THE SCIENCE & POLITICS OF THE 1996 BOISE FRONT FIRE - WHAT HAVE WE LEARNED FROM THE 8TH STREET FIRE REHABILITATION[1,2]

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Abstract. *The 8th Street Fire intensely burned 15,300 acres of highly erodible granitic soils immediately above Boise, the capitol city of Idaho in August 1996. Immediately downslope from burned watersheds were 12 schools, three hospitals, 65 child care facilities, 25 long-term care centers and numerous public buildings, including the Federal building, City Hall and Stale Capitol. Agency managers, public officials and local citizens expressed concern about the potential for devastating debris torrents and flash flooding; many remembered the flooding that occurred in 1959 in downtown Boise after a thunderstorm moved over a recently burned watershed just to the south of the 1996 8th Street Fire area.*

This presentation discusses the process that was implemented locally to manage the recovery of the burned watershed while protecting the lives and properties at risk in town. "Best science" was utilized in preparing the recovery alternatives and actions considered. Public opinion concerning the recovery methods and the impacts to the aesthetics of the watershed landscape had to be dealt with through many hours of public meetings and workshops. We share lessons learned concerning collaboration on a multi-million-dollar landscape rehabilitation plan covering 12 different agency jurisdictions. Follow-up monitoring and research continue to make this backyard outdoor laboratory a learning tool for the public and for science.

INTRODUCTION

The August 1996 8th Street Fire burned 15,300 acres and impacted scenic and watershed values, wildlife habitat and recreation. The human-caused fire began in the Military Reserve Park of north Boise on Monday August 26, 1996. Whipped by strong southerly winds on a day of >100-degree air temperature, the fire quickly grew to over 15,000 acres. Firefighters from local, state, and Federal agencies were mobilized. Although hundreds of homes in Boise's foothills were threatened and many neighborhoods were evacuated, only one home was seriously damaged; that home sat at the end of a cul-de-sac, surrounded on three sides by dry grass and brush.. Fire suppression efforts were concentrated on protecting life and property while the fire raced unchecked upslope through brush and grasslands on steep fragile slopes, eventually burning into timber stands in the upper watersheds above Boise.

SETTING

There are five main watersheds draining from the northeast into and through the City of Boise. These include Cottonwood Creek (including Curlew Gulch and Freestone Gulch), Hulls Gulch, Crane Creek, Stewart Gulch, and Dry Creek. From Boise (elevation 2,800 ft.), the watersheds quickly rise to an elevation of over 6,000 ft. along the Boise Ridge. Runoff from these drainages is used primarily for aesthetic and limited irrigation purposes. Several of the watercourses have been engineered under or through heavily populated urban areas, with thousands of homes, numerous schools, hospitals, nursing homes, hazardous waste sites, and commercial properties in the potential flood zones. The foothills area includes a 12,000-acre Area of Critical Environmental Concern and is the primary ground water recharge area for the Boise Front aquifer, which is a primary source of drinking water for the city of Boise.

Soil surveys had classified 90 percent of the foothills as highly erosive lake deposits and decomposed granite. The rehabilitation team estimated that before the fire, the area routinely lost about 2 tons of soil per acre every year. Immediately after the burn, soil loss was estimated at 13 tons per acre per year. The rehabilitation team projected that the lower-elevation slopes would be prone to excessive erosion and flooding for about two years, while the upper elevations would take up to six years to fully stabilize.

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[1]*Published in Proceedings of the Seventh Biennial Watershed Management Conference, Charles W. Slaughter, editor. Water Resources Center Report No. 98, University of California, Davis (1999).*
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The pre-fire vegetation in 1996 was at high risk to wildfire as a result of many decades of fire suppression. Potential high fire intensities and resulting altered watershed conditions were seen as increasing post-fire risk of accelerated soil erosion, sedimentation, and flooding. The fire burned through land owned or managed by both public and private entities: Boise National Forest 3,160 acres; Bureau of Land Management 4,180 acres; State of Idaho 2,120 acres; Private/City/County 5,840 acres; total fire area 15,300 acres. Four drainages — Curlew and Freestone Gulches in Cottonwood Creek, Hulls Gulch, and Crane Creek — burned from the edge of Boise to their timbered headwaters.

The 8th Street Fire was contained on August 31 and declared controlled on September 2, 1996.

