conserving natural resources for our future

SPECIAL REPORT

Cost of Fire

Exploring the Raging Cost of Catastrophic Wildfire

Cost of Fire: An Analysis

The number and size of catastrophic fires, those that alter the ecosystem and reduce the productivity of the resources, seem to be increasing, as this year set records. And with an increase in the number of homes in the wildland at risk - the issue of severe wildfire is front and center.

Fire can be beneficial in many ecosystems; even catastrophic wildfires can serve an ecological process. However, there are an increasing number of catastrophic wildfires and the cost of fighting those fires is high, and the damage to our natural resources and human health can be extraordinary. In over 50 years of record keeping, 2006 has proven to be the most destructive in terms of acreage, burning over 9.3 million acres. The federal government spent more than $1.5 billion this year fighting these fires. In four of the last seven years, costs have exceeded $1.3 billion and burned more than seven million acres per year.

Cost of Fire

In addition to the federal costs, great expense is also born by state and county governments, but those amounts are not generally described because they are not collected or readily available. Recent fire activity in Montana and Colorado can illustrate this point. Montana's severe fire season of 2003 utilized about $40 million dollars of state funds after all federal reimbursements. Thus far in 2006, Montana has expended about $60 million in state funds before any potential offset of federal funds. This year Colorado has committed about $7 million in state funds to cover suppression costs, and in 2002 the amount was $25 million.

It is difficult to determine the contribution made by the nation's nearly 3,000 counties toward the cost of suppression. Also, the statutory responsibility for suppression varies greatly from state to state. Using Colorado again as an example, the sheriff in each county is responsible for suppression with the county supporting the costs until a fire exceeds the county capacity to manage. This means there are many fires, some fairly large, that will not be included in federal or state totals. Some counties bear the brunt of fire suppression in their boundaries.

So many homes are now located in areas of high wildfire risk that catastrophic fires account for 2.3% of the nation's insurance losses. The most costly fires in terms of insured losses have been in California; in today's dollars the 1991 Oakland fire caused losses of about $2.2 billion, and the 2003 wildfires in San Diego and San Bernardino Counties of about $2 billion. This year, less than 700 primary residences have been lost compared to more than 3,000 in 2003 and 2,000 in 2002.

There are so many homes in the wildland that resource managers can seldom let a fire burn unchecked to reduce significant suppression costs. During any of the recent heavy fire seasons there were 20,000 fire fighters mobilized across the country. Salaries for 20,000 people are a significant costs. Equipment costs are also high -- $1,500-a-day fire engines, and large helicopters and aircraft can cost $10,000 to $50,000 a day. Firefighters have to eat and the food has to be prepared and served in remote locations increasing the cost of supporting the firefighters.

Biomass Option Must Be Considered

One option that conservationists and policy makers need consider is that of biomass-related projects. Not only can fuel be reduced from our forest lands to help protect from catastrophic wildfire, but that fuel can be used for a variety of purposes, most notably as a renewable energy source.

We do not have accurate data for all of the costs involved with fire -- tax revenues, businesses being closed, lost wages, tourism dollars -- but biomass seems an attractive economic alternative to suppression.

Conservation districts and other agencies are coming together in different parts of this country to make biomass work for everyone involved. It's had great success in the Northeast, in southern states like New Mexico, and in northwestern states like Montana. Now, say its advocates, it is time to employ biomass in more areas to help reduce the cost of fire.

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2006 Fire Season Sets Records

This year firefighters dealt with fire that was more intense, and spread across more acreage than ever recorded in the past 50 years. The 2006 fire season gave more reasons why conservationists, foresters and landowners all need to further investigate the issue of fire, and the most economically feasable way to fight it, whether it be through prevention, suppression or a combination of both.

These costs also do not include indirect costs, such as the millions of dollars in health care expense. The fine particulate matter in smoke - PM 2.5, less than 2.5 micrometers in diameter - can cause minor eye burning and runny noses, but also illnesses such as bronchitis and can aggravate chronic heart and lung diseases. A recent study in Alberta, Canada showed that when the town of Edmonton was inundated with smoke for two days, it caused an estimated

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Sediment is pouring into Cheesman Reservoir more than four years after the Hayman Fire (submitted photo).

Best Way to Address Cost? Experts Offer Opinions

Erik Christiansen knows fire. For the past 30 years he's worked on fire management for the federal government, and for the last nine years he has served as a fire behavior analyst for a Pacific Northwest overhead team that deals with some of the toughest fire challenges in the nation.

