Born of Fire

The National Fire Plan in the Southwest

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October 2007

Special thanks to the U.S. Forest Service Southwestern Region Fire and Aviation Staff and to the Idaho Conservation League.

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Executive Summary

Many years of human intervention, logging, overgrazing, and fire suppression have altered the structure and function of forest ecosystems. Coupled with rapidly changing climate and housing development in the forest interface, these impacts critically endanger Southwestern forests. Fire is an essential element in forest renewal and its use as a fuel management tool to prevent uncharacteristic fires is a key recommendation in forest management.

Southwestern forests evolved with fire. Without it, ecosystem processes and relationships are severely compromised. Despite growing awareness of the importance of wildfire, fire continues to be suppressed at significant economic and environmental cost.

Emotion, rather than reason, drives forest ecosystem management. Widespread fear of fire among the public and political leaders is the greatest obstacle to cost-effective and ecologically-appropriate forest management. In particular, wildfire can be an effective tool for eliminating the buildup of hazardous fuels. However, the more expensive practices of logging and thinning are preferred fuel management strategies. Government agencies and political leaders often claim we can log these forests back to health.

The National Fire Plan (2001) recognizes the essential ecological role of wildfire. This plan provides technical and financial guidance for wildland fire management across the U.S. It directs land management agencies to safeguard forest interface communities yet to allow more fires to burn in backcountry forests. These recommendations would save tax dollars, restore forest ecosystems, and protect forest communities. Yet despite directives from the federal government, fire suppression is still the norm in the Southwest.

Nationally, fire suppression costs for the USDA Forest Service and the Department of Interior have exceeded $1 billion every year since 2000 and surpassed $2 billion in two of those years. (NASF 2007). In 2007, the Forest Service will likely spend 45% of its budget on wildland fire suppression. (NASF 2007). Despite the fact that federal wildland fire policy calls for the reintroduction of fire into the landscape and abundant evidence that natural fire reduces hazardous fuels, most natural fire ignitions on Forest Service lands are continue to be suppressed.

Forest Guardians completed a comprehensive review of fuel treatment programs from 2001 to 2006 and Fire Management Plans (FMPs) in the Southwestern Region of the U.S. Forest Service. The review considers data available from the Forest Service concerning Wildland Fire Use (WFU), fuel treatments inside and outside of the Wildland Urban Interface (WUI), size of fires, expenditures on fuel treatments and fire suppression costs. The results reveal that although the Forest Service has developed fire plans that consider WFU, most forests are failing to implement that component of fire plans.

In sum, the Forest Service's fire management practices in the Southwest do not incorporate the best available science and do not comply with federal laws. Fire can be used much more extensively and effectively to manage hazardous fuels in the Southwest.

Results

Fires in the Southwest Region 2007

- The National Interagency Fire Center reports that New Mexico and Arizona had 1,454 fires on USFS lands to date, burning a total of 46,033 acres.
- There have been 1,072 prescribed fires in New Mexico and Arizona in 2007, burning a total of 54,336 acres.
- 37 fires were allowed to burn as wildland fire use in New Mexico and Arizona in 2007, burning 29,282 acres.

Fire Suppression

- Fires are aggressively suppressed on more than 90% of National Forest land in the Southwest and are suppressed before they grow to one acre 80% of the time.
- The Forest Service Southwestern Region has spent between $51 million and $145 million annually suppressing fires from 2001-2006.
- From 2001 through 2006, the Southwestern Region spent a total of $503 million on fire suppression.
- Individual National Forests in the region spent between $560,000 and $27 million per year on fire suppression in the years 2001-2006.
- Spending on fire suppression varied wildly across the region: in 2006, for example, on the Lincoln, $54,000 an acre was spent putting out 36 fires that burned a total of just 25 acres, whereas the Kaibab spent $24 an acre putting out 215 fires that burned 62,961 acres altogether.

Fuel Treatment

- The Southwestern Region is utilizing fire more often than mechanical means for fuel treatments, 65% of all acres treated in the last two years, although this trend was not consistent for all forests.
- To date in 2007, the USFS had ignited 1,072 prescribed fires in New Mexico and Arizona burning a total of 54,336 acres treated in this manner for fuel buildup.
- The percentage of acres treated with fire declined from 78% in 2003/2004 to 65% in 2005/2006 while the percentage treated by mechanical means increased proportionately.
- For 2005-2006, according to figures provided by the Forest Service, the average cost of a fire-treated acre was $56, while the cost to treat an acre mechanically was four times that amount, at $205 on average.
- From 2003/2004 to 2005/2006, the percentage of treated acres in the WUI declined from 76% to 43%. Overall, from 2003 to 2006, 54% of treated acres were WUI and 46% were non-WUI.
- The greatest discrepancy in fuel treatment costs between fire and mechanical from 2005-2006 was in the Santa Fe National Forest, where mechanical treatment cost about $500 more per acre than fire treatment.
- Only four of eleven National Forests in the Southwest Region are using naturally ignighted fire to manage fuels (WFU), despite direction to do so in fire management plans.

