



"That Thing Was Rolling": The Cavity Lake Fire

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Rarely are decisions in land management clear cut. There are always trade-offs. You manage for the benefit of one or a group of species, and another set are impacted negatively. This is especially true in the present era of multiple use management where recreation, commodity interests, and ecological stewardship are all promoted by powerful interest groups and land managers have to juggle often conflicting objectives.

So, it was a unique land management challenge that was presented to the Superior National Forest in the summer of 1999. A severe storm blew down forest on close to 500,000 acres of forest land. The resulting fuel loads made the threat of catastrophic wildfire immediate and real. Land managers on the National Forest and in State and local agencies, as well as community leaders realized that it would take a well-planned, sustained, focused effort to solve the challenge of protecting the local communities and the forest from a disastrous fire.

It is also a rarity in land management to have the wisdom of decision and action validated beyond a doubt. Seven years after the blow-down, the Cavity Lake Fire provided just that for a host of persons who went to work after the 1999 storm. Seven years of endless meetings, exhaustive planning, repetitive training, and a controversial and unprecedented set of prescribed burns were all justified when a large, intense wildfire was stopped in its tracks as it was steamrolling towards the homes and businesses of the Gunflint Corridor in northeastern Minnesota. (Download map showing fire perimeter and fuel treatments)

The fuel treatments put in place in the Boundary Waters Canoe Area Wilderness (BWCAW) were part of a treatment strategy designed by Mark Finney of the Missoula Fire Lab for landscape level treatments. 'Finney bricks,' as the treatments are often called, build a brick/grid pattern across a landscape; and are strategically placed across the landscape in order to be able to stop a wildfire while only treating 15% to 20% of the total area. (See Advances in Fire Practice article - SPLATS, SPOTS and the Future of Fuels Treatment)

Researchers are already analyzing the fire and fuel treatments for lessons learned about the performance of landscape level prescribed burn treatments, but perhaps the greatest lessons that will come out of the Cavity Lake Fire is the role of leadership and cooperation. The communities around the Forest took the threat of fire created by the 1999 blow-down seriously and they were proactive in reducing the threat on private land. State and local agencies were also aggressive in mitigating fire risks in surrounding forests. And, the National Forest leaders struck a delicate balance between overplaying and underplaying the threat, avoiding 'crying wolf' about fire potential while maintaining focus on what needed to be done.

The Blow-Down and Its Aftermath

In the early morning hours of July 4, 1999 a series of thunderstorms formed over North Dakota. On radar the storms quickly developed an ominous archer's bow shape called a 'bow echo' by meteorologists. Bow echoes are associated with severe thunderstorms that carry straight-line winds in violent downbursts. The storm moved across North Dakota causing significant damage in the Fargo area, and then crossed into Minnesota. When the storm hit the Boundary Waters Canoe Wilderness Area in the Superior National Forest there were estimated to be 10,000 to 12,000 people camping, canoeing, and recreating in the Wilderness for the Independence Day holiday.



Before and After Photos showing the effects of the blow down.

The storm hit the Forest hard and fast with winds over 90 miles per hour. Trees were uprooted and snapped and a swath of forest 30 miles long and 4 to 12 miles wide was blown down. Overall, the storm impacted about 350,000 acres in the Wilderness and about 500,000 acres in the Superior National Forest.

Search and rescue lasted for 15 days, and the immediate concern was helping persons trapped and/or injured by the storm. Soon, though, the long-term public safety implications of the blow-down began to crystallize. Forest officials knew that they had a serious wildfire threat on their hands.

The obstacles to preparing and planning for the fire seasons to come were formidable. First, they needed to develop an entirely different set of suppression responses. The sheer scale of downed timber made it difficult to move around in the blow-down. This created conditions that negated the effectiveness of most direct attack strategies. The fire management

personnel had to develop a set of 'check and hold' techniques. Also, the potential size of a blaze and the threat it could pose to communities and lands outside the forest meant that emergency response would involve local, State, and federal resources. Extensive planning and coordination was required.

Second, the Forest needed to implement large-scale, landscape level fuel treatments and they needed to do it as quick as possible. This was made more difficult by the fact that most of the blow-down was in the nation's most popular Wilderness area with a local economy dependent on uninterrupted access to the backcountry. There would have to be new levels of cooperation and communication established with the local communities that would be the most impacted by the fuel treatments.

The fuel loading was beyond the experience of the land managers and fire personnel on the Superior; and they needed a quick upgrade in skills and training to do able to do the large-scale fuel treatments, primarily large acreage prescribed burns. Again, they had to develop interagency and public/private partnerships that were only loosely organized at the time of the blow-down.

The Forest quickly requested and received alternative NEPA procedures from the Council on Environmental Quality (CEQ) in the White House allowing expedited salvage logging, mechanical fuel treatment, and prescribed fire in the area around the Gunflint Corridor. This allowed the land management staff to get a quick jump on the work that needed to be done. The National Forest staff made a conscious effort not to short-circuit any of the regular public involvement procedures. They held tours. They conducted public meetings. And, they established a monitoring board to oversee the fuel reduction efforts. But, most importantly, they got to work.