Erik Christiansen
Fuels Management Specialist - BLM

"We get to go to the big ones," said Christiansen. "(Fighting fire) is a big operation."

Christiansen serves as the Fuels Management Specialist for the Bureau of Land Management. Addressing fire, and the costs involved is a matter of three options, he said.

"Fundamentally, there are three legs: fire mitigation, fuels management, fire suppression. What proportion in various locales is most proficient? That's a heck of a question," he said.

It is a question, though, that the BLM and the US Forest Service (his previous employer) have spent a great amount of time and resources trying to answer.

"It's a huge complex question and it's the crux of our program," he said. "Not every policy can be reduced to a cost-benefit analysis. There are other factors that need to be considered. Like so many things we try to reduce it to a soundbyte and the whole issue of fire management defies simplistic packaging."

Part of the problem, according to Christiansen, is that fire is not consistent from region to region. Whereas many want to make broad statements about the severity and intensity of recent fires, Christiansen argues that each case and each ecosystem must be looked at in a unique manner.

"We lump fire into one huge category," he said. "All of our vegetative systems in the nation have different fire regimes and different tolerance of fire.

"Many of the large fires that I've personally been on have been in ecosystems where fire is necessary for that ecosystem to regenerate itself, specifically lodgepole pine in the Pacific Northwest. That cycle has been going on since the last ice age. The only constant in the woods is change."

Christiansen also suggests that another component when trying to decide the cost benefits between preventive and suppression methods are the indirect economic impacts that result from fighting fire.

"From an economic perspective there are different ways to look at that whole issue," he said. "The overwhelming amount of aviation resources we use are not government owned or managed, they're private contractors. The kitchen units, the shower units, duplicating equipment - that all comes from private contractors. There is a great deal of that which is expended that goes directly into local and regional economies."

Jerry Williams is also a veteran on the issue. Williams is the former director of Fire and Aviation for the Forest Service, and for the past year he's served as a senior advisor to the Brookings Institution.

Williams believes that the best approach -- both from an economic stance and for the sake of the forest and its wildlife - is to put a greater emphasis on land management.

"I think the message we're seeing in this last decade is that if we're not managing the land, we can't build a fire department big enough to deal with the consequences," said Williams. "When I say managing the land, I mean putting it back into some more resilient condition, some kind of understory thinning, some kind of prescribed burning regimen, much like we follow in the southeastern part of the states with the long needle pine ecosystems there -- a series of management actions that over time are designed to re-introduce the right kind of fire into these ecosystems."

Williams believes that sometimes the damage calculated due to fire understates all of the other losses that are often difficult to track or describe in terms of dollars and cents.

"These fires are not only taking out the species," said Williams, "but they're also having profound adverse consequences to nutrient cycles, energy cycles, water cycles ... we're not only adversely impacting the species, but we're having some real negative effects on the ecological systems as well."

The emphasis on land management, said Williams, should go to the areas of greatest concern because it is those few areas where fires are hitting agency budgets the hardest.

"One statistic that is important is that we're successful with initial attack and extended initial attack on close to 99 percent of the fires we deal with," said Williams. "It's only about one percent of the fires that get away and are resulting in about 95 percent of burned acres and 85 percent of the total suppression-related expenditures. Clearly we're on the margins of fire-suppression effectiveness."

USFS Uses Math As a Defense Against Fire

One of the ways the US Forest Service is working to address the issue of high fire costs is crunching data. The Rocky Mountain Research Station has been studying fire data for roughly a decade, long before other agencies began to consider such information.

Krista Gebert began working with the Station in 1996. Before that the group mostly looked at timber sales and forest planning.

"Our project leader had the foresight to see that the timber program was being reduced and thought that working with fire would be a good idea," said Gebert.

Through close work with forest managers and leaders in Washington D.C., the group aids the Forest Service and the Department of Interior on budgetary concerns.

"One of the main things we do is try to forecast wildland fire suppression expenditures at an aggregate national level for the Washington office in order for them to make budgetary decisions," said Gebert. "It's become a large issue because all of the federal agencies have a constrained budget that doesn't get any bigger year to year (in fact, it's illegal for the Forest Service to spend more than they are appropriated). The bigger the chunk of the budget that suppression takes up, the more pressure it puts on other parts of the agency. It's become an issue, not just for the people who deal with fire in the Forest Service, but for everyone in the Forest Service to try to figure out if we are spending too much, or maybe it's a bargain. We don't know that right know and a lot of work is being done to find out."