Fire Management Plans

- The highest-scoring FMP, was the Gila National Forest, receiving 81 points out of 100. Only 3 scores improved since the last evaluation in 2004; 8 scores worsened. Southwestern National Forests are slow to translate current fire ecology and budget realities into management activities on the ground.

Fire Management in Southwestern National Forests

In order to assess the Forest Management Plans in the Southwestern Region of the USDA Forest Service, Forest Guardians developed a grading system based on twelve objective questions. The questions were designed to evaluate the FMPs based on whether they used the best available science, involved the public and other interested parties, complied with federal law, considered wildland fire use, and incorporated financial considerations. See Table 1 for grades and grading criteria.

More than 90 percent of the Southwestern national forests did not incorporate the best available fire science into the FMPs. Most Southwestern national forests technically allow WFU in isolated wilderness areas but have never applied WFU in practice. Only 3 national forests permit WFU outside of wilderness areas. In short, the management practices identified in the FMPs are often unused. On-the-ground practices do not reflect contemporary fire ecology knowledge.

Fires are so heavily suppressed that few fires burn more than an acre. For example, in 2005, 80% of total acres burned in just eight fires – only 0.5% of all the fires in the region. See Appendix 2 for fire suppression figures by forest, state, and region in 2005 and 2006. On average, the cost of fire suppression was $173 per acre, reaching a high of $54,015 per acre on the Lincoln National Forest in 2006. See Table 2 for fire suppression costs by national forest.

National Forest FMP	Table 1: National Forest Grades												Grade
	Points Received												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
Apache-Sitgreaves National Forest	5	10	5	4	10	10	6	0	0	5	5	0	60 - **D**
Carson National Forest	3	10	0	5	10	6	7	0	0	5	5	0	51 - **F**
Cibola National Forest	5	10	0	5	10	8	9	5	0	5	5	0	58 - **F**
Coconino National Forest	3	10	0	5	10	10	10	0	0	5	5	0	58 - **F**
Coronado National Forest	8	10	6	8	10	5	8	0	0	5	5	0	58 - **F**
Gila National Forest	0	10	10	8	10	8	10	5	0	5	5	0	81 - **B**
Kaibab National Forest	3	10	7	0	10	8	10	3	0	5	5	0	61 - **D**
Lincoln National Forest	3	10	0	4	10	8	10	0	0	5	5	0	55 - **F**
Prescott National Forest	2	10	2	5	10	8	10	0	0	5	5	0	57 - **F**
Santa Fe National Forest	3	10	8	5	10	8	10	5	0	5	5	5	74 - **C**
Tonto National Forest	0	0	0	7	10	6	7	2	0	5	5	0	45 - **F**

1) Does FMP incorporate best available science? (10)

2) Does the FMP consider WFU? (10)

3) What are the number of acres ascribed to WFU use as a percentage of the total number of acres on the management unit (i.e. total number of wilderness acres, acres ascribed to WFR by the Forest Plan or the WFU Implementation Plan) Has WFU ever been applied? (10)

4) What is the ratio of prescribed burning to mechanical treatments (acres of prescribed fire vs. acres of mechanical treatments as a percentage of the total acres treated from 2003-2004) What portion of total acres treated were WUI vs NON-WUI (2003-2004)?(10)

5) Does the forest plan allow for fire use, if not, are they amending it to allow for fire use? (10)

6) Are FMU's/FMZ's present, and are they delineated by natural/ecological boundaries or by resource boundaries? (10)

7) Are FMP's developed across agency boundaries or with collaborative partnerships? (10)

8) Do FMP's contain a discussion of public involvement? (5)

9) Did the FMP go through the NEPA process? (10)

10) Were fire management records released when requested? (5)

11) Does the FMP consider economics? (5)

12) Does the FMP have standards or guidelines for cost containment? (5)

Table 2: USFS Southwest Region Wildfire Suppression Costs							
National Forest	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**Totals 2001-2006**
Apache Sitgreaves	$1,858,907	$24,907,127	$15,113,985	$12,120,092	$2,686,293	$5,751,194	**$62,437,597**
Carson	$2,488,756	-$165,564	$7,156,129	$2,550,222	$2,005,352	$1,167,298	**$15,202,193**
Cibola	$5,197,322	$5,409,917	$1,845,420	$8,690,641	$1,764,716	$2,680,770	**$25,588,785**
Coconino	$5,838,480	$10,496,906	$3,808,321	$5,110,633	$1,810,518	$6,278,932	**$33,343,790**
Coronado	$2,892,742	$26,597,982	$24,701,357	$14,002,435	$8,465,942	$5,377,356	**$82,037,815**
Gila	$2,257,141	$10,595,549	$19,302,176	$5,056,594	$2,318,313	$12,831,372	**$52,361,145**
Kaibab	$4,163,443	$6,585,642	$1,114,264	$3,275,976	$1,515,421	$3,895,703	**$20,550,449**
Lincoln	$10,655,279	$13,012,030	$2,782,564	$10,044,503	$795,909	$1,344,980	**$38,635,265**
Prescott	$1,057,134	$6,053,241	$603,685	$5,154,050	$2,254,766	$3,373,742	**$18,496,618**
Santa Fe	$8,574,453	$15,941,032	$7,733,961	$3,908,866	$3,509,147	$2,616,255	**$42,283,714**
Tonto	$6,347,198	$6,403,509	$10,096,217	$20,936,838	$23,803,958	$10,020,668	**$77,608,389**
Regional Office	$6,111,209	$19,587,237	$5,930,578	$1,858,166	$560,605	$742,123	**$34,789,919**
TOTAL	**$57,442,062**	**$145,419,597**	**$100,188,816**	**$92,708,815**	**$51,490,941**	**$56,080,393**	**$503,330,624**