Leadership and the Creation of Focus

One of the remarkable aspects of the response to the blow-down has been the level and strength of coordination between the federal land managers, State/local officials, and community leaders. “Before the blow-down cooperation existed, but it was not formalized,” says Kris Reichenbach, a public affairs officer with the Superior National Forest. “We held a kickoff meeting to develop communication and a coordination plan. We invited every agency, organization, and interest that we could identify. We were amazed at the level of interest and response. From that, we developed a core group that had access to wider networks.”

Kristen Nelson, a social scientist from the University of Minnesota, has been researching the community response to the blow-down. She says that the success has to be looked at as a three part whole – the federal agencies, Minnesota Department of Natural Resources, and local civic leaders. “Local residents and businesses have a wide ranging agenda in connection to the Wilderness. They are concerned with tourism and the economy. The leadership at all levels was able to keep wildfire up on that agenda, and to keep the groups coordinated in responding to it. Everyone had a role and they stuck to it.”

While the government agencies and emergency response officials developed strategies for responding to a fire event, communication with the public about the ongoing efforts in the Wilderness and on the Forest became key. Fire prevention was also a top concern. With so many visitors camping in the Wilderness Area, human caused fires were a serious threat. Backcountry outfitters, as the last point of contact with many Wilderness visitors, became important conduits for information on fire prevention from the Forest Service. The Forest Service developed an extensive communication network involving local media and email and fax networks. They tested and retested the system for the ability to quickly disperse emergency information as widely as possible. In addition, county governments and local volunteer fire departments (VFDs) embraced Firewise and began promoting the program to local landowners.

The success of the communication and fire prevention efforts is clear and quantifiable. Before the blow-down, 50% of the fires in the Wilderness were human-caused, while after the blow-down only 10% were. In addition, over 50% of the homeowners and businesses in the Gunflint Corridor installed components of a mobile sprinkler system operated by the local VFDs, which could be operated in the event of a wildfire. “After the blow-down everyone understood the extent of the problem from a public safety standpoint. Residences and businesses put emergency procedures in place and people put sprinkler systems in place,” says Reichenbach.

Forest officials were surprised by the level of local response. “I think when people are impacted by something on the level of the blow-down, they want to do something to reduce their vulnerability. If you give them the right information about actions they can take to protect themselves, they take it and run with it. That is what happened here,” says Reichenbach.

Finney’s Bricks

In 1999, soon after the blow-down, Mark Finney and a group of colleagues arrived on the Superior National Forest to begin assessing the fuels problem. Mark Finney says that US foresters do not have much experience with blow-downs and the team was not real sure what to expect from a fire in that heavy of a fuel environment. They turned to the Canadians who have dealt with large fires in blow-downs in Northern Ontario. “They told us to expect intense, slow moving fires that snub their nose at the weather. These fires are real juggernauts. The Canadians said there is really nothing you can do in terms of fighting the fire directly.”

The Boundary Waters Canoe Wilderness Area is a difficult place to model in terms of fire behavior and fuels. A look at a map shows that the Wilderness is a mosaic of water and islands. While most fuel and fire behavior models register water as a barrier, only the largest expanses of water are barriers to fire spread in the BWCWA. It took some tweaking to find the right fit between ground conditions and modeled scenarios. According to Paul Tiné, a former Superior National Forest Fuels Specialist, who worked on the modeling, “The models are not sensitive enough to show the role of spotting in the BWCWA. In the Wilderness, fires can spot across lakes up to a ½ mile wide and even larger. We had to do that manually. Unless it hits one of the big water lakes, we couldn’t assume that water would stop a running fire.”

View of Cavity Lake Fire burning an island on Seagull Lake, BWCAW.

Finney's team proposed a radical solution based on some theoretical ideas that Finney had been developing for a number of years - a strategic set of fuel treatments spread across the landscape in a pattern that would never let the fire gain a head of steam, and would provide areas where firefighters could work to slow fire spread.

Jim Sanders, Forest Supervisor for the Superior, studied the models, and then looked at the treatments that Finney was proposing. He decided to go ahead with it, knowing that he was committing the forest to a fuel treatment effort that would dwarf anything that they had tried previously. "We had a half a million acres of blow-down. We knew that we were not going to get all of it. This seemed like the best strategy," says Sanders.



Photo by C. DeSain

The fire and fuels staff on the Forest decided to conduct direct fuel reduction in areas close to homes and indirect treatments in the Wilderness Area, using Finney's bricks to maximize the effectiveness of the area they could treat. Outside of the Wilderness the team worked with State and private agencies to do mechanical removal of fuels and prescribed fire to create defensible space around homes and businesses.

"These forests burn on a 30 year cycle and typically a large fire is 50-60 acres. We were proposing to burn the forest in 12,000 acre chunks," says Sanders. "This is made even more difficult by the fact that we are balancing wilderness values with fire management. We had our fire crews moving around the area by canoe – paddling chain saws and pumps in the bottom of the canoes."