Post-fire Flooding in Boise

There is a history of damaging debris flows and floods following summer thunderstorms on burned slopes in the foothills above Boise. Damaging floods in 1959 (following three foothills fires: Rocky Canyon Fire, 1957, 2,100 acres; Toll Gate Fire, 1958, 650 acres; Lucky Peak Fire, 1959, 9,517 acres) carried large quantities of mud, rocks, and debris into the city of Boise and onto the lowlands east of Boise. Peak discharges in Cottonwood Creek were as high as 9,500 cubic feet per second and 5,380 cubic feet per square mile. The mass of debris (sediment and rocks) transported from these floods was estimated at over 250,000 tons. About 50 blocks of Boise were covered by mud and water with several hundred acres of farmland covered by mud, rocks, and water (a large portion, which is now in urban development). Loss of life was averted by timely efforts of police and nearby residents who warned those in the path of the floods. Flood damage estimates to and around the city of Boise were $500,000 (1959 dollars).

The city of Boise since 1959 has greatly increased in the area, density, and types of development which puts life and property in Boise at a much greater risk than in 1959. The population of Boise in 1960 was approximately 34,000; by 1996 it had increased almost five-fold to 160,000. The Eighth Street fire burned a much larger area and several complete watersheds as compared to the three smaller fires leading up to the flooding in 1959. All of these watersheds drain through and under Boise.

Due to the threat of flash floods and mud slides, the City of Boise declared a local disaster emergency and the Governor of Idaho declared a state of emergency for Ada and Boise counties. The area that was particularly vulnerable contains at least 12 schools, three hospitals, 65 child-care facilities, 25 long-term care centers, and numerous public buildings, including the Federal Building, State Capitol, and City Hall. The area of vulnerability includes over 7000 housing units, has a daytime population of 37,400 and a nighttime population of 16,700 persons, and estimated total private property valuation in excess of $740 million (public property not included).

ACTION TAKEN

Initial Reconnaissance Survey Team

On August 28, less than 2 full days after the fire began, an interdisciplinary/interagency reconnaissance survey team (Forest Service and BLM) was established. This team completed a reconnaissance survey to initially identify issues, agencies, needed disciplines, tentatively locate flood source areas, and determine a plan of action for the BAER (Burned Area Emergency Rehabilitation) team if deemed necessary. This reconnaissance team included the disciplines of hydrology, soils, range, recreation, wildlife, and economics (cost/risk analyst).

The reconnaissance survey concluded that a full BAER survey team was definitely necessary, based on the extreme risk to life and property from potential flood source areas in several watersheds. There was need to notify city and county officials immediately of potential threat of post-fire flooding, accelerated soil erosion and loss of soil productivity. The reconnaissance survey identified several specific issues, including: 404/401 Stream Channel Alteration Permits and Certification would be needed; Heritage Resource assistance would be needed; road access to Bogus Basin Area Ski Area Resort was threatened; numerous towers associated with two large high-voltage interstate power lines may be at risk to flooding/landslides; fire suppression-related surface disturbance, such as bulldozer and hand firelines, if not properly rehabilitated, could substantiality add to risk of soil erosion and flooding; critical big game winter range area for elk and mule deer, and an important grazing allotment, were included in portions of the burned area; three sensitive plant species were identified within the fire area. There was an overall safety concern for data collection and treatment implementation activities.

Loss of an extensive recreational area was a specific concern during and following the BAER survey and implementation activities. This is a major recreation use area for the city of Boise, with an estimated 10,000 visitors per week using the area during the summer for hiking, jogging, mountain biking, trail bikes, horse riding, recreational atv's, and so on.

The 8th Street Fire BAER Survey Team

The interagency BAER survey team had the range of technical skills needed to evaluate site conditions that indicate the effects of the fire on the watershed.

· Hydrologists
· Administrative Officer
· Soil Scientist
· Contracting Specialist
· Recreation
· Public Affairs Specialist
· Geologist/Geomorphologist
· Writer/Editor
· Botanist
· Computer/GIS Services
· Ecologist
· Financial Management
· Cultural Resources
· Infrared Photo Interpreter
· Civil Engineer
· Local Forest Representative
· Range/Plant Materials
· Fire Management Specialist
· Reforestation Specialist
· Visuals/Landscape Architect
· Climatologist
· Wildlife Biologist
· Research
· Law Enforcement

Agencies represented included:

· Boise City Engineering Department
· Ada City-County Emergency Management
· USDA Natural Resources Conservation Service
· USDA Forest Service National Forest Systems
· USDA Forest Service Research
· USDI Bureau of Land Management
· Idaho Department of Lands
· Idaho Department of Water Resources
· Idaho Department of Environmental Quality
· National Weather Service
· Idaho Department of Fish and Game
· United States Geological Survey
· USDA Agricultural Research Service
· US Army Corps of Engineers
· Idaho Power, Inc.
· Bogus Basin Ski Area Resort
· State Bureau of Disaster Services
· U.S. Navy's "Blue Angels"

The team leaders were responsible for assembling and managing the burned-area survey team and for ensuring the survey was completed promptly, to allow completion of the Interagency Fire Rehabilitation Report and subsequent individual agency BAER reports requesting authorization of funding. The Core Teams were:

Hillslopes and Stream Channels (two teams): These teams were comprised of a soil scientist, hydrologist, geologist/geomorphologist, and botanist/plant materials specialist. Their assignments were to evaluate the post-fire conditions of the hillslopes and stream channels while identifying and prescribing treatments for emergency watershed conditions. The field data sheets (HO-4) identifies the minimum data collected by these teams.

