these growth statistics fit all the counties reviewed. Two Oregon, one Washington state, and one Idaho county where fires occurred experienced slight population declines in the 2000-2005 period. But even there, three of the declining population counties still had increases in housing. These counties certainly reflect the continuing trend of strong demographic growth in the western states which by 2020 is expected to reach over 80 million people or 24% of the total US Population.

Impact of Fuels Programs

Weather and topography are not controllable, but the forests have some degree of control over fuels. Indeed, several forest supervisors made passionate statements about the overwhelming need to treat the land to curb the rising wildfire suppression problem. Every forest visited emphasized their commitment to fuels reduction efforts as a key

preventative action. There were even a few fires where fire progression was significantly slowed or stopped because of previous fuels reduction efforts.

Unfortunately, efforts devoted to fuels reduction are falling short of forest goals and the forest goals themselves are short in terms of what needs to be treated on the land. The biggest impact on future conditions today are the wildfires themselves. Fuels treatments in WUI areas are recognized as effective helping to protect structures and communities, but have marginal impact on the forest as a whole and the effectiveness of small parcel treatments throughout the forest is of unproven effectiveness.

Balancing Risks and Cost

The dilemma facing national forests over containing suppression costs and protecting resource values inside the forest and communities at risk outside the forest is both real and difficult. Agency administrators, certainly the ones interviewed in this review, understand the critical importance of balancing those risks, knowing that large wildfires are commanding a greater share of the agency's budget. At the same time, their span of control over suppression costs is small. The use of incident business advisors (IBAs), daily cost reporting, assertive monitoring of requisitions for equipment and supplies, and releasing crews and assets at the earliest possible moment can and does save money. But such savings, when they happen, are marginal at best. Panel estimates of the apparent percentage of savings on fires based on IBAs submitted reports was in the range of five to ten percent.

This is not to denigrate the role of IBAs and the current exercise of cost monitoring on large wildfires. The Panel recognizes and commends the efforts made to ensure proper "fiscal vigilance" is in place on large wildfires. It is essential that national forests and IMTs work constantly at eliminating even the appearance of waste, abuse, and potential conflict of interest. As many of the forests noted in the discussion sessions, fire fighting is a business with many contractors, suppliers, and local community interests vying for their share. Significant damage could be done to the reputation and credibility of federal fire suppression efforts by revelations of excessive overcharging, improper procurement, or inappropriate resource ordering.

Given the above, the Panel chose to focus much of its inquiry into cost management strategies that could potentially impact fire suppression costs at larger levels. The recommendations that follow, and which are the core of this report, reflect perhaps a different viewpoint of cost management. The panel adapted as its analogy an example taken from a recent business journal interview with a leading corporate executive who suggested that difficult management problems may best be solved by thinking in opposites. His actual example was to not state the problem as trying to find ways to lose weight, but rather by understanding why one gains weight. For fire cost management, the Panel looked through forest and IMT strategic decisions to understand why and where fire costs tended to increase, rather than why administrators and IMT commanders were unable to reduce costs.

Four such issue areas were identified where the Panel concluded that suppression costs could be significantly affected. Each will be developed as a set of findings based on observations of the 19 fires reviewed followed by specific recommendations. If there is an underlying theme to the recommendations, it would be to make cost management strategy more collaborative, as the report title implies. The Panel's review of the fires found that the best opportunities to contain fire cost growth were in the interactions of different participants in the fire suppression decision-making process. Final fiduciary responsibility may lie with the agency administrator, but limiting cost growth requires mutual understanding of competing priorities and collective action to expand the range of suppression options. This applies whether it is the relationships between the national forests and the surrounding communities or between the forest staff and the IMTs.

Notes on the Evaluation Design and Framework

In terms of project review objectives, the Panel was tasked to examine and report on fire suppression costs for wildfire incidents during Fiscal Year 2006 that exceed $10,000,000 in cost and ascertain the following:

- Determine if the Forest Service exercised fiscal diligence in managing specific incident suppressing activities. This panel is not expected to complete an exhaustive fiscal audit of all incident phases. Rather, focus on strategic decisions and actions, compliance to policy and law, and risk analysis and management.
- In instances where the Forest Service may not have executed prudent fiscal decisions, with respect to public/firefighter safety, natural resource, and private property protection, estimate the proportions of appropriate and excess suppression costs (recognizing that excess costs would be earmarked for return to the treasury based on end of fiscal year 2005 balances).

The Panel was to submit a final report with findings and recommendations to the Secretary of Agriculture on cross-cutting policy and systems issues that impact strategic decision making and selection of tactics for fire management. To accomplish these tasks, the Panel crafted an evaluation framework that could examine fire suppression management from the forests' and IMTs' perspectives beginning with prefire conditions and fire prevention planning through all stages of initial and extended attack to large fire incident management, ending with restoration and landscape rehabilitation efforts.

To conduct the actual assessment, a series of site visits to each of the 17 national forest where the fires occurred was planned as a high level, strategic review in the form of a discussion between the Panel members and decision makers and support staff of the national forest. The site visit agenda divided the discussions into three parts (see tab below) followed by a summation and an interview with each forest Supervisor or Deputy. A brief summary of panel comments for each field visit will be forwarded to each of the national forests for additional comments.

Site Visit Discussion Segment	Issue Coverage and Invited Perspectives
I. Prefire Landscape Condition • Reviewing the fire sites and their history • Understanding the condition of the land and values being protected	Perspectives from the LMPs, the FMPs, fuels reduction programs, and fire prevention and community landscape prevention efforts
II. Fire Chronology and Strategy • Fire suppression effort from ignition through initial and extended attack • Transition to large fire incident management to control, containment, and mop-up	Perspectives from the forest's line officers, fire management site team, IMT command, aviation management, and involved community and partner fire organizations
III. Fire Management Outcomes • Reviewing fire suppression decisions & effectiveness • Include cost management and fire severity and landscape restoration issues	Perspectives on communications, information, and planned and actual resource commitment by line officers and fire managers, business advisors, and others in the context of public and firefighter safety, resources being protected, and costs expended. Discussion of restoration requirements & future resource issues

In addition to extensive information requests sent to each forest in January before the site visit cycle began, a list of discussion questions was also forwarded to set the stage for the site visit review. It should be noted that two further considerations were factored into the evaluation design for the 2006 review. First, the 2006 review was tailored to build on the foundation of the approach conducted by the 2004 and 2005 review team so that future reviews could track similar issues and assess change. Secondly, the Panel reviewed in depth the five regional reviews conducted of all fires over five million dollars.

Panel Review of Fiscal Diligence

The Panel was required to determine if the forest had "exercised fiscal diligence in managing specific incident suppressing activities". The Panel took this task literarily and voted at the end of each site review – Yes or No – if they felt there was any indication of inappropriate fiscal behavior based on the fire chronology review discussion and other documents provided.

It should be stated that the levels of documentation varied from fire to fire. In some cases, the Panel had incomplete information from the forest in terms of the advance information request. Each forest however responded rapidly to complete the Panel's

information requests by the end of the site visit. There were also difficulties with cost information and incident situation reporting information from national sources. Some of those problems were caused by the proliferation of fires being managed under complexes and final reconciliation and uploading of incident records which was still on-going. Finally, much of the information about cost sharing agreements and charges between the forests and states was incomplete. The Panel collected and discussed generally the forest's process for cost reimbursement but was not able to examine specific cost issues.

The Panel accepted these limitations in the spirit of their charge of not having to do "…an exhaustive fiscal audit of all incident phases. But rather, focus on strategic decisions and actions, compliance to policy and law, and risk analysis and management." A sufficient discussion with fire staff, IMT commanders, and other forest staff was conducted to enable the Panel to confirm their fiscal diligence review.

For the record, the Panel voted No for each of the 19 fires they assessed in terms of the forest having exercised inappropriate or inadequate fiscal diligence. There were fire situational strategic and tactical decisions that the Panel sometimes questioned, but these were not indicative of fiscal wrongdoing.

Panel Findings and Recommendations

Four issue areas are addressed in this recommendations section. Discussion of the issue area and an explanation of its significance opens each issue area followed by summary findings based on frequency of occurrence from the 19 fires in the review. Supplemental Tables showing forest by forest details are located at the end of the report. Finally, panel recommendations outline proposed pathways for change.

Issue Area 1 Findings – Land Management and Resource Plans and Fire Management Plans as Strategic Frameworks for Managing Fire Suppression Investment

The Land Management (and Resource) Plans (hereafter referred to as simply LMP) and the Fire Management Plans (FMP) are the two main documents that provide direction and guidance for all the activities undertaken by a national forest in managing all the resources of the forest. The FMP is in a sense an extension of the LMP that specifically addresses all management issues related to fire, whether they are wildfires, wildland fire use fires, or prescribed fires. If these two documents are not aligned and linked and the FMP does not directly reference the guidance of the LMP, conflicts or confusion may arise. Previous reviews of large fires have mentioned this potential confusion as a source of concern. The Panel examined the two documents relevant to each fire and evaluated how well the documents work together as tools for guiding wildfire suppression strategy.

The LMP and FMP documents were examined for the 17 national forests (Supplemental Table 2). This consisted of 18 LMP documents. The Salmon/Challis NF operates with two that relate to Salmon NF and the Challis NF before the two forests were merged into

the Salmon/Challis NF. The five newest LMPs are for the Boise NF, Cleveland NF, Los Padres NF, San Bernardino NF, and the Superior NF. All five were completed since the National Fire Plan was implemented in the year 2000.

Seventeen FMP documents were examined; one for each forest in our sample (including Six Rivers NF). The FMP for the Six Rivers NF was not considered an official document as it was withdrawn in response to litigation, but it was included in our analysis of LMP and FMP characteristics. Five national forests, the Cleveland NF, Ochoco NF, Okanogan NF, Los Padres NF, and the Six Rivers NF were operating with FMPs that had not been revised for the 2006 fire season.

Land Management Plans Findings

The majority (16 of 18) of the LMPs have at least a general discussion of fire issues and management goals. The level of detail and decision-making guidance varied widely between plans. The LMP elements considered most useful by the Panel for developing fire management strategies include:

1) A detailed discussion of recent fire history,
2) An organization of the forest into zones or areas that clearly identify both forest resource management and fire protection goals,
3) Information on wildland/urban intermix and interface zones,
4) Guidance on the appropriate response to wildfires,
5) Information on wildfire fuels, and,
6) Cost containment guidance.

Of the 18 LMPs examined, only five addressed at least three of these six criteria. Of the five LMPs published after the 2006 National Fire Plan, only two were in the category of addressing three or more of the important fire elements listed above. The results of the analysis of the LMPs are listed in Supplemental Table 3 and summarized below.

- Fire History – Five of the 18 national forests incorporated a general discussion of fire history into the LMP, but only two of these 18 had sufficient information to assist in making decisions.

- Fire Organization – Nine of the 18 national forests defined management units by geographic boundaries that can provide a common basis for describing fire management criteria in an FMP.

- Urban Interface and/or Intermix – Only one of the 18 national forests discussed the influence of urban pressures on fire management goals. Four of newest LMPs are for forests in areas with extensive urban issues but even these had little discussion of these impacts on fire management.

- Appropriate Fire Suppression Response – Eight of the 18 national forests provide a discussion of fire suppression response issues in their LMPs, but only two of the

8 are in LMPs implemented after the National Fire Plan. Five of the 18 discuss appropriate response from only a suppression point of view; four of the 18 also discuss response from a management point of view.

- Hazardous Fuels – The management of hazardous wildfire fuels is discussed in 12 of the 18 national forest LMPs. Eight of the 12 specify goals for fuels treatment. All forests interviewed were failing to meet their goals for a variety of reasons. They cited tight windows for when fuels work, especially prescribed fire, can be accomplished, smoke restrictions, increasing costs of fuels reduction over funding available, earmarking requirements for projects for WUI areas over wilderness areas, and increasing longer lead times to get fuels projects planned and approved. Despite these issues, all the forests interviewed remain strongly committed to fuels reduction programs.

  The panel also requested information about recent fuels treatment efforts (since 2000) in the forest to obtain some sense of potential future impact. Even those forests with aggressive fuels programs were essentially treating between five to ten percent of the total forest acreage. Some forests noted that they had abandoned landscape, mosaic fuel treatment efforts as unrealistic and were focusing on strategic placements. On the other side, the fire history maps provided by forests to the Panel largely confirm the dramatic increase in fire activity since 2000 displayed in current wildfire statistical trends. The Panel noted in most of the site visit discussions that current fire activity was significantly outpacing fuels reduction efforts and was not contradicted.

- Cost Containment – Six of the 18 national forests incorporate a general reference to the cost of fire suppression but none provide detailed guidance.

Fire Management Plans Findings

Fire Management Plans are intended to provide specific guidance to the forest managers and planners on all issues related to fire. These documents should not only address the fire related land management issues identified above but they should also be dynamic documents that incorporate information from recent fires, changes in wildfire fuel levels, urban interface and intermix changes, and all other forest activities that affect fire planning. Seventeen FMPs were reviewed. The results of the analysis of the FMPs are listed in Supplemental Table 4 and summarized below.