The large prescribed burns were ignited from the air using aerial ignition devices, ping-pong balls and heli-torches. The fire crews quickly learned about fire behavior in the blow-down - it was intense. "On some of the prescribed burns on large islands in the Wilderness, the in-draft created 3 foot whitecaps on the lake," says Sanders. The crews learned to use natural barriers such as bogs and lakes to control the fire. In fact, the crews ended up putting in much less fireline than they planned in the Environmental Impact Statement after they learned how to use the natural barriers. The crews also collected data and validated what the fuels and fire behavior models were showing – a large wildfire would be difficult to contain if it got up and running.

Most importantly the crews gained valuable experience handling large, intense fires in the blowdown – experience that became invaluable when the Cavity Lake Fire ignited this past July.

The Cavity Lake Fire ignited on July 14, 2006 on a day that saw a barrage of 30 to 40 lightning strikes across the Forest. When the Cavity Lake Fire ignited there were already multiple on-going initial attack operations. Aerial water drops of 60,000 gallons of water did nothing to stop the fire in the first few hours after it ignited. By the next morning the fire had grown to 500 acres, and soon afterwards it grew to 3000 acres. It was quickly developing into an intense fire. On July 16, a front moved through the area bringing 50 mph winds that kicked the fire into high gear, quadrupling its size to 12,000 acres. The fire eventually burned almost 32,000 acres, making Cavity Lake the largest fire in the area in over 100 years. Sanders says that the fire was a plume dominated fire, creating its own fronts and weather, even backing against the wind. For the first few days the plume was a solid 3000 acre column that did not break up until some relief came from the weather.



Crews heading out in canoes to get to the fire. Photograph by Peter Willis, State of Minnesota.

Overall, 30,000 acres of the blow-down were burned by prescribed fire by the time of the Cavity Lake Fire. This was out of a planned 75,000 acres. Most of these burns were stacked closely together, on the downwind side of the prevailing westerly winds, near the eastern end of the Wilderness. The treatments were prioritized to protect the residences and businesses to the east of the Wilderness in the Gunflint Corridor and along the edges in other

directions. After the edges were protected, the plan was to start putting the “Finney brick” treatments in the middle, moving from East to West. That part of the plan had just begun when the Cavity Lake Fire burned through four of the planned treatment areas. Paul Tiné, the former fuels specialist on the Superior says, “Based on our estimates during the planning stages of the prescribed burn program, if the Cavity Lake Fire would have occurred after they those treatments in, it would have likely only have grown to about 15,000 acres rather than 32,000.”

When the fire made its first main run to the northeast it quickly came within a few miles of structures on the eastern edge of Seagull Lake on the edge of the Wilderness in the Gunflint Corridor. The only real barrier that would keep the fire from spreading into the Corridor and then eventually into Canada was Three Mile Island, an area which had been prescribed burned in 2002. When the fire hit the treated area it laid down significantly and made the aerial water drops much more effective, and allowed ground crews to enter the area and mop up. “Without the three mile island burn, this story would not have been so positive. We would have lost about 200 homes and it would have become an international incident as the fire moved into Canada,” says Sanders. “Same story to the North, when it hit those treated areas it only advanced another half a mile at most. Those treatments were the difference between this being a success story or a large tragedy.”

Lessons Learned

While there is no question that the fuel treatments were effective in containing the Cavity Lake Fire, Mark Finney says that the fire did not really test his ideas on the strategic placement of treatments. “The fire definitely laid down in those big burn blocks and that is a success. Some people questioned whether the burns would even change fire behavior in such a high fuel environment. The fire burned into some large burns that were in place on the edges, but it did not burn through the grid pattern in the middle. It is too bad this fire didn’t occur 2-3 years down the road, and then we would have had more of the grid pattern in place.”

Finney is quick to praise the leadership at all levels in Minnesota. “We contributed some ideas that must have seemed a little wacky at the time, and to their credit they took the recommendations to heart. There were large obstacles to getting the work done that needed to be done. Persons of lesser character would have avoided it and just played the risk game. This is an excellent example of science and management making something good happen.”

Sanders agrees and says that Finney’s ideas changed the way he viewed management of the Forest. “Mark Finney’s ideas helped us to think strategically about the Wilderness and expanded the scale of how we view problems. We are now bringing that strategic view to the forest as a whole.”

The efforts of a wide range of organizations, agencies, and individuals withstood quite an onslaught. This is not just a story about Forest Service leadership, even though that played a significant role. It is really a

story about what can be accomplished when leaders at all levels agree to a natural resource management plan and stick with it, even in the face of intense scrutiny.

Advances in Fire Practice is a sub-site of wildfirelessons.net and is focused on bringing efforts and ideas to the forefront that leaders in the fire management, practice, and research communities have identified as innovative and widely applicable. It provides access to critical and proven fire information and resources. Advances in Fire Practice section can be reached directly by going to <http://www.wildfirelessons.net/AFP.aspx> or through the main Wildland Fire Lessons Learned Center website at www.wildfirelessons.net.

The Wildland Fire Lessons Learned Center actively promotes a learning culture for the purpose of enhancing safe and effective work practices in the entire U.S. wildland Fire community. It is located at the National Advanced Fire & Resource Institute in Tucson, Arizona.