So far the data has focused on real suppression costs, and not the indirect costs that come with wildfire. But the group has begun two new studies that will soon supply new sets of data to help project other potential economic losses due to wildfire as well.

The Rapid Assessment of Values at Risk (RAVAR) project began this year.

"This project will look at all of the values at risk in whatever fashion it can, including timber values, housing and endangered species habitat," said Gebert. "They can't be measured in dollar terms but they can be described."

Another project, which just received funding from the Joint Fire Sciences, will look at fire severity; "good" versus "bad" fire.

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$10-12 million in lost wages, decreased productivity, and increased medical care. The cost of fighting the fire was about $10 million.

So what is the real cost of fire in dollars? Well, much more than just the cost of suppression. In fact, a recent study shows that the real cost was closer to triple the cost of just suppressing the fires. Suppression costs do not account for the loss of property, human and property loss, public health, the cost of restoration to federal and private lands, the impacts to the watershed, or lost tourist revenue. The cost of wildfires is vastly underestimated since federal and state agencies only track suppression costs, structures lost, and acres burned.

Let's look at just one of the fires in the study. The 2002 Hayman Fire, which was the largest in Colorado history and affected nearly three million people, impacted the municipal water supply. That cost alone was more likely triple the $39 million in suppression costs when factoring in public health, water supply, and restoring private and federal lands.

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Restoration of the natural resources lags behind when such large acres burn each year, particularly on federal lands. Reforesting - the planting of trees or using natural regeneration to restore the forest - is a critical first step in forest management. Re-establishing the forest protects the soil and water quality, as well as wildlife habitat that were lost. There has been Congressional and public response to increase resources to suppress the fires but not in reforestation. Restoring the forests is lagging behind. The backlog of national forest acres needing to be replanted has increased from 722,000 in 2000 to 900,000 acres in 2004. As inventories are completed newer numbers will be available but we know that the backlog is continuing to increase.

Although fire can have positive effects when within prescription, catastrophic fires can be damaging to wildlife populations and can even threaten species. Not all the damage is as evident as massive flames overrunning wildlife but more burning up den trees and sources of food and cover. Without forest cover, soil erosion greatly increases and can clog stream channels and damage fish and other aquatic populations. Examples of significant impact on T&E species include the Los Alamos Fire, an escaped prescribed fire, in New Mexico where 90 percent of the Mexican spotted owl habitat was lost. In California, 11 spotted owl nesting sites here lost between 1999 and 2002 because of wildfire. In 2002, the Biscuit Fire destroyed 49 known nesting sites and tens of thousands of acres of spotted owl habitat in Southern Oregon and Northern California. Wildfire is now cited as the primary threat to spotted owls and the Pacific fisher.

Based on the Cohesive Fuels Strategy, about 180 million acres are at risk on our federal forest lands and 59 million of our private forests have been identified as overstocked, or in poor health, and vulnerable to catastrophic fire, severe insect outbreak or invasive species and unable to maintain these forces within their natural parameters.

Resource managers know that better forest management where wildland and urban areas meet would help reduce the severity and cost of these wildfires.

We know that in order to restore our forests and reduce threats:

- The need to actively manage and reduce tree densities through landscape-level treatments is critical in restoring natural ecological processes and maintaining habitat conditions and connectivity.
- It will take many years of concentrated effort, using a wide variety of tools to restore our forests to a healthy condition.
- Continuing to work together, collaboratively - federal agencies, states, counties, communities and homeowners can make a difference.

In some locations, forest products can already be removed economically through commercial timber sales, thus reducing the fuel load and the risk to catastrophic fire. However, in many other locations the material that needs to be removed is low value smallwood or material that has no current market value at all.

Reducing the heavy fuels on sites without commercial outlets is costing as much as

Forst remains from the 2002 Hayman Fire, the largest in Colorado history (NACD photo).

$800 to $1,200 per acre and the fuel reductions are often simply mechanically grinding the woody material into chips and spreading them on the ground.

Developing markets for woody biomass has the potential to offset the costs of non-commercial hazard reduction. This would allow increasing the number of acres treated and thus communities could be made safer.

Utilizing this material may not require a stand alone harvesting operation, but might be adding the recovery of logging slash and small wood.