Forest Guardians also considered hazardous fuel treatments and the portion of treatments applied inside and outside the Wildland Urban Interface (WUI). A *WUI* is a buffer of usually one half mile around communities with a density of greater than 3 structures per acre or more than 250 per square mile. *Hazardous fuel* is burnable vegetation that can lead to undesirable fire behavior. There are two categories of fuel treatments. Mechanized fuel treatments, typically tree thinning, brush clearing, or chipping debris, are invasive and may require construction of roads. Non-mechanical treatment, typically prescribed burning, is less invasive and fills the important function of fire in the ecosystem.

Mechanical treatments are more expensive, costing about three times more than treating the area with fire (according to estimates from Applet and Morton 2003). According to data from the Forest Service, fire treatment cost $56 per acre on average and treating an acre mechanically cost $205 per acre. See Table 3 for hazardous fuel treatment acres and costs by national forest.

Table 3: Hazardous Fuel Treatment by National Forest 2003-2006[1]						
National Forest 2003-2006	Fire Use (acres)	Approx. Fire Cost	Mechanical (acres)	Approx. Mech. Cost	WUI (acres)	non-WUI (acres)
Carson	7,744	$2,323,200	6,648	$6,648,000	9,020	5,332
Cibola	32,901	$9,870,300	11,676	$11,676,000	19,129	21,076
Coconino	64,398	$19,319,400	23,622	$23,622,000	26,766	21,243
Coronado	48,837	$14,651,100	6,170	$6,170,000	16,301	35,193
Gila	103,272	$30,981,600	5,091	$5,091,000	33,159	73,700
Kaibab	34,255	$10,276,500	41,558	$41,558,000	33,498	42,315
Lincoln	26,384	$7,915,200	29,947	$29,947,000	41,655	14,648
Prescott	29,284	$8,785,200	10,852	$10,852,000	27,854	12,598
Santa Fe	32,626	$9,787,800	22,008	$22,008,000	45,319	9,315
Tonto	72,447	$21,734,100	11,954	$11,954,000	45,181	41,687
Totals	507,593	$152,277,900	214,183	$214,183,000	359,459	311,900

Recommendations

In order to improve the management of hazardous fuels on Forest Service lands in the Southwest, restore the critical role of fire, reduce the risks to firefighters, and control the rising costs of fighting fires, Forest Guardians offers the following recommendations.

1. Federal agencies responsible for forest management in the Southwest must focus National Fire Plan resources on the Wildland Urban Interface.
2. Private property and home owners should take steps to make their immediate surroundings more fire safe.
3. Communities must devise adequate evacuation routes.
4. Once the Wildland Urban Interface is adequately treated, fire should be used nearly exclusively to manage fuels in the backcountry.
5. Fire Management Plans should be updated and reissued under the National Environmental Policy Act and Endangered Species Act.
6. Wildland Fire Use should be prioritized in all Southwestern Fire Management Plans.
7. The Wildland Fire Situation Analysis model must be revised to incorporate the negative impacts associated with aggressive fire suppression.
8. A more rigorous financial assessment must be conducted on fire suppression operations.

[1] Because cost data were not available from the Forest Service for all years, estimated costs from Applet and Morton (2003) are used. Using median values from these estimates, fire costs approximately $300 per acre and mechanical treatments cost $1000 per acre.

Early Fire History of Southwestern Forests

> "We didn't invent fire…It was already out there—has been on the planet for at least 400 million years. And it will outlive us, all of our monuments, all our words."
> -*Stephen Pyne, Whole Earth, Winter 1999*

The vast forests of the western United States were born of fire, and wildfire continued to shape these forests and their associated wildlife communities until Euro-American settlement. Before fire suppression, smoky skies were probably common during the fire season throughout the Southwest. The 1896 Forest Committee, of the National Academy of Sciences, declared that in their tour of six western states, they were never out of the sight of smoke.[2]

Native Americans of the region often burned parts of western forests to manage game populations. The degree to which these burns changed western forests is not clear, but completely natural fire regimes and forests have probably not existed since humans began manipulating fire.