- The majority of the FMPs reviewed are for the most part considered static documents. Only three of the 17 reviewed had current fire information incorporated into the document and provided systematic input into fire management strategy. Of the 14 FMPs considered mostly static, the general strategy is to place new documents and fire program updates as appendices into the FMP. While this may be expedient, the Panel concluded that any updated information added to the plans during the annual revisions could easily be overlooked. Several forests mentioned as reasons for this practice concerns about

keeping the FMP out of potential litigation (i.e. the Six Rivers effect). The result however, the Panel concluded, was that there was little reason to believe that the current FMP would essentially read any differently five years from now, despite the significant increase in fire activity of the past decade.

- The size of the fire management units defined in FMPs vary greatly in size and number from national forests with as few as two covering more than a million acres each to national forests with more than 10 units covering as few as 70,000 acres.

- Ten of the 17 national forests allow wildland fire use to help achieve management goals in at least one of their fire management units. The average percentage of forest area where wildland fire use is allowed ranges from 22% to 48% for the five forests that report acreage. Seven of the national forests reviewed do not allow wildland fire use. All these forests cited the high risk to the WUI as the reason to not allow wildland fire use.

- Only four of the 17 national forests addressed the influence of the wildland/urban interface and intermix zones in enough detail to define protection roles. Even in forests with known, complex WUI issues the discussion was very superficial.

- Only three of the 17 national forests addressed differences in management goals and direction with neighboring public and private landowners with their own management plans (e.g. Bureau of Indian Affairs, Bureau of Land Management, large industrial land owners, Non-Governmental Organizations). Even these three FMPs that discussed boundary differences had very brief discussions. These boundary issues undoubtedly influence fire suppression strategy and tactical decisions but the issues are surprisingly under-represented in all of the fire management plans. There was also no indication in any of the FMPs that Community Wildfire Protection Plans were identified or their activities and objectives addressed, much less discussed.

- Nine of the 17 national forests examined had a discussion of Appropriate Management Response (AMR) in the FMP. However, none of the discussions were presented in enough detail to understand what the flexibility of the AMR strategy really entails or to guide fire managers towards dynamic AMR strategic decisions.

- Cost containment goals and management issues are mostly under-represented in FMPs. A few of the plans had a simple statement stressing “cost effective methods” but only one of the 17 forests examined had a section discussing suppression cost issues.

Impact of Fuels Program

Treating fuels is known to be a very important component of managing the national forests. Nearly all of the forests discuss the fuels reduction programs in the LMPs (12 of the 17), including all but one of the post-National Fire Plan LMPs. Because the LMPs are from two to 20 years old, depending on the forest, the information provided by these documents is of marginal value to fire planning. For the most part, the FMPs do not discuss the fuels program. While detailed information on the fuels program is available in each forest, including a mandatory program of work, it is not apparent that the information is readily available to the management teams supporting a wildfire in progress. During the interview phase of this investigation it was noted that none of the forests were meeting their declared fuels reduction goals. Up to date information on the size, location, and current condition of the projects (have they been maintained?) would be a good addition to the Fire Management Plans.

Relationships between Land Management and Fire Management Plans

Comparing the discussion of the important fire related issues in both the LMPs and the FMPs it is clear that the two documents are not well linked in this regard (Supplemental Table 5). Linkage was evaluated by tallying the number of FMPs that referenced specific land management areas and documenting for each forest how many times one of the five important fire issues was discussed in both the LMP and the FMP. Fire Management units in eight of the 17 forests are directly referenced to specific land management areas. However, five of these the management areas are defined by management goals, rather than geographic boundaries, making them less useful in linking the land management and fire management guidelines to a specific fire zone. All of this disconnect may well be a product of how land management plans were established historically to allocate land for different purposes according to standards and guidelines. But the result is still a difficult linkage between the two plans.

The linkage between the other five noted fire issues is even less direct. Fire history was linked on one forest, wildland/urban interface and/or intermix interests were linked on one forest, and AMR was linked on four of the 17 forests.

It is not surprising that the fire related information in the LMP and FMP for a particular national forest is not well synchronized since the two documents were developed at different times and for different reasons, combined with the fact that many LMPs were written long before the National Fire Plan and Healthy Forest Restoration Initiative policies were implemented. The LRP framework well addresses identifying resources, desired conditions, and stating land management objectives. The framework does not address how well these management issues interact with the five important fire issues identified above including the pressures on land management decisions by fire history, hazardous fuel levels, WUI interests, cost guidance, and AMR. The age of the LMP is not the major issue –both pre and post 2000 LMPs can work in addressing wildfire issues on the national forests if a dynamic FMP is in place that provides the needed coordination on the major fire issues.

As a summary note to this issue area section, it must be pointed out that the Panel did not read all the documentation contained in the 17 LMPs and FMPs provided for this review. LMPs on some national forests are multi-volume documents with their appendices in hundreds of pages. FMPs are not quite so voluminous, but many when their appendices are included reach almost a 1000 pages. The Panel did read the opening sections and used that as their point of emphasis. Clearly, if the LMP and FMP are to provide strategic guidance for fire suppression efforts and investments, critical information must be updated often and more important be readily available. Often during the site visit discussion, forest and Fire staff would say – "it's in our fire management plan" or "it goes back to our land management plan". That may well be true, but if it's buried in a 1000 page document, finding it is an entirely different matter.

Issue 1 Recommendations – Land Management & Fire Management Plan

1A. Develop guidance for future revisions of Land Management Plans. Future LMPs should incorporate elements of the importance of fuels reduction activities, fire history, changes in the WUI and how these elements impact land management. While the current legal situation of the LMPs is problematic, there is perhaps now a "strategic opportunity" for future revisions of the plans to address the impacts of climate change and forest health, including recent fire history as a core element.

1B. Transform the Fire Management Plan from a static, program reference document to a strategic assessment of fire management planning and policies. The FMP should be more dynamic, integrative, and collaborative. The opening section of a more dynamic FMP would:

- assess in depth and continually update fire history since 2000 in terms of expected fire behavior, intensity, and risk
- monitor growth of the WUI and compare fire management priorities and protection policies with state, local, tribal neighbors—and private and public interests in a highly collaborative process
- refine and explain cost management expectations for fire management programs (Prevention, Fuels Reduction, Suppression, and Restoration)
- Create a strong linkage from the FMP to the WFSA process.

1C. Expand Appropriate Management Response guidance beyond the model and textual boilerplate currently found in most FMPs. Elements recommended for AMR guidance include the following:

- transparent planning methods and a strategy that is understandable to public and neighboring partners,
- consistent definitions across the Forest Service regions and the five federal agencies
- clarification of the current array of fire operational strategies, including Wildland Fire Use, late success ional reserves, minimum impact suppression tactics,

- techniques for developing strategic opportunities in (1) cost share agreements and different suppression requirements and policies (2) annual joint operating plans on protection roles and communications capabilities (3) Community Wildfire Protection Plans.

Issue Area 2 Findings – The Wildland Fire Situational Analysis and Delegation of Authority as Fire Suppression Management and Cost Factors

At the outset of a potential large escaped fire, forests are required to complete a situational assessment and complexity analysis to both determine what type of incident management team to request and to scope the proposed fire effort. These assessments are completed by the forest fire staff, resource planners and district rangers for review by the forest supervisor. Once the agency administrator has approved and signed the WFSA, it along with a delegation of authority letter, is passed to the incoming IMT commander. Both documents are included in the briefing package for the newly arriving IMT.

As might be expected, the WFSA is most problematic on large wildfires. In fact, the Panel reviewed 69 WFSAs and supporting documentation on these 19 fires, an average of 3.5 WFSAs per fire. There were actually more, but the Panel was at least able to look at the initial WFSAs for each of the 19 fires. In the discussion of the fire chronology, the Panel devoted considerable time to reviewing each WFSA provided to ascertain whether the WFSA was effective in helping the forest and the IMTs shift strategies as the fire situation changed and to help contain suppression costs. The WFSA, per Forest Service policy, has specific cost monitors and trigger points that in addition to indicating cumulative fire suppression costs for a daily review, requires higher level signatures if certain cost thresholds are exceeded.

Wild Fire Situation Analysis Findings

The Panel heard mixed messages about WFSAs. It seems many administrators agree with the premise that the process can help focus thinking, encourage collaboration, and assist in formulating suppression strategies. But, as it is currently implemented the WFSA process falls short in effectively reaching any of these goals. All 19 of the initial WFSAs selected target in terms of predicting the size of the fire (acres burned) and choosing suppression strategy were exceeded by the actual final size of the fire (See Supplemental Table 7). WFSAs also include a worst case scenario, and even that estimated size was below the fire size approximately half the time. The panel concluded that the current WFSA process on these fires was inadequate in helping forests determine their suppression strategy, concurring with the comments of several forest supervisors that the WFSA failed in "forcing us to think big enough."

In tracking subsequent changes during the incident the Panel found no clear pattern for the preparation of a new WFSA. In several cases, new WFSAs were prepared because the fire cost was reaching the $10 million mark and would require a regional director's signature. In other cases, new WFSAs were prepared during team transitions when a new IMT was coming in to take over the fire. In some instances, a new WFSA

was prepared because the forest and the IMT recognized that the current suppression strategy was not effective or in anticipation of a major weather event expected to influence fire behavior.

The remaining findings come from the discussions between the panel's international fire experts and the forests during the site visit. They represent an effort to understand the underlying issues that frustrate agency administrators and fire managers in making the WFSA an effective tool.

- In many locations, considerable time was spent developing WFSAs. However, the WFSA process appeared to be treated by IMTs more as an obligatory document rather than a guiding strategic suppression tool, providing credible direction and an opportunity to analyze viable cost options. In contrast, the Panel heard numerous complaints from forests that compiling the WFSA took several key fire staff and local resource personnel away from the fire activity during a critical period in fire response.

- Exceeding the predicted cost or the geographic boundaries within a WFSA bore no consequences for IMTs or line staff. Based on the WFSAs reviewed, there was no indication that a WFSA was ever rejected by an IMT even though in some instances the IMTs felt the fire would exceed the parameters in the WFSA and in some fires there was discernable tension between forests and IMT commanders.

- WFSAs did not exhibit consistency when considering the inclusion or exclusion of assets or values adjoining the national forests.

- WFSAs did not include any scale down triggers to curb costs. The triggers for a new WFSA appeared to be: costs exceeding the delegated limitation, fire area exceeding the geographic area or boundaries defined in the WFSA or a replacement IMT arriving.

- WFSAs appear to have little senior line management oversight and in the documents provided there was no evidence (with one exception) that submitting a WFSA to a higher level for approval resulted in any strategic changes to the WFSA.

- Selected alternatives in the WFSAs were based upon expected levels of resources to implement. There was no evidence provided that these alternatives were ever reassessed when lower levels of suppression resources were received.

Delegation of Authority Findings

The Panel also reviewed the delegation of authority letter. This document is vital because it provides the IMT commander legal authority to operate and make decisions on behalf of the line officer. Again, the Panel requested and received the majority of the delegation of authority letters given to IMTs in conjunction with the WFSA. This review

revealed that in the vast majority of cases (16 out of 19 fires) it was a standard form letter with little detail specific to the wildfire. It referenced the WFSA and included text reaffirming public and firefighter safety. In only two or three instances did the delegation of authority letter include a specific cost containment objective.

Panel findings here focus primarily on what is not in the delegation of authority letter, but would be significant if cost containment is to be a priority.

- Delegations of authorities did not provide realistic cost objectives or performance measures for cost management.

- Delegations of authorities did not provide suppression resource priorities to incident complexes.

Issue Area II Recommendations – The Wildland Fire Situational Analysis and Delegation of Authority as Fire Suppression Management and Cost Factors

2A. Encourage more collaboration in the WFSA process. More important than replacing the current WFSA with another computer model or analytical document is rethinking the WFSA process itself. Some form of simpler complexity analysis could be completed to guide the selection of the type of IMT. However, the forest would be better served if IMTs and line staff jointly develop wildfire strategies through a WFSA within 36 hours from the time of assignment, when a Type I or II Team is assigned to a fire. This type of collaboration would also facilitate a full discussion of suppression strategies, cost expectations and management performance objectives for IMTs.

2B. Address options for short term and long term management of suppression resources. WFSAs should develop and contain scale-down triggers for resource management, especially with regard to the length of time Type I and Type II teams remain on fires. Likewise, on campaign or longer duration fires, there should be a mechanism for switching procurement and resource ordering strategies from short term to long term. The identification of assets/resources for longer term use should be a regional priority developed prior to the start of each fire season.

2C. Make delegation of authority letters strategic documents. They should contain specific statements outlining larger suppression objectives (especially as they relate to other jurisdictions and protection responsibilities), resource values and final restoration concerns, and expectations about containing fire cost growth. They should also include performance measures for successful suppression, cost management and public and firefighter safety.