Roads and Trails (two teams): These teams were comprised of a hydrologist, civil engineer, and recreation specialist. Their assignments were to evaluate the post-fire conditions of the roads and trails while identifying and prescribing treatments for emergency watershed conditions.

Other teams which covered the entire fire area included: cultural resources; wildlife biologist, T&E plants, range management, landscape architect, and timber/reforestation. These teams worked with the core teams assigned to each watershed and assisted in describing the emergency situation and developed potential treatment measures compatible with their resources.

Additional specific data collection needs or processes initiated during the BAER survey included:

· Review of watersheds drainage through, under, and around the city of Boise and Ada County to assist in determination of risk and exposure to life and property.

· Estimate cost of property and potential lives at risk from flooding.

· Stream Channel Alteration Permit 404/401 process.

· Determination of risk to the Bogus Basin Ski Area and estimating cost associated with loss of this road to the ski area.

· Field review with Idaho Power engineers to determine risk to the two large powerlines and numerous towers crossing the fire area.

· Daily public media field trips and briefings.

· Collection and analysis of climatological (precipitation data)

· Location and development of rehabilitation criteria for fire suppression related efforts such as dozer and hand lines.

Treatment Objectives

Protection of life and property was the primary objective of all treatments. As identified above, there is a signifi-

cant risk to life and property with a history of actual post-fire flooding to Boise and adjacent areas. The need for immediate implementation of treatments providing maximum reduction in risk to life and property was obvious. However, the decision to use contour trenching with the potential long-term visual impact to Boise required intensive design, testing, analysis, public input, and unanimous support and approval by Boise city and Ada county officials.

The secondary objective was to retain soil onsite to preserve soil productivity, which is foundation for restoring and sustaining the health of these watersheds above Boise. Theses foothills and watersheds provide an important playground and scenic backdrop for Boise and are often referred to as the "Soul of Boise". Rehabilitating these watersheds to avoid long-term disruption of hillslope and stream channel processes is essential.

The remaining objectives focused on the recreational and wildlife resources.

Development of Treatment Alternatives

The selection of treatment measures was based on four considerations: Treatments necessary to protect soil and water resources from unacceptable loss or to prevent unacceptable downstream damage; Treatments that are proven effective and are feasible to implement prior to damage producing storms; Treatments that are environmentally and socially acceptable and compatible with long-term restoration needs; Treatments that have minimal costs while providing essential protection.

Additional considerations included: Need to implement treatments prior to the first damaging storm; Availability of supplies; Access to the areas needing treatment; Work force and equipment availability; Effectiveness of the treatment measures; Possibility of climatic events of more severity than designed for.

Four alternative treatment scenarios were identified:

1. No Action - allow for natural processes to occur while accounting for potential flood threats.

2. Treatments based on similar post-fire watershed conditions but assuming there was no threat to life and property downstream.

3. Maximum treatment to reduce the threat to life and property (without trenching).

4. Maximum treatment to reduce the threat to life and property (including trenching).

It was strongly emphasized from the beginning and continues to be emphasized that none of the alternatives could completely eliminate the potential impacts and risk to the city of Boise from a severe storm.

The final Rehabilitation Report outlined four alternatives ranging from Alternative I (no action) to Alternative 4 (high level of mitigation). The team determined that Alternative 4, Maximum Treatment, was preferred but was contingent upon the input on social acceptance from the city and county leaders and concerned public.

Alternative 4, Maximum Treatment, was ultimately selected and implemented. Alternative 4 recommended:

- Contour felling and hand trenches in forested area
- Contour trenches just below the tree line
- Straw-bale check dams in small stream basins
- Straw wattles on selected slopes
- Tillage on the more gradual slopes
- Seeding and planting

That decision ultimately withstood close scrutiny from several teams of scientists, including a private-industry team commissioned by the Mayor of Boise and a team formed by the Idaho Bureau of Disaster Services.

Treatment Summary

- Log terraces were constructed on 350 acres of burned forest land at the highest elevations.