Early foresters, blinded by the demand for wood products, believed that the suppression of fire would lead to more abundant and profitable harvests. This kind of management proved disastrous. Fire suppression robs forests of vital nutrients and perpetuates dense stands of small trees and underbrush rather than creating space and nutrients for large trees to grow. From 1500 to 1800, an average of 145 million acres burned every year nationwide – about 18 times the recent annual burn total (USDOI 2001). By the 1930s, 50 million acres in the lower 48 were burned annually by wildfire and by the 1970s the number of acres had dropped to 5 million (USDA and USDOI 2000).

Recent Fire History of Southwestern Forests

The 1995 Federal Fire Policy was the first attempt at developing a strategy for public lands that accounted for the essential ecological role of fire. The policy acknowledged the need to restore the role of fire in the nation's forests. Prescribed burning and Wildland Fire Use, where wild fires are allowed to burn without aggressive suppression, can help achieve ecological objectives. The policy was updated in 2001 as the Federal Wildland Fire Management Policy. This policy, in addition to the National Fire Plan, provides direction for fire management. These directives mandate that Fire Management Plans (FMPs) be established for every burnable acre of vegetation on public lands (USDA Forest Service 2004).

FMPs provide the foundation for the implementation of the Federal Wildland Fire Management Policy, and they are the most important determinants of fire management activities on the ground. Ideally, FMPs specify how the restoration of fire-adapted ecosystems will be accomplished, provide guidance on reducing the impacts of fire suppression, encourage collaboration between land management agencies, delineate specific performance measures, require monitoring, and incorporate the "best available science."

In addition to the review and update of the 1995 Federal Fire Policy, Congress and the President developed the National Fire Plan to address concerns about the number of acres burned and the rising cost of fire suppression. Starting in 2001, Congress doubled funding for fire management to approximately $3 billion. Land managers were directed to reduce the

[2] Stephen Pyne, pers com.

risk of future fires through thinning, prescribed burning, and the development of FMPs. Further, funding was increased for preparedness, research, and grants to state and local fire departments to increase their firefighting capacity.

Wildfire Today

Wildfires have always blazed in Western forests. The size and severity of historic fires and the degree to which modern fires reflect historic fire behavior are sometimes debated. Today, the greatest hurdle in accepting the natural occurrence of fire is the prevalence of human settlement near these wild forests.

The Forest Service in the Southwestern Region characterizes less 24 percent of wildfires from 1986 to 2002 as high intensity (USDA Forest Service 2004). Portions of recent fires have been uncharacteristically hot and large. However, these fires may be consistent with historic burns and contribute to healthy functioning ecosystems (Baker and Ehle 2003; Kotliar et al 2003).

Recent science indicates that large scale and high intensity wildfire may be a phenomenon closely related to long-term drought and climatic conditions (Whitlock 2004; Pierce et al. 2004). Contrary to common assumption, modern fire behavior may be more closely related to climate change than to past forest mismanagement. Large wildfire activity increased in the mid-1980s, with higher large-fire frequency, longer wildfire durations, and longer wildfire seasons that seem to be strongly associated with increased spring and summer temperatures and an earlier spring snowmelt (Westerling et al. 2006).

Wildfire and Biodiversity

The impacts of fire on sensitive wildlife and plants are mixed. Fire management activities such as suppression that result in the exclusion of wildfire can have lasting negative impacts on some plant and animal species. Without large wildfires, the magnificent aspen forests of the Southwest would not grace our landscapes and fill their role in forest succession. Many other plant communities rely on fire for maintaining biodiversity. Of the 146 threatened, endangered, and rare plant species found in the conterminous U.S. for which there is conclusive information on fire effects, 135 species benefit from wildland fire or are found in fire-adapted ecosystems (Hessl and Spackman 1995).

Moderate intensity wildfires do not adversely impact occupancy of the Mexican spotted owl, a threatened species (Yasuda 1997; Scott 1998; Jenness 2000). Scientists have concluded, based on 15 years of research, that spotted owls have the ability to withstand the immediate affects of fire. In fact, the owl may be adapted to survive wildfires of various sizes and severities (Bond et al. 2000).Fire may even be beneficial for owls because of the "mosaic" of successional stages that result in the forest, leading to enhanced prey diversity and higher prey density.

Research also indicates that birds and stream insects respond well to wildfire in healthy forest ecosystems (Minshall G.W. 2003; Johnson and Wauer 1996). However, when forest systems have a history of fire suppression, more time is necessary for aquatic insects to recover from fire. Any additional impacts including fire suppression and recovery activities may worsen the response of aquatic invertebrates (Minshall 2003).

Fire retardant often finds its way into streams and lakes. It includes ammonia-based fertilizer and, in some cases, sodium ferrocyanide, and can be highly toxic to fish. Fire lines and roads cleared by bulldozers can collectively remove large portions of wildlife and plant habitat and agitate animals. Fire suppression activities may be just as harmful to wildlife as are wildfires, and perhaps even more so. Many organisms are adapted to withstand and even benefit from fires of varying intensities.