Issue Area III Findings – Incident Management Team Structure and Transitions as Fire Suppression Cost Factors

Large fire management is invariably a complex interaction between local forces on the national forest where the fire breaks out and the various nationally and regionally

assigned incident management teams who come to the forest to lead the suppression effort. Current policy limits assignments to 14 days for national teams, although some teams depart early and occasionally a team will extend past the 14 day deadline. National Type I and Type II teams are essentially franchise assets with their assignments being carefully monitored with an expectation that they will be assigned to the most complex and highest priority situations.

The panel examined a number of facets involving IMT selection, structure, and transitions. All totaled, there were 31 Type I and 39 Type II assignments to the 19 fires reviewed. (Type III teams are also critical elements in fire suppression management; there were 47 Type III assignments for the 19 fires. See Supplemental Table 8).

Incident Management Team narratives, as available, were also reviewed by the Panel. Here, each fire's chronology was tracked from a staffing perspective- i.e. what team was assigned when, what was the staffing and overhead levels for the team at the outset of their assignment, the midpoint, and the conclusion compared to reported cumulative cost level. The daily Incident Status reports – (ICS 209s) were used to accomplish this.

The ratio of overhead to operational personnel is a significant cost driver. Overhead personnel costs consume a large portion of the total costs associated with response operations and are a significant factor to recognize when addressing cost containment issues. Based on the review of ICS 209 staffing data, there seems to be excessive amounts of overhead personnel assigned to support an incident when compared to the number of personnel assigned to the fire line, especially in the end stages of an incident. (Supplemental Table 9). Part of that may be explained by IMT composition and other requisite functions on the fire that must be addressed on a fixed cost basis, as opposed to varying up or down with crew staffing numbers.

- Flexibility and agility of IMTs are not currently core strengths. IMTs are founded on consistency and reliability which is ingrained in their structure, team member selection, and training and development. Again, this is not to say that IMTs are inefficient or ineffective in how they operate, but in a more dynamic and resource scarce environment, flexible response may be increasingly valued.

- Understanding the need to staff fully supported IMTs, some of the core ICS tenants are to have scalable and flexible IMT organizations. Without such abilities, IMTs are constrained in their ability to tailor a response organization based upon the needs of the incident. This can result in an entire team being deployed for an assignment on which they are overqualified and over staffed.

- Based upon complexity analyses, several forests identified and expressed a need for a specific function and instead received an entire IMT. Similarly, forests often mentioned that what they really needed for their situation was a "short" Type I team or a "long" Type II team, or a "bulked up" Type III team. In other situations, forests mentioned ordering a better Type II teams for better logistics or even a Type I for better finance near the end of the incident. These statements are

indications of cost containment concerns that are frustrated by a one size fits all common IMT structure and assignment process. This lack of management flexibility adds to cost.

- Type III IMT in-house capabilities for handling the end stages of incidents are often regarded as insufficient. The Panel's review looked especially hard at the last 20% of the fire cycle- namely, how long it took the forest to get the fire turned over to a local type III team and hence a lower cost expenditure level.

- Many Type I and II IMTs remained on scene after the fire exhibited other than Type I incident characteristics. Comments during the site visits were repeatedly made that additional time on scene generated costs that would not have been incurred if the Type III IMT had the needed capacity to take over.

- Transition costs due to IMT deployment time limits and rotations are rising. While the need for 14 day assignments to deal with stress and fatigue issues is well recognized, this also translates in heavy fire seasons to back to back 14 day rotations for IMTs. Long-duration campaign fires will be the real test of whether a more flexible deployment time schedule can work. They certainly call for a different scheduling model.

- Transitions cost money, and in some cases, sacrifice productivity. Assignment policy – whether it is for national IMTs, local teams or contracted resources should factor in short fire vs. longer fire rotation considerations from a cost perspective

Issue Area III Recommendations – Incident Management Team Structure and Transitions as Fire Suppression Cost Factors

3A. Tailor more agile IMTs to fit the needs of the incident, as opposed to a standard IMT formula. Recognizing the adage, "if you are not in operations, then you support operations", explore creating a flexible ratio between fire line and support personnel that allows the IMTs to contain high, fixed levels of overhead personnel costs while maintaining operational support capabilities without losing IMT productivity. With an aim to creating a more agile organization, IMTs would be more adaptable towards selective deployment capability. When coupled with the frequency and high cost associated with IMT transitions, IMT should consider staffing only the functions requested before deploying to an incident. Instead of transitioning an entire IMT, explore the opportunity to transition only those functions that require enhanced command and control.

3B. Enhance local Type III IMTs to provide for a more robust capability during incident close out while capitalizing on state and local resources to provide additional protection resources or to supplement the IMT.

3C. Explore alternative strategies that allow greater degrees of flexibility when committing IMTs to prolonged large fire operations, such as:

- Identify trigger points (up/down/maintain) based on incident complexity and tactical resource commitments that indicate a need to scale down incident operations, particularly during the closing phases of fire fighting operations.

- In the case of large fire management, consider the opportunities presented by a large fire IMT with the capability to stay on-scene for longer periods of time.

Issue Area 4 Findings – Formulating a Collaborative Cost Management Strategy for Wildland Fire Incidents

Despite the numerous studies and reviews conducted of large wildfire costs since the National Fire Plan, cost containment has not been institutionalized in the Forest Service. There is general recognition and acceptance from IMTs and field personnel to agency administrators of the importance of keeping fire suppression costs in check. However, no one is exactly sure what cost management means or how to achieve it other than exercising various forms of fiscal vigilance on resource ordering and usage. Asked about the escalating costs for the full range of assets used on large wildfires, fire staff would generally reply that people had to understand fire fighting is expensive, but still cost-effective considering the potential losses averted. Similarly, in the panel's interviews with Forest Supervisors, line officers would note that when wildfires reach large sizes, there is enormous social and political pressure to use every available resource, regardless of cost, to control the fire.

In this last issue area, the Panel attempted to address some of the political and economic factors that must be confronted if cost management strategies are to have any chance of keeping fire costs from growing even larger. These factors include:

- Understanding the complete cost cycle on large wildfires. Costs are large on wildfires in part because different actions are being taken and then lumped into one incident cost. Initial Attack costs are not reported. Likewise, demobilization, rehabilitation and restoration efforts towards the end of the fire are not broken out. Burn-out operations, often taken at the end of the incident are not accounted for separately and actually add acres to the final fire size. Each of these components has cost implications and should be tracked from fire origin to completion of the burned area emergency restoration work.

While some of these components are covered by different budget funding codes, at the forest (and regional level) there is not an accounting of the separate phases, core activities, and cost implications within each large wildfire.

Earlier the role and function of the IBA was discussed. The panel reiterates its finding here that even when the IBA role is fully staffed it will have a marginal impact on

reducing fire suppression costs. IBA reports and finance section reports of IMTs were provided on several fires indicating specific cost containment efforts were taken, but also confirming the range of savings at five to ten percent of the total costs.

Of course, a marginal reduction of five to ten percent out of almost a half billion dollars is real money. There is a place for exercising fiscal vigilance and ensuring that a watchful eye is in place, especially when such a significant percentage of fire costs goes to contractors. On the 2006 fires reviewed here, over 100 million dollars were spent on support costs or 24% of the total expenditure (Supplemental Table 10).

- The current use of IBAs is primarily ensuring cost accountability and focused on fiscal integrity. But this is not at the strategic level and several of the IBAs the Panel spoke with all indicated that they did not see their role as challenging IMT commanders about ordering too many aviation assets or crews. Whether IBAs could be more fully integrated into the planning and resource ordering process up front is questionable. A first step might be to ensure that IBAs play a role in establishing cost management objectives identified in the WFSA and delegation of authority processes.

What IBAs can do, as several noted in the site visits, is to help shift the procurement and acquisition process from short to longer term cost planning. Review of the ICS 209s indicated in the majority of longer duration fires, there was early recognition that the fire was going to be a long term event, until a season ending event occurred.

- Given that, the IBA could help facilitate the shift to long term fire operations. This would begin with renegotiating contracts to a lower, longer term usage rate, shifting procurement strategies, and rethinking retention of assets. IBAs could lead the development of a regional supported, dual fire strategy- one with short term/high cost resources and the other with long term/low cost resources.

Another dimension of this type of cost planning dichotomy is the use of federal vs. state and contractual assets. The Panel discussed at length with many of the forest fire staffs and IMTs the merits and demerits of using higher priced state crews (notably California), more moderate, but sometimes more expensive contract crews and less expensive federal crews. A similar discussion involved bringing in out-of-region crews from Alaska or the Southeast and how that impacted on travel costs. The Panel's finding is simply that the first forests' savings on a large fire that gets cheaper crews is offset by the last forests' forced choice of using the most expensive crews. This is essentially a zero-sum game in terms of cost.

Some type of index cost factor should be developed to average out crew and engine costs appropriately. That would, in terms of cost management strategy, shift the emphasis to the more collaborative approach envisioned here. The emphasis should be on pre-fire season discussions to narrow the cost differences between federal, state, and contractor costs and to size the pool of resources in advance of reaching the highest preparedness levels. Offsets, if they are warranted, could then go into cost sharing agreements. But

clearly the need is to monitor and contain the escalating cost of crews, engines, aviation assets, etc and make a pre-fire season determination as to what the resource mix will include. Such a pre-season decision might also clarify the role of the military.

Much of the above is rather speculative. The panel's main point remains that collaborative cost management must be both strategic and innovative. It should focus on national and regional costs and contracts and not induce forests to try to contain costs by searching for the cheapest resources. However, it should also draw IMTs and forests and contract suppliers into a productive search for "constraints-driven" solutions and cost innovations.[5] Finally, collaboration should include clarifying protection priorities, suppression objectives and cost between the national forests and neighboring jurisdictions beyond current practice of agreeing on protection boundaries and responsibilities.

Issue Area 4 Recommendations– Formulating a Collaborative Cost Management Strategy for Wildland Fire Incidents

4. Formulate a collaborative cost management strategy that provides a better picture of fire suppression costs over the incident span. The strategy rethinks the cost comptroller function played by the IBA, establishes short term and longer term cost plans for fire resource ordering and procurement, and reaffirms the regional and national role in pricing fire resources (federal, state & local, private contractor and military). This collaborative cost strategy would:

- Reformulate cost tracking and reporting to cover the complete cost cycle on large wildfires,

- Reprioritize the role of IBA to make it more realistic and focused on what it can best affect (fiscal integrity, contract oversight, controlling fraud, waste and abuse),

- Identify switching points to move suppression cost management from short term to long term, (i.e. negotiate rates for short term/long term resource commitments, note if expected containment date is expressed in weeks instead of days to trigger a shift in the way resources are contracted and used),

- Establish index rates on different types of crews and assets (federal, state, local, and contractor) and work collaboratively to narrow pricing differentials.

[5] For an interesting discussion of how severe resource limitations can be linked to better performance from teams, see "In Praise of Resource Constraints" by Michael Gilbert, Martin Hoegl, and Liisa Valikangas, Sloan Management Review Spring 2007.

A Final Note - Rethinking Fire Outcomes

In the closeout sessions with the forests during the site visits, the Panel asked whether some form of new outcome measurement was needed to assess fire suppression efforts. The panel noted the general dissatisfaction across the forests with a simple cost per acres burned, a measure which the Panel rejected as totally inadequate to gauge large wildfire outcomes. Likewise, some construct of losses averted, which would be particularly impressive on these 19 fires given the small number of structures burned and excellent safety record, is unable to grapple with the larger question of whether the fire should have been suppressed in the first place.

Many of the forests provided burn severity maps of the area within the fire perimeter and discussed with the Panel some of the positive aspects of their fires. However, the Panel concluded that there were too many differing definitions of fire severity across the sample and perceptions of prefire conditions (especially where there were impacts of bug kill, invasives, previous burns, and other forest health problems) to construct a useful metric here. As the Forest Service national and regional fire organizations move to Appropriate Management Response as the most desirable suppression strategy it will be all the more critical to develop a better set of fire outcome measures that can portray fire suppression from an investment perspective.

Analyzing the outcome of a large wildfire must also consider how the forest has changed with regard to desired future condition of the forest (something both the LMP and FMP must continually address). Finally there must be some measure of improvements made in educating the public and community leaders to the risks of fire and how to better adapt to living in a new wildfire environment.