- At high elevations below treeline, mini-excavators were utilized to construct about 40 miles of trench on 750 acres of steep (40-65 % slope) burned land. Trenches are 2 _ to 3 feet wide and 2 to 3 feet deep, spaced about 75 to 120 feet apart vertically, and partitioned by check dikes at 50-foot intervals to reduce the potential for failure of an entire trench if a local breach were to occur.

- About 1600 acres of moderately steep (30-50 % slope) burned land was treated with straw wattles installed on the contour in a checkerboard fashion, to assist in interrupting overland runoff. Wattles are made of rice straw and photodegradable mesh; individual wattles are 8 inches diameter by 25 feet long, weighing 35 pounds.

- Straw bales were used to build 2,230 check dams across strategid stream channels. Straw bales were wrapped in chicken wire or photodegradable mesh and positioned across the channel in a shallow trench; erosion cloth was draped in

front of and across the bales, to allow water to flow through but hold soil in place.

Mechanical tillage was accomplished on about 700 acres, to increase direct infiltration of rainfall into the soil mantle.

During the fall of 1996, drill seeding, hand seeding and aerial seeding was accomplished on several thousand acres, using a mixture of grasses and forbs. Some bitterbrush seed was added through dribblers and hand planting by volunteers. In the 1996-1997 winter, part of the burn was aerially seeded with a mixture of basin big sagebrush, mountain big sagebrush, alfalfa, and western yarrow. In spring of 1997 23,000 bitterbrush seedlings and 6,700 silver sagebrush seedlings were planted. It is planned that an additional 180,000 bitterbrush seedlings will be planted on the burn during the next several years.

INTERAGENCY COOPERATION

A Multi-Agency Coordination (MAC) Group was established for the 8th Street Fire which included the BLM District Manager, Boise National Forest Supervisor; Area Supervisor for Idaho Department of Lands; and NRCS Assistant State Conservationist. The purpose of the MAC Group was to iron out any differences between agencies, give unified direction, and review outcomes to make sure goals were met. Adaptive management continued throughout the effort and was the only way to be successful.

There were many minor differences to overcome, but none were big enough to prevent treatment of the burned landscape. Because of necessary coordination among agencies, unit-area cost of treatment was higher; 404 permitting could have gone more smoothly; use of GPS in the very beginning could have resulted in lower contract costs; basic agency differences in policy interpretation caused some difficulties; trespass and access agreements with landholders should have been worked out beforehand to the extent possible.

There were many things that went right. Recommended treatments extended from top to bottom of the watershed and crossed over different land ownerships. Partners pulled together to implement a sound plan – a plan that was validated by the subsequent September 11, 1997, storm and related flood event in Crane Creek. The agencies proved that they could overcome policy differences and get projects done within extremely limited time frames

Communication among agencies at all levels has improved because of this cooperative effort.

HYDROLOGIC RESEARCH

While immediate concern about post-fire consequences centered on hydrologic effects, lack of direct information on infiltration conditions on the Boise Front forced decision makers to make assumptions about the degree and duration of impact the fire had on infiltration. Management decisions were then made based on those assumptions. Treatments were chosen based on the assumption that the fire had drastically reduced the infiltration capacity and increased the erodibility of the foothills.

In the summer of 1997 the Northwest Watershed Research Center, USDA-ARS, began investigating fire impacts on infiltration in the Boise Foothills. The objective was to quantify differences in infiltration capacity, runoff and erosion between burned and unburned areas one and two years following the fire. Utilizing a newly-designed rainfall simulator, water was applied at a rate of 2.65 in/hr and runoff samples were collected and analyzed for runoff volume and sediment concentration.

The fire had the greatest impact on intensely burned south-facing slopes, where infiltration capacity was reduced from 2.1 to 1.3 in/hr. North-facing slopes also showed a significant fire effect, but the reduction in infiltration capacity was nearly half (0.4 in/hr) that found for the south-facing slopes. Runoff consistently began between two and four minutes after the rainfall started.. This very rapid response helps explain why the Boise Front experienced minor flooding in September, 1997, following a thunderstorm of moderate intensity that lasted only nine minutes.

CONCLUSIONS

Even though the 8th Street Fire rehabilitation project had the unanimous support of local and state elected officials and broad support from local residents, by late August, 1997, (the first anniversary of the fire) the decision to accomplish aggressive rehabilitation and flood control work was still being questioned by some residents. Their rationale was that very little erosion had occurred in the damaged Foothills despite an unusually wet winter and spring, while many unburned areas had experienced heavy damage from mud slides. However, we have heard little if any criticism since September 11, 1997, when a 9-minute rainstorm dropped nearly half an inch of rain on a small portions of the burned area, sending muddy water and debris down two major watersheds. The relatively small amount of water and mud that flowed into residential areas at the fringes of the foothills left little doubt that the treatments had helped minimize the damage.