Wildfire and Water

A commonly heard concern is that fire will destroy entire watersheds and threaten municipal water supplies, but there is very little information to support these fears. In fact, evidence points to the impacts from logging and associated activities as potentially more damaging to watersheds in the long-term than wildfire (Rhodes 2007). Generally, wildfires burn in "mosaics" of high, mid, and low intensities and very few fires are high-intensity burns. When big, hot fires occur, it is most often because of "severe fire weather;" characterized by hot, dry and windy conditions.

Severe fire conditions are rare. Moreover, when they do occur, prior fuel treatments, are mostly ineffective (USDA Forest Service 2003). Most wildfires are suppressed quickly and effectively in municipal watersheds. Fire promotes healthy forests, which are absolutely essential for maintaining clean water supplies.

Reducing hazardous fuels mechanically, whether trees are removed or not, often requires road construction and the use of heavy equipment, which degrades water quality and wildlife habitat. In particular, thinning for fuel reduction that requires mechanized equipment will likely reduce water quality regardless of mitigation measures (Rhodes and Purser 1988). Fuel reduction activities may actually be more damaging to watersheds than natural wildfires.

Wildfire and Roads

Wildfire frequency and seasonality are related to road density (Forest Service 2000; Hann et al. 1997; Swetnam and Baisan 1996). In California's national forests, over 52 percent of human-caused fires occurred within 33 feet of a road edge (Johnson, 1963). However, mechanical fuels reduction activities often necessitate road construction.

Human access on roads is strongly correlated with fire ignitions in unplanned locations outside of the natural fire season. These fires can quickly grow beyond control, and unwanted effects on ecosystems and human communities may result. Avoiding new road construction and even reducing the miles of unnecessary roads in forests would result in fewer unwanted fires, better wildlife habitat, and improved water quality.

Wildland Fire Use

Fire Management Plans provide the underlying direction for fire management activities including fire suppression, prescribed burning, fuels reduction, post-fire rehabilitation and Wildland Fire Use. *Wildland Fire Use* is the management of naturally-ignited wildland fires to accomplish specific resource management objectives in defined geographic Fire Management Units (FMUs). The plans detail organizational and budgetary needs and provide guidance for evaluating the implementation. The plans are required to be updated based on regular monitoring and review.

By allowing some fires to burn, land managers can lower the cost of fire suppression, restore fire-adapted ecosystems, reduce fuel accumulations, and safeguard firefighters. An approved Wildland Fire Use plan gives forest managers more flexibility in managing fires to achieve hazardous fuel reductions.

Fire Vision for the Southwest

Managers of our Southwestern forests must foster fire as a cost-efficient and environmentally-preferable management tool. The renewing force of fire should be reintroduced to Southwestern forests, restoring the region's ecology and lessening the chances of catastrophic fires. Not every acre can be burned without prior mechanical treatments, but thinning projects should be geographically limited and ecologically grounded. Thinning is not appropriate when prescribed wildland fire can accomplish the same goals.

Forest managers should prioritize the protection of interface communities through joint-fuels reduction programs. However, the obligation to take protective measures should rest on private property owners. Fire proofing structures and immediate surroundings, commonly know as the Firewise program, is most critical for homes to withstand severe fire conditions (Cohen 1995; Cohen and Butler 1998; Cohen 1999).

Actions to reduce home ignitability include using fire resistant construction materials, removing flammable materials like firewood from around the house, cleaning flammable debris from roofs and gutters, pruning the lower branches of trees, raking needles and leaves, mowing grass adjacent to the house, and thinning dense groups of trees. Homes will not survive even low intensity ground fires if the above precautions are not in place. For example, many of the homes lost in Los Alamos during the 2000 Cerro Grande fire were consumed by surface fires that spread through pine needles, dry vegetation and wood piles that were in contact with wood siding or other flammable parts of the structure (Cohen 2000).

To protect forest communities, their immediate surroundings must be treated, local fire departments must be adequately funded, and evacuation routes must be identified. Once communities in the forest interface are reasonably protected, fire can become a viable forest management tool.

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Appendix 1: Forest Management Plan Evaluations for New Mexico and Arizona

Apache-Sitgreaves (D)

This FMP received 60 points. The low score results from several important considerations that the plan did not discuss, including use of the best available science, provisions for public involvement, and guidelines for cost containment. The plan was not developed through the NEPA process.

The plan only permits WFU in Wilderness areas, and these comprise 9% of the total 2.11 million acres of forest. Between 1994 and 2004, naturally-ignited fires have been used a total of only five times in these areas.

During the period 2003-2004, 30% of fuel treatments took place in the WUI. This proportion improved significantly in 2005-2006, when 60% of the treatments were in the WUI. However, the proportion of fire to mechanical treatments declined from 2003-2004 to 2005-2006, from 72% treated with fire to 49% treated with fire.