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Supplemental Table 1. Summary of Fire Conditions by Element at Time of Ignition

Incident[*a] (Region)	Pre-Fire Conditions				Conditions During Fire			Total Number of Elements
	Regional and National Prepare-dness Levels both at 4 or 5	Fuel ERC near 90th per-cent-ile	Extre-me Fuel Load-ing	Ext-reme Wea-ther Con-dition	Re-mote Locat-ion	Rug-ged Terr-ain	Major Wind Event During Fire	
Tripod Complex (6)		X	X	X	X		X	5
Day (5S)	X	X	X	X	X	X	X	7
Bar Complex (5N)		X	X	X			X	4
Columbia Complex (6)	X	X		X			X	3
Derby (1)	X	X			X	X	X	5
Pigeon (part of Bar) (5N)			X					1
Orleans Complex (5N)	X	X		X	X	X		5
Shake Table Complex (6)	X	X	X					3
Uncles Complex (5N)		X		X	X	X		4
Potato (4)	X	X	X	X	X			5
Red Mountain (4)	X	X		X			X	4
Horse (5S)		X	X	X	X			4
Rattlesnake (4)	X	X		X	X	X		5
Ralston (5N)	X	X		X		X		4
Heart/Millard Complex (5S)		X	X	X	X	X	X	6
Happy Camp (5N)		X		X	X	X	X	5
Hunter (5N)	X			X			X	3
Cavity Lake (9)		X	X		X		X	4
Maxwell (6)			X					1
TOTALS	10	16	10	14	11	8	9	

[a.] Fires Listed in descending order of cost

Supplemental Table 2.

Dates of Land Management and Fire Management Plans for Each Large Fire by Region and Forest.[a]

Region	Fire	Forest	LMP Date	FMP Date
1	Derby	Gallatin	1987	2006
		Custer	1987	
4	Potato	Salmon/Challis	1987	2006
	Red Mountain	Boise	2003	2006
	Rattlesnake			
5-N	Bar Complex	Shasta-Trinity	1995	2006
	Orleans Complex	Six Rivers	1995	(2005)[b]
	Uncles Complex	Klamath	1994	2006
	Happy Camp			
	Ralston	Tahoe	1990	2006
	Hunter	Mendocino	1995	2006
5-S	Day	Los Padres	2005	2005
	Horse	Cleveland	2005	2004
	Heart/Millard	San Bernardino	2005	2006
6	Tripod	Okanogan	1989	2004
	Columbia Complex	Umatilla	1990	2006
	Shake Table	Malheur	1990	2006
	Maxwell	Ochoco	1989	2004
9	Cavity Lake	Superior	2004	2006

[a] listed in approximate order of descending cost within region
[b] Fire Management Plan withdrawn in response to litigation

Supplemental Table 3a.
Summary of Fire Related Issues Discussed in Land Management Plans

Reg-ion	Forest	Date of Plan	# LMA (defined by)		Fire Discussion		
			Geo[a]	Goal[b]	Gen. issue	History	Fuels
1	Custer	1987		14	x		x
	Gallatin	1987		25	x	x' [c]	
4	Salmon	1987	14		x		x
	Challis	1988		25			x
	Boise[d]	2003	22		x	x	x
5-N	Shasta-Trinity	1995	22		x	x	x
	Six Rivers	1995		18	x		
	Klamath	1994		17	x		x
	Tahoe	1990	107		x		
	Mendocino	1995	41		x	x	x
5-S	Los Padres	2005	18		x		x
	Cleveland	2005	11		x		x
	San Bernardino	2005	15		x		x
6	Okanogan	1989		15	x		x
	Umatilla	1990		25	x		
	Malheur	1990		24	x		
	Ochoco	1989	28				x
9	Superior	2004		11	x	x'	

[a] Land management units defined by geographic boundaries
[b] Land management units defined by management goals
[c] x' more detail than a general discussion or comments related to specific areas
[d] Shaded rows identify Land Management Plans implemented after the 2000 National Fire Plan

Supplemental Table 3b.
Summary of Fire Related Issues Discussed in Land Management Plans

Region	Forest	Fire-Related Discussion			
		Cost Guidance	Appropriate Response		Urban Interface and Intermix
			Suppres-sion	Manage-ment	
1	Custer	x			
	Gallatin		x		
4	Salmon	x		x	
	Challis	x			
	Boise		x		x
5-N	Shasta-Trinity		x		
	Six Rivers				
	Klamath				
	Tahoe				x
	Mendocino				
5-S	Los Padres				
	Cleveland				
	San Bernardino				
6	Okanogan	x			
	Umatilla			x	
	Malheur	x		x	
	Ochoco	x	x		
9	Superior		x	x	

[d] Shaded rows identify Land Management Plans implemented after the 2000 National Fire Plan

Supplemental Table 4a.
Strategic Elements of Fire Management Plans

Reg-Ion	Forest	Date of Plan	Content (static or dynamic)	Fire Management Units			
				Num-ber of units	Size (acres)	Allow Wild-land Fire Use	Reference to LMP units
1	Custer	2006	Mostly static			6	
	Gallatin	2006	Mostly static	15	71,000	7	X
4	Salmon-Challis	2006	Mostly static	7	628,000	5	X
	Boise	2006	Mostly static	3	not reported	1	X
5-N	Shasta-Trinity	2006	Mostly static	4	not reported	3	
	Six Rivers	2005	Mostly static	3	360,000	0	
	Klamath	2006	Mostly static	4	not reported	1	X
	Tahoe	2006	Partly dynamic	5	not reported	0	
	Mendocino	2006	Partly dynamic	4	not reported	1	X
5-S	Los Padres	2005	Mostly static	2	not reported	0	X
	Cleveland	2004	Mostly static	2	not reported	0	
	San Bernardino	2006	Mostly static	2	not reported	0	
6	Okanogan	2004	Mostly static	2	2.1 million	1	
	Umatilla	2006	Mostly static	6	not reported	0	X
	Malheur	2006	Mostly static	12	95,000	5	X
	Ochoco	2004	Mostly static	6	110,000	0	X
9	Superior	2006	Partly dynamic	3	not reported	1	

Supplemental Table 4b.
Strategic Elements of Fire Management Plans

Reg-lon	Forest	Discussion of Fire Issues[a]				
		Fire History (Dates)	WUI protection roles	Boundary protection with neighbors	AMR Strategy	Cost Containment
1	Custer					
	Gallatin		X	X	X	
4	Salmon-Challis	General			X	
	Boise	1970-2001	X	X		
5-N	Shasta-Trinity	1970-2002		X	X	X
	Six Rivers	1910-2004	X			
	Klamath	1922-1999			X	
	Tahoe	1974-2002	X			
	Mendocino	General				
5-S	Los Padres	1903-2000				
	Cleveland	General				
	San Bernardino	1983-2003				
6	Okanogan	General			X	
	Umatilla	1984-2003			X	
	Malheur	1970-2001			X	
	Ochoco	1910-2004	X			
9	Superior	1976-2005			X	

[a]The Item is marked with "x" when the discussion of the topic in the FMP is sufficient to at least provide general guidance in the decision making process, a very general statement on the subject is not sufficient.

Supplemental Table 5a.
Relationship between Land Management Land Management areas and Fire Management units

Reg-ion	Forest	LMP Date	FMP Date	Number of LM areas	Number of FM units	FMU's referenced to LMA's
1	Custer	1987	2006	14	6	
	Gallatin	1987	2006	25	15	x'[a]
4	Salmon-Challis	1987	2006	39	7	x'
	Boise	2003	2006	22	3	x
5-N	Shasta-Trinity	1995	2006	22	4	
	Six Rivers	1995	(2005)[b]	18	3	
	Klamath	1994	2006	17	4	x'
	Tahoe	1990	2006	107	5	
	Mendocino	1995	2006	41	4	x
5-S	Los Padres	2005	2005	18	2	x
	Cleveland	2005	2004	11	2	
	San Bernardino	2005	2006	15	2	
6	Okanogan	1989	2004	15	2	
	Umatilla	1990	2006	25	6	x'
	Malheur	1990	2006	24	12	x'
	Ochoco	1989	2004	28	6	x
9	Superior	2004	2006	11	3	

[a] x' = The management units the FMU's are referenced to are goal-defined, not specific geographic areas.
[b] Date for Six Rivers NF is not official, the plan was withdrawn in response to litigation.

Supplemental Table 5b.
Relationship between Land Management Plans and Fire Management Plans

Region	Forest	Detailed Discussions of Fire Issues									
		Fire History		Cost Guidance		AMR		Urban Interface and Intermix		Hazard Fuels	
		LMP	FMP	LMP	FMP	LMP	FMP	LMP	FMP	LMP	FMP
1	Custer						x			x	
	Gallatin	x					x		x		
4	Salmon-Challis					x	x			x	
	Boise		x					x	x	x	
5-N	Shasta-Trinity		x		x		x			x	
	Six Rivers		x						x		
	Klamath		x				x			x	
	Tahoe		x					x	x		
	Mendocino		x							x	
5-S	Los Padres		x							x	
	Cleveland									x	
	San Bernardino		x							x	
6	Okanogan						x			x	
	Umatilla		x			x	x				
	Malheur		x			x	x				
	Ochoco		x							x	
9	Superior	x	x			x	x				

Supplemental Table 6a.
Sample Population & Housing Growth in the WUI (1990-2005)

Incident	State	County	Population				
			1990	2000	Est. 2005	Change 1990 to 2000	Change 2000 to 2005
Derby	MT	Sweet Grass	3,154	3,609	3,672	14.40%	1.70%
		Stillwater	6,536	8,195	8,493	25.40%	3.60%
		Park	14,562	15,694	15,968	7.80%	1.70%
	Derby Totals		*24,252*	*27,498*	*28,133*	*13.40%*	*2.30%*
Potato	ID	Custer	4,133	4,342	4,077	5.10%	-6.10%
Red Mountain	ID	Boise	3,509	6,670	7,535	90.10%	13.00%
Rattle-snake	ID	Valley	6,109	7,651	8,332	25.20%	8.90%
Bar	CA	Trinity	13,063	13,022	13,622	-0.30%	4.60%
Pigeon	CA	Trinity	13,063	13,022	13,622	-0.30%	4.60%
Orleans	CA	Humboldt	119,118	126,518	128,376	6.20%	1.50%
		Siskiyou	43,531	44,301	45,259	1.80%	2.20%
	Orleans Totals		*162,649*	*170,819*	*173,635*	*5.00%*	*1.60%*
Uncle	CA	Siskiyou	43,531	44,301	45,259	1.80%	2.20%
Happy Camp	CA	Siskiyou	43,531	44,301	45,259	1.80%	2.20%
Ralston	CA	Placer	172,796	248,399	317,028	43.80%	27.60%
Hunter	CA	Mendoci no	80,345	86,265	88,161	7.40%	2.20%
Day	CA	Ventura	669,016	753,197	796,106	12.60%	5.70%
		Los Angeles	8,863,164	9,519,338	9,935,475	7.40%	4.40%
	Day Totals		*9,532,180*	*10,272,535*	*10,731,581*	*7.80%*	*4.50%*
Horse	CA	San Diego	2,498,016	2,813,833	2,933,462	12.60%	4.30%
Heart-Millard	CA	San Bernar-dino	1,418,380	1,709,434	1,963,535	20.50%	14.90%
Tripod	WA	Okan-ogan	33,350	39,564	39,782	18.60%	0.60%
Columbia (State)	WA	Columbia	4,024	4,064	4,129	1.00%	1.60%
		Garfield	2,248	2,397	2,344	6.60%	-2.20%
	Columbia Totals		6,272	6,461	6,473	3.00%	0.20%
Shake Table	OR	Grant	7,853	7,935	7,297	1.00%	-8.00%
Maxwell	OR	Wheeler	1,396	1,547	1,455	10.80%	-5.90%
Cavity Lake	MN	Cook	3,868	5,168	5,367	33.60%	3.90%
	2006 Fire Totals		15.486	17.232	18.397	11.30%	6.80%

Note: Individual counties may be included more than once if they are involved in separate fires.