Utilization of woody biomass may take many forms and there are successful examples of many of these appearing across the country … cogeneration for steam and power, biodiesel, cellulosic ethanol, engineered lumber products, etc….

We know that the removal of small wood and reducing fuel ladders and fuel loads, although expensive, is also economical. In fact, a study in the northwest shows that the cost of reducing the fuels loads would be more than offset by lowering the costs of fighting fires in the future; even if there never was a wildfire in the stand, there are other tangible benefits such as timber not lost, increased water yield, community safety and health, that justify the cost of fuel load reduction.

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Here are a few sets of benefits for why biomass must be a strong consideration in our fight against wildfire:

Air Quality

According to Dr. Gregg Morris of the Green Power Institute, and documented in the seminal NREL report: The Value of the Benefits of U.S. Biomass Power the potential benefits of forest biomass over open burning is 9.39 cents per Kilowatt hour. Values are relative to open burning of biomass or accumulation in the forest (eventually to be burned or decomposed and returned to the air as methane and other emissions). Other potential benefits include maintaining good air quality by reducing wildfire and prescribed fires emissions; carbon trading and/or emission reduction credits; and reducing greenhouse gas production.

Social Benefits

• According to the WGA Biomass Report, biomass creates approximately four or five rural jobs per megawatt of capacity (1 MW = 1,000 kilowatts, or enough electricity for the continuous use of 1,000 average homes). And by reducing the risk of catastrophic wildfire it brings about economic stability to rural, forest-dependent communities.

• By helping to avoid catastrophic fire, biomass projects help to protect or improve recreation opportunities in the forest, and also protect or maintain the scenic values that are appreciated by all. No specific values has been placed on these benefits, however, they can be significant, especially in nationally-significant recreation areas such as Florida, where 1998 wildfires in the northeastern part of the state produced estimated economic impacts of at least $600 million, according to an article published in the Journal of Forestry.

• Biomass is the better option when considering public health. It reduces smoke and fire-related safety concerns, and injuries that stem from fighting those large fires. It also helps to reduce the respiratory concerns that catastrophic wildfire brings about to the at-risk public.

• By reducing the threat of wildfire, biomass projects also reduce the threat of lost productivity experienced after a wildfire sweeps through an area. Fire can damage facilities, disrupt traffic, and close public schools and business.

Forest Health

• There are many forest health benefits to biomass-related projects. It reduces unnatural forest density; risk of mortality to insect, disease or drought; increases forest fiber production; and produces timber and small wood products.

A biomass thinning program in the Eagle Lake Ranger District, Lassen National Forest (1993-2005) yielded an average of $267.36 per acre.

• According to data from the USFS Rocky Mountain Research Station, we spent an average of $856 per acre on large fire suppression costs from 1994 to 2005. Not only do biomass projects help to avoid those costs and the costs of rehabilitating those lands, but the reduction of fire risk also helps protect our public and private property in forest regions.

• One cannot put a value on the importance of preserving our fish and wildlife habitat. It is important to protect snags, down logs and other desired habitat components, and the precise application of desired vegetative conditions. Catastrophic wildfire often destroys the homes of so many of our valued species. Biomass is a better option to help protect that wildlife.

• Another result of wildfire is that it can leave sediment in our water. Cleaning this up afterward can be an expensive endeavor, as evident by the Hayman Fire. Biomass efforts help to reduce and avoid sediment delivery; reduce turbidity; increase water yield; and stablize flow patterns.

The table below illustrates how much more cost and loss is involved in catastrophic wildfire, yet often unaccounted for.

Hayman Fire Watershed Damage:

Lost value of water storage capacity	$37 million
Fisheries losses	$297,000
Burned area emergency rehabilitation (BAER)	$23.71 million
NRCS Grants for state, county, and private rehab	$10.80 million
Denver water emergency rehabilitation	$2.23 million
Forest Service long-term rehab funding requested	$36.77 million
Total estimated cost for watershed and rehab	**$110.8 million**

Representative data from USFS press release on the Hayman Fire (137,760 acres, 2002, Colorado)

Cost of Fire Resources

There are several good sources of information for those interested in learning more about catastrophic wildfire statistics and preventive measures. Here are a few key sites to start with:

National Interagency Fire Center
http://www.nifc.gov/

Rocky Mountain Research Station
http://www.fs.fed.us/rm/

Firewise
http://www.firewise.org/

Information on the Hayman Fire
http://www.fs.fed.us/rm/hayman_fire/

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