Carson NF (F)

This FMP received the second-lowest score of 51 points. The plan lacks use of the best available science, provisions for public involvement, and guidelines for cost containment. The plan was not developed through the NEPA process.

The FMP permits WFU in Wilderness areas, yet these comprise less than 6% of the forest. As of 2004, WFU had never been employed.

Fifty percent of fuels reduction projects were outside of the WUI, and 50% of those are mechanical, costing $3,576,000 during 2003-2004. In 2005-2006, the percentage of fuel treatments in the WUI increased from 54% to 76%. The percentage of acres treated with fire remained approximately the same.

Cibola NF (D)

This FMP received 62 points. The FMP includes a discussion of public involvement. However, the FMP does not have guidelines for cost containment, does not incorporate the best available science, and was not developed through the NEPA process.

The FMP authorizes WFU, but on just 7 percent of the 1.95 million acres of forest land base. As of 2004, the forest had never used wildland fire.

In 2003-2004, seventy percent of the fuels treatments were within the WUI boundaries, and 84% of those were prescribed burns. In 2005-2006, only 28% of fuel treatments were in the WUI, and overall only 66% of the forest was treated with fire. The score for this FMP declined to reflect the change in fuel treatment.

Coconino NF (C)

This FMP received 63 points. It provides a only weak discussion of fire ecology principles and was not developed through the NEPA process. The FMP lacks guidelines for cost containment and a discussion of public involvement.

The Coconino has a Wildland and Prescribed Fire Management Policy Implementation Procedures and Reference Guide that provides parameters for WFU, but the tool has never been applied. Of 182,000 acres of Wilderness areas, the plan designates only Kachina Peaks for WFU, comprising just 7% of all Wilderness on the nearly 2 million acre forest. WFU is not allowed outside of designated Wilderness areas.

In 2003-2004, approximately 95% of fuel treatment prescriptions were focused on the WUI, and 80% were prescribed burns. In 2005-2006, 69% of fuel treatments used fire, and only 61% of fuel treatments took place in the WUI.

Coronado NF (F)

This FMP received 58 points. The FMP was developed through interagency collaboration, contains provisions for "sound science" and includes a discussion of fire ecology principles. However, the FMP focuses on suppression and does not have guidelines for cost containment, does not incorporate a discussion of public involvement, and was not developed through the NEPA process.

The FMP allows WFU in the 335,695 acres of Wilderness, comprising 27% of the land base. However, WFU is not permitted in any areas outside wilderness.

Over 29,000 acres were burned with prescribed fire on the Coronado, comprising 77% of hazardous fuels treatments in 2003-2004. In 2005-2006, the percentage treated with fire increased to 87%. However, the proportion of the WUI that received treatment declined from 64% in 2003-2004 to 44% in 2005-2006.

Gila NF (B)

This FMP received the highest score of 81 points. Over 41,000 acres have been burned during 2003-2004, the most of any national forest in the Southwestern region. However, the FMP fails to incorporate a discussion of the best available science, does not have guidelines for cost containment, and was not developed through the NEPA process.

The Gila is one of three Southwestern national forests that permit WFU outside of Wilderness areas. It is the only one that had applied WFU in any of its 3.3 million acres of Wilderness as of 2004.

Although 53% of the fuels treatment prescriptions were outside of the WUI in 2003-2004, 89% of the treatments were prescribed burns. Mechanical fuel treatments have been limited to 1,400 acres, the smallest acreage of any Southwestern national forest. In 2005-2006, the proportion of fire-treated areas increased to 94%. However, only 6% of fuel treatments took place in the WUI during this period of time.

Kaibab NF (D)

This FMP received 61 points. It fails to incorporate a discussion of up-to-date fire ecology, does not have guidelines for cost containment, and was not developed through the NEPA process.

The FMP permits WFU in several parts of the forest. It is one of only three Southwestern forests that allow WFU outside of Wilderness areas.

In 2003-2004, 74% of the fuel treatment prescriptions were in the WUI, and 50% of treatments were prescribed burns. In 2005-2006, only 29% of the fuel treatments were in the WUI, and only 41% of total acres were treated with fire.

Lincoln NF (F)

This FMP received 55 points. It does not include the best available science, guidelines for cost containment or stipulations for public involvement. It was not developed through the NEPA process.

Although the FMP considers WFU, it has restricted its use to Wilderness areas. As of 2004, WFU had not been applied even in designated areas.

During 2003-2004, 85% of fuels treatment prescriptions were within the WUI during 2003-2004. Eighty-two percent of fuels treatments were prescribed burns. In 2005-2006, only 28% of fuel treatments used fire, and only 29% were within the WUI.

Prescott NF (F)

This FMP received 57 points. It does not incorporate the best available science, guidelines for cost containment, or a discussion of public involvement. It was not developed through the NEPA process.

The FMP considers WFU, but it is restricted to portions of Wilderness areas.