Supplemental Table 6b.
Sample Population & Housing Growth in the WUI (1990-2005)

Incident	State	County	Housing Units				
			1990	2000	Est. 2005	Change 1990 to 2000	Change 2000 to 2005
Derby	MT	Sweet Grass	1,639	1,860	1,907	13.5%	2.5%
		Stillwater	3,291	3,947	4,028	19.9%	2.1%
		Park	6,926	8,247	8,387	19.1%	1.7%
	Derby Totals		*11,856*	*14,054*	*14,322*	*18.5%*	*1.9%*
Potato	ID	Custer	2,437	2,983	3,042	22.4%	2.0%
Red Mountain	ID	Boise	2,894	4,349	4,792	50.3%	10.2%
Rattle-snake	ID	Valley	6,640	8,084	9,132	21.7%	13.0%
Bar	CA	Trinity	7,540	7,980	8,192	5.8%	2.7%
Pigeon	CA	Trinity	7,540	7,980	8,192	5.8%	2.7%
Orleans	CA	Humboldt	51,134	55,912	58,160	9.3%	4.0%
		Siskiyou	20,141	21,947	22,975	9.0%	4.7%
	Orleans Totals		*71,275*	*77,859*	*81,135*	*9.2%*	*4.2%*
Uncle	CA	Siskiyou	20,141	21,947	22,975	9.0%	4.7%
Happy Camp	CA	Siskiyou	20,141	21,947	22,975	9.0%	4.7%
Ralston	CA	Placer	77,879	107,302	137,086	37.8%	27.8%
Hunter	CA	Mendo-cino	33,649	36,937	38,418	9.8%	4.0%
Day	CA	Ventura	228,478	251,712	266,554	10.2%	5.9%
		Los Angeles	3,163,343	3,270,909	3,339,763	3.4%	2.1%
	Day Totals		*3,391,821*	*3,522,621*	*3,606317*	*3.9%*	*2.4%*
Horse	CA	San Diego	946,240	1,040,149	1,113,207	9.9%	7.0%
Heart-Millard	CA	San Bernar-dino	542,332	601,369	652,802	10.9%	8.6%
Tripod	WA	Okan-ogan	16,629	19,085	19,868	14.8%	4.1%
Columbia (State)	WA	Columbia	2,046	2,018	2,065	-1.4%	2.3%
		Garfield	1,209	1,288	1,277	6.5%	-0.9%
	Columbia Totals		3,255	3,306	3,342	1.6%	1.1%
Shake Table	OR	Grant	3,774	4,004	4,161	6.1%	3.9%
Maxwell	OR	Wheeler	782	842	850	7.7%	1.0%
Cavity Lake	MN	Cook	4,312	4,708	5,305	9.2%	12.7%
	2006 Fire Totals		5,713,469	6,108,875	6,408,915	6.9%	4.9%

Note: Individual counties may be included more than once if they are involved in separate fires.

Supplemental Table 7a – Comparative review of WFSAs

Incident	A.. WFSA # & Date	B. For Complex Multiple Fires- Were there multiple WFSAs-Were they reconciled	C. Delegation of Authority Letter	D. WFSA- Initial Size – Worst Case
DERBY	8/22/06	Jungle added to Derby but not identified in missing WFSA. Out into ranch land.	8/24/06-McNitt	3000/61440/87040
POTATO	7/28/06 8/1/06 8/10/06	Zane (not in WFSA) but included in costs	7/28/06 Not specific 8/5/06 Specific to costs upper limit of expenditure	?/6080/41000 ?/12088/73000 ?/32878/123460
RED MOUNTAIN	D5-2-8/16/06 Red3-8/26/06 Red5-9/7/06	One fire, then complex of fires and another complex for a total of 5 fires, on three different forests.	8/15/06-Miller-Red Mtn 8/16/06-Lund-Red Mtn 9/1/06-Martin-Cmplx 9/7/06-Broyles – Cmplx 9/9/06 – Loach, ACA 9/11/06-Broyles-Cmplx 9/13/06-Broyles-Cmplx 9/16/07-Broyles-Red Mtn.	?/9000/14500 ?/45623/133637 ?/67827/230429
RATTLE-SNAKE	8/22/07 8/27/06 9/10/06	Combined WFSA for Summit and Rattlesnake, selected strategies for each in one WFSA	Saleen Muir Muir Loach	22625/185150-8.4/20.0 Trigger unknown, but notes say costs and strategies exceeded.
BAR COMPLEX	7/25/06 (3 fires) 7/27/06-Oven-Bake, Little) 8/13/06-Cmplx 9/10/06-Complx	Little, Oven, and Bake Added Martin Fire	7/26/06-Pincha-Tulley 7/29/06-Pincha-Tulley 8/15/06-Dietrich 8/30/06-Garwood	?/600/25600 692/20890/0 (Oven,Bake) ?/600/256000 (Little) 14,244/36165/Season end 40000/79000/Season end

Incident	A.. WFSA # & Date	B. For Complex Multiple Fires- Were there multiple WFSAs-Were they reconciled	C. Delegation of Authority Letter	D. WFSA- Initial Size – Worst Case
PIGEON	9/2/06 9/10/06 +Pigeon	Pigeon Added to Bar	9/4/06-Feser 9/17/07-Johnson (Bar North) 9/17/06-Molumby (Bar South) 9/19/06-Johnson (Bar North) Joint 10/4/06-Rocky (Complex)	No data 9000/34000/148000, $21-45 for Pigeon only
ORLEANS	7/27/06 7/30/06 8/24/06	First WFSA had 2 fires, w Buck separate. Then they were all combined in Somes Fire/Orleans Complex.	7/27/06-Blume (11 fires) 8/9/06-Sinclear (3 fires) 8/10/06- Signed by 2 forests 8/23/06-Johnson-Somes only Form letter	100/53000, $2-3.2 million 15000/88000, $15-18 22400/99000, $33-60
UNCLES COMPLEX	7/24/06-#1 7/28/06Rush#1 7/28/06-Hancokc#1 8/15/06-Uncles/Hancock#2 9/8/06-Uncles/Hancock#3	Separate to start then amalgamated and reconciled	7/24/06-Sinclear 7/28/06-Sinclear (+Rush) 8/5/06-Kaage-Complex 8/20/06-Hahnenberg-Uncles and Hancock 8/31/06-Kaage-Uncles/Hancock 9/14/06-Schwartzlander-Uncles/Happy Complexes 9/25/06-Bent-Uncles Cmplx	25200/0, $6-10 8960/21000, $6.9-8.3 16000/25000, $6.3-9.9 117000/200000, $12-15 184373/215400, $14-15.5
HAPPY CAMP	7/26/06 (7 fires) 7/29/06-1A 8/12/06 (HC06) Pages missing, even numbers	No reconciliation of multiple fires	Form letter, filled in blanks. 7/26/06-Bradley 8/8/06-Garwood 8/19/06-Beal 9/3/06-Paul (Titus Fire) 9/14/06-Schwartzlander (Happy and Uncles combined)	8/12/06-12500/89000 $16.5-20 Missing pages contained other data

Incident	A.. WFSA # & Date	B. For Complex Multiple Fires- Were there multiple WFSAs-Were they reconciled	C. Delegation of Authority Letter	D. WFSA- Initial Size – Worst Case
HUNTER	8/24/06 8/28/06	Multiple with no reconciliations.	8/26/06-Philbin 8/28/07-Philbin-split fire 8/28/06-Oplinger-1/2Hunter and Kingsley. 8/5/04-Oplinger-reassigned to total control and put Philbin under Oplinger 8/15/06-Merrill-Hunter Form letters with no specifics	15300/85000 $8.7-48 million 1000/15300/85000 $60-100 million
RALSTON	9/6/06 9/7/06	Covered two forests, Tahoe and El Dorado. Not complex but covered two units	9/6/06-Sinclear 9/7/06-Sinclear+Snell, Unified combined. 9/8/06-Oplinger+Snell, Joint Form letters	2000/0, .73-.92 million 38400/113000 $31-36 million
HORSE	The 1st WFSA is No. 2 – 7/23/06	N/A	7/23/06-Specific to values at risk but not for cost. 7/25/06-	7500 initial 75000/134000
HEART-MILLARD COMPLEX	M1-7/9/06 M2-7/12/06 M2(3)3-7/14/06 SM1-7/11/06 SM2-7/23/06	Yes, multiple No Heart WFSA Strategy triggers	7/10/07-Walker 7/12/06-Hensen/Fiorella 7/15/06-Mulmuby 7/19/06-Mulumby	200/500/8000 2000/50000/120000 7000/8000/10000 37000/10000/51200 24695/12416/ 289780
DAY	9/4/06 9/7/06 9/13/06 9/17/06 9/23/06 9/27/06	One fire only, inside LP forest Cost triggered new WFSA IMT change Exceeded strategy and size Cost exceeded	9/5/06-Smith 9/7/06-Pincha-Tulley 9/18/06 – Waterbury 9/21/06-Pincha-Tulley 9/21/06-Dietrich 9/22/06-Custer	500/25000/525000 4200/118000/52500 27000/116000/ 525000 60000/460000/ 750000 117000/460000/ 750000 159300/487552/ 852926
MAXWELL	7/24/06 7/28/06 8/02/06 8/8/06	Single large	7/31/06-Reed 8/7/06-Goheen 8/15/06-Peterseon 8/25/06-Hann	300/6945/77856 2500/21850/77856 5508/21850/77856 6973/21850/77856

Incident	A.. WFSA # & Date	B. For Complex Multiple Fires-Were there multiple WFSAs-Were they reconciled	C. Delegation of Authority Letter	D. WFSA-Initial Size – Worst Case
TRIPOD COMPLEX	**7/4/04-#1-Spur Peak** **7/3/06-#1ASpur Peak** **7/27/06-#2 Spur Peak** **7/24/06-#1 Tripod** **7/27/06-#2 Tripod** **8/8/06-#3 Tripod** **8/25/06-#4 Tripod** **9/5/06-#5 Tripod** **8/22/06-#1 Cedar Creek** **8/22/06-#1 Tatoosh** **9/6/06-#1 Van Peak**	Yes, they all burned together except Tatoosh.	7/24/06-La Fave-DNR 7/25/06-La Fave-FS 7/29/06-Custer-FS/DNR 7/31/06-Custer-ACA 8/7/06-Custer-Zone2 8/8/06-Lohrey-West Zone 8/8/06-Molumby-Zone2 8/15/06-Lohrey-DNR/FS 8/23/06-Whitney-DNR/FS 8/24/06-Whitney- 8/24/06-Whitney 8/26/06-Whitney 8/27/06-Gormeley 9/5/06-Anderson 9/7/06-Anderson 9/19/06-Gormley 10/1/06-La Fave	100/14000/24750 500/700/43576 3000/70000/240000 150/6000/80000 8000/55000/221000 78000/198400 /579300 134000/198400/ 579300 163098/198400/ 579300 650/13779/40443 650/7530/126959 500/9843/259308
SHAKE TABLE COMPLEX	8/21/06 8/29/06	Single large fire and a couple of small ones. BLM ODF assumed the strategies only applied to Malhuer even though all three signed the WFSA		1000/800/120000 10500/99064 /172373
COLUMBIA COMPLEX	8/21/06 8/30/06	One fire	8/22/06-Jennings-DNR 8/27/06-Jennings-FS 8/29/06-Lohrey-Joint 9/12/06-Jennings-Joint	68000/8980/229770 76000/103483/ 400377

Incident	A.. WFSA # & Date	B. For Complex Multiple Fires- Were there multiple WFSAs-Were they reconciled	C. Delegation of Authority Letter	D. WFSA- Initial Size – Worst Case
CAVITY LAKE	7/14/06 7/15/06 7/17/06 7/19/06 7/31/06 8/7/06	Single fire	7/15/06-Stagmeir 7/19/06-Lohrey 8/1/06-Minnelin 8/8/06-Witzke Forms only, no specifics	350/1000/0 1300/1000/0 11500/23500/ 236000 16000/67000/ 615000 31830/56300/ 553600 31830/40000/ 553600

Critical WFSA-Delegation Issues

A- Number of WFSAs – and amount of change compared to fire progression)
B- If a complex/multiple fires – were there multiple WFSAs
C- Delegation of Authority letter – template or specific guidance
D- WFSA 1 – relationship to final fire size

Supplemental Table 7b – Comparative review of WFSAs

Incident	E. WFSA Related to FMP-NF Boundaries	F. Timing of WFSAs Vs IMT Changes	G. Cost Containment Strategy	Other Issues Complexity Analysis
DERBY	Outside on land WFSA did NOT account for downstream values	Some missing WFSAs	None.	Underestimated the potential, overconfident. Down stream values not considered.
POTATO	All within NF boundaries, no line of sight in plans.	8/7 Type I transition Cost triggered the WFSA revisions in both cases	Yes. Specific cost limits and directions for re-evaluation	2 completed, 7/30 and 8/4 3 days to initial WFSA Complexity analysis done independently of WFSA
RED MOUNTAIN	All inside	Size and cost ? New strategy	Not specific just final cost targets	Our copies were not signed and daily reviews were not completed.
RATTLE-SNAKE	All within NF, commensurate with FMP	No, triggered by costs and strategies	No specifics but had an upper limit, combined the two fires into one cost statement. They were washed together.	One WFSA to save time and money. Historic ranger station
BAR COMPLEX		Cost trigger, strategy failed Strategy	None	
PIGEON	Included BLM and some private.		None	Large expenditures to protect private land on the south Safety requirements caused the decision for one management team
ORLEANS	All within	Initial Acres, cost Strategy change	None	Tribal land added complexity FSPRO used extensively and risk assessments were done.
UNCLES COMPLEX	All wilderness	Breach of strategies caused revisions.	Nothing specified	None
HAPPY CAMP	Yes, stayed inside	Unknown triggers for WFSA, unknown IMT relationships	None what so ever.	None

Incident	E. WFSA Related to FMP-NF Boundaries	F. Timing of WFSAs Vs IMT Changes	G. Cost Containment Strategy	Other Issues Complexity Analysis
HUNTER	All inside, but outside values were considered.	Strategy for management with split responsibilities caused WFSA change.	None, form letter used for DOA.	Slow to downsize after containment.
RALSTON	Two forests and stayed within them	Blew out the first and Unified Command triggered changes	None	Underestimated the first WFSA Extensive use of State resources Unified command state and forest.
HORSE	FMP didn't recognize the need to fix the breach caused by Laguna in 1970. Cal-Fire protected external resources at great cost	7/23/06 7/25/06 IMT changes but not related to WFSA	None	Fire halted by rain Use of military helicopters
HEART-MILLARD COMPLEX	No line of sight, Millard in NF Sawtooth outside	Yes, they were coordinated	None	No risk documentation
DAY	Some WUI and I-5 corridor threatened Old FMP with out of date information	Yes	WFSA triggered by cost for the next level of approval	LA and Ventura County suppression concerns with backburns.
MAXWELL	Essentially all on forest LMP allowed for WFU. FMP doesn't permit it.	Breach of boundary Cost trigger Cost trigger	None, spending limits only.	
TRIPOD COMPLEX	FMP done at a much later date that LMP. FMP set some direction because of changed forest conditions.	Multiple strategy changes, multiple cost changes, multiple management organizational changes.	Initial Strategy change-rain Initial Exceeded area ?Cost	Heavy influence from DNR on Elliot State Forest and Lynx habitat.
SHAKE TABLE COMPLEX	LMP write for timber. FMP calls for full control but WFSA has direct/indirect chosen.	Breach area. Changed strategy	None	See Column B.