In 2003-2004, Prescott was the only Southwestern national forest that directed all hazardous fuel treatments to the WUI. Eighty-one percent of those acres were treated with fire. However, in 2005-2006, only 45% of treated acres were in the WUI, and only 68% of total acres were treated with fire.

Santa Fe NF (C)

This FMP received 74 points. The FMP incorporated the public during development and collaborated across agency boundaries. . The FMP includes cost containment standards but fails to include an up-to-date discussion of fire ecology principles and was not developed through the NEPA process.

The Santa Fe National Forest permits WFU outside of designated Wilderness areas. Though WFU is now being considered outside of wilderness, it has not to date.

In 2003-2004, 88% of hazardous fuels treatments took placed in the WUI. Seventy percent of hazardous fuels treatments were prescribed burns. In 2004-2005, 80% of fuel treatments took place within the WUI, and only 51% of total treatments were prescribed burns.

Tonto NF (F)

This FMP received the lowest score of 45 points. It fails to incorporate cost containment standards and lacks a discussion of fire ecology principles. It was not developed through the NEPA process. Moreover, WFU is not permitted anywhere in the forest.

In 2003-2004, 89% of hazardous fuels treatments took place in the WUI. Prescribed burns made up 67% of total treated acres. In 2005-2006, only 29% of treatments took place in the WUI. Fire use increased to 88% of total treated acres.

Appendix 2: Fire Suppression on USFS Lands in New Mexico and Arizona in 2005 and 2006.

				2005			
National Forest	**Total Fires**	**Acres Burned**	**Fires ≤ 1 acre (portion)**	**Fires ≤ 10 acres (portion)**	**Fires ≥ 100 acres (portion)**	**Ave. Suppression Cost per Acre**	**Notes**
Apache Sitgreaves	214	3,182	173 (81%)	206 (96%)	4 (2%)	$12,553	60% of total acres burned in one fire (Snake Ridge)
Carson	74	4,171	63 (85%)	70 (95%)	2 (3%)	$481	94% of total acres burned in one fire (Pine Canyon)
Cibola	147	1,205	119 (81%)	133 (90%)	2 (1%)	$1,464	53% of total acres burned in one fire (Airport)
Coronado	91	24,346	64 (70%)	75 (82%)	5 (5%)	$348	95% of total acres burned in one fire (Florida)
Coconino	326	1,311	294 (90%)	320 (98%)	2 (<1%)	$1,381	79% of total acres burned in two fires (Tater and Bull Run)
Gila	183	109,767	125 (68%)	159 (87%)	14 (8%)	$21	98% of total acres burned in five fires
Kaibab	141	9,598	120 (85%)	133 (94%)	3 (2%)	$158	97% of total acres burned in three fires
Lincoln	33	141	29 (88%)	30 (91%)	0	$5,637	96% of total acres burned in three fires
Prescott	68	10,541	42 (62%)	59 (87%)	3 (4%)	$214	95% of total acres burned in two fires (Sycamore and Butte)
Santa Fe	176	672	161 (91%)	175 (99%)	1 (<1%)	$5,220	76% of total acres burned in one fire (Mesa Camino)
Tonto	214	132,089	146 (68%)	181 (85%)	22 (10%)	$180	86% of total acres burned in four fires
New Mexico	**613**	**115,957**	**497 (81%)**	**566 (92%)**	**19 (3%)**	**$90**	**96% of total acres burned in six fires**
Arizona	**1,054**	**181,067**	**839 (80%)**	**973 (92%)**	**39 (4%)**	**$224**	**76% of total acres burned in five fires**
Southwest Region	**1,667**	**297,024**	**1336 (80%)**	**1539 (92%)**	**58 (3%)**	**$173**	**80% of total acres burned in eight fires or just .5% of all fires in the region**

				2006			
National Forest	**Total Fires**	**Acres Burned**	**Fires ≤ 1 acre (portion)**	**Fires ≤ 10 acres (portion)**	**Fires ≥ 100 acres (portion)**	**Ave. Suppression Cost per Acre**	**Notes**
Apache Sitgreaves	231	10,079	193 (83%)	218 (94%)	8 (4%)	$571	89% of total acres burned in three fires
Carson	113	116	95 (84%)	112 (99%)	0	$10,020	44% of total acres burned in one fire
Cibola	141	18,188	104 (74%)	121 (86%)	14 (10%)	$147	83% of total acres burned in five fires
Coronado	82	9,786	48 (59%)	67 (82%)	9 (11%)	$549	78% of total acres burned in three fires
Coconino	416	5,955	362 (87%)	404 (97%)	5 (1%)	$1,054	72% of total acres burned in one fire (Brins)
Gila	181	90,379	129 (71%)	160 (88%)	11 (7%)	$142	98% of total acres burned in eight fires
Kaibab	215	62,961	183 (85%)	199 (93%)	8 (4%)	$24	93% of total acres burned in one fire (Warm)
Lincoln	36	25	32 (88%)	36 (100%)	0	$54,015	60% of total acres burned in three fires
Prescott	96	7,376	74 (77%)	81 (84%)	5 (5%)	$457	85% of total acres burned in two fires (Cornfield and Tiger)
Santa Fe	166	3,190	149 (90%)	163 (98%)	1 (<1%)	$1,100	96% of total acres burned in one fire (Bear Paw)
Tonto	328	13,377	270 (82%)	306 (93%)	7 (2%)	$749	86% of total acres burned in three fires
New Mexico	**637**	**111,898**	**509 (80%)**	**592 (93%)**	**26 (4%)**	**$184**	**61% of total acres burned in two fires**
Arizona	**1,368**	**109,534**	**1124 (82%)**	**1275 (93%)**	**42 (3%)**	**$687**	**91% of total acres burned in fourteen fires and 54% burned in one fire**
Southwest Region	**2,005**	**221,431**	**1633 (81%)**	**1867 (93%)**	**68 (3%)**	**$253**	**93% of total acres burned in 28 fires (or 1.4% of all fires) and 57% burned in three fires**