Incident	E. WFSA Related to FMP-NF Boundaries	F. Timing of WFSAs Vs IMT Changes	G. Cost Containment Strategy	Other Issues Complexity Analysis
COLUMBIA COMPLEX	Mostly state land burning onto FS	Exceeded area and above cost	None	After cross billing the $10 million threshold wouldn't have been met.
CAVITY LAKE	All NF	Initial Exceeded area Cost	None	Fuels management used in fire suppression

E. Linkage of WFSA to FMPs – and outside boundaries (was WFSA inside NF boundary

F. Timing of WFSA changes – Money, Change in Teams, or Recognition Tactics were failing

G. Does WFSA/D of A contain a section or wording on cost containment and its importance? Cost reduction trigger points

Supplemental Table 8 – Number of IMTs on Large Wild Fires

Incident	*Fire Costs (in Millions)*	*Days to 90% Contain-ment*	*Acres*	*# Team Type III*	*# Team Type II*	*# Team Type I*	*# Team Type Unknown or Not Formal Type*
Tripod Complex	$74.2	76	113,011	3	3	4	
Day	$53.4	26	162,702	1	1	6	2
Columbia Complex (State)	$35.9	41	109,259	2	2	1	
Bar Complex	$24.0	104	100,414	1	1	6	
Pigeon (added to Bar)	$22.2			1	1	1	
Orleans Complex	$16.9	35	15,172	2	0	0	
Shake Table Complex	$16.1	19	14,453	6	2	1	
Uncles Complex	$14.7	84	30,454	3	4	0	1
Derby	$14.5	27	223,570	2	2	2	
Horse	$13.7	5	16,681	0	3	2	
Red Mountain	$13.6	36	35,482	3	2	2	2
Heart/Millard Complex	$13.0	23	23,917	1	1	1	
Ralston	$13.0	11	8,423	3	1	1	
Happy Camp	$12.5	54	6,134	1	5	0	
Potato	$12.5	32	18,236	2	3	1	
Hunter	$12.1	19	16,296	5	2	1	
Cavity Lake	$11.4	22	31,830	3	2	1	
Maxwell	$11.3	12	7,157	2	2	0	1
Rattlesnake Complex	$9.7	43	43,600	2	2	1	
Totals				47	39	31	6

Note: Incidents are listed in order of descending fire cost

Supplemental Table 9 – Comparative Review of IMT Staffing & Transitions

Incident Start Date (teams)	*Team Commander, Type, Start*	*Committed Personnel (Containment Percent)*	*Overhead*	*Costs to Date ($)*	*Cost Containment Observations from Narratives*
Derby 8/22 223,570 $14.5 (2 Type III; 2 Type II, 2 Type I)	Bennett III 8/23	38 (0%)	38	200,000	National shortage of resources kept staffing to a minimum. Use of daily cost containment analysis checklist. Moved aviation operations to facilitate shorter flight times.
	Mcnitt II 8/25	213 (20%) 402 (40%)	46 101	800,000 1,250,000	
	Bennett I 8/31	557 (2%) 1005 (55%)	112 337	2,400,000 10,610,000	
	Stanich I 9/15	662 (70%) 462 (90%)	293 236	17,150,000 19,686,000	
	Reid II 9/22	183 (90%) 163 (90%)	109 113	21,247,000 22,119,000	
	Sites III 11/6	0 (100%)	0	not reported	
Tripod Complex 7/24 113,011 $74.2 (3 Type III; 3 Type II, 4Type I)	Belsby III 7/24	31(0%)	5	5,000	
	La Fave II 7/26	262 (0%) 543 (0%)	54 140	Not Reported 1,848,246	
	Custer I 8/1	876 (0%) 1,616 (10%)	223 483	6,273,305 12,101,933	
	Molumby I 8/13	2,287 (25%) 2,780 (30%)	720 899	(23,056,000) (37,500,000)	
	Whitney I 8/27	1,744 (48%) 2,338 (54%)	753 800	51,322,034 59,521,346	
	Anderson I 9/6	1430 (56%) 1415 (65%)	657 575	68,138,993 76,400,000	
	Gormley II 9/19	734 (70%) 627 (70%)	323 300	83,503,198 83,261,842	
	LA Fave II 10/2	203 (85%) 131 (85%)	102 84	82,560,000 82,875,390	
	Brodenson III 10/6	89 (85%)	63	82,875,390	
	Van Woert III 10/9	0 (100%)	0	68,175,390	
Shake Table Complex 8/22 14,453 $16.1 (6 Type III; 2 Type II, 1 Type I)	Stock III 8/22	64 (0%) 68 (0%)	15 15	NR NR	
	Hunt II 8/24	68 (0%)	15	NR	
	Hunt I 8/26	873 (10%) 1,498 (20%)	131 275	594,452 4,969,494	
	West II 9/05	1,146 (65%) 920 (75%)	255 229	9,400,00 11,300,000	
	Brock III 9/10	320 (85%) 312 (90%)	29 34	NR NR	
	Pugh III 9/13	225 (90%)	33	NR	
	Cross III 9/14	233 (95%) 46 (96%)	33 6	13,500,000 NR	
	Nash III 9/21	83 (100%)	15	NR	
	Cross III 10/4	0 (100%)	0	NR	

Incident Start Date (teams)	*Team Commander, Type, Start*	*Committed Personnel (Containment Percent)*	*Overhead*	*Costs to Date ($)*	*Cost Containment Observations from Narratives*
Maxwell 7/24 7,157 $11.3 (1 Type FUMT, 2 Type III; 2 Type II, 0 Type I)	Petersen III 7/24	16 (0%)	0	Costs not reported	Used activated satellite phone system that allowed establishment of base camp closer to the fireline, reducing travel costs and risk of vehicle accidents. Used equipment group to better manage equipment. Used local agency helicopters on a loan basis. Used exclusive use helicopters Established overhead water fill stations that increased water delivery by 66 percent. Prepared a demobilization plan early to identify and release resources no longer needed. Used resources already on the fire to complete rehabilitation. Established a Central Oregon MAC group early.
	Reed FUMT 7/26	261 (0%)	58	365,000	
	Reed II 7/27	327 (0%) 1019 (50%)	63 211	485,000 4,345,141	
	Goheen II 8/8	961 (95%) 706 (95%)	229 191	9,229,450 10,754,956	
	Petersen III 8/14	485 (100%)	170	11,554,661	
Potato 7/27 18,236 $12.5 (2 Type III; 3 Type II, 1 Type I)	Rogers III 7/27	45	20	Costs not reported	
	Lunde II 7/29	106 (0%) 746 (15%)	65 185	835,770 2,950,747	
	Broyles ! 8/7	767 (25%) 690 (42%)	208 226	5,188,000 9,130,642	
	Van Bruggen II 8/23	343 (90%)	113	13,513,824	
	Raley II 8/24	147 (90%) 13 (95%)	11 7	13,789,968 (Costs not reported ; last cost 14,084,565 on 8/25)	
	Davis III 8/28	1 (95%)	0	(Cost not reported)	

Incident Start Date (teams)	*Team Commander, Type, Start*	*Committed Personnel (Containment Percent)*	*Overhead*	*Costs to Date ($)*	*Cost Containment Observations from Narratives*
Red Mountain 8/14 35,482 $13.6 (2 NR; 3 Type III; 2 Type II, 2 Type I)	Clinton NR 8/14	13 (0%)	3	50,000	
	Miller III 8/15	25 (5%)	3	N/R	
	Cardoza III 8/16	72 (10%) 120 (18%)	2 4	N/R N/R	
	Lund II 8/19	287 (25%) 382 (20%)	105 139	527,000 1,610,000	Sharing of aviation units with other fires and local unit. Helibase location on federal land. Limited use of retardant.
	Raley II 8/27	451 (10%) 609 (10%)	30 167	2,511,074 4,034,179	Use of logistics and transportation trailers holding power cords, distribution boxes and other times, saving $2,100. use of tents instead of office trailers saving $14,000. Use of local EMS instead of private ambulances saved $4,200. Combining 2 helibases into on saved $24,50 in supervisory costs. Combining 2 helibases eliminated need for 2 support trailers, saving $7,500. Sharing aviation resources between 2 incidents saved $200,000. Planning staff produced the executive summary of using a copy service, saving $4,500. Single close-out summary document saved $500 in printing costs.
	Martin I 9/02	508 (30%) 450 (20%)	244 194	5,800,000 7,000,000	
	Broyles I 9/10	382 (25%) 498 (75%)	175 187	9,370,081 11,872,067	Coordinated trips into Boise, switched out 2000 gallon to 4200 gallon. Use of yurts, wall tents, circus tent instead of contract equipment saved $160,000. Started daily shift at 0700 to reduce operational period saved $160,000. Combined operations, command, and general staff meeting to reduce tents. Released 3 engines early saving $2000, released type I helicopter saving $90,00, released 2 type I helicopters ahead of schedule, saving $360,000. Crews used for rehab, saving $35,000. Released 1 of 2 dozers, saving $8400. Utility spike camp saved $31000. Release of 2 water tenders saving $4400. Total quantifiable savings $690,800.
	Rex Miller III 9/23	32 (95%) 28 (90%)	3 3	13,600,000 N/R	
	Good N/R	32 (90%)	7	N/R	

Incident Start Date (teams)	*Team Commander, Type, Start*	*Committed Personnel (Containment Percent)*	*Overhead*	*Costs to Date ($)*	*Cost Containment Observations from Narratives*
Rattlesnake Complex 8/21 43,600 $9.7 (2 Type III; 2 Type II, 1 Type I)	Williams III 8/22	120 (0%)	4	(Cost not reported)	
	Saleen II 8/23	243 (not reported %) 605 (15%)	32 145	150,000 3,303,241	Operation section monitored progress on the fire and initiated demobilization or canceling out outstanding orders based on situation updates and weather conditions.
	Muir I 9/6	505 (25%) 463 (30%)	143 142	6,800,000 9,600,000	Use of Garden Valley Work Site for ICP instead of leased site. Release of excess aircraft resources and equipment immediately. Use of spike camps. Use of mobile retardant base and helibase operations on private property. Limited IMT rentals and care pooled. Used local resources and copying. Renegotiated more cost effective agreements for long-term use. Combined daily medical trips. Utilized leased equipment rather than renting or buying. Used IM medical supplies. Released high-cost equipment. Utilized GIS specialist and equipment rather than contract support. Evaluated buy versus lease options for equipment. Utilized best value consideration when demobilizing contract equipment.
	Lund II 9/22	177 (87%) no reported data midpoint	75 no reported data midpoint	13,297,877 no reported data midpoint	Utilizing exclusive use helibase and not private land, releasing more expensive Call When Needed helicopter and using exclusive use. Filling key positions with local aviation personnel. Utilizing local fire engine and releasing contract water tenders, using Boise national forest ATGS and platforms.
	Demasters III 9/28	71 (89%) 157 (90%)	9 10	13,249,196 not reported	
Orleans Complex 7/24 15,172 (2 Type III; 0 Type II, 0 Type I)	Blume II 7/28 8/11	390 (2%) 772 (25%)	107 229	852,000 9,400,000	
	Johnson II 8/25 8/31	315 (72%) 219 (90%)	164 102	16,600,000 17,456,000	

Incident Start Date (teams)	*Team Commander, Type, Start*	*Committed Personnel (Containment Percent)*	*Overhead*	*Costs to Date ($)*	*Cost Containment Observations from Narratives*
Bar Complex 7/23 100,414 $24.0 (1 Type III; 1 Type II, 6 Type I)	Pincha-Tulley I 7/26	251 (5%) 511 (25%)	60 130	97,700 5,454,223	Cost containment was initially addressed in terms of containing the fires at the least size and as soon as possible. Given the amount of fire activity, the lack of resources and inaccessible terrain, the least fire size was changed to the containment strategy that minimized fireline construction and resource need.
	Dietrich I 8/16	411 (41%) 523 (46%)	152 162	10,904,664 15,447,559	
	Garwood II 8/31	457 (52%) 568 (57%)	142 160	19,596,031 21,196,812	
	Feser I 9/06	577 (49%) 1,366 (49%)	189 264	23,500,000 32,300,000	
	Molumby/Johnson I 9/19	1,858 (39%) 1,334 (39%)	562 527	42,100,000 48,200,000	
	Molumby I 9/30	925 (40%) 834 (43%)	245 233	53,800,000 55,300,000	
	Oplinger I 10/04	535 (48%) 468 (73%)	207 218	56,900,000 59,300,000	Implemented a cost containment strategy to reduce the daily cost of the complex as well as reviewing various ongoing land use agreements, contracts for cost comparison of like resources, and other fiscal items while coordinating any incident purchases with the established buying team.
	Rogers III 10/14	110 (NR) 35 (84%)	26 4	60,861,096 61,227,513	
Uncles Complex 7/24 30,454 $14.7 (1 Type FMT, 3 Type III; 4 Type II, 0 Type I)	Allen III 7/24	1 (0%)	0	Not reported	
	Sinclear II 7/26	41 (0%) 541 (10%)	41 111	50,000 1,300,000	
	Kaage II 8/7	484 (20%) 344 (35%)	120 153	4,900,000 8,250,000	
	Hahmenberg FMT 8/21	123 -- 122 (37%)	84 57	9,376,000 9,890,000	
	Kaage II 9/1	149 (35%) 156 (35%)	64 94	10,562,000 12,020,000	
	Swartzlander II 9/16	194 (50%) 103 (50%)	87 47	13,700,000 14,300,000	
	Bente III 9/27	34 (50%) 34 (50%)	4 4	15,000,000 15,240,000	
	Lindley III 10/12	14 (85%) 10 (90%)	4 3	15,395,000 15,469,319	

Incident Start Date (teams)	*Team Commander, Type, Start*	*Committed Personnel (Containment Percent)*	*Overhead*	*Costs to Date ($)*	*Cost Containment Observations from Narratives*
Happy Camp 7/23 6,134 $12.5 (1 Type III; 5 Type II, 0 Type I)	Mendes III 7/25	NR (10%)	10	30,000	
	Bradley II 7/27	315 (10%) 460 (20%)	73 165	450,000 2,226,500	
	Garwood II 8/09	506 (30%) 312 (85%)	227 164	5,321,000 9,928,124	
	Claypool II 9/01	22 (80%) 64 (NR)	3 4	9,938,124 10,690,000	
	Paul II 9/04	128 (25%) 241 (45%)	64 113	10,825,000 12,097,200	
	Swartzlander II 9/17	31 (95%) 1 (100%)	6 1	13,000,000 12,634,830	
Hunter 7/24 16,296 $12.1 (5 Type III; 2 Type II, 1 Type I)	Philbin II 7/26	162 (0) 554 (15%)	40 192	185,000 2,860,656	
	Walker II 8/12	653 (90%) 346 (100%)	246 119	8,740,059 11,185,179	
	Merrill III 8/21	272 (100%) 0 (100%)	85 0	Not reported 12,786,333	
	Dado III 8/27	19 (100%)	5	12,786,333	
	Spivey III 8/27	11 (100%)	5	13,263,351	
	Shippelhoute III 7/25	10 (0%)	0	Not reported	
	Dalpymple III 7/25	68 (0)	9	Not reported	
	Opliger I 7/27	78 (10%) 725 (25%)	48 110	1,372,000	
Horse 7/23 16,681 $13.7 (0 Type III; 3 Type II, 3 Type I)	Shreve II 7/23	470 (no report %)	16	Costs not reported	
	Garwood Pickens II 7/24	778 (5%)	51	Costs not reported	
	Garwood Henson II 7/25	1,418 (15%)	86	1,900,000	
	Wilcock Henson I 7/27	1,622 (50%)	125	5,115,500	
	Wilcock I 7/29	859 (100%) 417 (105)	209 170	6,865,500 9,337,071	
	Hayes I 8/2	263 (not reported %)	140	Costs not reported	
Millard Complex (1 Type III;1 Type II, 1 Type I)	Bogens III 7/9	249 (NR)	12	N/R	
	Walker II 7/10	410 (10%) 907 (5%)	64 129	325,000 3,059,654	
	Molumby I 7/20	626 (62%) 90 (62%)	138 63	11,466,819 14,289,913	

Incident Start Date (teams)	*Team Commander, Type, Start*	*Committed Personnel (Containment Percent)*	*Overhead*	*Costs to Date ($)*	*Cost Containment Observations from Narratives*
Day 9/4 162,702 $53.4 (2 NR, 1 Type III; 1 Type II, 6 Type I)	Nelson III 9/04	0 (0%)	0	NR	Use of local agency facility as Area Command Post eliminated 100% of the facility costs had an Area Command Post been contracted. Integrated local agency resources into the operations section and planning process. Incident complex used two separate IMTs that agreed to generate one IAP, share aviation resources, and share safety observer personnel.
	Smith II 9/05	327 (0%) 595 (0%)	47 92	168,000 390,000	
	Pincha-Tulley I 9/07	671 (0%) 1,682 (30%)	75 254	1,259,758 13,124,674	
	Pincha-Tulley/Dietrich I 9/21	2,094 (39%) 2,853 (39%)	470 575	25,631,867 30,315,848	
	Dietrich/Custer I 9/23	3,081 (40%) 4,788 (63%)	500 1,017	33,500,948 57,524,249	
	Custer/Feser I 10/03	1,275 (100%)	596	74,860,014	
	Feser I 10/04	1,205 (100%) 529 (100%)	559 270	72,885,659 75,400,000	
	Ladon/Molecek I 10/16	157 (100%) 46 (100%)	80 80	75,950,000 78,000,000	
	NR NR 11/21	13 (100%)	10	NR	
	NR NR 12/06	0 (100%)	0	78,000,000	
Ralston 9/5 8,423 $13.0 (3 Type III; 1 Type II, 1 Type I)	Herrera III 9/5	71 (0%)	6	Not reported	
	Sinclear III 9/7	211 (29%)	29	750,000	
	Sinclear II 9/8	1083 (0%)	137	2,300,000	
	Oplinger I 9/9	1227 (11%) 1463 (77%)	156 188	3,504,555 10,500,000	National preparedness levels at 5 and Regional Preparedness Level at 4; federal resources unattainable and had to use non-federal resources.
	Herrera III 9/19	Data not reported, end of Oplinger 134 (100%)	Data not reported, end of Oplinger 22	Data not reported, end of Oplinger 13,600,000	
Pigeon (part of Bar) 9/2 NA $22.2 (1 Type III; 1 Type II, 1 Type I)	Hayes III 9/2	298 (0%)	11	Not reported	
	Garwood II 9/3	194 (14%) 374 (17%)	16 16	355,000 1,022,778	
	Feser I 9/6	530 (25%)	50	3,500,000	

Incident Start Date (teams)	*Team Commander, Type, Start*	*Committed Personnel (Containment Percent)*	*Overhead*	*Costs to Date ($)*	*Cost Containment Observations from Narratives*
Cavity Lake 7/14 31,830 $11.4 (3 Type III; 2 Type II, 1 Type I)	Stegmier II 7/16	49 (10%) 170 (0%)	46 82	104,800 481,250	
	Lohrey I 7/21	266 (not reported %) 515 (45%)	110 230	1,574,984 4,686,398	
	Mannelin II 8/3	466 (85%) 364 (92%)	199 143	8,299,081 9,946,543	
	Witzke Heavirland III 8/9	156 (95%) 98 (95%)	84 50	10,517,842 10,940,000	
	Lynch Heavirland III 8/16	91 (96%) 0 (97%)	44 0	11,213,804 11,331,000	
	Lynch Heavirland III 9/28 (last 209)	0 (100%)	0	Costs not reported	
Sawtooth (State Jurisdiction) 7/9 6170 $17.9 (4 Type III; 0 Type II, 2 Type I)	Foley III 7/9	14 (0%)	14	Not Reported	
	Hill III 7/10	568 (75%)	54	330,000	
	U.C. III 7/11	743 (0%)	98	450,000	
	U.C. I 7/12	1342 (15%) 407 (100%)	145 103	4,750,000 17,404,950	
	McClelland I 7/21	183 (100%) 80 (100%)	10 13	17,700,000 17,850,000	
	Stock III 7/24	39 (100%)	2	17<950,000	
Columbia Complex (State Jurisdiction) 8/21 109,259 $35.9 (2 Type III; 2 Type II, 1 Type I)	Mellander III 8/22	177 (0%)	66	Not Reported	
	Jennings II 8/23	217 (0%) 736 (10%)	76 121	300,000 3,300,000	
	Lohrey I 8/30	1219 (20%) 1653 (45%)	296 510	7,600,000 16,700,000	
	Jennings II 9/14	1096 (80%) 949 (80%)	409 336	27,255,000 31,500,000	
	Fernandez III 9/26	105 (85%) 119 (95%)	51 51	35,400,000 35,400,000	

Supplemental Table 10a. Summary of ICARS Cost Data ($ millions) Broken down by Cost Category and Showing each Fire within Complexes, the Dates the Data Covered are also shown.

Incident	Avi-ation	Crews	Equip-ment	Direct Pers-onnel	Indir-ect Pers-onnel	Sup-port	Sub-totals	**TOT-ALS**
Tripod Complex								**83.65**
8 mile (7/25-10/1)	7.24	4.99	6.97	4.81	3.69	8.33	36.03	
Trpd a (7/24-10/11)	4.32	9.94	12.75	3.27	4.39	12.04	46.71	
Trpd b (8/2-10/10	0.21	0.07	0.13	0.07	013	0.28	0.90	
Day								
East (9/6-9/22)	6.39	4.06	4.93	1.33	3.27	5.47	25.44	**98.10**
West	14.11	13.54	19.23	3.66	9.29	12.82	72.65	
Columbia Cmplx (8/21-9/25)	3.93	5.56	9.29	1.33	1.96	9.00		**31.07**
Bar Cmplx								
Ovn/Bk (7/25-8/14)	2.21	2.84	1.45	0.83	1.64	408	13.04	**46.46**
Pigeon (9/2-10/13)	3.50	6.75	7.42	2.70	4.92	8.12	33.42	
Derby (8/22-10/2)	5.01	2.38	4.75	0.90	2.20	5.34		**20.59**
Orleans Cmplx (7/24-10-26)	2.36	4.09	3.72	0.83	1.82	6.03		**18.85**
Shake Table Cmplx (8/22-9/15)	1.51	6.59	2.74	0.76	1.04	2.63		**15.26**
Uncles Cmplx (7/23-9/25)	3.53	3.22	1.25	1.65	1.89	3.50		**15.04**
Potato	Insufficient Data							**?**
Horse (7/23-8/1)	1.27	1.96	8.00	0.67	1.24	2.01		**15.15**
Red Mt (8/10-9/23)	3.86	2.81	1.04	0.73	1.69	3.77		**13.89**
Rattlesnake (8/21-9/5)	1.66	1.65	1.02	0.33	0.38	1.26		**6.30**
Heart-Millard Cmplx								**14.75**
Millard (7/9-7/25)	6.50	1.42	0.70	0.28	0.96	1.39	11.25	
Heart (7/15-7/24)	0.35	0.50	0.48	0.14	0.60	1.42	3.50	
Ralston (9/5-9/19)	2.18	2.17	3.26	1.41	1.29	3.54		**13.85**
Happy Camp	Insufficient Data							**?**
Hunter (7/24-8/9)	1.52	0.99	1.26	0.24	0.84	2.02		**6.87**
Cavity Lake (7/14-8/2)	2.93	1.49	0.37	0.40	1.03	1.74		**7.97**
Maxwell (7/24-8/14)	0.58	4.63	2.09	0.88	0.67	3.00		**11.85**

Supplemental Table 10b. Summary of ICARS Cost Data (percentage) Broken down by Cost Category and Showing each Fire within Complexes.