Appendix 3: Fuel Treatments by National Forest in New Mexico and Arizona in 2003 to 2006.[3]

National Forest 2003-2004	Fire Use (acres)	Fire Use (portion)	Approx. Fire Cost	Mechanical (acres)	Mechanical (portion)	Approx Mech. Cost	WUI (acres)	WUI (portion)	non-WUI (acres)	non-WUI (portion)
Apache-Sitgreaves	21,831	69%	$6,549,300	9,592	31%	$9,592,000	21,821	69%	9,602	31%
Carson	4,548	56%	$1,364,400	3,576	44%	$3,576,000	4,264	52%	3,860	48%
Cibola	17,174	83%	$5,152,200	3,598	17%	$3,598,000	13,712	66%	7,060	34%
Coconino	27,028	80%	$8,108,400	6,629	20%	$6,629,000	32,276	96%	1,381	4%
Coronado	29,364	90%	$8,809,200	3,336	10%	$3,336,000	6,904	21%	25,796	79%
Gila	44,988	97%	$13,496,400	1,396	3%	$1,396,000	29,642	64%	16,742	36%
Kaibab	13,658	55%	$4,097,400	11,376	45%	$11,376,000	18,642	74%	6,392	26%
Lincoln	18,288	67%	$5,486,400	8,985	33%	$8,985,000	23,687	87%	3,586	13%
Prescott	12,682	81%	$3,804,600	2,890	19%	$2,890,000	16,838	100%	0	0%
Santa Fe	17,287	70%	$5,186,100	7,521	30%	$7,521,000	21,481	87%	3,327	13%
Tonto	23,303	82%	$6,990,900	5,021	18%	$5,021,000	28,824	94%	1,800	6%
Total	**230,046**	**(78%)**	**$69,013,800**	**63,884**	**(22%)**	**$63,884,000**	**218,091**	**(76%)**	**78,596**	**(24%)**

[3] Because cost data were not available from the Forest Service for all years, estimated costs from Applet and Morton (2003) are used. Using median values from these estimates, fire costs approximately $300 per acre and mechanical treatments cost $1000 per acre.

National Forest 2005-2006	Fire Use (acres)	Fire Use (portion)	Approx. Fire Cost	Mechanical (acres)	Mechanical (portion)	Approx Mech. Cost	WUI (acres)	WUI (portion)	non-WUI (acres)	non-WUI (portion)
Apache-Sitgreaves	33,614	49%	$10,084,200	35,065	51%	$35,065,000	39,756	61%	25,191	39%
Carson	3,196	51%	$958,800	3,072	49%	$3,072,000	4,756	76%	1,472	24%
Cibola	15,727	66%	$4,718,100	8,078	34%	$8,078,000	5,417	28%	14,016	72%
Coconino	37,370	69%	$11,211,000	16,993	31%	$16,993,000	31,404	61%	19,862	39%
Coronado	19,473	87%	$5,841,900	2,834	13%	$2,834,000	9,397	44%	11,976	56%
Gila	58,284	94%	$17,485,200	3,695	6%	$3,695,000	3,517	6%	56,958	94%
Kaibab	20,597	41%	$6,179,100	30,182	59%	$30,182,000	14,856	29%	35,923	71%
Lincoln	8,096	28%	$2,428,800	20,962	72%	$20,962,000	17,968	62%	11,062	38%
Prescott	16,602	68%	$4,980,600	7,962	32%	$7,962,000	11,016	45%	13,548	55%
Santa Fe	15,339	51%	$4,601,700	14,487	49%	$14,487,000	23,838	80%	5,988	20%
Tonto	49,144	88%	$14,743,200	6,933	12%	$6,933,000	16,357	29%	39,887	71%
Total	**277,442**	**(65%)**	**$83,232,600**	**150,263**	**(35%)**	**$150,263,000**	**178,282**	**(43%)**	**235,883**	**(57%)**