	Avi-ation	Crews	Equip-ment	Direct Person-nel	Indirect Person-nel	Sup-port
Tripod Complex						
8 mile	8.7	6.0	8.3	5.8	4.4	10.0
Tripod a	5.2	11.9	15.2	3.9	5.3	14.4
Tripod b	0.3	0.1	0.2	0.1	0.2	0.3
Total	*14.1*	*17.9*	*23.7*	*9.8*	*9.8*	*24.7*
Day						
East	6.5	4.1	5.0	1.4	3.3	5.6
West	14.4	13.8	19.6	3.7	9.5	13.1
Total	*20.9*	*17.9*	*24.6*	*5.1*	*12.8*	*18.6*
Columbia Complex	12.6	17.9	29.9	4.3	6.3	29.0
Bar Complex						
Oven-Bake	4.8	6.1	3.1	1.8	3.5	8.8
Pigeon	7.5	14.5	16.0	5.8	10.6	17.5
Total	*12.3*	*20.6*	*19.1*	*7.6*	*14.1*	*26.3*
Derby	24.3	11.6	23.1	4.4	10.7	25.9
Orleans Complex	12.5	21.7	19.7	4.4	9.7	32.0
Shake Table Cmplx	9.9	43.2	18.0	5.0	6.8	17.3
Uncles Complex	23.5	21.4	8.3	11.0	12.5	23.3
Potato	incomplete data					
Horse	8.4	12.9	52.8	4.4	8.2	13.2
Red Mountain	27.8	20.2	7.5	5.3	12.1	27.1
Rattlesnake	26.3	26.2	16.1	5.2	6.1	20.0
Heart-Millard Cmplx						
Millard	44.0	9.6	4.7	1.9	6.5	9.4
Heart	2.4	3.4	3.3	0.9	4.1	9.7
Total	*46.4*	*13.0*	*8.0*	*2.9*	*10.6*	*19.1*
Ralston	15.8	15.7	23.5	10.2	9.3	25.5
Happy Camp	incomplete data					
Hunter	22.1	14.4	18.3	3.5	12.3	29.4
Cavity Lake	36.7	18.7	4.7	5.0	12.9	21.9
Maxwell	4.9	39.1	17.7	7.4	5.7	25.3

Panel Bios

Richard (Rick) E. Clevette

10088 Island View Close
Chemainus, British Columbia
Canada

Mr. Clevette holds a diploma in Forest Resource Technology and has various certificates and recognitions from extension and governmental in-house training programs. He has over 32 years with the British Columbia Ministry of Forests; the last 15 with the Protection Program as the provincial Manager, Fire Management. As well as managing the suppression/operations program, his position was responsible for interagency and corporate liaison at the provincial, national and international level. During his protection tenure, Rick was instrumental in drafting and implementing the British Columbia Emergency Response Management System (based on ICS principles), the Northwest Fire Compact and new stand-alone Wildfire legislation.

Rick has also chaired many national and international wildfire associations including the Canadian Committee on Forest Fire Management, the Canadian Interagency Forest Fire Center, Western Fire and the Northwest Fire Council. He also chaired the 2nd International Wildland Fire Conference held in Vancouver in 1997.

As the provincial fire program manager, Rick was an invited participant on a 5 week fire management study tour of Australia and New Zealand. He has participated in numerous United Nations sponsored summits and study sessions relating to all aspects of wildland fire management. Rick retired in 2003 and currently provides consultant services to the provincial government, the forest industry and utility companies on fire management and fire prevention issues. He is also working with local and regional governments on community wildfire protection plans.

Lauren C. Cragg

Managing Director
LC Cragg & Associates, LLC
Hartford, CT

Lauren C. Cragg heads a consulting firm specializing in counseling organizations on strategic risk planning, risk management and resource maximization for governmental entities, educational institutions, associations, special districts/utilities, nonprofits and private companies.

Prior to her forming her own firm, in 1997, Ms. Cragg served as the Assistant Risk Manager (for Bechtel) on the largest public works project in North America, The Central Artery Tunnel Project. In that role, she provided risk assessments, contractual reviews, insurance policy analysis and extensive negotiations with insurance carriers. She also identified areas for minimizing risk and maximizing resources, development of claims reporting policies including streamlining of procedures between intergovernmental agencies.

Ms. Cragg has extensive experience in the risk management and insurance industry; she has served as a consultant to Willis, North America, assisting in identifying construction and public sector opportunities. She Was the Wrap-up Practice Leader and Vice President at Lockton Companies. She was a senior Advisor to Munich American Risk Partners (Munich RE) providing strategic risk assessments and niche marketing analysis. At Marsh, she served as an Account Executive/ Vice President specializing in higher education, public entities and nonprofit business. At Towers Perrin, she created numerous alternative risk programs and served as the Acting Risk Manager for the City of Stamford, Ct.

Ms. Cragg received a Bachelor of Arts from Grinnell College and a Master of Public Administration from the University of Colorado at Denver. She also holds an Associate Risk Management designation and a Graduate Certificate in Dispute Resolution from the University of Massachusetts at Boston. She has served on the industry committee of the Public Risk Management Association and on the Executive Board of the National Council for Public-Private Partnerships

Gary Morgan AFSM

Director, Strategy Implementation
Australasian Fire Authorities Council
East Melbourne, Australia

After beginning his career as a qualified forester in 1975, Gary career covered many disciplines of land management including forestry, fisheries, recreation management, fire management, pest plants and animal control, and the private use of crown land. These opportunities led Gary to perform the key Victorian position of Manager, Commercial Forestry. In this role he was responsible for timber harvesting and sawmilling across the State of Victoria. After a period in this role, Gary was appointed to the position of Chief Fire Officer, in the Department of Sustainability and Environment.

Gary operated in the Chief Fire Officer position for just over nine years from July, 1996 until August, 2005. In this period Gary was responsible for fire management on all non-private lands. This is approximately 8 million hectares of parks, forests and reserves within Victoria. During wildfires, under interdepartmental arrangements, he was responsible for all fire suppression personnel from a number of Government Agencies including: the Department of Sustainability and Environment, Department of Primary Industries, Vic Forests (softwood plantations), Forestry Victoria (Eucalyptus plantations and native forests) and Parks Victoria. In line with the Department of Sustainability and Environment's broader emergency management role, Gary's role increased in 2004, to become the Director for Emergency Management

Gary has been an active member of the Australasian Fire Authorities Council, the peak fire industry body within Australasia, for 10 years. During Gary's period as Chairperson for the Forests and Fire Management Group, the strong relations between the United States' National Wildfire Coordination Group and the Australian / New Zealand Forests Fire Management Group were formalized into an Arrangement. This enabled Australian and New Zealand wildland fire suppression resources to be provided to the United States during 2000, 2002, 2003, 2006 and the United States and New Zealand to provide wildland firefighters and aircraft to Victoria in 2003 and 2007.

After leaving the State Government, Gary has been engaged by both the Australasian Fire Authorities Council and the Bushfire CRC to manage regional cooperation, the development of fire management position statements and fire research for the rural and land management fire agencies within Oceania. On the international scene, Gary has continued to be involved in the International Liaison Group for the 4th International Wildland Fire Conference and the United Nations, International Strategy for Disaster Reduction Wildland Fire Advisory Group.

Lieutenant Jeffrey H. Rubini

United States Coast Guard Pacific Area
Alameda, California

Lieutenant Jeff Rubini is a National Incident Management System program manager for Coast Guard Pacific Area. He teaches intermediate and advanced level NIMS ICS courses and oversees Pacific Area's Type I Incident Management Assist Team. On-going initiatives include ICS course design and development, drafting and editing the Department of Homeland Security's Emergency Response Field Operations Guidebook, providing ICS training throughout the Coast Guard, and is an active member with the University and Agency Partnership Initiative at the Naval Postgraduate School. As a member of the Pacific Area Incident Management Assist Team, he is a qualified Type II Planning Section Chief and Type III Operations Section Chief. Most recently, Lieutenant Rubini served as the Planning Section Chief during the Super Typhoon Ioke response operation.

In his previous assignment, he served as Hazardous Materials Response Department Head and Assistant Operations Officer at the Gulf Strike Team in Mobile, Alabama. As a qualified National Strike Force Response Officer, Lieutenant Rubini responded to some of the nation's most high-profile emergency and disaster response operations including the multi-agency responses to STS-107 Space Shuttle Columbia, T/V TORM MARY and M/V ATHOS I oil spills, Hurricanes Isabel, Charley, Francis, Ivan, Jeanne, Katrina, Rita, and Wilma; Norfolk Southern train derailment, and the Group of Eight Summit security response operation.

A native of Newtown, Pennsylvania, Lieutenant Rubini graduated from Officer Candidate School in September 2002, holds a bachelors in geography from the Pennsylvania State University, and a masters in homeland security.

Frank L. Shelley

Pacific Area Operational Planning and
Force Readiness Division
Incident Management Training Branch Chief
United States Coast Guard

Mr. Shelley joined the Pacific Area Operation Planning and Force Readiness Division as the Incident Command System (ICS) coordinator in June 2005, having responsibility for implementing ICS training for all of Pacific Area. Besides teaching ICS 300/400, and training other instructors, Mr. Shelley also teaches and coordinates advanced ICS training at the 300/400 level for both position specific and team training. In this capacity, he oversees ICS issues and projects through out the Coast Guard's Pacific Area, which covers 10 states, 4 territories, and over 73 million square miles of ocean spanning north to south poles and from North America to Asia.

A 9th generation Californian, and 2nd generation Coastie, Mr. Shelley joined the Coast Guard after graduation from San Jose State with a Bachelor's in Aviation Maintenance. Mr. Shelley Served on three different Cutters (two as Chief Engineer), and at six different Marine Safety Field units. At two of these units (MSD Massena and Activities Baltimore) Frank was a plank owner, involved in the initial planning and set up of the new units (using an ICS 10 month event planning cycle), both of which involved a new way of doing business in the Coast Guard.

Mr. Shelley Retired from the Coast Guard in 1998 at the rank of Commander, and was a full time art student, studio potter, and director of a ceramics/glass studio in the Humboldt Bay area prior to his return to the Coast Guard in 2002, where he was assigned as the Pacific Area Marine Safety Staff as Chief of the Response Branch in June of that year. Previously a position that dealt almost exclusively with Environmental response from natural disasters and industrial accidents. Under his tenure the position took on new responsibilities in the areas of Radiation, Chemical and Biological weapons in the Coast Guard's Post 9/11 atmosphere. These responsibilities included not only detection prior to a release, but also ALL HAZARDS response using ICS for any post incident activity.

In addition to a FAA Airframe and Power plant license, he holds a Master's Degree in Occupational Safety from Marshall University. Mr. Shelley was raised in Santa Cruz CA but with his wife Leslie now calls Eureka CA home.

Dr. John R Shelly

Cooperative Extension Advisor
University of California
Berkeley, CA

Dr. John Shelly is a Wood Scientist and Cooperative Extension Advisor in Biomass and Forest Product Utilization at the University of California at Berkeley. He is recognized nationally for his expertise in woody biomass utilization. He also specializes in the physical properties of wood and manufacturing technology. Recent research efforts involve analyzing the basic properties and commercial availability of biomass resources, including wood, from wildland/urban interface and intermix tree removals, fuels reduction efforts, forest thinning, and drought and beetle-induced mortality. Current research projects are focused on the technology needed to wisely use these underutilized resources to enhance forest health and economic development. These include leading major projects on the utilization of diseased wood in the coastal urban interface regions of central and northern California inflicted by the Sudden Oak Death disease; and, of dead and dying trees in the drought-stressed, beetle-infested forests of southern California.

Dr. Shelly teaches forest products at the University of California and workshops in woody biomass utilization throughout California. Dr. Shelly serves on the Board of the California Biomass Collaborative and is the regional representative for the National Sun Grant initiative funded by the US Department of Transportation. He previously served on the faculty at the University of Kentucky.

Dr. Shelly earned his masters and doctorate in Wood Science and Technology from the University of California at Berkeley. He is current chair of the Northern California section of the Forest Products Society, past Regional Board Member of the International Forest Products Society, and a member of the Society of Wood Technology.

Dr. Sharon Caudle

Assistant Director
U.S. Government Accountability Office
Washington D.C.

Advisor to the Panel*

Dr. Sharon Caudle is an assistant director for homeland security with the U.S. Government Accountability Office's (GAO) Homeland Security and Justice Team. She specializes in homeland security strategic policy and management issues. Current work involves catastrophic disaster lessons learned from Hurricane Katrina, national preparedness performance expectations, and regional strategic planning. In addition to GAO, Dr. Caudle has extensive government headquarters and field experience with the U.S. Office of Management and Budget, Department of Agriculture (Food Stamp Program and Women, Infants, and Children's Supplemental Feeding Program), and the State of Nevada in social services and quality control. She also serves as adjunct faculty for the Office of Personnel Management's Management Development Centers and The George Washington University. Dr. Caudle taught at Auburn University and Syracuse University in public management and information technology management.

She earned her masters and doctorate in public management from The George Washington University in Washington, DC. She also earned a master's in homeland security and homeland defense from the School of International Studies, Naval Postgraduate School, in Monterey, CA. She is a senior fellow with The George Washington University's Homeland Security Policy Institute, a member of the American National Standards Institute Homeland Security Standards Panel steering committee, and a member of the technical committee for the national preparedness standard NFPA 1600.

* Dr Caudle served in a non-decision-making role. She was an expert advisor on performance and program evaluation metrics, risk assessment and incident management.